An Examination of the Learning Styles of Brazilian Senior High School Students Attending Public and Private Schools in a Metropolitan Area of Brazil

By

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Abstract

The need to continue learning throughout life challenges students in all nations (Kodrzycki, 2003; Souza, 2003). Students are called to "learn how to learn", master learning strategies and take ownership of their own learning (De Vita, 2001; Renzulli & Dai, 2001). Educators are called to acknowledge and understand that students learn in a different way and are thus, pressed to diversify instructional techniques used in the classroom (Cassidy, 2004). In this context, the knowledge of individual learning styles can become an essential tool to assist students and educators. Learning styles have been researched to a great extent in United States, however little is known about Brazilian students' learning styles, especially in secondary education, which is the last step for the majority of students in Brazil. This study sought to make a contribution to the discussion of learning styles, as it investigated the relationship between learning styles of Brazilian senior high school students and the type of school attended - public or private school. This study also examined the relationships between students' learning styles and gender, age, attitudes toward school and their plans to attend college. The Portuguese version of the Felder-Solomon Index of Learning Styles was administered to 351 students. Overall findings of this study indicated that the majority of Brazilian students were active, sensing, visual and sequential learners. The results suggested a significant relationship between visual/verbal students' learning styles and the type of school attended. Results also yielded statistical significance for sensing/intuitive students'

learning styles, and gender. Results indicated statistical significance for sequential/global

students' learning styles and age. The findings indicated that verbal students like school

more than visual students. The majority of students indicated they plan to attend college.

However, the results suggested that there was no significant relationship between

students' learning style and their plans to attend college. Implications of this study

include: educators need to be aware of diversity of learning styles found in the classroom,

and educators should acknowledge that learning styles differences present a potential to

influence student learning, motivation, and attitudes toward school.

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List of Abbreviations

ELT   Experiential Learning Theory

ENEM   National Secondary Education Examination

FSLSM   Felder-Silverman Learning Style Model

IBGE   Brazilian Institute of Geography and Statistics

ILS   Index of Learning Styles

INEP   National Institute for Educational Studies and Research

IRB   Institutional Review Board

MEC   Brazilian Ministry of Education

UNESCO   United Nations Educational, Scientific and Cultural Organization

Chapter 1

Introduction

Learning how to learn is central to education today. The constantly changing world

requires that educators make the transition from a teaching paradigm to the new learning

paradigm. The new learning paradigm challenges educators to maximize learning in the

classroom and empower students with skills necessary to become lifelong learners (Barr & Tagg,

1995; Fear et al., 2003).

Furthermore, students are called to "learn how to learn", master learning strategies and

take ownership of their own learning (De Vita, 2001; Renzulli & Dai, 2001; Souza, 2003). De

Vita (2001) stressesed that students are expected to develop the "ability to adapt and respond

effectively to different learning stimuli and environments" (p. 172) and also to "evaluate

personal strengths and weaknesses…and plan as well as monitor self-development" (p. 172).

Wirth and Perkins (2008) emphasized that learning how to learn allows students to "continue

learning with greater effectiveness and is a particularly important skill with the recent explosion

of knowledge and technology" (p. 5).

In this context, the knowledge of individual learning styles can become an essential tool

to implement the new learning paradigm. Knowledge of individual learning style preferences

will help students see themselves as learners, which will lead them toward more engagement in

the learning process and improve their effectiveness as learners. Students' awareness of their

learning style preferences can lead to improving performance and learning outcomes (Claxton &

Murrell, 1987; Claxton & Ralston, 1978; Pritchard, 2005; Rassool & Rawaf, 2007; Strang, 2010). When students understand more about their own preferences for learning, they are also learning how to learn, which is "an empowering experience that students need if they are to be successful lifelong learners" (Claxton & Murrell, 1987, p. iv).

Learning involves the reception and processing of new information. The way students take in, process, and recall information varies in form and degree of effectiveness (Felder & Spurlin, 2005; James & Galbraith, 1985). Student learning may occur through seeing and hearing; reflecting and acting; reasoning; memorizing; and "steadily and in fits and starts" (Felder & Silverman, 1988, p. 674).

Researchers refer to the way students attempt to receive new information, and connect it to previous knowledge and experiences, as their learning style, or preferred learning style (Felder & Brent, 2005; Felder & Spurlin, 2005; James & Galbraith, 1985; Silver, Strong & Perini, 2000). Learning styles can be defined in several ways depending on the approach and schools of thought (Claxton & Murrell, 1987; Curry, 1983; Smith & Dalton, 2005). Smith and Dalton (2005) pointed out that some researchers view individual learning styles as "static and commonly applied to all learning situations" (p. 43). Others believe that individual learning styles can "vary with context and content" (p. 44). Still others argue that the learning styles of an individual have some characteristics that are stable and other characteristics that are influenced by environment (Keefe & Ferrell, 1990). Despite these differences, learning style theories have a common focus – the unique differences in learning, and how individuals learn (Dunn & Griggs, 2000; Evans, Cools, & Charlesworth, 2010; Felder & Brent, 2005; Felder & Spurlin, 2005; Prices & Milgram, 1993; Silver, Strong & Perini, 2000).

Recent studies about learning styles indicate a continued interest in this subject and its influence on students' learning processes (Cook & Smith, 2006; Durham-Thompson, 2005; Evans, Cools, & Charlesworth, 2010; Felder & Brent, 2005; Felder & Spurlin, 2005; Hlawaty, 2009; Mestre, 2010; Pallapu, 2009; Penger, Tekavcic, & Dimovski, 2008; Platsidou & Metallidou, 2009; Smith & Dalton, 2005). Rassool and Rawaf (2007) emphasized that understanding students' learning styles preferences can enhance learning. Graf, Viola, Leo, and Kinshuk (2007) stated that "incorporating learning styles in teaching plans may make learning easier and leads to better achievement" (p. 79).

Curry (1983) emphasized that research has "...come to positive conclusions about the relationship between learning style and improved educational (teaching and learning) outcomes" (p. 4). Keefe (1979) stated that the diagnosis of student learning styles provides the "most powerful leverage yet available to educators to analyze, motivate, and assist students in school… it is the foundation of a truly modern approach to education" (p. 132). Keefe also emphasized that a "student's learning style provides the road map for personalized education and for training and/or matching strategies" (p. 138).

The application of learning styles theories can assist educators to design more effective instruction and place students in learning situations that are appropriate for them (Keefe, 1979). Learning styles theories when applied to the classroom raise awareness in both teacher and learner that each one has different ways of learning and those differences should be addressed for teaching to be effective and learning to take place (Claxton & Murrell, 1987; Pritchard, 2005).

Furthermore, research from other countries has demonstrated that learning styles affect the way students learn and the way students respond to new learning experiences. Significant relationships have been identified among learning styles preferences, gender, age, school grade,

area of study, academic achievement (high versus low), cultural background and ethnicity (Cagiltay & Bichelmeyer, 2000; Cagiltay, 2008; Honigsfeld, 2001; Leahy, Gaughran, & Seery, 2009; Leino, Leino, & Lindstedt, 1989; Lovelace, 2005; Rassool & Rawaf, 2007; Tatar & Dikici, 2009). As researchers agree on the benefits of knowing one's learning style, Wechsler (1993) recommended that:

> Research on learning styles should be conducted in different countries in order to know which is the best means to increase educational achievement in different parts of the world, and which are the highest priorities for people in different cultures. The importance of these factors may vary from one culture to the other, depending on their respective values or social rewards for specific behaviors and achievements. (p. 209)

Statement of the Problem

Educational literature concerning student learning styles in the U.S. has been a subject of interest and discussion in the last four decades. As a result, there are numerous studies on learning styles (Akella, 2010; Biggs, 2001; Cassidy, 2004; Cassidy & Eachus, 2000; Coffield, 2006; Coffield, Moseley, Hall, & Ecclestone, 2004; Cooper, 2009; Curry, 1983, 1990a, 1990b, 2000; Dunn, 2009; Dunn & Griggs, 2007; Dunn et al., 2009; Evans, et al., 2010; Gantasala & Gantasala, 2009; Graf, Lin, & Kinshuk, 2008; Hall, 2005; James & Galbraith, 1985; Keefe, 1985, 1987, 1988, 1989; Lemire, 2002; Pallapu, 2009; Penger, et al., 2008; Price, 2004; Renzulli & Sullivan, 2009; Sternberg & Zhang, 2001).

This body of research has been used to influence curricula and practice in education. However, the results of these research have not been extended to other countries since individuals' learning styles may be influenced by different cultural backgrounds and ethnicity (De Vita, 2001; Dunn & Griggs, 1995b; Griggs, 1993; Griggs & Dunn, 1989; Joy & Kolb, 2009; Ku & Shen, 2009; Pak & Sands, 1996; Wu & Alrabah, 2009; Yamazaki, 2005; Zhang & Lambert, 2008).

In Brazil, research focusing on learning styles in still in its infancy. Little has been published on student's learning styles in Brazil, and the focus of studies has been on higher education (Almeida & Silva, 2004; Portilho, 2005; Silva & Neto, 2007; Sobral, 1992). Few Brazilian students go on to attend university (Brock & Schwartzman, 2004; The Brazilian Institute of Geography and Statistics [IBGE], 2010; Wechsler, 1993) therefore, learning styles research should be conducted at the secondary school level.

In addition, the few studies that have been conducted in Brazilian K-12 schools used the same instrument - The Dunn, Dunn, and Price learning styles inventory (LSI), to identify students' learning styles (De Paula, 2002; De Paula, 2004; Milgram, Dunn, & Price, 1993; Torres, Almeida, & Wechsler, 1994; Wechsler, 1993). Thus, there is a need to increase and diversify knowledge about students' learning styles at the primary and secondary school levels through the use of other instruments and further research.

Purpose of the Study

The purpose of this study was to examine the relationship between learning styles of Brazilian senior high school students and the type of school attended, public or private schools. The Brazilian public school system has been criticized for the quality of education offered. Public schools, normally, serve students from low-income neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). This study also investigated the relationships between Brazilian senior high school students' learning styles and gender, age, attitudes toward school and their plans to attend college. The Portuguese language version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global.

Significance of the Study

The results of this research added to the body of knowledge about learning styles an examination of Brazilian senior high school students' learning styles. This information may be helpful in enhancing Brazilian educational practices. Claxton and Murrell (1987) stated that information on learning styles can help educators "become more sensitive to the differences students bring to the classroom. It also can serve as a guide to the design of learning experiences that either match, or mismatch, students' style" (p. 77).

This study might provide insights to college faculty in designing instructional materials for incoming freshman students. Felder and Spurlin (2005) agreed that an important application of learning styles is to support the design of effective instruction:

> Having a framework for identifying the different types of learners can help an instructor formulate a teaching approach that addresses the needs of all students. Moreover, determining the learning style profile of a class using an instrument such as the Index of Learning Styles (without being overly concerned about which student has which preferences) provides additional support for effective instructional design. (p. 105)

This study may assist Brazilian students by making them aware of their learning style preferences. This awareness could lead to improved study skills and increase their confidence as learners. Also, being aware of their preferences in learning might empower the students to take charge of their own learning. Felder and Spurlin (2005) recognized the value of identifying and making students aware of their learning styles: "Doing so can provide them with valuable clues about their possible strengths and weaknesses and indications of things they might work on to improve their academic performance" (p. 105).

Research Questions

This study addressed the following research questions:

1. What is the relationship between Brazilian senior high school students' learning styles as measured by the Index of Learning Styles and the type of school attended, public or private?

2. What is the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, based on gender and age?

3. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitudes toward school?

4. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college?

Limitations

1. A Portuguese version of the Index of Learning Style was used to collect the data. The Portuguese version of the ILS has been used in other studies in Brazil (Almeida & Silva, 2004; Pereira, Kuri & Silva, 2004; Silva & Neto, 2007; Soto, Azevedo, Cunha, & Andrade, 2008); however the validity and reliability of the Portuguese version have not been identified yet.

2. The data were collected from Brazilian senior high school students enrolled in public or private school in Belo Horizonte-Brazil. The results may not be representative of students in other areas of Brazil.

Assumptions

The following assumptions were made for the purpose of this study:

1. The instructions provided to students before the data collection were clear and accurate.

2. The Portuguese version of the Index of Learning Style is a suitable instrument to identify learning styles preferences.

3. Participants understood the survey questions and reported honestly and consistently.

4. The results as reported on the Index of Learning Style reflect participants' learning styles.

Definition of Terms

Terms used in this study:

1. *Brazilian Private School:* Private schools are tuition-based. They serve middle and upper-class students. Normally, private schools are well equipped and emphasize preparation for entrance exams in college (Brock & Schwartzman, 2004).

2. *Brazilian Public School:* Public schools in Brazil are tuition-free. They offer 3 sessions of 4 hours of instructions per day. Normally, public schools are located and serve students in low-income neighborhoods.

3. *Felder-Silverman Learning Styles Model:* This model Classifies students according to where they fit on four dimensions - active/reflective, sensing/intuitive, visual/verbal, and sequential/global - pertaining to the ways they receive and process information (Felder & Silverman, 1988).

4. *Index of Learning Styles (ILS):* ILS is a self-scoring questionnaire designed by Richard Felder and Barbara Solomon to assess individuals' preferences on the four dimensions of the Felder-Silverman Learning Styles model: active/reflective, sensing/intuitive, visual/verbal, and sequential/global.

5. *Learning Paradigm:* It is a concept developed by Robert Barr and John Tagg in 1995. The authors proposed that higher education should embrace a shift from the instruction paradigm to a new Learning Paradigm. Among other changes the Learning Paradigm requires that students take responsibility for their own learning.

6. *Learning Styles:* The way students attempt to receive new information, and connect it to previous knowledge and experiences. Learning styles theories have a common focus on the unique differences in learning, and how individuals learn (Felder & Spurlin, 2005; Silver, Strong & Perini, 2000).

7. *Senior High School Students:* Individuals in the last year of the secondary education, enrolled in public or private school in Brazil, this is comparable to 12th grade in U.S. schools. Secondary education is not mandatory in Brazil. High school students have the option to attend school in the morning or evening sessions. Students already in the workforce attend school in the evening sessions.

Organization of the Study

In this chapter an introduction to the study was presented. The research questions, purpose, statement of the problem, significance, and limitations of the study were discussed. The chapter also included the definitions of terms used in the study. Chapter 2 provides a review of literature related to the study. It presents a discussion of learning in today's society; an overview of the Brazilian educational system; and a summary of the current knowledge about learning styles. It also reviews influential learning style theorists; the learning style model developed by Felder and Silverman (1988) and the instrument associated with the model – Index of Learning Styles. Learning style studies concerning the research questions proposed in this study are also included.

Chapter 3 presents the design of the study; describes the participants; explains the data collection method; provides a summary of the demographic information sheet; and describes the Index of Learning Styles (ILS). A discussion of the validity and reliability of the ILS is included. In addition, Chapter 3 identifies the data analysis used in the study. Chapter 4 includes the demographic profile of the participants. Further, it presents the results of the chi-square, the multiple linear regression and logistic regression analysis. Chapter 4 concludes with a summary of the results. Chapter 5 discusses the results, conclusions, implications, and recommendations for practitioners and future research.

Chapter 2

Review of Literature

Introduction

In today's fast paced society, the need to learn how to learn and to continue learning throughout life challenges young adults in all nations (Kodrzycki, 2003; Souza, 2003). The constantly changing world requires that educators make the transition from a teaching paradigm to a learning paradigm. The learning paradigm challenges educators to maximize learning in the classroom and empower students with skills necessary to become lifelong learners (Barr & Tagg, 1995; Chickering & Gamson, 1999; Fear, et al., 2003; Renzulli & Dai, 2001).

Educators are called to acknowledge and understand that students learn in different ways and are thus, pressed to diversify instructional techniques used in the classroom (Cassidy, 2004). Kuh, Kinzie, Schuh, and Whitt (2005) claimed that "interest in creating the conditions that enhance student learning and supporting students in achieving their educational goals is at an all-time high" (p. 3). Chickering and Gamson (1987) emphasized that educators should "respect [students] diverse talents and ways of learning" (p. 5). Furthermore, they stated that "students need the opportunity to show their talents and learn in ways that work for them" (p. 5).

Students also, are called to learn how to learn, master learning strategies and take ownership of their own learning (De Vita, 2001; Renzulli & Dai, 2001; Souza, 2003). De Vita (2001) stressed that students are expected to develop the "ability to adapt and respond effectively to different learning stimuli and environments" (p. 172).

The challenge of preparing students to become lifelong learners is strong in secondary education in countries like Brazil, where secondary education is the last step for the majority of students (Brock & Schwartzman, 2004; Milgram, et al., 1993; Torres, et al., 1994). In 2002, 9% of Brazilian high school graduates, ages 18-25, were enrolled in college (National Institute for Educational Studies and Research [INEP] 2003; United Nations Educational, Scientific and Cultural Organization [UNESCO] 2004).

The purpose of this study was to examine the relationship between learning styles of Brazilian senior high school students and the type of school attended, public or private schools. The Brazilian public school system has been criticized for the quality of education offered. Public schools, normally, serve students from low-income neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). This study also investigated the relationships between Brazilian senior high school students' learning styles and gender, age, attitudes toward school and their plans to attend college. The Portuguese language version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global.

This chapter presents a brief discussion of learning in today's society. Challenges and demands students face are addressed. An overview of the Brazilian educational system is presented next. After that, a summary of the current knowledge about learning style, its definition and its implication to student learning is addressed. Subsequently, this literature review reviews influential learning style theorists and discusses their contributions to the advancement of the topic, the learning style model developed by Felder and Silverman (1988), and the instrument associated with the model – Index of Learning Styles. Learning style studies relating to the research questions proposed in this study are also reviewed.

Learning in Today's Society

Learning is a complex and fascinating process that challenges and empowers each one who pursues it. Each student approaches learning in a unique way. As stated by Cooper (2009) learning is a "personal process that each student experiences alone … the actual cerebral process of learning is unique to the student acquiring the knowledge, skills, and/or dispositions inherent in a particular topic" (p. 284).

As economic and educational globalization takes place, students are expected to take responsibility for their own learning. New information and changing technology call for students to become lifelong learners. It is essential that individuals engage in learning in the classroom and beyond the educational systems (Aljojo, Adams, Alkhouli, Fitch, & Saifuddin, 2009; Avis, Fisher, & Thompson, 2010; Hall, 2005; Hall & Moseley, 2005; Jarvis, 2004; Kodrzycki, 2003).

Kolb (1984) described learning as a continuous process that "occurs through the active extension and grounding of ideas and experiences in the external world and through internal reflection about the attributes of these experiences and ideas" (p. 52). Learning is the "process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it" (p. 41). Kolb focused on the individual process of learning. He reinforced that the "learning process is not identical for all human beings" (p. 62). Kolb and Kolb (2005) asserted that "learning is the major determinant of human development and that how individuals learn shapes the course of their personal development" (p. 4).

Freire (1970) concured that learning is a continuous process. He emphasized that learning is a deliberate process of creating knowledge. Freire stated that "for apart from inquiry, apart from the praxis, men cannot be truly human. Knowledge emerges only through invention and re-

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invention, through the restless, impatient, continuing, hopeful inquiry men pursue in the world, with the world, and with each other" (p. 58).

Gagné (1977) focused on the outcome of learning. He identified learning as an ongoing process that brings about changes. He defined learning as a "change in human disposition or capability, which persists over a period of time, and which is not simply ascribable to the processes of growth" (p. 3). London (2011) added that:

> learning is all about change, and change drives learning.…Change creates opportunities and imposes demands.…Learning can bring about change by creating new capabilities and opening the door to new and unexpected opportunities…[learning] has the potential to empower a person to influence the future, providing choices that would not be available otherwise. (p. 3)

London (2011) stated that students' achievement improve when students "learn in a way that lets them capitalize on their strengths and compensate for and remediate their weaknesses. As such, instruction and assessment should be diverse to allow for learner-guided methods for encoding and applying subject matter" (p. 5). Thus, the educational system should strive to "meet the learning needs of each student as an individual learner" (Cooper, 2009, p. 283).

Learning how to learn, mastering learning strategies and taking ownership of their own learning is a necessity faced by all students (Barr & Tagg, 1995; Bransford, Brown, & Cocking, 2000; De Vita, 2001; Fear, et al., 2003; Paul & Elder, 2009; Wirth & Perkins, 2008). Students are expected to develop the "ability to adapt and respond effectively to different learning stimuli and environments" (De Vita, 2001, p. 172), and also to assess their weakness and strengths, plan their personal development and monitor progress. Wirth and Perkins (2008) emphasized that learning how to learn allows students to "continue learning with greater effectiveness and is a particularly important skill with the recent explosion of knowledge and technology" (p. 5).

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Souza (2003) considered that the primary goal of education should be helping students develop the ability for continuous learning. He stated that "today it is necessary to learn how to learn. It is no longer acceptable to concentrate education in just one period of our lives. To exercise citizenship in any aspect, it is necessary to keep learning our whole lives" (p. 94).

Simplicio (2007) discussing characteristics of today's students, calls attention to the fact that "although millennial students are better informed, more technologically savvy, and worldlier, they are also more diverse, more demanding, needier, and harder to teach than any other students in the past" (p. 2). Cassidy (2004) recognized that "educators in all fields are becoming increasingly aware of the critical importance of understanding how individuals learn" (p. 420). The focus on teaching is being replaced by the urgent need to focus on how to promote student learning. In this context, the knowledge of individual learning styles becomes a critical tool for helping educators advance the transition from a teaching paradigm to a new learning paradigm (Barr & Tagg, 1995; Chickering & Gamson, 1987, 1999; Fear, et al., 2003).

