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The Effects of Syllabus Design on Course Information Retention by At-risk First Semester College Students

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THE EFFECTS OF SYLLABUS DESIGN ON COURSE INFORMATION RETENTION BY AT-RISK FIRST SEMESTER COLLEGE STUDENTS

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Researchers have examined and researched most aspects of the educational experience. However, one component has been neglected, the syllabus, specifically the design of the syllabus. Syllabi are a common element found across institutions of higher education. The syllabus is utilized to provide students with key information regarding course expectations, however students are not necessarily reading or retaining this important information. Today's students communicate using multimodal means e.g. graphics, text. In academia, words and text are the primary sources of knowledge, and images function merely as illustrations. Use of a multimodal information delivery method which includes text and graphics may enhance the integration of learned materials and ultimately knowledge. This investigation sought to understand if syllabus design has an impact on the retention of course information presented in the syllabus. Specifically, if an infographic syllabus addendum increased the retention of syllabus information, focusing on what research indicates students identified as important information in a syllabus. The cognitive theory of multimedia learning was the theoretical framework for the study, along with infographic design features and the textual requirement to create the infographic syllabus addendum. A quasi-experimental approach was utilized where the control group received only the traditional text-based syllabus, and the two experimental groups received an infographic addendum along with the traditional text-based syllabus. The students

were tested both at three weeks and at ten weeks to determine if syllabus design impacts the retention of information over time. The study participants were first semester freshman from a regional campus which primarily serves individuals identified as academically at-risk. A series of ANOVA tests along with a correlational analysis was conducted to answer the following questions: 1) does syllabus design impact the retention of course information, 2) do demographics impact course information retention, 3) does prior academic preparation impact the retention of course information, 4) do graphics impact course information retention, and 5) does color impact course information retention? Statistical analysis indicates that both syllabus design and graphics promotes the retention of syllabus information over time. Additionally, a student's high school GPA does have a positive correlation to retention of course information over time.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

"…In instructing, be brief in what you say in order that your reader may grasp it quickly and retain it faithfully." Horance - Epistolas Ad Pisones De Ars Poetica

Introduction

"Education becomes scientific in proportion to the increasing willingness of educationalist to test their hypotheses" (Peddiwell & Benjamin, 1939, p .11). Researchers have examined and researched most aspects of the educational experience. However, one component has been neglected—the syllabus—specifically the design of the syllabus. This is not to say that aspects of the syllabus have not been researched (such as the objectives); however, the functionality and validity of the design itself has not been studied to any significant degree. Currently, the accepted syllabus design is based on "best-practice" principles. The issue with the term "best-practice" is that "best" cannot be quantified, is minimally qualified and is not generalizable. How syllabi are constructed varies and are as individualistic as the individuals that create them (Wasley, 2008). The current syllabus design is ostensibly for the students. However, an examination of the "best-practice" components reveals that most of the syllabus is designed for entities other than the students and their needs.

The advantage of utilizing the syllabus as a treatment for this study is that it is the one common experience for higher education students. Syllabi are an inherent and expected aspect of the higher education experience, along with books and buildings (Fink, 2012). Therefore, syllabi are ubiquitous to courses within any higher education institution. The issue is that every

university has different expectations of what is required in a syllabus, and these expectations are frequently irrelevant to students and their needs (Berrett, 2012; Sidorkin, 2012).

Statement of Problem

Historically, the valued and perceived mode of communication in education has been text-base, e.g., reading and writing. This was a change from the originally preferred verbal method in the early phases of education, 1600-1800, and is currently in transition to a more visually oriented mode in today's society (Eitel & Scheiter, 2015; Rudolph, 1977). Education is always in transition, however, the current transition has the potential to radically transform the methodology of teaching.

Today's students communicate using multimodal means, e.g., graphics, text, audio. The instructors' focus on a text-based course syllabus solely is contrary to the traditional students' preference for multimodal communication. This dichotomy may be one reason for students' difficulty retaining the syllabus's critical information related to the course requirements and ultimately the lack of student engagement (Thompson, 2007). Traditional first-semester college students, ages 18-23 are frequently referred to as 'Millennials". Millennials comprise a very large group with a variety of names e.g. Gen Y, Generation Z, the Net Generation, Digital Natives, Echo Boomers and Nexters (Bracy, Bevill, & Roach, 2010). Prensky, (2001a), described digital natives as individuals who grew up accessing and utilizing information that is created utilizing a multimodal framework of images, text, and sound. Millennial students or digital natives are comfortable with technology and tend to be visual learners. These individuals' brains are undergoing a transformation in the way that information is coded and maintained (Restak, 2003). The question then becomes, if course materials, such as the syllabus, are

augmented to utilize the technological skills and brain functions these digital natives take for granted, would learning be enhanced?