Knowledge of individual learning styles will assist students to see themselves as learners, and become more engaged in the learning process, and improve their effectiveness as learners. Students' awareness of their learning style preferences can lead to improving student's performance and learning outcomes (Claxton & Murrell, 1987; Claxton & Ralston, 1978; Pritchard, 2005; Rassool & Rawaf, 2007; Strang, 2010).

While students understand more about their own preferences for learning, they are also learning how to learn, which is "an empowering experience that students need if they are to be successful lifelong learners" (Claxton & Murrell, 1987, p. iv). Bostrom and Lassen (2006) stressed that "being able to recognize and evaluates one's learning style is a key means of reflecting on one's own thinking processes" (p. 186). Paul and Elder (2007) highlighted that

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"what is worth learning is worth learning well, and there is nothing better worth learning than the very process of learning itself" (p. i).

<div align="center">Overview of Brazilian Educational System</div>

Brazil has been described as a land of inequity (Brock and Schwartzman, 2004; McCowan, 2007; UNESCO, 2011). Economic inequity is reflected in the country educational system. Brock and Schwartzman (2004) emphasized that "Brazil is known for having one of the world's highest levels of income inequality, and this is strongly related to education" (p. 12). A large country, occupying nearly half of South America and with a multiracial population of approximately 192 million inhabitants, Brazil is one of the nine highly populated developing countries which faces challenges to achieve basic quality education for its people (IBGE, 2010; UNESCO, 2006). The United Nations Educational, Scientific and Cultural Organization's report stated that "Brazil is ranked among the 53 countries that have not achieved – and are not about to achieve – the Education for All goals by 2015" (para. 1). However, according to UNESCO, education in Brazil has shown signs of improvement in the last two decades. UNESCO reported significant advances in the field of universal education that have occurred in Brazil:

- Access to primary and lower secondary education has become almost universal. 94.4% of the population in the ages 7 to 14 is now included in primary and lower secondary education.
- The proportion of young people attending secondary education at the right age has doubled compared to that of 1995, showing a significant advance in the access to secondary education.
- The rate of youth and adult illiteracy has been reduced.
- Access to higher education has increased. (UNESCO, 2011, para. 3)

The Brazilian educational system addresses basic education, which offers elementary and secondary education, and higher education. The Brazilian educational system is well described

by Brock and Schwartzman (2004). They explained that the Brazilian educational system is comprised of two main blocks:

> The first is 'basic education', which comprises eight years of 'fundamental education', for children aged 7 to 14, and three years of 'secondary education', …for youngsters aged 15 to 17….The next block is higher education, divided into a first professional, graduate level, with course programmes lasting from three to six years, granting Bachelor's degrees; and a postgraduate level for students working for Master's and doctoral degrees (… the first higher education level is often translated, in English, as 'undergraduate', and the second, as 'graduate'). Besides, there is a pre-school level, for children under seven and a wide array of specialisation, non-degre postgraduate course, lasting for a year. (Brock & Schwartzman, 2004, p. 31)

All educational levels are offered by public and private institutions. Wechsler (1993) called attention to the fact that the quality of "secondary education typically differs considerably between public and private schools; the former is generally inferior" (p. 197). The Brazilian public school system has been criticized for the quality of education offered (Castro, 2004; Zibas, 2005; Domingues, 2000; UNESCO, 2011; INEP, 2004). Public schools, for the most part, serve students from low-income neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). As explained by Brock and Schwartzman,

> Middle- and upper-class families send their children to private basic and secondary school, which are of better quality, and prepare them to be admitted to the most prestigious, public (and free) higher education insitutuions. Students from poorer families, if they get to higher education at all, can only enter the less prestigious courses in public universties, or go to private insititutions, where the courses are also of low prestige and quality, for which they have to pay. (p. 12)

UNESCO stated that "secondary education of quality helps young people realize their full human potential and take their place in society as productive, responsible and democratic citizens" (para.1). With 17.4% of its population at ages between 15-24, Brazil has challenges to promote the quality of education needed by a country in fast economic development. Within the 15-24 age group, only 14.7% are full time students, 15.6% work and study, 17.8% do housework

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and nearly half, 46.7% only work. In 2009, considering the age group 15-17, only 85.2% were enrolled in school. However, only 50.9% of those enrolled in school, were attending secondary education. The other 41% of students were still attending elementary school. This problem is even worse if less advanced Brazilian regions are considered (IBGE, 2010).

Brock and Schwartzman (2004) explained the cause of the mismatch between age group and grade attended. They revealed that in the Brazilian educational system "the main problems were quality and retention – that is, the tradition of holding the children back when they do not perform as expected in school examinations" (p. 9). Grade retention was a common practice in Brazilian schools. As a result, in Brazil "many students are not at level they should be, and there are too many adults occupying the places of young drop-outs" (Brock & Schwartzman, 2004, p. 9). Furthermore, they stated that "in secondary education, about half the students are 18 years or older, and should have already left school" (p. 10). Secondary education is offered both during the day and in the evening. The decision for attending school during the evening shift is related to the student' age and being a full time worker (Herrán & Rodríguez, 2000).

As a way to assure the quality of education offered in the country, the Brazilian Ministry of Education (MEC) has established a goal for 2021 that students completing secondary education would reach a score of 6 in the National Secondary Education Examination (ENEM). This score is comparable to what is expected by students in developed countries. Secondary students graduating from public schools are far from achieving this goal; however, students graduating from private schools already reached 5.9 for the ENEM during 2005 (IBGE, 2010). However, the majority (86.3%) of Brazilian students attending secondary education are enrolled in public schools. Brock and Schwartzman (2004) provided a description of secondary education in Brazil:

Secondary education, which has expanded enormously in recent years, is by most accounts a disaster area. Half the students in secondary education attend evening classes, many of them work and are older than they should be, and the content of their courses tends to be irrelevant …. For most, the only goal is to get the education credential necessary for the job market or for some kind of higher education opportunity. Only the private sector has retained some quality, but, even there, rote learning to get into the most prestigious university courses is widespread. (p. 30)

Brazilian educators and law makers are aware of the challenges faced at the secondary education level. Debate about the quality and inequity and recommendations for changes are present in Brazilian educational literature (Castro & Tiezzi, 2004; Domingues, Toschi, & Oliveira, 2000; Júnior, 2003; Kuenzer, 2000; Maldi & Gomes, 2003; National Institute of Educational Studies Anísio Teixeira [INEP], 2004; Zibas, 2005). Souza (2001) stressed that the "main challenge is the pursuit of increasingly high levels of quality at all levels of education" (p. 65). Several years later, UNESCO (2011) observed that "quality and equity remain a crucial challenge in Brazil, as both are essential to respond to the needs of the country and for the construction of a knowledge society" (para. 1).

Learning Styles

Educational literature concerning student learning styles has been a subject of increasing interest and discussion for the last four decades (Aljojo, et al., 2009; Braio, Beasley, Dunn, Quinn, & Buchanan, 1997; Claxton & Murrell, 1987; Claxton & Ralston, 1978; Curry, 1983, 1990a, 2000; DeBello, 1990; Desmedt & Valcke, 2002, 2004; Dunn, 1981, 1984, 1993a; Dunn & Dunn, 2005; Dunn & Griggs, 1988, 1995a, 2007; Felder, 1993; Felder & Brent, 2005; Felder & Silverman, 1988; Irvine & York, 1995; Keefe & Ferrell, 1990; Smith & Dalton, 2005; Swanson, 1995). Learning styles became prevalent during the 1970's, and served to identify individual differences in learning. As a result, there is a large body of published research on learning styles (Akella, 2010; Biggs, 2001; Cassidy, 2004; Cassidy & Eachus, 2000; Coffield, 2006; Coffield, et

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al., 2004; Cooper, 2009; Dunn, 2009; Dunn & Griggs, 2007; Dunn, et al., 2009; Evans, et al., 2010; Gantasala & Gantasala, 2009; Graf, et al., 2008; Hall, 2005; Keefe, 1985; Lemire, 2002; Pallapu, 2009; Penger, et al., 2008; Price, 2004; Renzulli & Sullivan, 2009; Sternberg & Zhang, 2001).

Research on learning styles has been used to influence curricula and practice in education. Renzulli and Dai (2001) pointed out that research on learning styles assists educators investigating the matter of "what are characteristic ways one approaches learning tasks" (p. 34). Sternberg and Zhang (2001) added that when educators consider the learning styles of students, they demonstrate understanding of the cultural and individual diversity present in the classroom, and at the same time improve both instruction and assessment. Cassidy (2004) stated that the concept of learning style "has provided some valuable insights into learning in both academic and other settings" (p. 420).

Irvine and York (1995) revealed that learning styles are an "important field of examination, particularly since learning-style theory suggests that educational experiences designed to be more congruent with student learning style may enhance academic achievement" (p. 487). Cassidy (2004) stated that "the manner in which individuals choose to or are inclined to approach a learning situation has an impact on performance and achievement of learning outcomes" (p. 420).

Kolb (1984) cautioned that "individual styles of learning are complex and not easily reducible into simple typologies" (p. 66). Learning involves the reception and assimilation of new information. The ways that students learn varies. Learning may occur by "seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing

and drawing analogies and building mathematical models; steadily and in fits and starts" (Felder & Silverman, 1988, p. 674).

Researchers refer to the way that students attempt to receive new information, and connect it to previous knowledge and experiences, as their learning style, or preferred learning style (Felder & Silverman, 1988; Felder & Spurlin, 2005; Silver, Strong, & Perini, 2000). Learning styles can be defined in several ways depending on the approach and schools of thought (Cassidy, 2004; Claxton & Murrell, 1987; Claxton & Ralston, 1978; Cook & Smith, 2006; Curry, 1983, 1990a, 1990b; Sadler-Smith, 2001; Smith & Dalton, 2005). Litzinger, Sang Ha, Wise, and Felder (2007) defined learning styles as "characteristic preferences for alternative ways of taking in and processing information" (p. 309).

A well known and accepted definition of learning styles comes from the work of Keefe (1979). He defined learning styles as the "characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 4).

Keefe (1979) asserted that cognitive factors are "internal to the information processing system and require careful training for any adaptive change" (p. 138). The affective factors are "preferential in nature and respond to both training and matching strategies" (p. 138). The psychological factors are "rooted in learner reactions to the environment and are responsive to instructional matching" (p. 138).

Smith (2005) pointed out that some researchers view individual learning styles as "static and commonly applied to all learning situations" (p. 43). Others believe that individual learning styles can "vary with context and content" (p. 44). Still others argue that the learning styles of an

individual identify some characteristics that are stable and other characteristics that are influenced by environment (Dunn, 1980, 1981, 1983, 1984; Keefe, 1988; Keefe & Ferrell, 1990).

Learning styles theories have a common focus on the individual differences in learning and how individuals learn. However, researchers use different approaches to identify the ways that individuals learn (Felder & Spurlin, 2005; Kolb, 1984; Silver, et al., 2000; Sims & Sims, 1995; Sternberg & Grigorenko, 2001).

Witkin (1954), Kagan (1964), and Myers-Briggs (1978), emphasized cognitive aspects of learning styles; others emphasize affective aspects; while still others such as Grasha and Reichmann (1974), Friedman and Stritter (1976), and Dunn and Price (1977), emphasized environmental aspects (Claxton & Murrell, 1987; Curry, 1983, 1990a; Dunn, 1993b; Dunn & Dunn, 1978; Dunn & Milgram, 1993; Griggs, 1993; Price & Milgram, 1993).

Learning styles research encompasses a variety of definitions, theoretical models, and learning styles instruments. Bostrom and Lassen (2006) state that there are more than 70 learning styles models available. In addition, the terms learning styles and cognitive styles are sometimes used interchangeably (Curry, 1983, 1990a, 1999; Desmedt & Valcke, 2002, 2004; Irvine & York, 1995; Riding & Cheema, 1991; Wilson, 1998). Curry (2000) stated that "over 100 different investigators have published some version of a cognitive or learning style measurement system resulting in conceptual fragmentation and incomparable results (p. 246). The variety of learning styles definitions and conceptual frameworks present a challenge to educators.

Trying to bring clarity and consensus to the literature of learning styles, researchers such as Curry (1983, 2000), Miller (1987), Rayner and Riding (1997), Rayner (2000), and Desmedt and Valcke (2002, 2004) have proposed ways to systematize the conceptual field of learning styles.

Desmedt and Valcke (2002, 2004) conducted an innovative and broad review of cognitive and learning styles literature. The authors used data from citation analysis to propose an alternative organization of the field and shed light on leading theoretical orientation in the literature. Citation analysis is a quantitative research method that uses citation indexes to collect data. Desmedt and Valcke identified the most cited first authors in cognitive and learning styles literature in the last four decades. They also identified authors who were cited together in both literatures or co-cited within each field, thus suggesting author clusters. These groups reveal how "cognitive style research and learning style research differ from, and relate to, one another" (p. 461).

Desmedt and Valcke's (2002, 2004) findings revealed that Kolb was frequently cited and is by far the most influential author in learning styles literature. Rita Dunn was the second most cited author and thus has a high impact on the field of learning styles. James Keefe and Lynn Curry were also among frequently cited authors in learning styles research. The contributions these authors bring to the field of learning styles will be discussed in depth in a later section.

Desmedt and Valcke (2004) found that Dunn (Dunn & Dunn, 1978) together with Myers (Myers & Myers, 1980), Witkin (Witkin, Moore, Goodenough, & Cox, 1977) and Curry (1983) formed a "theoretical orientation that is at the heart of the learning styles research" (p. 457). As stated by Desmedt and Valcke, these authors agreed that "learning styles are consistent individual differences in the way people learn, that there is no 'good' or 'bad' learning style, and that it is of prime importance that education meets the specific strengths and weaknesses of learners" (p. 457).

Desmedt and Valcke's (2004) alternative overview provides an explanation of the interchangeable use of the terms learning styles and cognitive styles. Differences between the

concept of learning and cognitive styles are evident when considering the origination of the theoretical orientations. Desmedt and Valcke identified that "most cognitive style models are developed in laboratory or clinical settings to explain individual differences in cognitive processing, and they are applied in various fields" (p. 459). The persistent attributes of cognitive styles are "stability, bipolarity and a strong independence with personality" (p. 459). Learning style models according to Desmedt and Valcke (2004) were

> developed and used in various educational contexts to explain and accommodate individual differences in learning. Learning styles are generally defined as relatively stable and consistent. It is however acknowledged that the characteristics of the learning environment and learning experiences influence their development. (p. 459)

Desmedt and Valcke's (2004) study found that Witkin's (1971; 1977) work was essential to both learning styles and cognitive styles fields. Desmedt and Valcke suggested that the conceptual misunderstanding between learning styles and cognitive styles originated from the work of authors such as, Witkin (1971; 1977), Riding (1991), and Myers (1980), who "have investigated the applications of cognitive styles in an educational context" (p. 459). Desmedt and Valcke added that "cognitive styles applied in education are being perceived as learning styles" (p. 459).

Sadler-Smith (2001) investigated the relationship between cognitive style and learning style. She administered the Learning Style Inventory (Kolb, Rubin, & Osland, 1995) and Cognitive Styles Analysis (Riding, 1991) to students at a university in the UK. The results indicated that "cognitive style and learning style are independent" (p. 615). Sadler-Smith proposed that in order to advance the field "there is a need to delineate cognitive styles and learning styles as separate constructs" (p. 610). Sadler-Smith stated that her study lends support to Curry's (1983) taxonomy, in which Curry "placed learning style in between learning preferences and cognitive style in a layered 'onion' model of individual difference constructs"

(p. 609). Curry (2000) explained that the onion model "separates instructional format preference, learning style, and personality variables" (p. 240).

Sadler-Smith (2001) recommended that future research "treat learning styles and cognitive styles as separate constructs" (p. 615). This recommended research approach was to bring some clarity in the use of these constructs. However, even today, Sadler-Smith's recommendation has not been accepted by leading researchers. The current literature still indicates a preference for what Irvine and York (1995) noted about the use of the terms learning styles and cognitive styles. Irvine and York stated that "technically, learning style is an umbrella term encompassing three distinct styles or substyles: cognitive, affective and physiological" (p. 484). Irvine and York's claim supported Keefe's (1987) earlier statement that learning style is a "broader term and includes cognitive along with affective and physiological styles" (p. 6).

Knowledge of learning styles can facilitate students' learning. Recent studies about learning styles indicate a continued interest in this subject and its influence on students' learning processes (Dunn & Griggs, 2007; Dunn, et al., 2009; Felder & Brent, 2005; Hawk & Shah, 2007; Honigsfeld & Dunn, 2009; Lockitt, 1997; Pritchard, 2005; Rassool & Rawaf, 2008). Bostrom and Lassen (2006) stated that "being able to recognize and evaluate one's learning style is a key means of reflecting on one's own thinking processes" (p. 186).

Rassool and Rawaf (2008) emphasized that understanding students' learning styles preferences can enhance learning. They go on to say that this understanding is especially important for those students who are underperforming in their studies. Keefe (1979) indicated that a "student's learning style provides the road map for personalized education and for training and/or matching strategies" (p. 138).

Research has demonstrated that learning styles affect the way students learn and the way students respond to a learning experience. Dunn and Dunn (2005) advocated that students' achievement and motivation increase when teachers take into consideration the variety of learning styles that are present in the classroom. Significant relationships have been identified among learning styles preferences, gender, age, ethnicity, cultural background, area of study and school grade (Braio, et al., 1997; Burke & Dunn, 2003; Cagiltay & Bichelmeyer, 2000; Demirbas & Demirkan, 2007; Demirkan & Demirbas, 2008; Dunn & Dunn, 2008; Dunn, 1993a, 2009; Dunn et al., 2010; Dunn & Dunn, 2005; Dunn et al., 1990; Dunn, et al., 2009; Durham-Thompson, 2005; Fritz, 2002; Gantasala & Gantasala, 2009; Gary, Debbie, & David, 2005).

Giving a learning preference survey to students is a way to help them see themselves as learners, which will lead them toward more engagement in the learning process and "improve their effectiveness as learners" (Keefe, 1979, p. 132). Keefe (1979) asserts that the diagnosis of student learning styles provides the "most powerful leverage yet available to educators to analyze, motivate, and assist students in school … it is the foundation of a truly modern approach to education" (p. 132). Irvine and York (1995) stated that:

> teachers who understand the preferred style of a student can use that knowledge to design and plan instruction and to encourage students to experiment with a wider repertoire of learning approaches.…learning-styles research is a useful beginning point in designing appropriate instruction for culturally diverse students. (p. 494)

Furthermore, students' awareness of their learning style preferences can lead to improving student performance and learning outcomes (Braio, et al., 1997; Burke & Dunn, 2002; Claxton & Murrell, 1987; Claxton & Ralston, 1978; Dunn & Dunn, 2008; Dunn, 2009; Pritchard, 2005; Sims & Sims, 1995). When students understand more about their own preferences for learning, they are also learning how to learn, which is "an empowering experience that students need if they are to be successful lifelong learners" (Claxton & Murrell, 1987, p. iv).

Several researchers have indicated that an important way to use learning styles theories in the classroom is to raise awareness in both teacher and learner that each individual has different ways of learning and that those learning differences should be considered for teaching to be effective and learning to take place (Claxton & Murrell, 1987; Pritchard, 2005).

Irvine and York (1995) affirmed that there are many aspects of the learning styles literature that have "significant potential for enhancing the achievement of culturally diverse students" (p. 494). Irvine and York continued on by stating:

> learning-styles research emphasizes the cultural context of teaching and learning.…The cultural context of teaching and learning reminds teachers to be attentive not only to individual students' learning styles but to their own actions, instructional goals, methods, and materials as they relate to their students' cultural experiences and preferred learning environment....The learning-styles research reminds teachers to (a) understand and appreciate students' personal cultural knowledge, and (b) use their students' prior knowledge and culture in teaching.…learning-styles research is extremely helpful in that it rightly places the responsibility for students learning with teachers, instead of ascribing blame to students and their parents. It holds teachers responsible and accountable for designing instruction to meet students' individual learning needs by making them aware that all students are capable of learning, provided the learning environment attends to a variety of learning styles. (p. 494)

The application of learning styles theories can assist educators to design more effective instruction and place students in learning situations that are appropriate for them (Keefe, 1979). Claxton and Murrell (1987) observed that knowledge of learning styles can help educators "become more sensitive to the differences students bring to the classroom. It can also serve as a guide to the design of learning experiences that match or mismatch students' styles, depending on whether the purpose of the experience is instrumental or developmental" (p. 78).

Smith and Dalton (2005) claimed that research about learning style indicates that when the "learner has a fair understanding of his or her own style, they learn more effectively" (p. 13). Smith and Dalton add that "learners who know their own style and/or preferences will make

informed choices about what to engage with in learning, and which learning experiences and resources are likely to be attractive and useful, and which are not" (p. 13). Rollins (1990) stated that:

> knowledge about learning styles is a fundamental tool for teachers and provides a deeper, more profound view of the learner than previously perceived. It is part of the basic framework upon which a sounder theory and practice of thinking, learning, and instruction may be built. (p. 64)

Curry (1983) emphasized that research has "...come to positive conclusions about the relationship between learning style and improved educational (teaching and learning) outcomes" (p. 4). As researchers agree on the benefits of knowing one's learning style, Wechsler (1993) recommended that:

> Research on learning styles should be conducted in different countries in order to know which is the best means to increase educational achievement in different parts of the world, and which are the highest priorities for people in different cultures. The importance of these factors may vary from one culture to the other, depending on their respective values or social rewards for specific behaviors and achievements. (p. 209)

Influential Learning Style Theorists

Lynn Curry

Lynn Curry is well known for advocating the strengths of learning style as a field of inquiry. She calls on researchers to periodically critically review the field of learning style, as a way to detect research gaps and misinterpretations, and also identify future directions research should follow (Curry, 1990a, 1990b). Curry (2000) defined learning style as "individual consistencies in perception, memory, thinking, and judgment across any stimulus condition" (p. 239). Curry (1983) recognized the need to organize the theories and constructs related to learning styles research. She proposed that the various models of learning styles could be organized in layers, using the metaphor of an onion to illustrate her learning style taxonomy.

The "onion model," as stated by Curry (2000), "separates instructional format preference, learning style, and personality variables" (p. 240). Curry added that all levels are "stable enough to be predictive of individual behavior, although the outermost layer (instructional preference) is the least stable over time and the easiest to alter through interaction with other variables valued by the individual" (p. 240). Curry pointed out that the studies of Melear (1989) and Sanchez (1996) maintained the validity of the "onion model." In 1987, Claxton and Murrell suggested adding an additional trait to Curry's taxonomy of learning styles – the social-interaction.

The innermost layer of Curry's taxonomy of learning styles represents the cognitive personality style. Sims and Sims (1995) explained that the cognitive personality style "is defined as an individual's approach to adapting and assimilating information. This adaptation does not interact directly with the environment. Rather, these are underlying and relatively permanent personality constructs" (p. 36). Models such as The Holland Typology of Personality (Holland, 1966); The Myers-Briggs Type Indicator – MBTI (Myers, 1976); Witkin's field dependence/independence (Witkin, 1976); and Kagan's impulsivity/reflectivity model (Kagan, 1965) are examples related to the cognitive personality level (Claxton & Murrell, 1987; Curry, 2000). Sims and Sims (1995) added that the instruments focusing on individual's personality style offer the "student excellent information for personal self-knowledge and how it may relate to learning settings" (p. 26).

In the second layer is information processing, which describes how individuals tend to assimilate and process information (Claxton & Murrell, 1987; Curry, 1983; Smith, 2005). Sims and Sims (1995) revealed that information processing is "a set of processes that function at the intersection between fundamental personality levels, individual differences, and environmentally based learning format choices" (p. 32). Models such as Kolb's learning style inventory (1984),

Schmeck's inventory of learning process (1983), and Gregorc's Learning Syle Delineator (1979) are examples related to the information processing level (Claxton & Murrell, 1987; Curry, 2000; Sims & Sims, 1995). Sims and Sims (1995) highlighted that the instruments focusing on information processing provide the "student vital in-class learning mode preferences as well as cues for being aware of possible teacher learning style preferences" (p. 26).

The third layer is social-interaction models, which describes how learners tend to interact and behave in learning situations (Claxton & Murrell, 1987). Instruments such as Grasha-Reichmann Student Learning Styles Scales (GRSLSS) developed by Grasha and Reichmann (1974) and Furhrmann-Jacobs model (Furhmann & Grasha, 1983) are associated with the social-interaction layer. Also, studies of Eison (1979) and Mann (1970) are related to this layer (Claxton & Murrell, 1987).

The fourth and outermost layer is instructional preference. This layer is the least stable and most subject to external influence. It is also the most observable of the preferences. Instructional preference relates to the individuals' choice of the environment in which to learn (Cassidy, 2004; Claxton & Murrell, 1987; Curry, 1983; Smith & Dalton, 2005). Instruments such as Dunn and Dunn learning styles inventory (1983), the Canfield learning styles inventory (1980), the Friedman and Stritter Instructional Preference Questionnaire (1976), and Hill Cognitive Style Interest Inventory (1976) are associated with the instructional preference layer. Sims and Sims (1995) noticed that the instruments focusing on instructional and environmental preference can "assist the student with regard to study or work setting needs" (p. 26).

Marshall (1985) argued that Curry's taxonomy of learning styles was helpful for "classifying learning style models and instruments into a meaningful structure. It can provide a

framework for the re-examination of much of the earlier research and for conducting future research" (p. 426).

In 1987, as cited in Sims and Sims (1995), Curry presented the results of a five year psychometric study where she reviewed 21 learning styles definitions and instruments. Curry's major concern was with the reliability and validity of the learning styles instruments.

Curry (2000) reviewed three decades (1970 – 2000) of literature related to learning styles, studying approach, and instructional preference in medical education. She concluded that the following claims related to learning styles are supported by the research reviewed:

a. There are reliable learning style differences across medical specialties;

b. Age and gender have an effect on learning style preference;

c. Learning style has an effect on academic performance (Curry, 2000, p. 249).

Curry stated that the learning style theory is "often misunderstood and occasionally misapplied" (p. 248). She found that "the most significant limitation is conceptual confusion" (p. 246), and the other significant limitation "stems from poor research design" (p. 246). She explained that the conceptual confusion emerged from the large number of learning styles instruments available. Curry (2000) stated that "over 100 different investigators have published some version of a cognitive or learning style measurement system resulting in conceptual fragmentation and incomparable results (p. 246).

Discussing the research design, Curry (2000) stated that "various authors have based, justified, or interpreted their work using misconceptions, overgeneralizations, or unsupported assertions and suppositions" (p. 246). In response to researchers who challenged the reliability of Kolb's LSI, Curry stated that "thirty years of reliability testing has demonstrated remarkable test-

retest stability for most of the well known styles measures and most subsections to those measures" (p. 247).

James Keefe

James Keefe, as director of Research for the National Association of Secondary School Principals (NASSP), strongly supported and extended the notion that learning is an individual process. Keefe (1987) understood that "each learner has preferred ways of perception, organization, and retention that are distinctive and consistent" (p. 7). Keefe pushed educators to acknowledge that each student approaches learning in a unique way and proposed a model of student learning styles that would provide educators with information that would allow creation of a learning environment tailored to individual students. Keefe (1987) emphasized that the discussion and interest in learning styles emerged as an essential element to "make learning and instruction more responsive to the needs of individual students" (p. 14).

Keefe (1979) defined learning styles as the "characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 4). The cognitive factors are "internal to the information processing system and require careful training for any adaptive change" (p. 138). The affective factors are "preferential in nature and respond to both training and matching strategies" (p. 138). The psychological factors are "rooted in learner reactions to the environment and are responsive to instructional matching" (p. 138).

Keefe (1987) coordinated an investigation of thirty-one cognitive, affective, and physiological style variables. The results of his study served as the base for the development of the NASSP Learning Style Profile and the development of a research-based learning style paradigm, which took into consideration three lines of research: personality theory, the

information processing aspect of cognitive style, and aptitude-treatment interaction. Keefe

(1987) stated that NASSP Learning Style Profile is the only instrument designed to measure all

three dimensions of learning style: cognitive, affective, and physiological dimensions.

According to Desmedt and Valcke (2002, 2004), James Keefe is among the top most

cited authors in learning styles research. Keefe's 1979 learning style definition is widely

accepted and used.

Rita Dunn

Rita and Kenneth Dunn contributed to the popularization of learning styles-based

instruction in elementary and secondary schools. The Dunn and Dunn learning styles model

(1974 – 2003) is one of the most respected models in the U.S and abroad (Desmedt & Valcke,

2002, 2004; Wilson, 1998). It is influenced by cognitive style theory and brain lateralization

theory (Dunn, 1984; Dunn & Griggs, 2007; Dunn & Honigsfeld, 2009). Dunn and Dunn's

learning styles model has been studied and evaluated extensively (DeBello, 1990; Dunn & Dunn,

2005; Dunn & Griggs, 1995a, 2007; Dunn, et al., 2009; Lovelace, 2005).

Several instruments were developed to assess individuals' learning style based on the

Dunn and Dunn's learning styles model. One instrument is the Productivity Environmental

Preference Survey (PEPS). It is well known among K – adult educators (Dunn & Griggs, 2007;

Price & Milgram, 1993). Since it was developed, four decades ago, the PEPS has been

researched, refined, and used in numerous studies in the U.S. and at least 30 nations around the

world (Dunn & Dunn, 2008; Dunn, et al., 1990; Dunn & Griggs, 1995b, 2007; Dunn, Griggs, &

Price, 1993; Dunn & Honigsfeld, 2009; Dunn & Milgram, 1993; Durham-Thompson, 2005;

Hlawaty, 2002; Honigsfeld, 2001; Honigsfeld & Dunn, 2003). The Productivity Environmental

Preference Survey (PEPS) assesses individual preferences for:

- The environmental elements: Sound, light, temperature, and design;

- The emotional elements: Motivation, persistence, responsibility, and structure;

- The sociological elements: Learning alone, in a pair, with peers, in a team, with authoritative or collegial adults, or in a variety of ways;

- Physiological elements: Perceptual, intake, time-of-day, mobility;

- Psychological elements: global versus analytic processors and impulsive versus reflective learners (Dunn & Griggs, 2007, p. ix).

Dunn and Dunn (1993) defined learning styles as "the way in which an individual begins to concentrate on, process, internalize, and remember new and difficult academic information or skills" (p. 2). Dunn and Griggs (2007) stressed that "certain elements of style are biologically imposed; others develop as an outgrowth of individual life experiences. No style is better than another" (p. vii). Dunn and Griggs (2007) added that "learning style is comprised of environmental, emotional, sociological, physiological, and psychological elements that enable individuals to receive, store, and then use the knowledge or skills to which they have been exposed" (p. viii).

Dunn and Honigsfeld (2009) called attention to the fact that students can learn easy material using a wrong style, however, "few can master challlenging academic material unless it is learned through their strengths" (p. 11). Dunn and Dunn (2005) advocated that students' achievement and motivation increase when teachers take into consideration the variety of learning styles that are present in the classroom.

Dunn and Honigsfeld (2009) stated that learning style is a "biologically and developmentally determined set of unique characteristics that make the identical instruction effective for some students and ineffective for others" (p. 139). Thus, they considered that there

was no instructional method that can be effective for all students. Dunn and Honigsfeld (2009) further indicated that the best way to increase student learning in the classroom is by "identifying and responding to each individual's learning-style strengths" (p. 7). Dunn and Griggs (1995b) obeserve that "given responsive environments, resources and approaches, students attain statistically higher achievement and aptitude test scores in congruent (matching) rather than dissonant (mismatched) treatments" (p. 16). Dunn and Dunn (2008) reinforced that "if students do not learn the way we teach them, we must teach them the way they learn" (p. 98).

David A. Kolb

David A. Kolb, a leading proponent of learning style concept, proposed the experiential learning theory (ELT) as a way to explain adult learning and development. He stated that ELT is a "holistic integrative perspective on learning that combines experience, perception, cognition, and behavior" (Kolb, 1984, p. 21). Joy and Kolb (2009) clarify that experiential learning theory draws on the work of influential theorists of human learning and development such as John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung, Paulo Freire, Carl Rogers, among others.

The adult learner experience is central to the ELT. Learners' experiences make them different from each other. In experiential learning theory "individuality is manifested not only in the stage of development but also in the course of development – in the particular learning style the person develops" (Kolb, 1984, p. 138). Kolb (1984) added that the "complex structure of learning allows for the emergence of individual, unique possibility-processing structures or styles of learning (p. 64). Kolb defined learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it" (p. 41).

In experiential learning theory (ELT), learners demonstrate preference for one of the modes of grasping experience: concrete experience (CE) and abstract conceptualization (AC). These two bipolar dimensions constitute the feeling-thinking continuum. Joy and Kolb (2009) revealed that learners who prefer concrete experience "are open to new experiences, depend on people contact for gathering information, are intuitive and make feeling based judgments" (p. 71). Learners who have a preference for abstract conceptualization are "logical and analytical in their approach to a learning situation and seek theories and generalizations" (p. 71). At the same time, learners also demonstrate preference for one of the modes of transforming experience: reflective observation (RO) and active experimentation (AE). These two bipolar dimensions compose the doing-watching continuum. Learners who favor reflective observation (RO) "watch and observe all sides of an issue in order to understand its meaning and take time to act" (p. 71). Those who rely on active experimentation (AE) "like to try things out, are more willing to take risks and are practical and application oriented" (p. 71).

Joy and Kolb (2009) described the learning process as an "idealized learning cycle or spiral where the learner 'touches all the bases' – experiencing, reflecting, thinking, and acting – in a recursive process that is responsive to the learning situation and what is being learned" (p. 71). Learners may enter the learning cycle in different modes. "Because of our hereditary equipment, our particular life experiences, and the demands of our present environment, we develop a preferred way of choosing among the four learning modes" (Joy & Kolb, 2009, p. 71). Thus, Joy and Kolb stated that "the concept of learning style refers to the individual differences in approaches to learning based on an individual's preference for using a combination from these dialectic modes" (p. 71). As described by Kolb (1984), the two sets of dualities result in the following four learning styles:

Convergent – Individuals with preference for the convergent learning style rely on abstract conceptualization for grasping the experience and on active experimentation for transforming the experience. This approach favors problem solving, decision making, and practical applications of ideas. Convergers act fast on their decisions. Converger individuals are controlled in their expression of emotion. They are the opposite of divergers, and prefer dealing with things rather than people.

Divergent – Individuals with preference for the divergent learning style prefer to grasp the experience through concrete experience mode, and transform the experience through reflective observation mode. Awareness of meaning and values, and imaginative ability are the strengths of diverger individuals. Because of their imaginative ability they are able to see problems from different perspectives. They enjoy brainstorming possibilities and implications. Divergers are people and feeling-oriented.

Assimilation – Assimilator types prefer to grasp the experience through reflective observation dimension and transform the experience through abstract conceptualization dimension. The ability to create theoretical models and capacity for inductive reasoning are the strengths of assimilator individuals. Thus, assimilators develop models and theories, plan well, and are systematic. Assimilator individuals are more concerned with ideas and abstract concepts than about people.

Accommodating – Accommodator types prefer to grasp the experience through use of active experimentation mode and transform the experience through concrete experience mode. Accommodators take risks, get things done, and are comfortable with assuming leadership. Thus, doing things, carrying out plans and tasks and getting involved in new experiences are the strength of this mode. Accommodators are the opposite of assimilators. Accommodators enjoy

being around people and rely on others for information instead of their own logical capacity

(Claxton & Murrell, 1987; Joy & Kolb, 2009; Kolb, 1984).

Kolb Learning Style Inventory (KLSI), based on the experiential learning theory of

growth and development (Kolb, 1984), was "designed to measure the degree to which

individuals display different learning styles" (Joy & Kolb, 2009, p. 71). Kolb and Kolb (2005)

stated that "previous research (Kolb, 1984) has shown that learning styles are influenced by

personality type, educational specialization, career choice, and current job role and tasks" (p. 4).

Joy and Kolb (2009) stressed that the experiential learning theory (ELT) emphasizes that:

> learning style is not a psychological trait but a dynamic state resulting from synergistic transactions between the person and the environment. The stability and endurance of these dynamic states depend not only on the genetic qualities or characteristics of human beings but also on the demands of the environment they are in. (p. 71)

Felder-Silverman Learning Style Model (FSLSM)

Felder and Silverman (1988) stated that "a learning-style model classifies students

according to where they fit on a number of scales pertaining to the ways they receive and process

information" (p. 674). Felder and Spurlin (2005) explained that the Felder-Silverman Learning

Style Model (FSLSM) was designed to "capture the most important learning style differences

among engineering students and provide a good basis for engineering instructors to formulate a

teaching approach that addresses the learning needs of all students" (p. 103). Felder and Brent

(2005) added that "instruction designed to address a broad spectrum, of learning styles has

consistently proved to be more effective than traditional instruction, which focuses on a narrow

range of styles" (p. 59). Graf, Lin, and Kinshuk (2008) compared the FSLSM with other learning

styles models, such as Kolb's (1984) and Honey and Mumford's (1982) and concluded that the

"FSLSM seems to be most appropriate for the use in educational systems" (p. 124).

Felder and Silverman (1988) recognized that other theorists have influenced the development of their learning style model. The authors clarified that the sensing/intuition dimension of the FSLSM is derived from Jung's Theory of Psychological Types. These dimensions are closely related to concrete experience and abstract conceptualization dimensions of Kolb's experiential learning model. Also, the active/reflective dimension is based on Kolb's learning style model (Felder & Brent, 2005).

The four dimensions of FSLSM are: sensing/intuitive, visual/verbal, active/reflective, and sequential/global. The sensing/intuitive dimension distinguishes between the two ways of how an individual perceives information. The visual/verbal dimension deals with the input of information by an individual. The active/reflective dimension is related to how an individual processes information or transforms it into knowledge. The fourth dimension, sequential/global, is associated with the understanding of information (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005). Felder and Spurlin (2005) stated that although each of the above dimensions is similar to dimensions in other learning style models, the combination is unique to the FSLSM. The FSLSM dimensions and learners characteristics associated with each dimension are described below:

Sensing and Intuitive Perception:

- Sensing: Sensing learners (sensors) prefer learning new information through their senses. They like learning facts, solving problems by standard methods. Sensors are practical, careful and patient with details. They like data, observations and experimentation. They are good at memorizing facts and doing hands-on work.

- Intuitive: Intuitive learners (intuitors) prefer learning new information through reflection. Intuitors are more comfortable with abstractions. For intuitors, translating

symbols into what they represent is very easy. They enjoy discovering possibilities and

relationships. Intuitors like innovations. Intuitors grasp new concepts easily. They enjoy

complications.

Visual and Verbal Input:

- Visual: Visual learners retain more information from what they see: pictures, diagrams,

  graphs, time lines, films and demonstrations.

- Verbal: Verbal learners prefer written and spoken explanations. They enjoy learning

  mathematical formulas.

Active and Reflective Processing:

- Active: Learners who favor active experimentation retain and understand new

  information through engagement in physical activity, trying things out – discussing or

  applying it or explaining it to others. Active learners enjoy working in groups. Sitting

  through lectures is hard for active learners.

- Reflective: Learners who favor reflective observation retain and understand new

  information by examining and manipulating it introspectively – thinking things through

  before trying them out. Reflective learners prefer working alone or with one or two

  familiar partners. They learn best when provided opportunities to think about the

  information being presented.

Sequential and Global Understanding:

- Sequential: Sequential learners prefer learning new information sequentially, in linear

  steps, in small connected chunks. They follow logical stepwise paths in solving a

  problem. Their solutions are orderly and easy to follow, but they may lack

  understanding of the big picture its interrelationships with other subjects and

disciplines. Sequential learners prefer material that is presented in a steady progression of complexity and difficulty.

- Global: Global learners are synthesizers and thinkers. They think in a systems-oriented manner. Their holistic perspectives enable them to see connections that no one else sees. Global learners prefer learning new information in fits and starts. They make intuitive leaps and may be unable to explain how they came up with solutions. Global learners enjoy jumping directly to more complex and difficult material (Felder, 1993; Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

Graf, Viola, Leo, and Kinshuk (2007) compared the FSLSM with other learning styles models and emphasized that the FSLSM describes the "learning style of a learner in more detail, distinguishing between preferences on four dimensions….FSLSM is based on tendencies, indicating that learners with a high preference for certain behaviour can also act sometimes differently" (p. 81). Felder and Spurlin (2005) called attention to the proper use and understanding of learning styles models and instruments:

- Learning style dimensions are continua, not either/or categories;
- Learning style profiles suggest behavioral tendencies rather than being infallible predictors of behavior;
- Learning style preferences are not reliable indicators of learning strengths and weaknesses;
- Learning preferences can be affected by a student's educational experiences; and
- The point of identifying learning styles is not to label individual students and modify instruction to fit their labels. (p. 105)

Felder-Solomon Index of Learning Styles

The Index of Learning Styles (ILS) was designed by Richard Felder and Barbara Solomon to assess individuals' preferences on the four dimensions of the Felder-Silverman Learning Styles model (FSLSM): active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Brent, 2001; Felder & Spurlin, 2005). The instrument "combines three facets of Learning Styles: personality, learning modality, and cognitive processing…it allows a multi-modal approach" (Boyd & Murphrey, 2004, p. 124).

Graf, Viola, Leo and Kinshuk (2007) asserted that the Index of Learning Styles is an "often used and well-investigated instrument to identify learning styles" (p. 83). The validity and reliability of the ILS has been established across multiple domains (Cook & Smith, 2006; Felder & Spurlin, 2005; Graf, et al., 2007; Hosford & Siders, 2010; Litzinger, et al., 2007; Platsidou & Metallidou, 2009; Viola, Graf, Kinshuk, & Leo, 2007).

De Vita (2001) stated that the ILS "has been explicitly developed for classroom application and, though suitable to profile individual learning preferences" (p. 168). Felder and Spurlin (2005) indicated that the use of the Index of Learning Styles (ILS) to assess the learning styles profile of a class can provide support for instruction. Knowing the different types of learning styles that students bring to the classroom can help instructors to "formulate a teaching approach that addresses the needs of all students" (Felder & Spurlin, 2005, p. 105).

The Index of Learning Styles has been translated to several languages. Empirical studies using the Index of Learning Styles (Felder & Brent, 2001) concluded that the instrument is suitable and valid for international research (Aljojo, et al., 2009; De Vita, 2001; Ku & Shen, 2009; Litzinger, et al., 2007; Platsidou & Metallidou, 2009; Strang, 2009, 2010). The Index of Learning Styles (ILS) is discussed in-depth in Chapter 3.

Learning Styles Studies Related to the Research Questions

Research has demonstrated that learning styles affects the way students learn and the way students respond to a learning experience. Significant relationships have been identified among adolescents and young adults learning styles preferences, gender, age, ethnicity, cultural background, area of study and school grade (Cagiltay & Bichelmeyer, 2000; Cutolo & Rochford, 2007; De Vita, 2001; Demirbas & Demirkan, 2007; Demirkan & Demirbas, 2008; Dunn & Dunn, 2008; Dunn, 1993a, 2009; Dunn, et al., 2010; Dunn, et al., 1990; Graf, et al., 2008; Homauni, Kadivar, & Abdollahi, 2007; Jones, Reichard, & Mokhtari, 2003; Kinshuk, Liu, & Graf, 2009; Miller, Ogilvie, & Branch, 2008; Yamazaki, 2005). In addition, significant relationships have been identified among high school students' learning styles preferences and academic achievement (Burke & Dunn, 2003; Dreher, 1997; Dunn & Griggs, 1988; Durham-Thompson, 2005; Homauni, et al., 2007; Matthews, 1995, 1996; O'Brien, 1994; Park, 2002; Peters, 2009; Snyder, 2000; Thornton, Haskell, & Libby, 2006; Uzuntiryaki, 2007; Uzuntiryaki, Bilgin, & Geban, 2003; Wilson, 1996; Yildirim, Acar, Bull, & Sevinc, 2008).

The majority of learning styles research has been conducted in the fields of general or higher education. There has been limited research concerning learning styles and high school students. An explanation may be the one suggested by Boyd and Murphrey (2004). In research discussing the scope of learning style instruments and the population studied within the field of agricultural education, Boyd and Murphrey (2004) reported that "college students have been studied much more frequently (20 out of 29) than high school audiences. It is possible that the paperwork required by the Institutional Review Board to study minors may in fact discourage studies focused on high school populations" (p. 130). A review of the learning styles literature indicates that this may be also the case in other fields of study. This section focuses on learning

styles research related to the questions addressed in this study. The following studies illustrate the evidence available in the literature.

Learning Style and School Type

There have been limited studies addressing students' learning styles prefererence and the type of high school attended. In a study conducted by Montgomery (1994), the Dunn, Dunn, and Price Learning Styles Inventory (LSI) was administered to 168 traditional high school students and adult students attending vocational business education programs in six Missouri area vocational-technical schools. The purpose of the study was to determine whether there is a difference in the learning styles between the two groups. The results indicated that significant differences existed for seven of the twenty-two variables on the LSI. Students' scores on the variables Evening/Morning, Unmotivated/Motivated, Parent Figure Motivated, Structure, Design, Teacher Motivated, and Auditory Preferences demonstrated significant differences. Montgomery suggested that these differences indicated the need for educators to adapt their teaching methods and student study times to more nearly match the diverse learning styles represented in these two groups of students.

Leahy, Gaughran, and Seery's (2009) study investigated students' learning styles preferences within the Irish secondary education system. The Index of Learning Style was used to assess the learning styles preference of 530 students in technology education course - 146 female and 379 male - from four types of secondary schools: vocational, secondary, community college/school and comprehensive. One school was single sex-male, another single sex-female and others were co-educational. The students' ages ranged from 12-16 years old. The results of this study indicated that students' learning style varied across school types and gender. Active and visual were the predominant styles among students. Students in single sex-female school

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indicated significant preference for reflective style. Students from co-educational schools demonstrated preference for the active style. Students from community schools demonstrated preference for the active and sensing style. The vocational school students indicated preference for reflective and intuitive style. Leahy, Gaughran, and Seery (2009) acknowledged that these differences in style preferences contradicted the stereotype for the type of schools.

Learning Styles and Gender and Age

Relevant studies investigating high school students' learning styles preferences and gender and age include: Hlawaty (2002); De Paula (2002); Honigsfeld & Dunn (2003); Durham-Thompson (2005) and Reese and Dunn (2008).

Hlawaty (2002) examined the relationship between learning styles preferences, gender and age, and academic achievement. The German version of the Dunn, Dunn, and Price Learning Styles Inventory (LSI) was used to assess the learning style of 869 German adolescents, ages 13, 15, and 17, enrolled in public school. Males and females were equally represented in the study. The results indicated that 9 of the 22 learning styles elements – light, temperature, persistence, authority-figure present, tactual perceptual strength, intake, afternoon, parent-motivated, and teacher-motivated – were significantly discriminated among the three age groups. Hlawaty (2002) stated that "younger adolescents appear to be more persistent, authority-, parent-, and teacher-motivated than older students" (p. 7). Considering gender, German male and female students demonstrated different learning styles preferences. Findings suggested significant difference for 5 of the 22 learning styles elements – light, motivation, responsibility, learning in several ways, and intake. In addition, the results indicated that German students demonstrated significant differences among the achievement groups for 5 of the 22 learning styles elements – structure, authority-figure present, mobility, and being parent and teacher motivated.

A study focusing on Brazilian students' learning styles preferences, gender and age, and academic achievement was conducted by De Paula (2002). The Portuguese language version of the Dunn, Dunn, and Price Learning Styles Inventory (LSI) was used to assess the learning style of 905 Brazilian adolescents, ages 13, 15, and 17, enrolled in public school. Males and females were equally represented in the study. The results indicated that 9 of the 22 learning styles elements – light, motivation, structure, alone, tactual perceptual strength, intake, evening vs. morning, parent- and teacher-motivation) were significantly discriminated among the three age groups. The results for gender indicated that 2 of the 22 learning styles elements – responsibility and responsibility/conforming – were significantly discriminated. Academic achievement was also significantly discriminated for with 2 of the 22 elements – persistence and responsibility/conforming). De Paula (2002) also compared Brazilian students' results with results from students in five other countries – Bermuda, Brunei, Hungary, New Zealand, and Sweden. All studies used the Dunn, Dunn, and Price Learning Styles Inventory (LSI) in the students' appropriated language to identify learning styles preferences. Comparing the six countries, students' learning styles significantly differentiated among participants by age; gender and achievement.

Another relevant international study comparing gender differences among the learning styles of 1,637 high school students from five countries - Bermuda, Brunei, Hungary, New Zealand, and Sweden - was conducted by Honigsfeld and Dunn (2003). Males and females participated in approximately even numbers. The Dunn, Dunn, and Price Learning Styles Inventory (LSI), in the students' appropriate language, was used to identify learning styles preferences. The results from all countries indicated significant gender difference for 9 of the 22 learning style elements. The findings suggested that males prefer more peer interaction and more

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kinesthetic activities. Female students scored higher on self-motivation, parent motivation, teacher motivation, and persistence. Females were more responsible and preferred higher temperatures and more social variety of learning than male students. In addition, Honigsfeld and Dunn (2003) reported that when students' learning styles were "compared by country, significant and more substantial differences emerged for all learning style variables except for auditory perceptual strength" (p. 200).

Durham-Thompson (2005) investigated the learning style preferences of high school Bermudian students in one senior high-school. The purpose was to compare the learning style preferences among 30 males and 40 females, low- and high-achieving students. The Productivity Environmental Preference Survey (PEPS) was administered to identify students' learning style. The results indicated nine areas of significant differences among the 21 learning-style elements for gender: Design; Motivation; Persistence; Responsibility; Learning in Several Ways; Auditory; Tactile; Parent Motivated; and Teacher Motivated.

A study conducted by Reese and Dunn (2008) in the U.S. found that high school graduates demonstrated diverse learning styles preferences based on gender. Reese and Dunn administered the Productivity Environmental Preference Survey (PEPS) to approximately 1500 entering college freshmen during orientation. The purpose of the study was to examine: "a) the extent of diversity that exists among entering college freshmen's learning styles; b) whether, and the extent to which, learning style is influenced by gender; and c) whether high school grade point average (HS/GPA) is a determining factor in academic success" (p. 95). Reese and Dunn (2008) summarized the results of the study concerning the variables students learning styles preferences, and learning styles preferences and gender as follow:

PEPS data revealed statistical differences among students' styles for the elements of Sound, Light, Temperature, Motivation, and Responsibility… Concerning freshman gender differences, although male students indicated a stronger need for learning with an Authority Figure, they also were more Visual, needed more Structure and Mobility, and were strongly Afternoon learners in comparison with the females in this sample. Conversely, female students revealed higher means for Bright Light, warm Temperature, Formal Seating, Motivation, Learning Alone or with Peers, Intake while concentrating, and a Variety of instructional approaches (rather than routines or patterns). Consistent with female traits internationally, this sample of freshman women had multiple Perceptual Strengths. Thus, they were more Auditory, Tactual, and Kinesthetic, and consistently more Persistent and Responsible than their male counterparts. Another variable on which these males and females differed were females' preferences for learning in the Late Morning in contrast with males' preferences for Afternoon learning. (p. 95)

Learning Styles and Students' Attitudes toward School

At the high school level, no studies directly investigated the relationship between high school students' learning styles and their attitudes toward school. However the following research is of interest for this study.

Uzuntiryaki, et al.(2003) investigated the relationship between high school students' learning styles, achievement, and their attitudes toward chemistry as a school subject. A learning style inventory developed by the authors based on the Grasha-Riechmann Student Learning Style Scale was administered to 179 9th grade and 151 10th grade students from different high schools in Turkey. Results indicated that there was a significant effect of learning styles on students' attitudes toward chemistry and their chemistry achievement. Students with preference for collaborative/participant/independent learning styles and students with preference for independent/collaborative/participant learning styles had better understanding of chemistry concepts and more positive attitudes toward chemistry as a school subject.

Learning Styles and Students' Plans to Attend College

The studies of Emanuel and Potter (1992), Matthews and Hamby (1995) and Nasser and Carifio (2006) are of interest to this research as they addressed learning styles differences of high school students and college students.

Emanuel and Potter (1992) conducted a study with 327 adolescents and 235 college students to investigate the relationship between learning styles preferences and orientation toward college. They used a 39 items learning styles inventory adapated from instruments developed by researchers such as Witkin and Grasha and Reichmann. The results of this study were significantly different across the two groups. High school students scored higher for dependent, collaborative and independent styles. College students scored higher on participative and competitive styles. Comparing high school students learning styles and their plans for college, the results indicated that students who want to go to college scored higher on dependent and participative styles and lower on independent styles. Emanuel and Potter (1992) suggested that students who are serious about going to college spend more time at school and thus become more dependent on teachers.

Matthews and Hamby (1995) compared the learning styles of high school and college students. The Kolb Learning Style Inventory was administrated to 6,218 high school students and 1,841 college students from a southeastern state in the U.S. The results indicated that high school and college students differ significantly in their learning styles preferences. The majority of high school students preferred the assimilating and converging styles while the majority of college students demonstrated preference for diverging and accommodating styles. Furthermore, Matthews (1995) in a five phase study, investigated the learning styles preferences of high school and college students. The Canfield Learning Styles Inventory was used to assess the

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learning styles preference of 6,207 students, ages 13 to 20, from public and private schools in a southern state in the U.S. According to the results, high school and college students differed in two categories: conceptual and independent/conceptual. College students were more conceptual than high school students and a few high school students had independent styles. Also, high school students were more applied than are college students. Matthews (1995) stated that "it appears that a large proportion of students in the conceptual categories go to college or the university. Secondary school had more students in the applied typologies than conceptual typologies" (p. 95).

Nasser and Carifio (2006) conducted an international study to investigate the learning styles of 90 female and 109 male prospective students at a university in Lebanon and their selection of academic major. The Felder and Silverman Index of Learning Style was used. The results indicated significant differences. Overall, students demonstrated preference for the visual and active learning styles. Students who opted for business, economics, and engineering majors scored high in active and visual styles. Science majors scored high in intuitive, sequential and visual. Communication majors scored high in active and sensing. Architecture majors were more visual. Those who chose the humanities and social sciences were more active and visual. Nasser and Carifio (2006) stated that "a better understanding of the relationship between student learning preferences and the selection of and success in a given major may help to improve course instruction" (p. 66).

<div align="center">Summary</div>

This chapter presented a brief discussion of learning in today's society. Challenges and demands students face were addressed. Learning how to learn, mastering learning strategies and taking ownership of their own learning is a necessity faced by all students (Barr & Tagg, 1995;

Bransford, et al., 2000; De Vita, 2001; Fear, et al., 2003; Paul & Elder, 2009; Wirth & Perkins, 2008). An overview of the Brazilian educational system was presented. The literature reviewed indicated that the Brazilian public school system has been criticized for the quality of education offered (Castro & Tiezzi, 2004; Domingues, et al., 2000; INEP, 2004; UNESCO, 2011; Zibas, 2005). A summary of the current knowledge about learning style, its definition and its implication to student learning were addressed. Researchers agreed that students' awareness of their learning style preferences can lead to improving student performance and learning outcomes (Braio, et al., 1997; Burke & Dunn, 2002; Claxton & Murrell, 1987; Claxton & Ralston, 1978; Dunn & Dunn, 2008; Dunn, 2009; Pritchard, 2005; Sims & Sims, 1995). Subsequently, this literature reviewed some influential learning style theorists and discussed their contributions to the advancement of the topic; researchers such as James Keefe, Lynn Curry, Rita Dunn and David Kolb were included. The learning style model developed by Felder and Silverman (1988) and the instrument associated with the model – Index of Learning Styles were discussed. Then, learning style studies concerning the research questions proposed in this study were reviewed. This literature review focused on research that would be most helpful in answering the research questions investigated in this study.

The next chapter presents the design of the study. Chapter 3 describes the participants; explains the data collection method; provides a summary of the demographic information sheet; and describes the Index of Learning Styles (ILS). A discussion of the validity and reliability of the ILS is included. In addition, Chapter 3 covers the data analysis used in the study.

Chapter 3

Methods

Introduction

This chapter restates the purpose and research questions for the study. It also, presents the design of the study; describes the participants; explains the data collection method; provides a summary of the demographic information sheet; and describes the Index of Learning Styles (ILS). A discussion of the validity and reliability of the ILS is also included in this chapter. In addition, this chapter covers the data analysis used in the study.

Purpose of the Study

The purpose of this study was to examine the relationship between learning styles of Brazilian Senior high school students and the type of school attended - public or private school. The Brazilian public school system has been criticized for the quality of education offered. Public schools, normally, serve students from poor neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). This study also investigated the relationships between Brazilian senior high school students' learning styles and gender, age, attitudes toward school and their plans to attend college. The Portuguese version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global (see English and Portuguese versions – Appendix 1).

Research Questions

This study addressed the following research questions:

1. What is the relationship between Brazilian senior high school students' learning styles as measured by the Index of Learning Styles and the type of school attended – public or private?

2. What is the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, based on gender and age?

3. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitudes toward school?

4. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college?

<div align="center">Design of the Study</div>

The design of this study is called descriptive, survey or non-experimental research. Merriam and Simpson (2000) stated that the purpose of descriptive research is to "systematically describe the facts and characteristics of a given phenomenon, population, or area of interest" (p. 61). Creswell (2003) explained that researchers may generalize the results from the sample to the population, since the survey method "provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (p. 153). Merriam and Simpson (2000) added that "the researcher does not manipulate variables or control the environment in which the study takes place" (p. 61).

A cross-sectional approach was used to gather the data of 351 senior high students attending public and private schools in Belo Horizonte, Brazil. Creswell (2003) clarified that in a cross-sectional approach data is collected at one point in time. The data were collected through a demographic and a self-reported questionnaire. The instruments were administered in pencil and paper format.

Participants answered seven questions from a demographic questionnaire developed by the researcher. The questions included: age, gender, grade, type of school – public or private, school session – morning or evening, students' attitude toward school and students' plans to attend college (see English and Portuguese versions – Appendix 2). The Portuguese language version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global.

Participants

Demographic Profile

Participants for this study consisted of 351 Brazilian senior high school students enrolled in public and private schools in Belo Horizonte-Brazil. They represent a convenience sample. Participants ranged from 16 to 42 years of age with mean age of 17.74 (SD = 2.43). The largest percentage of the sample consisted of students who were 17 years old (55.3%) followed by students who were 18 years old (22.5%). Chapter 4 will provide a more in-depth look at participants' demographics.

Data Collection

The data for this study were collected in Brazil. The participants consisted of 351 senior high students attending public and private schools in Belo Horizonte-MG. The data collection

followed the guidelines provided by the Institutional Review Board (IRB) at Auburn University. Permission from IRB is attached (Appendix 3).

Permission for collecting the data was first sought from the Secretary of Education of Minas Gerais state, in Brazil. Permission was then sought from the principal of each school. The data were collected in the classroom in public and private high schools in Belo Horizonte-MG, Brazil. The researcher visited the schools and presented the study to students. To ensure that each class was recruited based on the same information a script was used. See English and Portuguese version attached (Appendix 4).

Each student received an envelope containing a consent letter that was signed by parent/responsible person for students younger than eighteen years old (legal age in Brazil) and also an assent letter that was signed for all students willing to participate in this study. These letters were returned to the teachers or to the researcher on the day of the data collection. After obtaining permission from the students' parents and students, the surveys were administered. See English and Portuguese version attached (Appendices 5 and 6).

The students answered seven questions from the demographic questionnaire. After that, they completed the Portuguese version of the Index of Learning Styles (ILS) survey. The ILS consists of 44 questions that were available to students in paper and pencil format. The questions are forced-choice items where students chose one of two options "a" or "b". The ILS is not timed and usually takes fifteen minutes to complete. After students completed the ILS they were taught how to score their individual results. Students received an information sheet discussing strategies for improving learning based on students' learning styles results. In order to analyze the data, the anonymous surveys were coded from 1 to 351 (total number of participants). Codes 1 through 151 were assigned to surveys from private schools. Codes 152

through 249 were assigned to morning public schools and 250 through 351 were assigned to surveys from evening public schools.

Instrumentation

Demographic Survey

Students answered seven questions from a demographic questionnaire developed by the researcher. The first five questions included: age, gender, grade, type of school – public or private, and school session – morning or evening. The demographic survey also included one question/statement about students' attitude toward school. Students' attitude toward school was measured by their answer to the statement: I like school. Students responses were expressed using a five-point Likert-type scale with 1 = Strongly Disagree and 5 = Strongly Agree. Information about students' plan to attend college was measured by their answer to a forced-choice question – yes/no.

Index of Learning Styles

This study was conducted using the Portuguese language version of the Felder-Soloman Index of Learning Styles of Brazilian senior high students attending public and private schools. This instrument was designed to identify individual preferences on the four dimensions of the Felder-Silverman Learning Styles Model: active/reflective, sensing/intuitive, visual/verbal and sequential/global (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

Felder and Silverman (1988) stated that "a *learning-style model* classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information" (p. 674). Graf, Viola, Leo and Kinshuk (2007) asserted that the Index of Learning Styles is an "often used and well-investigated instrument to identify learning styles" (p. 83).

The Index of Learning Styles (ILS) was chosen for this descriptive or survey study for several reasons: First, it has been translated to Portuguese language (Kuri & Giorgetti, 1996) and used with Brazilian students previously (Almeida & Silva, 2004; Pereira, Kuri & Silva, 2004; Silva & Neto, 2007; Soto, Azevedo, Cunha, & Andrade, 2008), second it was available in pencil and paper format, third it was easy for the students to score. Also, as stated by De Vita (2001) the ILS "has been explicitly developed for classroom application and, though suitable to profile individual learning preferences" (p. 168).

Felder and Spurlin (2005) stated that the use of the Index of Learning Styles (ILS) to assess the learning styles profile of a class can provide support for instruction. Knowing the different types of learning styles that students bring to the classroom can help instructors to "formulate a teaching approach that addresses the needs of all students" (Felder & Spurlin, 2005, p. 105).

The Index of Learning Styles (ILS) was designed by Richard Felder and Barbara Soloman to assess individuals' preferences on the four dimensions of the Felder-Silverman learning styles model (Felder & Spurlin, 2005). The instrument "combines three facets of learning styles: personality, learning modality, and cognitive processing … it allows a multi-modal approach" (Boyd & Murphrey, 2004, p. 124).

The Felder-Soloman ILS is a self-scoring questionnaire that consists of four dimensions: active/reflective, sensing/intuitive, visual/verbal, and sequential/global. The active/reflective dimension is related to how an individual processes information. The sensing/intuitive dimension is associated to how an individual perceives information. The visual/verbal dimension is related to the input of information by an individual. The fourth dimension, sequential/global, is

associated with the understanding of information (Felder & Brent, 2001; Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

Eleven items are related to each one of the four dimensions. Thus, individuals are required to complete 44 sentences by selecting one of two options - a or b. These options represent appositive ends of one of the ILS scales (Litzinger, et al., 2007). Litzinger, Sang Ha, Wise and Felder (2007) stated that this "dichotomous structure was chosen to force a decision between the two alternatives … thereby increasing the chances that the instrument response will detect preferences" (p. 310). In addition, "the number of items on each learning style scale and the scoring method were also chosen so that a score of zero, indicating no preference, was not possible" (Litzinger et al., 2007, p. 310).

After answering the 44 questions, each student will have demonstrated a personal preference for each pole of scale/dimension. Graf, Viola, Leo and Kinshuk (2007) stated that these preferences are:

> expressed with values between +11 to -11 per dimension, with steps +/-2. This range comes from the 11 questions that are posed for each dimension. When answering a question, for instance, with an active preference, +1 is added to the value of the active/reflective dimension whereas an answer for a reflective preference decreases the value by 1. Therefore, each question is answered either with a value of +1 (answer *a*) or -1 (answer *b*). Answer *a* corresponds to the preference for the first pole of each dimension (active, sensing, visual, or sequential), answer *b* to the second pole of each dimension (reflective, intuitive, verbal, or global). (p. 82)

Describing the ILS, Hawk and Shah (2007) explained that scoring is 1, 3, 5, 7, 9, and 11, with 1 and 3 representing a mild preference, 5 and 7 representing a moderate preference, and 9 and 11 a strong preference. Felder and Silverman (1988) recognized that other theorists have influenced the development of their learning style model. The authors clarified that the sensing/intuition dimension of their learning style model is derived from Jung's Theory of Psychological Types. These dimensions are closely related to concrete experience and abstract

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conceptualization dimensions of Kolb's experiential learning model. Also, the active/reflective

dimension is based on Kolb's learning style model.

<p style="text-align: center;">Reliability and Validity of the ILS</p>

Felder and Spurlin (2005) pointed out that "construct validity signifies the extent to

which an instrument actually measures the theoretical construct or trait that it purports to

measure" (p. 108). Garson (2011) added that a "study is valid if its measures actually measure

what they claim to, and if there are no logical errors in drawing conclusions from the data" (para.

1).

Garson (2011) asserted that "reliability is the correlation of an item, scale, or instrument

with a hypothetical one which truly measures what it is supposed to" (para. 1). He added that it is

important that researchers disclose the reliability associated with the instruments being used in

their studies. Garson (2011) emphasized that "without reliability, research results using the

instrument are not replicable, and replicability is fundamental to the scientific method" (para. 1).

Cohen, Manion, Morrison and Morrison (2007) stressed that reliability in quantitative research is

a "synonym for dependability, consistency and replicability over time, over instruments and over

groups of respondents" (p. 146).

Felder and Spurlin (2005) clarified that reliability refers to "the homogeneity of items

intended to measure the same quantity (e.g., the active/reflective preference) that is, the extent to

which responses to the items are correlated" (p. 107). The authors explained that for instruments

measuring preference or attitude, such as ILS, a Cronbach's coefficient alpha of 0.5 or greater is

acceptable.

Graf et al. (2007) asserted that the Index of Learning Styles is an "often used and well-

investigated instrument to identify learning styles" (p. 83). Felder and Spurlin (2005) compiled

<p style="text-align: center;">59</p>

results of studies discussing the reliability and validity of the Index of Learning Style and concluded that:

> as long as the Index of Learning Styles is used to help instructors achieve balanced course instruction and to help students understand their learning strengths and areas for improvement, …our analysis and the other published analyses suggest that the current version of the instrument may be considered reliable, valid and suitable. (p. 111)

Felder and Spurlin (2005) stated that validity and reliability of ILS are related to the English-language version of the instrument. The accuracy of the translation of ILS to other languages may affect its validity and reliability. Creswell (2003) also recommended caution when the original instrument is modified. He advises that "the original validity and reliability may not hold for the new instrument, and it becomes important to re-establish validity and reliability during data analysis in a survey study" (p. 158).

The Index of Learning Style has been translated to Portuguese language and used with Brazilian students previously (Almeida & Silva, 2004; Pereira, Kuri & Silva, 2004; Silva & Neto, 2007; Soto, Azevedo, Cunha, & Andrade, 2008). However, in order to minimize the inconsistency of translation from English to Portuguese, the researcher had the ILS translated back from Portuguese to English by an English-speaking.

<div align="center">Data Analysis</div>

The participants consisted of 351 senior high students attending public and private schools in Belo Horizonte-MG., Brazil. Students answered seven questions from a demographic questionnaire developed by the researcher. Students also completed the Portuguese version of the Index of Learning Styles (ILS) survey. The ILS consists of 44 questions that were available to students in paper and pencil format. The data collection followed the guidelines provided by the Institutional Review Board at Auburn University.

The Predictive Analysis Software 18.0 (PASW, 2010) was used to perform a series of descriptive statistics, chi-square analysis, Multiple Linear Regression with Stepwise procedure, and Logistic Regression. Descriptive statistics were used to describe the participants. Ross and Shannon (2008) pointed out that "the purpose of descriptive statistics is to describe a variable or variables … It describes the mathematical center point of a set of numerical data" (p. viii).

Chi-square analysis was used to assess participants' variables such as, gender, age, and type of school attended. Also, the relationship between these variables and the four domains of the Index of Learning Styles: active/reflective, sensing/intuitive, visual/verbal and sequential/global. Green and Salkind (2008) explained that chi-square is a nonparametric procedure that "evaluates whether the proportion associated with a variable with two or more categories is equal to hypothesized values" (p. 349).

Multiple Linear Regression with stepwise procedure was completed to address the research question inquiring about the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitude toward school. Ross and Shannon (2008) stated that Multiple Linear Regression is a "method of predicting a dependent variable with two or more independent variables" (p. 163). Green and Salkind (2008) explained that when applying multiple linear regressions in a non-experimental study the dependent variable is called criterion and the independent variables are called predictors. Thus, in this study, the criterion was students' attitude toward school and the predictors were: type of school attended – private, public morning and public evening, and students' learning styles preferences.

Logistic Regression was used to analyze the data concerning the question about the relationship between Brazilian senior high school students' learning styles from public and

private schools as measured by the Index of Learning Styles, and their plans to attend college. Garson (2008) stated that logistic regression is a "form of regression which is used when the dependent is a dichotomy and the independents are of any type" (para. 1). Garson added that the logistic regression "estimates the odds of a certain event occurring … logistic regression calculates changes in the log odds of the dependent" (para. 4). In this study, the dichotomous dependent variable was students' plans to attend college. Students were asked to indicate their intention by answering a yes or no question. The independent variables were: type of school attended, private, public morning and public evening and students' learning styles preferences.

Summary

This chapter restates the purpose and research questions for the study. Chapter 3 also presents the design of the study; describes the participants; explains the data collection method; provides a summary of the demographic information sheet; and describes the Index of Learning Styles (ILS). A discussion of the validity and reliability of the ILS is also included in this chapter. In addition, this chapter covers the data analysis used in the study. Descriptive statistics were used to describe the participants. Chi-square analysis was used to assess participants' variables such as, gender, age, and type of school attended. Multiple Linear Regression with stepwise procedure was completed to address the research question inquiring about the relationship between Brazilian senior high school students' learning styles and their attitude toward school. Logistic Regression was used to analyze the data concerning the question about the relationship between Brazilian senior high school students' learning styles and their plans to attend college.

The next chapter includes the demographic profile of the participants. Further, Chapter 4 presents the results of the Chi-square, the Multiple Linear Regression and Logistic Regression analysis. Chapter 4 concludes with a summary of the results. Chapter 5 discusses the results of this study. The conclusions by research questions are also found in Chapter 5. Chapter 5 ends with recommendations for practitioners and future research.

Chapter 4

Findings

Chapter 4 reiterates the purpose of the study and the research questions. This chapter

also includes the demographic profile of the participants. Further, this chapter presents the results

of the chi-square analyses used to investigate the relationship between students' learning styles,

type of school attended, age and gender. In addition, the results of the multiple linear regression

and logistic regression analysis are presented. This chapter concludes with a summary of the

results. Version 17 of Statistical Program for Social Science (SPSS) software was used to

analyze the data. The data collected were handled following the guidelines from the Institutional

Review Board at Auburn University (see Appendix 3).

Purpose of the Study

The purpose of this study was to examine the relationship between learning styles of

Brazilian senior high school students and the type of school attended, public or private schools.

The Brazilian public school system has been criticized for the quality of education offered.

Public schools, normally, serve students from low-income neighborhoods while private schools

serve middle and upper-class students (Brock & Schwartzman, 2004). This study also

investigated the relationships between Brazilian senior high school students' learning styles and

gender, age, attitudes toward school and their plans to attend college. The Portuguese language

version of the Index of Learning Styles (ILS) was used to identify the following learning styles

domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global.

Research Questions

This study addressed the following research questions:

1. What is the relationship between Brazilian senior high school students' learning styles as measured by the Index of Learning Styles and the type of school attended – public or private?

2. What is the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, based on gender and age?

3. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitudes toward school?

4. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college?

Demographic Profile

The participants for this study consisted of 351 Brazilian senior high school students enrolled in public and private schools in Belo Horizonte-Brazil. They represent a convenience sample. Students answered seven questions from a demographic questionnaire developed by the researcher. The questions included: age, gender, grade, type of school – public or private, school session – morning or evening, students' attitude toward school and students' plans to attend college (see English and Portuguese versions - Appendix 2).

The Portuguese version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global (see English and Portuguese versions – Appendix 1).

Participants by Age

Participants consisted of 351 Brazilian senior high school students enrolled in public and private schools in Belo Horizonte-Brazil. Participants ranged from 16 to 42 years of age with mean age of 17.74 (SD = 2.43). The mean and standard deviation by age are provided in Table 1.

Table 1

Mean and Standard Deviation by Age ($N = 351$)

	Minimum	Maximum	Mean	Std. Deviation
Student Age	16.0	42.0	17.74	2.43

The largest percentage of the sample consisted of students who were 17 years old (55.3%) followed by students who were 18 years old (22.5%). Distribution and percentage of participants by age are presented in Table 2.

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Table 2

Distribution and Percentage of Participants by Age (*N* = 351)

Age	*N*	%
16	29	8.3%
17	194	55.3%
18	79	22.5%
19	26	7.4%
20	11	3.1%
21	3	.9%
22	2	.6%
23	2	.6%
26	1	.3%
31	1	.3%
37	1	.3%
39	1	.3%
42	1	.3%

Participants by Gender

Out of the 351 students, there were 180 female (51.3%) and 171 male (48.7%).

Participants in this study were nearly equally distributed by gender (see Table 3).

Table 3

Distribution and Percentage of Participants by Gender (*N* = 351)

Gender	*N*	%
Female	171	48.7%
Male	180	51.3%

Participants by School

Secondary education in Brazil is offered by public and private institutions. Wechsler

(1993) calls attention to the fact that the quality of "secondary education typically differs

considerably between public and private schools; the former is generally inferior" (p. 197). The Brazilian public school system has been heavily criticized for the quality of education offered (Castro & Tiezzi, 2004; Domingues, et al., 2000; INEP, 2004; UNESCO, 2011; Zibas, 2005). Public schools, for the most part, serve students from low income neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). High school students have the option to attend school in the morning or evening sessions. Students already in the workforce attend school in the evening sessions.

Participants in this study were enrolled in private and public schools. Students attended classes in three sessions – private morning, public morning and public evening. From the total of 351 participants, 151 participants were from private school, 98 participants were from public morning school, and 102 participants were from public evening school (see Table 4).

Table 4

Distribution and Percentage of Participants by School (*N* = 351)

Type of School	*N*	%
Private	151	43.0%
Public morning	98	27.9%
Public evening	102	29.1%

Participants by Learning Styles Domains

Active/Reflective

The active/reflective dimension is related to how an individual processes information or transforms it into knowledge. Learners who favor active experimentation retain and understand new information through engagement in physical activity, trying things out – discussing or applying it or explaining it to others. Learners who favor reflective observation retain and understand new information by examining and manipulating it introspectively – thinking things

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through before trying them out. Reflective learners prefer working alone or with one or two familiar partners (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

The results indicated that out of 351 participants, 274 were active learners and 77 were reflective learners. Active learners were almost four times the number of reflective learners (see Table 5).

Sensing/Intuitive

The sensing/intuitive dimension distinguishes between the two ways of how an individual perceives information. Sensing learners (sensors) prefer learning new information through their senses. Sensors are practical, careful and patient with details. Intuitive learners (intuitors) prefer learning new information through reflection. Intuitors like innovations. Intuitors grasp new concepts easily (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

As Table 5 exhibits, out of 351 participants, 258 were sensing learners and 93 were intuitive learners. Sensing learners were almost three times the number of intuitive learners.

Visual/Verbal

The visual/verbal dimension deals with the input of information by an individual. Visual learners retain more information from what they see: pictures, diagrams, graphs, time lines, films and demonstrations. Verbal learners prefer written and spoken explanations (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005).

The data revealed that 228 students were visual learners and 123 were verbal learners. Visual learners were almost the double the number of verbal learners (see Table 5).

Sequential/Global

The fourth dimension, sequential/global, is associated with the understanding of information. Sequential learners prefer learning new information sequentially, in linear steps, in

small connected chunks. They follow logical stepwise paths in solving a problem. Global

learners are synthesizers and thinkers. They think in a systems-oriented manner. Their holistic

perspectives enable them to see connections that no one else sees. Global learners enjoy jumping

directly to more complex and difficult material (Felder & Brent, 2005; Felder & Silverman,

1988; Felder & Spurlin, 2005).

As identified in Table 5, 236 participants were sequential learners and 115 were global

learners. Sequential learners were twice the number of global learners.

Table 5

Distribution and Percentage of Participants by Learning Styles Domains (*N* = 351)

Learning Styles	*n*	%
Active	274	78.1%
Reflective	77	21.9%
Sensing	258	73.5%
Intuitive	93	26.5%
Visual	228	65%
Verbal	123	35%
Sequential	236	67.2%
Global	115	32.8%

Data Analysis

Research Question 1

Learning Styles and School

1. What is the relationship between Brazilian senior high school students' learning styles as

measured by the Index of Learning Styles and the type of school attended – public or private?

Table 6 presents the distribution and percentages of participants by learning style

domains and type of school attended, private morning, public morning and public evening.

Table 6

Distribution and Percentage of Participants by Learning Styles Domains and Schools (*N* = 351)

	Active/Reflective		Sensing/Intuitive		Visual/Verbal		Sequential/Global	
	Active	Reflective	Sensing	Intuitive	Visual	Verbal	Sequential	Global
Private	118	33	107	44	105	46	92	59
n=151	(78.1%)	(21.9)%	(70.9%)	(29.1%)	(69.5%)	(30.5%)	(60.9%)	(39.1%)
Public	79	19	76	22	68	30	70	28
morning	(80.6%)	(19.4%)	(77.6%)	(22.4%)	(69.4%)	(30.6%)	(71.4%)	(28.6%)
n=98								
Public	77	25	75	27	55	47	74	28
evening	(75.5%)	(24.5%)	(73.5%)	(26.5%)	(53.9%)	(46.1%)	(72.5%)	(27.5%)
n=102								
	274	77	258	93	228	123	236	115
Total	(78.1%)	(21.9%)	(73.5%)	(26.5%)	(65.0%)	(35%)	(67.2%)	(32.8%)

Although the results of the chi-square analysis based on participants' learning styles domains and type schools - private, public morning and public evening, showed that no statistically significant difference existed between the active/reflective, sensing/intuitive, and sequential/global domains and the type of schools (see Table 7), the preference distribution patterns behind the nonsignificant relationships were different.

The data in Table 6 indicates that the majority of students in all three sessions are active, sensing, visual and sequential learners. Students in public evening sessions were more verbal (46.1%) than students in private (30.5%) and public morning (30.6%). Students in private school were more global (39.1%) than students in public morning (28.6%) and public evening sessions (27.5%). Students in public morning sessions were a little more active (80.6%) than students in private (78.1%) and public evening (75.5%).

A chi-square statistical analysis was conducted to assess the relationship between the type of school attended, private morning, public morning, or public evening, and the students' learning styles scores on the four domains of the Index of Learning Styles. Green and Salkind (2008) explained that chi-square is a nonparametric procedure that "evaluates whether the proportion associated with a variable with two or more categories are equal to hypothesized values" (p. 349). The significance level was set at alpha of 0.05.

<div align="center">Results by Learning Styles</div>

Active/Reflective

A chi-square analysis was conducted to assess the relationship between the type of school attended, private morning, public morning, or public evening, and the students' score on the active/reflective domains of the ILS. The results indicated no statistical significance for active/reflective students' learning styles domains, and the type of school attended – private morning, public morning and public evening, $\chi^2 (2) = .767$, $p = .682$ (see Table 7).

Sensing/Intuitive

A chi-square analysis was conducted to assess the relationship between the type of school attended, private morning, public morning, or public evening, and the students' score on the sensing/intuitive domains of the ILS. Results yielded no statistical significance for sensing/intuitive students' learning styles domains, and the type of school attended – private morning, public morning and public evening, $\chi^2 (2) = 1.366$, $p = .505$ (see Table 7).

Visual/Verbal

A chi-square analysis was conducted to assess the relationship between the type of school attended, private morning, public morning, or public evening, and the students' score on the visual/verbal domains of the ILS. Results indicated a significant relationship between

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visual/verbal students' learning styles domains and the type of school attended – private

morning, public morning and public evening, χ^2 (2) = 7.70, $p < .05$ (see Table 7). Results from

Table 6 indicated that 46.1% of students attending evening public school demonstrated

preference for verbal domain, whereas 30.5% of students attending private morning and 30.6%

of public morning students demonstrated preference for verbal domain. More students attending

evening public schools demonstrated preference for verbal domain than morning students

attending public or private schools.

Sequential/Global

A chi-square analysis was conducted to assess the relationship between the type of school

attended, private morning, public morning, or public evening, and the students' score on the

sequential/global domains of the ILS. Results suggested no statistical significance for

sequential/global students' learning styles domains, and the type of school attended – private

morning, public morning and public evening, χ^2 (2) = 4.82, $p = .090$ (see Table 7).

Table 7

Chi-square Analysis of Participants' Learning Styles Domains and Schools- Private, Public Morning and Public Evening (*N* = 351)

Learning Styles Domains	χ^2	Df	*p*
Active/Reflective	.767	2	.682
Sensing/Intuitive	1.366	2	.505
Visual/Verbal	7.693	2	.021[*]
Sequential/Global	4.817	2	.090

*p<.05

Learning Styles by Gender and Age

Research Question 2

2. What is the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, based on gender and age?

Learning Styles by Gender

Although the results of the chi-square analysis based on participants' learning styles domains and gender showed that no statistically significant difference existed between the active/reflective and sequential/global domains and students' gender (see Table 9), the preference distribution patterns behind the nonsignificant relationships were different.

Table 8 represents the distribution and percentage of participants by learning styles domains and gender. The results indicated that the majority of the students demonstrated a preference for active, sensing, visual and sequential domains. More female than male students demonstrated preferences for reflective, sensing, verbal and sequential domains. Among the females, active learners (75.4%) were three times the number of reflective learners (24.6%); sensing (78.4%) were almost four times the number of intuitive learners (21.6%); visual learners (59.1%) were 50% higher than verbal (40.9%) and sequential (69.0%) were more than double the number of global learners (31.0%).

The results in Table 8 also demonstrate that more male than female students indicated preferences for active, intuitive, visual and global learning styles domains. Among the male learners, active (80.6%) were four times the number of reflective learners (19.4%); sensing (68.9%) were more than double the number of intuitive learners (31.1%); visual learners (70.6%)

were more than twice the number of the verbal (29.4%); and sequential (65.6%) were almost double the number of global learners (34.4%).

Table 8

Distribution and Percentage of Participants by Learning Styles Domains and Gender ($N = 351$)

Learning Styles	Female		Males	
	n	%	*n*	%
Active	129	75.4%	145	80.6%
Reflective	42	24.6%	35	19.4%
Sensing	134	78.4%	124	68.9%
Intuitive	37	21.6%	56	31.1%
Visual	101	59.1%	127	70.6%
Verbal	70	40.9%	53	29.4%
Sequential	118	69.0%	118	65.6%
Global	53	31.0%	62	34.4%

A chi-square test was conducted to assess the relationship between the independent variable: participants' gender and the dependent variable: students' learning styles domains as measured by the Index of Learning Styles (ILS). The significance level was set at alpha of 0.05.

Results by Learning Styles

Active/Reflective

A chi-square test was conducted to assess the relationship between the independent variable, participants' gender and the dependent variable, students' score on active/reflective domains as measured by the Index of Learning Styles. Results indicated no statistical significance for active/reflective learning styles domains, and gender, $\chi^2 (1) = 1.341, p = .247$ (see Table 9).

Sensing/Intuitive

A chi-square analysis was performed to assess the relationship between the independent variable, participants' gender and the dependent variable, students' score on sensing/intuitive domains as measured by the ILS. Chi-square results yielded statistical significance for sensing/intuitive domains, and gender, $\chi^2(1) = 4.041$, $p = .044$. (see Table 9). There is a relationship between students' gender and their preferences for sensing/intuitive domains. More male students (31.1%) demonstrated preference for intuitive domain than female students (21.6%), whereas more female students (78.4%) demonstrated preference for sensing domain than male students (68.9%) - see Table 8.

Visual/Verbal

A chi-square analysis was completed to assess the relationship between the independent variable, participants' gender and the dependent variable, students' score on visual/verbal domains as measured by the ILS. Results indicated a significant relationship between visual/verbal learning styles domains and gender, $\chi^2(1) = 5.087$, $p < .05$ (see Table 9). There is a relationship between students' gender and their preferences for visual/verbal domains. More female students (40.9%) demonstrated preference for verbal domain than male students (29.4%), whereas more male students (70.6%) demonstrated preference for visual domain than female students (59.1%) - see Table 8.

Sequential/Global

A chi-square test was conducted to assess the relationship between the independent variable, participants' gender and the dependent variable, students' score on sequential/global domains as measured by the ILS. Results suggested no statistical significance for sequential/global domains, and gender, $\chi^2(1) = .474$, $p = .491$ (see Table 9).

Table 9

Chi-square Analysis of Participants' Learning Styles Domains and Gender ($N = 351$)

Learning Styles	χ^2	Df	p
Active/Reflective	1.341	1	.247
Sensing/Intuitive	4.041	1	.044[*]
Visual/Verbal	5.087	1	.024[*]
Sequential/Global	.474	1	.491

*$p<.05$

Learning Styles by Age

Although the results of the chi-square analysis based on participants' learning styles domains and age showed that no statistically significant difference existed between the active/reflective, sensing/intuitive and visual/verbal domains and students' age (see Table 11), the preference distribution patterns behind the nonsignificant relationships were different.

Table 10 displays the distribution and percentage of participants by learning styles domains and age. Within 16 year old age group, results indicated that active learners (82.8%) were almost four times the number of reflective learners (21.9%); sensing (72.4%) were more than twice the number of intuitive learners (27.6%); visual learners (72.4%) were also more than twice the verbal (27.6%), and sequential (75.9%) were about three times the number of global learners (24.1%).

The results at Table 10 indicated that within 17 year old age group, active learners (81.4%) were four times the number of reflective learners (18.6%); sensing (75.3%) were three times the number of intuitive learners (24.7%); visual learners (68.0%) were 50% higher than verbal (32.0%) and sequential (67.0%) were double the number of global learners (33.0%).

Table 10 illustrated that within 18 years old age group, active learners (74.7%) were almost three times the number of reflective learners (25.3%); sensing (69.6%) were more than

twice as the number of intuitive learners (30.4%); visual and sequential learners (57.0%) were almost 50% higher than verbal and global learners (43.0%).

The results at Table 10 demonstrated that within 19 years old or older, active learners (67.3%) were twice the number of reflective learners (32.7%); sensing (73.5%) were almost three times the number of intuitive learners (26.5%); visual learners (61.2%) were 50% higher than verbal (38.8%) and sequential (79.6%) were four times the number of global learners (20.4%).

Table 10

Distribution and Percentage of Participants by Learning Styles Domains and Age (*N* = 351)

Age	Active/Reflective		Sensing/Intuitive		Visual/Verbal		Sequential/Global	
	Active	Reflective	Sensing	Intuitive	Visual	Verbal	Sequential	Global
16	24	5	21	8	21	8	22	7
n=29	(82.8%)	(21.9%)	(72.4%)	(27.6%)	(72.4%)	(27.6%)	(75.9%)	(24.1%)
17	158	36	146	48	132	62	130	64
n=194	(81.4%)	(18.6%)	(75.3%)	(24.7%)	(68.0%)	(32.0%)	(67.0%)	(33.0%)
18	59	20	55	24	45	34	45	34
n=79	(74.7%)	(25.3%)	(69.6%)	(30.4%)	(57.0%)	(43.0%)	(57.0%)	(43.0%)
19 and up	33	16	36	13	30	19	39	10
n=49	(67.3%)	(32.7%)	(73.5%)	(26.5%)	(61.2%)	(38.8%)	(79.6%)	(20.4%)

N=351

A chi-square test was conducted to assess the relationship between the independent variable: participants' age and the dependent variable: students' learning styles domains as measured by the Index of Learning Styles (ILS). The significance level was set at alpha of 0.05.

Results by Learning Styles

Active/Reflective

A chi-square test was conducted to assess the relationship between the independent variable, participants' age and the dependent variable, students' score on active/reflective domains as measured by the Index of Learning Styles. Results indicated no statistical significance for active/reflective students' learning styles domains, and age, χ^2 (3) = 5.480, p = .140 (see Table 11).

Sensing/Intuitive

A chi-square analysis was performed to assess the relationship between the independent variable, participants' age and the dependent variable, students' score on sensing/intuitive domains as measured by the ILS. Results yielded no statistical significance for sensing/intuitive students' learning styles domains, and age, χ^2 (3) = .936, p = .817 (see Table 11).

Visual/Verbal

A chi-square analysis was completed to assess the relationship between the independent variable, participants' age and the dependent variable, students' score on visual/verbal domains as measured by the ILS. Results suggested that there were no significant relationships between visual/verbal students' learning styles domains and age, χ^2 (3) = 4.037, p =.257 (see Table 11).

Sequential/Global

A chi-square test was conducted to assess the relationship between the independent variable, participants' age and the dependent variable, students' score on sequential/global domains as measured by the ILS. Results indicated statistical significance for sequential/global students' learning styles domains, and age, χ^2 (3) = 8.165, p < .05 (see Table 11). There is a relationship between students' age and their preferences for sequential/global domains. More 18

year old students (43.0%) demonstrated preference for global domain than other age groups, whereas more 19 year old students (79.6%) demonstrated preference for sequential domain (see Table 10).

Table 11

Chi-square Analysis of Participants' Learning Styles Domains and Age (*N* = 351)

Learning Styles	χ^2	Df	*p*
Active/Reflective	5.480	3	.140
Sensing/Intuitive	.936	3	.817
Visual/Verbal	4.037	3	.257
Sequential/Global	8.165	3	.043[*]

*p<.05

Research Question 3

Learning Styles and Attitudes toward School

3. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitudes toward school?

Multiple Linear Regression with stepwise procedure was completed to address the research question inquiring about the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitude toward school. Ross and Shannon (2008) stated that Multiple Linear Regression is a "method of predicting a dependent variable with two or more independent variables" (p. 163). Green and Salkind (2008) explained that when applying multiple linear regressions in a non-experimental study the dependent variable is called criterion and the independent variables are called predictors. Thus, in this study, the criterion was students' attitude toward school and the

predictors were: type of school attended – private or public and students' learning styles preferences.

The results of the Multiple Linear Regression analysis indicated that 5.7% of variance in the dependent variable – students' attitude toward school – can be accounted by the Regression model. ANOVA Regression model is statistically significant, $F(3.347) = 7.044$ $p < 0.001$, indicating that there is a linear relationship between the independent variables – type of school and students' learning styles preferences – and dependent variable – students' attitude toward school. Verbal students expressed that they like school more than visual students, ($p = 0.011$). Results yielded no statistical significance for active/reflective, sensing/intuitive and sequential/global domains. Public school students demonstrated that they like school better than students in private school, ($p = 0.001$). Students enrolled in morning schools demonstrated that they like school better than students attending evening school, ($p = 0.001$). Overall, the results indicated that students in morning public school like school more than students enrolled in private and evening public school.

<center>Research Question 4</center>

<center>Learning Styles and Plans to Attend College</center>

4. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college?

Logistic regression was used to analyze the data concerning the question about the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college. Garson (2008) stated that logistic regression is a "form of regression which is used when the

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dependent is a dichotomy and the independents are of any type" (para. 1). Garson added that the logistic regression "estimates the odds of a certain event occurring…logistic regression calculates changes in the log odds of the dependent" (para. 4). In this study, the dichotomous dependent variable was students' plans to attend college. Students were asked to indicate their intention by answering a yes or no question. The independent variables were: type of school attended, private, public morning and public evening and students' learning styles preferences.

The results of the goodness-of-fit test indicated that the data fit the logistic regression model, $\chi^2(8) = 9.873$, $p = .274$. The results of logistic regression suggested that there were no significant relationships between the dependent variable, students' plans to attend college, and students' learning styles domains. Logistic regression results indicated that there was a significant relationship between the dependent variable, students' plans to attend college, and the type of school attended, evening and morning. The odds to plan to attend college for students enrolled in public evening school is 75% less than students in private and morning public schools, $p = .011$.

<div align="center">Summary</div>

The Predictive Analysis Software 18.0 (PASW, 2010) was used to analyze the data for this study. The data collected were handled following the guidelines from the Institutional Review Board at Auburn University. Chi-square results indicated a significant relationship between visual/verbal students' learning styles domains and the type of school attended – private morning or public morning and public evening. Chi-square results also yielded statistical significance for sensing/intuitive students' learning styles domains, and gender. Chi-square results indicated a significant relationship between visual/verbal students' learning styles

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domains and gender. Chi-square results indicated statistical significance for sequential/global students' learning styles domains and age.

The results of the Multiple Linear Regression analysis indicated that students in morning public school like school better than students enrolled in private and evening public school. Logistic regression results indicated that there was significant relationship between the dependent variable, students' plans to attend college, and the type of school attended. The odds to plan to attend college for students enrolled in public evening school is 75% less than students in private and morning public schools.

Chapter 5 will present the summary, conclusions, implications and recommendations for practitioners and future research

Chapter 5

Summary, Conclusions, Implications and Recommendations

Introduction

Learning styles – the unique ways each learner approaches a learning situation – is an

important piece that students bring to the classroom. Knowles (1990) stated that "learners are

highly diverse in their experiential backgrounds, pace of learning, readiness to learn, and styles

of learning" (p. 172). Researchers agree that students have different ways of learning or diverse

learning styles. Recent studies about learning styles indicated a continued interest in this subject

and its influence on students' learning processes (Evans, et al., 2010; Hlawaty, 2009; Mestre,

2010; Platsidou & Metallidou, 2009). Bacon (2004) stated that:

> One of the major educational movements of the past 25 years has been the increased
> attention to students 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. (p. 205)

Keefe (1979) asserted that making students aware of their learning styles is a way to help

them see themselves as learners, which will lead them toward more engagement in the learning

process and improve their effectiveness as learners. When students understand more about their

own preferences for learning, they are also learning how to learn, which is "an empowering

experience that students need if they are to be successful lifelong learners" (Claxton & Murrell,

1987, p. iv). Willians, McIntosh, Seary and Simpson (2006) emphasized that:

> When students are given the opportunity to discover their learning preferences, many are
> able to revise their existing perspectives about themselves as marginalised learners and to

change them. Understanding their specific learning preferences gives them a framework for adopting learning strategies that they can call upon in various learning situations. Armed with this repertoire, they can challenge old beliefs about themselves and create new realities. (p. 185)

In Chapter 1, research questions, purpose, statement of the problem, significance, and limitations of the study were discussed. Chapter 2 provided a review of literature. It presented a discussion of learning in today's society; an overview of the Brazilian educational system; and a summary of the current knowledge about learning style. Chapter 2 also reviewed influential learning style theorists; the learning style model developed by Felder and Silverman (1988) and the instrument associated with the model – Index of Learning Styles. Learning style studies concerning the research questions proposed in this study were also included in Chapter 2.

Chapter 3 presented the participants, the data collection method, a summary of the demographic information sheet, and described the Index of Learning Styles (ILS). A discussion of the validity and reliability of the ILS was included. In addition, Chapter 3 covered the data analysis used in the study. Chapter 4 included the demographic profile of the participants, the results of the chi-square, the multiple linear regression and logistic regression analysis. Chapter 5 discusses the results of this study. The conclusions by research questions are also found in Chapter 5. This chapter ends with recommendations for practitioners and future research.

Purpose of the Study

The purpose of this study was to examine the relationship between learning styles of Brazilian senior high school students and the type of school attended, public or private schools. The Brazilian public school system has been criticized for the quality of education offered. Public schools, normally, serve students from low-income neighborhoods while private schools serve middle and upper-class students (Brock & Schwartzman, 2004). This study also investigated the relationships between Brazilian senior high school students' learning styles and

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gender, age, attitudes toward school and their plans to attend college. The Portuguese language version of the Index of Learning Styles (ILS) was used to identify the following learning styles domains: active/reflective, sensing/intuitive, visual/verbal and sequential/global.

Summary

The participants for this study consisted of 351 Brazilian senior high school students enrolled in public and private schools in Belo Horizonte-Brazil. They represent a convenience sample. Students answered seven questions from a demographic questionnaire developed by the researcher. The questions included: age, gender, grade, type of school – public or private, school session – morning or evening, students' attitude toward school and students' plans to attend college. From the total of 351 participants, 151 participants were from private school (43%), 98 participants were from public morning school (28%), and 102 participants were from public evening school (29%). There were 180 females (51.3%) and 171 males (48.7%). Participants in this study were nearly equally distributed by gender. Participants ranged from 16 to 42 years of age with mean age of 17.74 (SD = 2.43). The largest percentage of the sample consisted of students who were 17 years old (55.3%) followed by students who were 18 years old (22.5%).

The Portuguese language version of the Index of Learning Styles (ILS) was used to identify the learning styles preferences of 351 Brazilian students. The students' scores on the learning styles domains – active/reflective, sensing/intuitive, visual/verbal and sequential/global – indicated that active learners were almost four times the number of reflective learners. Sensing learners were almost three times the number of intuitive learners. Visual learners were almost double the number of verbal learners. Sequential learners were twice the number of global learners (see Table 5). Overall the results demonstrated that the majority of students in all three

school sessions – private morning, public morning and public evening – indicated preference for active, sensing, visual and sequential learning style domains (see Table 5).

A chi-square statistical analysis was conducted to assess the relationship between the independent variable: type of school attended, private morning, public morning, or public evening, and dependent variable: the students' learning styles scores on the four domains of the Index of Learning Styles (ILS). The results indicated a significant relationship between visual/verbal students' learning styles domains and the type of school attended – private morning or public morning and public evening.

A chi-square test was conducted to assess the relationship between the independent variable: participants' gender and the dependent variable: students' learning styles domains as measured by the ILS. Results yielded statistical significance for sensing/intuitive students' learning styles domains, and gender. Results also indicated a significant relationship between visual/verbal students' learning styles domains and gender.

A chi-square analysis was conducted to assess the relationship between the independent variable: participants' age and the dependent variable: students' learning styles domains as measured by the Index of Learning Styles (ILS). Results indicated statistical significance for sequential/global students' learning styles domains and age.

Multiple linear regression with stepwise procedure was completed to address the relationship between the independent variables (predictors): type of school attended – private or public and students' learning styles preferences, and the dependent variable (criterion): students' attitude toward school. The results indicated that there is a linear relationship between the type of school and students' learning styles preferences and the students' attitudes toward school.

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The results from logistic regression suggested that there were no significant relationships between the students' plans to attend college, and the students' learning styles domains. Logistic regression results indicated that there was a significant relationship between the students' plans to attend college, and the type of school attended, evening and morning. The odds to plan to attend college for students enrolled in public evening school is 75% less than students in private and morning public schools, ($p = .011$).

<div align="center">Conclusions</div>

The findings of this study indicated that the majority of students in all three school sessions – private morning, public morning and public evening – demonstrated preference for active, sensing, visual and sequential learning style domains (see Table 5). This finding is in line with earlier Brazilian studies concerning students learning styles preferences. Almeida and Silva (2004) used the Portuguese version of ILS to investigate the preferences of engineering students; Silva and Neto (2007) administered the ILS to 194 accountant students; Soto, Azevedo, Cunha, Andrade (2008) used the ILS to examine the learning styles preferences of 104 agronomy and forestry students; in all three studies, the majority of the participants were active, sensing, visual and sequential learners.

Likewise, the findings of this study are supported by American studies. Pallapu (2009) used the ILS to examine the learning styles preferences of 346 college students in the U.S.. Berry and Settle (2011) identified the learning styles preferences of 180 college students. In both studies the participants indicated similar learning styles preferences. The majority of the students indicated preference for active, sensing, visual and sequential learning styles domains.

However, different findings were presented by Zhang and Lambert (2008). They administered the Chinese language version of the ILS to Chinese college students and found that

the majority of students indicated preference for reflective, sensing, visual, and global domains. The preference for reflective and global by Chinese college students differ from the findings from Brazilian and American studies, which indicated that students demonstrated a preference for active and sequential learning styles. In another study, Maldonado-Torres (2011) examined the relationship between Dominican and Puerto Rican students' learning styles. Although Maldonado-Torres' study used a different instrument, the findings of her study are the importance to this study of Brazilian students. Her findings indicated that Dominican and Puerto Rican students' have different learning style preferences. Maldonado-Torres (2011) stated that the findings from her study suggested that "students' country of origin may be related to their preferences in learning styles" (p. 234). She added that "although other factors should be considered in developing effective learning strategies, country of origin must be an important factor in determining individuals' learning styles" (p. 234).

Falt's (1999) statement about the proportion of sensing and intuitive in a general population does not reflect the findings of this study of Brazilian students. Falt (1999) estimated are that there are about 75% sensors and 25% intuitors in the general population. This ratio holds equally for men and women. The findings of this study indicated that among Brazilian students, 69% of females were sensors and 31% were intuitors.

The conclusions by research questions are presented below:

1. What is the relationship between Brazilian senior high school students' learning styles as measured by the Index of Learning Styles and the type of school attended, public or private?

The findings of this study indicated that there is a relationship between visual/verbal students' learning styles domains and the type of school attended – private morning, public morning and public evening public schools. This finding is in agreement with the findings of

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Montgomery (1994) and Leahy, Gaughran, and Seery's (2009) studies. Even though Montgomery (1994) used a different instrument to assess students' learning styles, his findings are similar to this study. He found that students' learning style vary across school types. Montgomery suggested that the differences in students' learning preferences indicated the need for educators to adapt their teaching methods to more nearly match the diverse learning styles represented in the school classrooms. Leahy, Gaughran, and Seery (2009) administered the ILS to Irish high school students and found that students in a single sex-female school indicated a significant preference for the reflective domain. Students from a co-educational school demonstrated preference for the active domain. Students from community school demonstrated preference for the active and sensing domains. The vocational school students indicated preference for reflective and intuitive domains. Leahy, Gaughran, and Seery (2009) acknowledged that these differences in learning style preferences contradicted the stereotype for the type of schools.

2. What is the relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, based on gender and age?

Findings from this study, suggested that learning styles vary according to students' gender. There was a significant relationship between male and female students and their preference for sensing/intuitive and visual/verbal learning style domains. Overall, these findings were consistent with the findings from other studies (De Paula, 2002; De Paula, 2004; Durham-Thompson, 2005; Hlawaty, 2002; Honigsfeld & Dunn, 2003; Reese & Dunn, 2008). Males and females demonstrated different learning styles preferences. The findings of Ku and Shen's (2009) study with Taiwanese freshmen college students also indicated learning style differences

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by gender. Students' scores on the ILS indicated that more female students demonstrated preference for intuitive and global domains than male students. Another study conducted with college students in the UK, indicated that more female students demonstrated preference for reflective and visual domains than male students (Prajapati, Dunne, Bartlett, & Cubbidge, 2011).

Considering students' age, the findings from this study indicated significant differences for sequential/global students' learning styles domains. This result is in line with other studies which indicated that students' learning style preferences change over time, student's maturation and experience (De Paula, 2002; De Paula, 2004; Dunn, 1993b; Dunn & Dunn, 1993; Dunn & Griggs, 1995b; Durham-Thompson, 2005; Griggs & Dunn, 1996; Hlawaty, 2002, 2009). Conversely, McChlery and Visser (2009) administered the ILS to accounting students in the United Kingdom and South Africa and found that students' learning styles preferences did not vary by age. Though, in order to support one of the above arguments and extend them to Brazilian students, it would be necessary to conduct a longitudinal study.

3. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their attitudes toward school?

The findings indicated that there is a linear relationship between the type of school and students' learning styles preferences and the students' attitude toward school. Verbal students expressed that they liked school more than visual students. Public school students demonstrated that they liked school better than students in private school. Students enrolled in morning schools demonstrated that they liked school better than students attending evening school. Overall, the findings indicated that students in morning public school liked school more than students enrolled in private and evening public school. These findings are in line with the study of

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Uzuntiryaki, Bilgin, and Geban (2003). They investigated students' learning styles preferences and their attitude toward chemistry as a school subject. Their findings indicated that students' attitudes toward chemistry varied based on the student learning style preferences.

4. To what extent is there a relationship between Brazilian senior high school students' learning styles from public and private schools as measured by the Index of Learning Styles, and their plans to attend college?

The findings suggested that there were no significant relationships between students' plans to attend college, and the students' learning styles domains. The findings of this study differ from findings of Emanuel and Potter's (1992) study. Emanuel and Potter investigated the relationship between high school students learning styles preferences and orientation toward college. Results indicated that students who want to go to college scored higher on dependent and participative styles and lower on independent styles. Emanuel and Potter (1992) suggested that students who are serious about going to college spend more time at school and thus become more dependent on teachers.

The majority of students in this study indicated that they plan to attend college. This result is not representative of the reality of college attendance in Brazil, where college enrollment in 2002, for high school graduates in the 18-25 age group was 9% (INEP 2003; UNESCO 2004). McCowan (2007) explained that "equity is not a word commonly associated with Brazilian society. The country is one of the most unequal in terms of income distribution, and educational opportunities are distributed in a similarly unjust way" (p. 583).

The findings indicated that there was a significant relationship between the students' plans to attend college, and the type of school attended, evening and morning. The likelihood of planning to attend college for students enrolled in public evening school is much less than

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students in private and morning public schools. This finding is supported by the literature. Brock and Schwartzman (2004) stated that "half the students in secondary education attend evening classes, many of them work and are older than they should be …. For most, the only goal is to get the education credential necessary for the job market…" (p. 30). In addition, McCowan (2007) emphasized that:

> Access to higher education in Brazil is to a large extent restricted to the higher socio-economic groups. Public universities have limited places and entry is determined by highly competitive exams, thereby excluding those who have not had a high quality secondary education or attended an expensive preparatory course. There has been considerable growth in the private sector to absorb the excess demand, but the majority of Brazilians cannot afford the fees. (p. 580)

Implications

The findings from this study extended and diversified the research on learning styles conducted with Brazilian students. The literature review, findings from international studies and findings of this study support the assertion that students have different learning styles. Brazilian students' learning styles were found to vary according to gender, age, type of school attended and attitude toward school. Implications of these findings are significant. Findings of this study can be used to inform educators in public and private secondary schools, and higher education about the differences in learning styles Brazilian students bring to the classroom.

As the results indicated that Brazilian students learn differently from each other, they need different learning strategies and will approach learning situations in a variety of ways. Earlier research suggested that educators should acknowledge that learning styles differences present a potential to influence student learning, motivation, and achievement. Thus, Brazilian educators need to be aware of the diversity of learning styles found in the classroom and translate

this awareness into a variety of teaching and learning strategies that will accommodate students' diverse styles preferences.

Findings may promote an awareness and appreciation for students' diverse learning styles. These findings may also offer insights into the implementation of learning styles theories in Brazilian secondary schools and higher education. Findings may make it possible for Brazilian educators to design curriculum and instruction in a way that will meet the needs of students more effectively. Felder and Spurlin (2005) agreed that an important application of learning styles is to support the design of effective instruction:

> Having a framework for identifying the different types of learners can help an instructor formulate a teaching approach that addresses the needs of all students. Moreover, determining the learning style profile of a class using an instrument such as the Index of Learning Styles (without being overly concerned about which student has which preferences) provides additional support for effective instructional design. (p. 105)

The application of learning styles theories can assist educators to design more effective instruction and place students in learning situations that are appropriate for them (Keefe, 1979). Claxton and Murrell (1987) observed that the knowledge of learning styles can help educators "become more sensitive to the differences students bring to the classroom. It can also serve as a guide to the design of learning experiences that match or mismatch students' styles, depending on whether the purpose of the experience is instrumental or developmental" (p. 78). Witte and Witte (2012) added that:

> If individuals know about their preferences, they could attempt to match learning activities with their preferred style or to try to extend their range of styles and use the less preferred style as a form of trial and error or as a discovery process. (p. 345)

Several researchers have indicated that an important way to use learning styles theories in the classroom is to raise awareness in both teacher and learner, that each individual has different

ways of learning and that those learning differences should be considered for teaching to be

effective and learning to take place (Claxton & Murrell, 1987; Pritchard, 2005).

Witte and Witte (2012) asserted that students often demonstrate a "preference for a given

learning style, and instructors who acknowledge these varying strengths and abilities will be able

to structure successful learning experiences for their students" (p. 336). Irvine and York (1995)

added that instructors who:

> understand the preferred style of a student can use that knowledge to design and plan
> instruction and to encourage students to experiment with a wider repertoire of learning
> approaches.…learning-styles research is a useful beginning point in designing
> appropriate instruction for culturally diverse students. (p. 494)

Findings of this study can be used to help high school and college students to gain a

better understanding of their own learning preferences and strengths. Students' performance

increase when they understand their strengths, and are encouraged to use their learning styles

preferences. When students understand their preferred way of learning, they can use the

information to develop strategies that will help them learn best in classes that are difficult for

them. Researchers agree that awareness of students' learning styles may increase student

learning and achievement (Claxton & Murrell, 1987).

Brazilian educators and law makers face the challenge of providing a better education for

its students. Souza (2001) stressed that the "main challenge is the pursuit of increasingly high

levels of quality at all levels of education" (p. 65). Findings of this study support the assertion

that Brazilian students have different learning styles. This information may give insights to

Brazilian educators and law makers as they design curricula and programs that are appropriate to

all types of learning styles preferences.

Furnham (2012) stated that the research into, and application of learning styles will

continue to increase as educators all around the world thrive to understand and accommodate the

needs of all learners. She emphasized the usefulness of learning styles concepts in education today:

> Style concepts fit well into the current spirit of the times, in which there is great interest in how to change and develop abilities and preferences. [Learning] Styles tests appear to offer as much insight as, if not more than, some of the instruments used in the past. (p.77)

Researchers recommended caution as the results of research on learning styles are extended to other countries since individuals' learning styles may be influenced by different cultural backgrounds and ethnicity (De Vita, 2001; Dunn & Griggs, 2007; Joy & Kolb, 2009; Ku & Shen, 2009; Pak & Sands, 1996; Strang, 2010; Wu & Alrabah, 2009; Yamazaki, 2005). Strang (2010) stated that "student learning styles differ across cultures; therefore, teachers should at least be aware of this potential impact on pedagogy" (p. 521). Wechsler (1993) recommended that:

> Research on learning styles should be conducted in different countries in order to know which is the best means to increase educational achievement in different parts of the world, and which are the highest priorities for people in different cultures. The importance of these factors may vary from one culture to the other, depending on their respective values or social rewards for specific behaviors and achievements. (p. 209)

Recommendations for Practitioners

Recommendations for Practitioners include:

- Inform students and parents about learning styles and its implication for student learning. Matthews (1995) recommended that administrators and teachers should instruct students about students' strengths and weaknesses related to their learning style.

- Administer and discuss the results of the ILS with students in the beginning of the school year, as a way to make students aware of their own learning preferences.

- Present and discuss with students learning strategies that work better for each of the learning styles domains.

- Administer the ILS to teachers and school administrators. Honigsfeld and Schiering (2004) emphasized that when "teachers reflect on their teaching, they develop a deeper understanding of their own actions, a firmer grasp on the processes that take place in their classrooms, and stronger problem-solving skills" (p. 487).

- Diversify and balance classroom activities as a way to accommodate students learning preferences and also challenge students to learn in ways that are not their preferred way.

Recommendations for Future Research

This study was limited to two types of schools – private and public – from a metropolitan area of southeast Brazil. Data collection was cross-sectional. Recommendations for future research are as following:

- Extend this study by investigating the learning styles of high school students from other areas of Brazil. The participants of this study were from a metropolitan area in the southeast of Brazil.

- Extend this study by including students attending public or private vocational schools. The participants of this study were from public and private schools with similar curricula.

- Extend this study by including sophomore, junior and senior students. This study only included senior students.

- Replicate this study by performing a longitudinal examination of the learning styles of Brazilian high school students attending public and private schools to identify possible changes in learning styles preferences. The data for this study were cross-sectional.

- Replicate this study and include students' race, economic status, and achievement as variables. These variables were not included in this study.

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- Replicate this study and explore in greater depth the relationship between students' learning styles preferences and their attitudes toward school.

- Investigate the learning styles of Brazilian high school students and their option of college major. Since the majority of students in this study indicated that they plan to attend college, it would helpful to include college major as a variable.

- Replicate this study and include students' preferences for different types of learning strategies as a variable. This variable was not included in this study. Since the results of this study demonstrated that students have different learning styles, it would be helpful to identify their preferred learning strategies.

- Replicate this study with high school students attending public and private schools in the U.S. to identify learning styles preferences.

- Use the data from this study to compare Brazilian high school students learning styles preferences with American and/or high school students of other nationalities.

- Extend this study by comparing Brazilian high school students learning styles and college students learning styles preferences.

- Extend this study by comparing Brazilian high school students learning styles with secondary education teachers learning styles. Studies comparing learning styles of students and teachers suggested that they have different learning styles. Berry and Settle (2011) found that teachers were reflective, intuitive, visual and global. In Brazil, Silva and Neto (2007) found that teachers were reflective, intuitive, visual and sequential, while students in both studies demonstrate preferences for active, sensing, visual and sequential styles.

- Investigate the reliability and validity of the Portuguese language version of Index of Learning Styles.

Overview

This study provided an examination of the learning styles of Brazilian high school students. This study was confined to a few schools in one city in Brazil and data may not be generalized to other areas. Brazilian students' learning styles were found to vary according to gender, age, type of school attended and attitude toward school. Educators should acknowledge that these differences present a potential to influence student learning, motivation, and achievement. Mathews (1995) asserted that the "knowledge of one's style could help a student use his or her strengths to perform at maximum potential, thus increasing the quality of life" (p. 96). Cegielski, Hazen, and Rainer (2011) stated that "should we as educators accept the challenge to teach them how they learn, our impact as educators may be greater and our students may be better prepared for the rigors of the profession into which they aspire to enter" (p. 144). The importance of the application of learning style research for all learners is enphasized by Dunn and Dunn (2008), who stated that:

> unless educators are willing to objectively examine that body of research on individual learning styles and experiment with the findings, increasing numbers of children across the world will be unable to profit much from lectures, readings, and discussions. Worse, they will be unable to contribute to a rapidly expanding, highly competitive, global economy. (p. 89)

By examining the learning styles of Brazilian high school students, this study sought to contribute to the understanding of how students learn in the southern part of the world. It is hoped that, this study will provide educators with insights, as they facilitate their students' journey in becoming lifelong learners.

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Appendix 1

Index of Learning Styles (ILS) English/Portuguese Versions

INDEX OF LEARNING STYLES [*]

DIRECTIONS

Enter your answers to every question on the ILS scoring sheet. 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.

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.

ÍNDICE DE ESTILOS DE APRENDIZAGEM
por
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INSTRUÇÕES

Faça um "X" na letra "a" ou "b" para indicar sua resposta a cada uma das questões. Por favor assinale apenas uma alternativa para cada questão. Se as duas alternativas "a" e "b" se aplicam a você, escolha aquela que é mais freqüente.

1. Eu compreendo melhor alguma coisa depois de

    a) experimentar.
    b) refletir sobre ela.

2. Eu me considero
    a) realista.
    b) inovador(a)

3. Quando eu penso sobre o que fiz ontem, é mais provável que me venham à mente
    a) figuras.
    b) palavras.

4. Tenho facilidade em
    a) compreender os detalhes de um assunto, mas a estrutura geral pode ficar imprecisa.
    b) compreender a estrutura geral de um assunto, mas os detalhes podem ficar imprecisos.

5. Quando estou aprendendo algum assunto novo, me ajuda
    a) falar sobre ele.
    b) refletir sobre ele.

6. Se eu fosse um professor, eu preferiria ensinar uma disciplina
    a) que trate com fatos e situações reais.
    b) que trate com idéias e teorias.

7. Eu prefiro obter novas informações através de
    a) figuras, diagramas, gráficos ou mapas.
    b) instruções escritas ou informações verbais.

8. Quando eu compreendo
    a) todas as partes, consigo entender o todo.
    b) o todo, consigo ver como as partes se encaixam

125

9. Em um grupo de estudo, trabalhando um material difícil, eu provavelmente
    a) tomo a iniciativa e contribuo com idéias.
    b) assumo uma posição discreta e escuto.

10 Acho mais fácil
    a) aprender fatos.
    b) aprender conceitos.

11 Em um livro com uma porção de figuras e desenhos, eu provavelmente
    a) observo as figuras e desenhos cuidadosamente.
    b) presto mais atenção no texto escrito.

12 Quando resolvo problemas de matemática, eu
    a) usualmente, trabalho de maneira a resolver uma etapa de cada vez.
    b) freqüentemente, antevejo as soluções, mas tenho que me esforçar muito para perceber as etapas que me conduzam ao resultado.

13 Na(s) escola(s) onde estudei eu
    a) em geral fiz amizade com muitos dos colegas.
    b) raramente fiz amizade com muitos dos colegas.

14 Em literatura de não-ficção, eu prefiro
    a) algo que me ensine fatos novos ou me indique como fazer alguma coisa.
    b) algo que me apresente novas idéias para pensar.

15 Eu gosto de professores
    a) que colocam uma porção de diagramas no quadro.
    b) que gastam bastante tempo explicando.

16 Quando estou analisando uma estória ou novela eu
    a) penso nas situações e tento colocá-los juntos para identificar os temas.
    b) tenho consciência dos temas quando termino a leitura e, então, tenho que voltar atrás para encontrar as situações que os confirmem.

17 Quando inicio a resolução de um problema para casa, normalmente eu
    a) começo a trabalhar imediatamente na solução.
    b) primeiro tento compreender completamente o problema.

18 Prefiro a idéia do
    a) certo.
    b) teórico.

19 Relembro melhor
- a) o que vejo.
- b) o que ouço.

20 É mais importante para mim que o professor
- a) apresente a matéria em etapas e seqüências claras.
- b) apresente um quadro geral e relacione a matéria com outros assuntos.

21 Eu prefiro estudar
- a) em grupo.
- b) sozinho(a).

22 Eu costumo ser considerado(a)
- a) cuidadoso(a) com os detalhes do meu trabalho.
- b) criativo(a) na maneira de realizar meu trabalho.

23 Quando busco orientação para chegar a um lugar desconhecido, eu prefiro
- a) um mapa.
- b) instruções por escrito.

24 Eu aprendo
- a) num ritmo bastante regular. Se estudar pesado, eu "chego lá".
- b) em saltos. Fico totalmente confuso(a) por algum tempo, e então, repentinamente eu tenho um "estalo".

25 Eu prefiro
- a) experimentar as coisas.
- b) pensar sobre como é que eu vou fazer as coisas.

26 Quando estou lendo como lazer, eu prefiro escritores que
- a) explicitam claramente as suas idéias.
- b) expõem suas idéias de maneira criativa, interessante.

27 Quando vejo um diagrama ou esquema em uma aula. Relembro mais facilmente
- a) a figura.
- b) o que o professor disse a respeito dele.

28 Quando considero um conjunto de informações, provavelmente eu
- a) presto mais atenção nos detalhes e não percebo o quadro geral.
- b) procuro compreender o quadro geral antes de atentar para os detalhes.

29 Relembro mais facilmente.
    a) algo que fiz.
    b) algo sobre o que pensei bastante.

30 Quando tenho uma tarefa para executar, eu prefiro
    a) dominar uma maneira para a execução da tarefa.
    b) encontrar novas maneiras para a execução da tarefa.

31 Quando alguém está me mostrando dados, eu prefiro
    a) diagramas e gráficos.
    b) texto sintetizando os resultados.

32 Quando produzo um texto, eu prefiro escrever
    a) a parte inicial do texto e avançar ordenadamente.
    b) diferentes partes do texto e ordená-las depois.

33 Quando tenho que trabalhar em um projeto em grupo, eu prefiro que se faça primeiro
    a) um debate (brainstorming) em grupo, quando todos contribuem com idéias.
    b) um brainstorming individual, seguido de reunião do grupo para comparar idéias.

34 Considero um elogio chamar alguém de
    a) sensível.
    b) imaginativo.

35 Das pessoas que conheço em uma festa, provavelmente eu me recordo melhor
    a) de sua aparência.
    b) do que elas disseram de si mesmas.

36 Quando estou aprendendo um assunto novo, eu prefiro
    a) concentrar-me no assunto, aprendendo o máximo possível.
    b) tentar estabelecer conexões entre o assunto e outros com ele relacionados.

37 Mais provavelmente sou considerado(a)
    a) expansivo(a).
    b) reservado(a).

38 Prefiro disciplinas que enfatizam
    a) material concreto (fatos, dados).
    b) material abstrato (conceitos, teorias).

39 Para entretenimento, eu prefiro
     a) assistir à televisão.
     b) ler um livro.

40 Alguns professores iniciam suas aulas com um resumo do conteúdo que
   irão trabalhar. Tais resumos são
     a) de alguma utilidade para mim.
     b) muito úteis para mim.

41 A idéia de fazer o trabalho de casa em grupo, com a mesma nota para todos do grupo,
     a) me agrada.
     b) não me agrada.

42 Quando estou fazendo cálculos longos
     a) tendo a repetir todos os passos e conferir meu trabalho cuidadosamente.
     b) acho cansativo conferir o meu trabalho e tenho que me esforçar para fazê-lo.

43 Consigo descrever os lugares onde estive
     a) com facilidade e com bom detalhamento.
     b) com dificuldade e sem detalhamento.

44 Quando estou resolvendo problemas em grupo, mais provavelmente eu
     a) penso nas etapas do processo da resolução.
     b) penso nas possíveis conseqüências, ou sobre a aplicações da solução
       nas diversas áreas.

FOLHA DE RESPOSTAS

1. Coloque um "X" nos espaços apropriados na tabela abaixo. Por exemplo, se você respondeu "a" na questão 1, coloque o "X" na coluna "a" da Questão 1.

2. Some as colunas e escreva os totais nos espaços indicados.

3. Para cada uma das quatro escalas, subtraia o total menor do maior. Escreva a diferença (1 a 11) e a letra (a ou b) com o total maior.

Por exemplo: se na coluna "ATI/REF" você teve 4 respostas "a" e 7 respostas "b", na parte reservada aos totais, você escreverá o 4 no espaço destinado à soma dos "a's" e o 7 na cela dos "b's"; e o "3b" no retangulo em branco logo abaixo – (o 3, resultado da subtração 7-4, e a letra "b" que corresponde à coluna que obteve mais respostas).

ATI/REF			SEN/INT			VIS/VER			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1			2			3			4		
5			6			7			8		
9			10			11			12		
13			14			15			16		
17			18			19			20		
21			22			23			24		
25			26			27			28		
29			30			31			32		
33			34			35			36		
37			38			39			40		
41			42			43			44		
Total dos X's de cada coluna											
ATI/REF			SEN/INT			VIS/VER			SEQ/GLO		
	a	b		a	b		a	b		a	b
(maior-menor) + letra do maior (veja exemplo abaixo*)											

*_Exemplo:_ se você totalizou 3 para letra a e 8 para a letra b, entre com 5b.

ESCALAS DO ESTILO DE APRENDIZAGEM

Coloque um "X" nos seus escores em cada uma das escalas.

ATIVO													REFLEXIVO
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b	

SENSORIAL													INTUITIVO
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b	

VISUAL													VERBAL
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b	

SEQUENC.													GLOBAL
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b	

- Se seu escore na escala está entre 1 e 3: você está claramente bem equilibrado(a) quanto às duas dimensões da escala.

- Se seu escore na escala é 5 ou 7: você tem uma preferência moderada por uma das dimensões da escala e aprenderá mais facilmente se o ambiente de ensino favorecer esta dimensão.

- Se seu escore na escala é 9 ou 11: você tem uma forte preferência por uma das dimensões da escala. Você pode ter dificuldades de aprendizagem em um ambiente que não favoreça essa preferência.

Appendix 2

Demographic Survey - English/Portuguese Versions

Demographic Questionnaire

1. Gender: _____ Female _____ Male

2. Age: _____ years

3. School: _____ Private School _____ Public School

4. Grade: _____

5. Session: _____ Morning _____ Evening

6. Please circle the number that represents how you feel about the following

   statement: I LIKE SCHOOL

   1   **2**   **3**   **4**   **5**

   Strongly Disagree   Strongly Agree

7. Are you planning to go to college?

   _____ Yes   _____ No

Questionário Demográfico

1. Genero: _____ Feminino _____ Masculino

2. Idade: _____ anos

3. Escola: _____ Particular _____ Pública

4. Série: _____

5. Turno: _____ Manhã _____ Noite

6. Por favor, indique o quanto você concorda ou discorda com a seguinte frase: EU GOSTO DA ESCOLA

1 **2** **3** **4** **5**

Discordo Totalmente Concordo Totalmente

7. Você pretende prestar vestibular?

_____ Sim _____ Não

Appendix 3

IRB Approval Letter

Office of Research Compliance
307 Samford Hall
Auburn University, AL 36849

Telephone: 334-844-5966
Fax: 334-844-4391
hsubjec@auburn.edu

May 19, 2010

MEMORANDUM TO:	Ms. Olga Duncan
	Department of Educational Foundations, Leadership, and Technology
PROTOCOL TITLE:	"An Investigation of the Learning Styles of Brazilian Senior High School Students Attending Public and Private Schools in a Metropolitan Area of Brazil"
IRB AUTHORIZATION NO.:	10-114 MR 1005
APPROVAL DATE:	May 5, 2010
EXPIRATION DATE:	May 4, 2011

The referenced protocol was approved "Minimum Risk" at the IRB Meeting on May 5, 2010, pending revisions. (Final revisions were received on May 13, 2010.) Please reference the IRB authorization number in any correspondence regarding your project.

Please remember that any anticipated change in the approved procedures must be submitted to and approved by the IRB prior to implementation of the planned activity. Any unanticipated problems involving risk to subjects or others require immediate suspension of the activity and an immediate written report to the IRB.

If you will be unable to file a Final Report on your project before May 4, 2011, you must submit a request for an extension of approval to the IRB no later than April 14, 2011 to be included on the agenda for the May 2011 IRB meeting. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to May 4, 2011, you must suspend the project immediately and contact the Office of Research Compliance.

A Final Report will be required to close your IRB project file. Please use only copies of only the IRB- approved consent documents when you recruit participants. You must retain signed consent forms for at least three years in a secure location on campus after completion of your study.

If you have any questions concerning this Board action, please contact the Office of Research Compliance.

Sincerely,

Kathy Jo Ellison, RN, DSN, CIP
Chair of the Institutional Review Board
for the Use of Human Subjects in Research

cc: Dr. Sherida Downer
    Dr. Maria Witte

Appendix 4

Recruitment Script - English/Portuguese Versions

RECRUITMENT SCRIPT (verbal, in person)

for a Research Study entitled

"An Investigation of the Learning Styles of Brazilian Senior High School Students attending Public and Private Schools in a Metropolitan Area of Brazil**"**

Hello! My name is Olga Duncan. I am a graduate student from the Department of Educational Foundations, Leadership and Technology at Auburn University. I would like to invite you to participate in my research study that investigates the Learning Styles of Brazilian Senior High School Students. You were selected as a possible participant because you are a senior high school student attending school public or private school in Belo Horizonte.

This study will take place next week during one of the Portuguese classes. If you decide to participate in this research study, you will be asked to complete two questionnaires. Your total time commitment will be approximately 30 minutes.

You will have a week to decide whether or not to participate in this study. If you decide to participate in this study, you can expect to get awareness about your preferred way of learning. It is my hope that this awareness leads to improved study skills and increases your confidence as learner.

In case you decide not to participate you may use the time for another activity in class. I will be in class to conduct the survey and will be glad to discuss your individual results with you if you want to do that. No individual information will be shared with the teacher or school principal. If you feel pressured to participate or just changed your mind, you may withdraw from the study at any time without any consequence.

If you would like to participate in this research study, please read and sign the Informed Consent letter and return one of the copies to your teacher. If you are younger than 18 years old, please ask your parent or responsible person to sign the Parental Permission/Child Assent letter that is with your information.

Do you have any questions now?   If you have questions later**,** please contact me by phone: 3433-4046 or e-mail: duncaol@auburn.edu. Thank you very much for your attention!
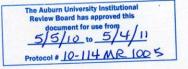
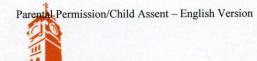Recrutamento de Participantes (pessoalmente)

Para a pesquisa de

"Investigação do Estilo de Aprendizagem de Alunos do Terceiro Ano do Ensino Médio de Escolas Públicas e Particulares de Uma Área Metropolitana no Brasil"

Olá! Meu nome é Olga Duncan, sou aluna de doutorado, do Departamento de Fundamentos Educaionais, Liderança e Technologia da Universidade de Auburn, Estados Unidos da América. Gostaria de convidá-lo a participar de uma pesquisa que estudará o estilo de aprendizagem dos alunos que frequentam o ensino médio em escolas públicas e particulares da cidade de Belo Horizonte-MG., Brasil. Você foi selecionado para participar desta pesquisa porque você é aluno do terceiro ano do ensino médio atendendo escola pública ou particular em Belo Horizonte. Este estudo ocorrerá na próxima semana durante uma das aulas de Português. Para participar deste estudo solicito a sua especial colaboração em responder dois questionários: Um contém dados demográficos como idade, genero e perguntas relacionadas a escola. O Segundo questionário é composto de perguntas sobre seu estilo de aprendizagem. O tempo de duração da pesquisa será de aproximadamente 30 minutos.

Se você decidir participar desta pesquisa, você poderá ampliar seu conhecimento sobre estilos de aprendizagem . Espera-se que, como resultado deste estudo, você possa melhorar sua maneira de estudar. Sua participação neste estudo é voluntária. Você tem o direito de não querer participar ou de sair deste estudo a qualquer momento.
Caso você queira participar por favor leia e assine o Termo de Consentimento Livre e Esclarecido. Caso você seja menor de 18 anos peça aos seus pais ou responsáveis para assinar juntamente com você. Você tem alguma pergunta? Caso você tenha, terei o maior prazer em fornecer qualquer esclarecimento sobre o estudo, assim como tirar dúvidas, bastando contato no seguinte telefone: 3433-4046 ou e-mail: duncaol@auburn.edu.
Obrigada!

Appendix 5

Parental Permission/Child Assent - English/Portuguese Versions

Parental Permission/Child Assent – English Version

AUBURN UNIVERSITY

COLLEGE OF EDUCATION

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)
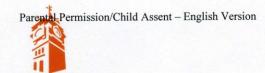
PARENTAL PERMISSION/CHILD ASSENT
for a Research Study entitled
"An Investigation of the Learning Styles of Brazilian Senior High School Students attending Public and Private Schools in a Metropolitan Area of Brazil"

Your child is invited to participate in a research study that will investigate the learning styles of Brazilian senior high school students attending public and private schools in Belo Horizonte. Learning styles are the ways that a student attempts to receive new information, and connect it to previous knowledge and experiences. The study is being conducted by Olga Maria C. Duncan, doctoral student, under the direction of Dr. Maria M. Witte, Associate Professor in the Auburn University Department of Educational Foundations, Leadership and Technology. Your child is invited to participate because he or she is a senior high school student attending public or private school in Belo Horizonte. Since your child is age 17 or younger we must have your permission to include him/her in the study.

This study will take place next week during one of the Portuguese classes. If you decide to allow your child to participate in this research study, your child will be asked to complete two anonymous questionnaires: One contains demographic questions such as age and gender, also questions related to school such as interest to attend college and attitude toward school. The second questionnaire is a survey that identifies student preference for learning style, which is his or her learning style. Your child's total time commitment will be approximately 30 minutes.

Parent/Guardian Initials_____

Participant Initials_____

Page 1 of 3

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The discomforts associated with participating in this study are minimal and may include peer pressure to participate in this study and/or discomfort with the results of their individual learning style score. Student and parents will have a week to decide whether or not to participate in this study.

In case you and your child decide not to participate he or she can use the time for another activity in class, such as reading or working on her homework. The loss of instructional time will be approximately 30 minutes. I will be in class to conduct the survey and will be glad to discuss the individual results of your student if he or she wants to do that. Risks may include breach in confidentiality and coercion to participate. To minimize these risks, the questionnaire and survey will be answered anonymously. No individual information will be shared with the teacher or school principal. In class, students will be informed that if they feel pressured to participate, or have changed their mind, they may withdraw from the study at any time without any consequence.
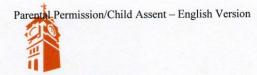
If your child participates in this study, your child can expect to be made aware about her or his preferred way of learning. It is my hope that this awareness leads to improved study skills and increases your child's confidence as a learner. I cannot promise you that your child will receive any or all of the benefits described. There is no cost if you decide to allow your child to participate in this study. Your child will not receive any compensation for participating in this study.

If you (or your child) change your mind about your child's participation, your child can be withdrawn from the study at any time. Your child's participation is completely voluntary. If you choose to withdraw your child, your child's data can be withdrawn as long as it is identifiable. Your decision about whether or not to allow your child to participate or to stop participating will not jeopardize yours or your child's future relations with Auburn University or the school which your child attends.

Any information obtained in connection with this study will remain confidential. Information

Parent/Guardian Initials_____

Participant Initials_____   Page 2 of 3

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obtained through your child's participation will be used as my doctoral dissertation and may

be published in academic papers and presented at professional meetings in the USA or here in Brazil.

Your child's privacy will be protected. No information identifying your child will be included in these

publications or meetings.

If you (or your child) have any questions concerning this research, *please feel free to let me know, and I will be happy to answer them. You may* contact me by phone: 3433-4046 or e-mail: duncaol@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your child's rights as a research participant, you may contact the

Auburn University Office of Human Subjects Research or the Institutional Review Board in the USA by

phone: 01-1- 21 (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH FOR YOUR CHILD TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO ALLOW YOUR CHILD TO PARTICIPATE. YOUR CHILD'S SIGNATURE INDICATES HIS/HER WILLINGNESS TO PARTICIPATE.

_____   _____   _____   _____
Participant's signature   Date   Investigator obtaining consent   Date

_____   _____
Printed Name   Printed Name

_____   _____
Parent/Guardian Signature   Date

_____
Printed Name

                                                  _____   _____
                                                  Co-Investigator   Date

                                                  _____
                                                  Printed Name

The date and time for completing the survey is: _____

Page 3 of 3

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460: Fax: 334-844-3072

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(Atenção: Não concorde em participar sem que um carimbo com aprovação da pesquisa e com data recente aplicado neste documento.)

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

(menores de 18 anos)

para a pesquisa de

"Investigação do Estilo de Aprendizagem de Alunos do Tereceiro Ano do Ensino Médio de Escolas Públicas e Particulares de Uma Área Metropolitana no Brasil"

O seu filho está sendo convidado(a) a participar de uma pesquisa que estudará o estilo de aprendizagem dos alunos que frequentam o ensino médio em escolas públicas e particulares da cidade de Belo Horizonte-MG., Brasil.Estilos de aprendizagem são as maneiras que alunos recebem novas informações e conectam com conhecimentos anteriores e experiencias. Cada um aluno é único em seu estilo de aprendizagem. Este estudo esta sendo conduzido por Olga Maria C. Duncan, aluna de doutorado, sob a supervisão de Dr. Maria M. Witte, Porfessora do Departamento de Fundamentos Educaionais, Liderança e Technologia da Universidade de Auburn, Estados Unidos da América. Seu filho foi convidado para participar desta pesquisa porque ele é aluno do terceiro ano do ensino médio atendendo escola pública ou particular em Belo Horizonte. A sua assinatura é necessária porque seu filho é menor de 18 anos.

Este estudo vai ocorrer na próxima semana durante uma das aulas de Português. Caso você autorize seu a participar deste estudo ele irá responder dois questionarios anônimos: Um contém dados demográficos como idade, genero e perguntas relacionadas a escola. O Segundo questionario é composto de perguntas sobre seu estilo de aprendizagem. O tempo de duração da pesquisa sera de aproximadamente 30 minutos.

Iniciais pais/responsáveis _____

Iniciais do participante_____   Pagina 1 de 3

Parental Permission/Child Assent – Portuguese Version

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Efeitos indesejáveis são possíveis de ocorrer em qualquer estudo de pesquisa, apesar de todos os cuidados possíveis. Os disconfortos associados com a sua participação neste estudo é minima e pode incluir pressão por parte dos seus colegas de classe e/ou disconforto com os resultados da pesquisa sobre seu estilos de aprendizagem. Alunos e pais terão uma semana para decidir se você deseja ou não participar desta pesquisa. Caso você decida que seu filho não deve participar deste estudo ele poderá usar o tempo da pesquisa para fazer outra atividade em classe, como ler ou fazer para casa. Respondendo os questionarios seu filho perderá aproximademente 30 minutos de aula de Português. Eu estarei na sua sala e ficarei feliz de discutir os resutados do seu questionario com seu filho caso ele deseje.
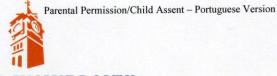
O questionario e teste de estilos de aprendizagem serão respondidos anônimos. Suas informações não serão compartilhadas com seus professores ou director da escola. Se você se sentir pressionado a participar ou simplesmente mudar de idéia, você poderá se retirar da pesquisa a qualquer momento sem nenhuma consequencia.

Se você decidir que seu filho pode participar desta pesquisa, ele poderá ampliar seus conhecimentos sobre estilos de aprendizagem . Espera-se que, como resultado deste estudo, seu filho possa melhorar sua maneira de estudar e aumentar sua confidencia como aluno. Eu não posso prometer que ele receberá estes beneficios.

Você não terá nenhum gasto com a participação de seu filho no estudo e também não receberá pagamento pelo mesmo. A participação de seu filho neste estudo é muito importante e voluntária. Vocês tem o direito de não querer participar ou de sair deste estudo a qualquer momento, sem penalidades ou perda de qualquer benefício ou cuidados a que tenha direito nesta instituição ou com a Universidade de Auburn. **A identidade de seu filho será mantida em sigilo.** Os resultados do estudo serão sempre apresentados como o retrato de um grupo e não de uma pessoa. Dessa forma, seu filho não será identificado quando o material de seu registro for utilizado, seja para propósitos de publicação científica ou educative no Brasil ou Estados Unidos da América.

Iniciais pais/responsáveis _____

Iniciais do Participante _____   Pagina 2 de 3

Parental Permission/Child Assent – Portuguese Version

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Caso você ou seu filho tenha qualquer pergunta relative a esta pesquisa, por favor fique a vontade para me comunicar. Eu terei o maior prazer em fornecer qualquer esclarecimento sobre o estudo, assim como tirar dúvidas, bastando contato no seguinte endereço e/ou telefone: 3433-4046 ou e-mail:duncaol@auburn.edu. Você receberá uma cópia deste documento.

Caso você tenha alguma pergunta sobre os direitos do seu filho como participante desta pesquisa por favor contate Auburn University Office of Human Subjects Research ou o Institutional Review Board nos USA por telefone: 01-1- 21 (334)-844-5966 ou e-mail no hsubjec@auburn.edu ou IRBChair@auburn.edu.
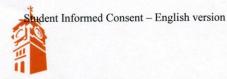
Eu e meu filho lemos as informações contidas neste documento antes de assinar este termo de consentimento. Declaramos que este estudo foi explicado e que recebemos resposta para todas as nossas perguntas. Confirmamos que recebemos uma cópia deste documento. Compreendemos que meu filho é livre para se retirar do estudo em qualquer momento, sem perda de benefícios ou qualquer outra penalidade. Dou meu consentimento de livre e espontânea vontade para que meu filho participe deste estudo. Assim como meu filho assina demonstrando seu desejo em participar.

_____	_____	_____	_____
Assinatura pais/responsáveis	Data	Assinatura do Pesquisador	Data
_____		_____	
Nome legível		Nome legível	
_____	_____	_____	_____
Assinatura do participante	Data	Pesquisador Supervisor	Data
_____		_____	
Nome legível		Nome legível	

A data e local da pesquisa sera: _____

Pagina 3 de 3

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460: Fax: 334-844-3072

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Appendix 6

Informed Consent - English/Portuguese Versions

Student Informed Consent – English version

AUBURN UNIVERSITY

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EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

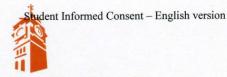**(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)**

INFORMED CONSENT
for a Research Study entitled
"An Investigation of the Learning Styles of Brazilian Senior High School Students attending Public and Private Schools in a Metropolitan Area of Brazil"

You are invited to participate in a research study that will investigate the learning styles of Brazilian senior high school students attending public and private schools in Belo Horizonte. Learning styles are the ways that a student attempts to receive new information, and connect it to previous knowledge and experiences. Each student has a unique style of learning. The study is being conducted by Olga Maria C. Duncan, doctoral student, under the direction of Dr. Maria M. Witte, Associate Professor in the Auburn University Department of Educational Foundations, Leadership and Technology. You are invited to participate because you are a senior high school student attending school public or private school in Belo Horizonte.

This study will take place next week during one of the Portuguese classes. If you decide to participate in this research study, you will be asked to complete two anonymous questionnaires: One contains demographic questions such as age and gender, also questions related to school such as interest to attend college and attitudes toward school. The second questionnaire is a survey that identifies student preference for

Participant Initials_____   Page 1 of 3

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Student Informed Consent – English version

AUBURN UNIVERSITY

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EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

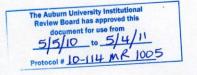learning style, which is his or her learning style. Your total time commitment will be approximately 30 minutes.

The discomforts associated with participating in this study are minimal and may include peer pressure to participate in this study and/or discomfort with the results of their individual learning style score. You will have a week to decide whether or not to participate in this study. In case you decide not to participate you may use the time for another activity in class, such as reading or working on your homework. The loss of instructional time will be approximately 30 minutes. I will be in class to conduct the survey and will be glad to discuss your individual results with you if you want to do that. Risks may include breach in confidentiality and coercion to participate. To minimize these risks, the questionnaire and survey will be answered anonymously. No individual information will be shared with the teacher or school principal. If you feel pressured to participate or just changed your mind, you may withdraw from the study at any time without any consequence.
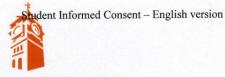
If you decide to participate in this study, you can expect to get awareness about your preferred way of learning. It is my hope that this awareness leads to improved study skills and increases your confidence as a learner. I cannot promise you that you will receive any or all of the benefits described. There is no cost if you decide to participate in this study. You will not receive any compensation for participating in this study.

If you change your mind about your participation, you can withdraw from the study at any time. Your participation is completely voluntary. If you choose to withdraw from the study, your data can be withdrawn as long as it is identifiable. After the questionnaires have been submitted it cannot be withdrawn since there will be no way to identify your questionnaires. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the school which you attend.

Participant Initials_____   Page 2 of 3

AUBURN UNIVERSITY

COLLEGE OF EDUCATION

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

Any information obtained in connection with this study will remain confidential. Information obtained through your participation will be used in my doctoral dissertation and may be published in academic papers and presented at professional meetings in the USA or here in Brazil. **Your privacy will be protected.** No information identifying you will be included in these publications or meetings.

If you have any questions concerning this research, *please feel free to let me know, and I will be happy to answer them now. If you have any questions later please contact* me by phone: 3433-4046 or e-mail: duncaol@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board in the USA by phone: 01-1- 21 (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature	Date	Investigator obtaining consent Date
Printed Name		Printed Name
		Co-Investigator Date
		Printed Name

The date and time for completing the survey is: _____

Page 3 of 3

AUBURN UNIVERSITY

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(Atenção: Não concorde em participar sem que um carimbo com aprovação da pesquisa e com data recente aplicado neste documento.)

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

para a pesquisa de

"Investigação do Estilo de Aprendizagem de Alunos do Tereceiro Ano do Ensino Médio de Escolas Públicas e Particulares de Uma Área Metropolitana no Brasil"

Você está sendo convidado(a) a participar de uma pesquisa que estudará o estilo de aprendizagem dos alunos que frequentam o ensino médio em escolas públicas e particulares da cidade de Belo Horizonte-MG., Brasil.Estilos de aprendizagem são as maneiras que alunos recebem novas informações e conectam com conhecimentos anteriores e experiencias. Cada um aluno é único em seu estilo de aprendizagem. Este estudo esta sendo conduzido por Olga Maria C. Duncan, aluna de doutorado, sob a supervisão de Dr. Maria M. Witte, Porfessora do Departamento de Fundamentos Educaionais, Liderança e Technologia da Universidade de Auburn, Estados Unidos da América. Você foi convidado para participar desta pesquisa porque você é aluno do terceiro ano do ensino médio atendendo escola pública ou particular em Belo Horizonte.

Este estudo vai ocorrer na próxima semana durante uma das aulas de Português. Para participar deste estudo solicito a sua especial colaboração em responder dois questionarios anônimos: Um contém dados demográficos como idade, genero e perguntas relacionadas a escola. O Segundo questionario é composto de perguntas sobre seu estilo de aprendizagem. O tempo de duração da pesquisa sera de aproximadamente 30 minutos.

Efeitos indesejáveis são possíveis de ocorrer em qualquer estudo de pesquisa, apesar de todos os

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cuidados possíveis. Os disconfortos associados com a sua participação neste estudo é minima e pode incluir pressão por parte dos seus colegas de classe e/ou disconforto com os resultados da pesquisa sobre seu estilos de aprendizagem. Você terá um semana para decidir se você deseja ou não participar desta pesquisa. Caso você decida não participar você poderá usar o tempo da pesquisa para fazer outra atividade em classe, como ler ou fazer para casa. Respondendo os questionarios seu filho perderá aproximademente 30 minutos de aula de Português. Eu estarei na sua sala e ficarei feliz de discutir os resutados do seu questionario com você.

O questionario e teste de estilos de aprendizagem serão respondidos anônimos. Suas informações não serão compartilhadas com seus professors ou director da escola. Se você se sentir pressionado a participar ou simplesmente mudar de idéia, você poderá se retirar da pesquisa a qualquer momento sem nenhuma consequencia.

Se você decidir participar desta pesquisa, você poderá ampliar seu conhecimento sobre estilos de aprendizagem . Espera-se que, como resultado deste estudo, você possa melhorar sua maneira de estudar e aumentar sua confidencia como aluno. Eu não posso prometer que você receberá estes beneficios. Você não terá nenhum gasto com a sua participação no estudo e também não receberá pagamento pelo mesmo.

Sua participação neste estudo é muito importante e voluntária. Você tem o direito de não querer participar ou de sair deste estudo a qualquer momento, sem penalidades ou perda de qualquer benefício ou cuidados a que tenha direito nesta instituição ou com a Universidade de Auburn.

A sua identidade será mantida em sigilo. Os resultados do estudo serão sempre apresentados como o retrato de um grupo e não de uma pessoa. Dessa forma, você não será identificado quando o material de seu registro for utilizado, seja para propósitos de publicação científica ou educative no Brasil ou Estados Unidos da América.

Caso você tenha qualquer pergunta relative a esta pesquisa, por favor fique a vontade para me comunicar. Eu terei o maior prazer em fornecer qualquer esclarecimento sobre o estudo, assim como tirar dúvidas, bastando contato no seguinte endereço e/ou telefone: 3433-4046 ou e-mail: duncaol@auburn.edu. Você

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Student Informed Consent – Portuguese version

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receberá uma cópia deste documento.

Caso você tenha alguma pergunta sobre seus direitos de participante desta pesquisa por favor contate Auburn University Office of Human Subjects Research ou o Institutional Review Board nos USA por telefone: 01-1- 21 (334)-844-5966 ou e-mail no hsubjec@auburn.edu ou IRBChair@auburn.edu.

Li as informações contidas neste documento antes de assinar este termo de consentimento. Declaro que este estudo foi explicado e que recebi resposta para todas as minhas perguntas. Confirmo que recebi uma cópia deste documento. Compreendo que sou livre para me retirar do estudo em qualquer momento, sem perda de benefícios ou qualquer outra penalidade. Dou meu consentimento de livre e espontânea vontade para participar deste estudo.

_____   _____

Assinatura do participante   Data   Assinatura do Pesquisador   Data

_____   _____

Nome legível   Nome legível

_____

Pesquisador Supervisor   Data

_____

Nome legível

A data e local da pesquisa sera: _____

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