When considering higher education and its practices, syllabi are one of the most recognizable features (Afros & Schryer, 2009). Slattery & Carlson (2005) stated the following: "Syllabi are a ubiquitous part of the teaching process, making the scarcity of research or scholarship pertaining to them surprising" (p. 159). Syllabi are a common element across institutions of higher education, the classes offered, and the faculty offering them. There has been a great deal written regarding the various purposes and components or the "nuts and bolts of a syllabus (Fornaciari, & Dean, 2014). However, there have been very few empirical studies on the topic of syllabus design (Snyder, 2002). One of the reasons for this lack of research is the fact that construction of a syllabus is not generally examined, nor taught as part of instructors' training within a higher education institution (Fink, 2012). Syllabus design should be based upon an approach that is scholarly in nature, with the process founded on empirically studied theories. Consideration should be given to the full range of syllabus functions and end users, and based upon sound pedagogical applications (McDonald, Siddal, Mandell, & Hughes, 2010; Snyder, 2002).

Purpose of the Study

The purpose of this experimental study is to examine if an infographic syllabus addendum will increase the retention of syllabus information. The treatment of the syllabus will use cognitive theory of multimedia learning and visual literacy principles, along with infographic design features and textual requirements to create the infographic syllabus addendum.

The learning experience for today's students is not significantly different from that of their parents, grandparents, and even great-grandparents. The focus of learning is dominated by classroom based lectures, textbooks, and written exams—primarily multiple-choice and essay-based (Paas, 1992). Christensen and Eyring (2011) indicate "in the spirit of honoring tradition, universities hang onto past practices to the point of imperiling their futures" (p. xxii). Digital natives, otherwise known as "Millennials," create and communicate using multiple methodologies. Their communication creations are holistic in nature, seamlessly pairing visual, auditory and in many cases musical, logical and spatial components. The digital native brain codes this multimodal information effectively (Prensky, 2001a). Thus, the presentation of information using this format should enhance retention of critical material. Of particular interest are the millennial students who have been identified as "at-risk." These students are individuals with contributing factors that can and do impact retention. The factors for student non-completion include ethnicity, disability, socioeconomic status, mental health issue, and first generation students (O'Keeffe, 2013).

Foundational Framework for the Study

This investigation sought to understand if syllabus design has an impact on the retention of course information. Specifically, if the manner in which the information is presented interacted with cognitive theory of multimedia learning principles on the retention of course information by "at-risk" students. The cognitive theory of multimedia learning's foundational stance is that if information is presented both verbally and graphically, greater learning will occur (Mayer, 2014a). The principles specifically examined in this study are:

1. Multimedia principle: individuals learn better when words and pictures are utilized vs te utilization of words alone;
2. Spatial contiguity principle: when pictures are used along with words, they are best in close proximity to each other;
3. Temporal contiguity principle: words and pictures should correspond with each other;
4. Coherence principle: students learn better when extraneous words, pictures, and/or sounds are excluded;
5. Individual difference principles: low-knowledge learners and those that are high-spatial learners respond stronger to the multimodal design effects than high-knowledge/low-spatial learners (Lajoie, 2014; Mayer, 2002).

Role of Visual Literacy

Images are a part of today's world and are often more powerful than words. There is a direct relationship between what we see and process and the manner in which we think (Bush, 1945; Moore, 2003). However, words and pictures communicate information in completely different ways. The addition of visual elements requires the reader to interpret both the visual and textual components of a message (Serafini, 2012). Multimodal text conveys the message through a combination of both written language and visual image. The interpretation of that text is influenced by an individual's personal experiences, prior knowledge, and socio-cultural contexts (Serafini, 2010). Visual literacy must follow a language learning process to evaluate the world graphically through images, similar to how one evaluates the world via text (Avgerinou, 2009; Trumbo, 1999).

Role of Syllabus Design

In multimodal communication, both text and images are an integral part of message design. For learning and memory of the material to occur, the information must be organized into a logical framework that allows for generalization of observation and the creation of a context with prior learning into memory (Mayer, 2014b; Nilson, 2007). A syllabus designed using both text and graphics should help students to clarify the logical flow of concepts and to highlight various relationships within the information, ultimately promoting the integration of that information into new knowledge (Nilson, 2007; Levitin, 2014; Restak, 2006).

Research Question

This investigation is primarily concerned with the following research question: What are the effects of an infographic syllabus design on course information retention by "at-risk" first-semester freshman students at Indiana University of Pennsylvania's regional campus? To answer this question, a series of null hypotheses were established and subsequent statistical testing and analysis was done to determine the statistical significance of the research data.

Study Variables

The independent variable is the method in which the syllabus information is imparted. The independent variable will be presented in three modalities: 1) text-based, 2) black and white infographic, and 3) color infographic. The dependent variable is students' retention of the information within the syllabus. The treatment is as follows: The control group received the traditional text-based syllabus in conjunction with the faculty member verbally reviewing the information contained within the syllabus. The class was a course to prepare first semester freshman on how to assume the role of a higher education student and the expectations

associated with that role. There were two experimental groups. Both received the same traditional text-based syllabus as the control group. One experimental group received an additional black and white infographic syllabus addendum while the other received an additional color infographic syllabus addendum. Both infographic addendums were identical in nature, the only difference was color. The faculty member verbally reviewed the information contained within the traditional text-based syllabus with both experimental groups, and the researcher reviewed how the infographic addendum modeled the text-based syllabus.

The context of this study was at the Punxsutawney regional campus for Indiana University of Pennsylvania. This is a residential campus with students from the surrounding counties, however, its primary mission is supporting and enhancing the "at-risk" student's experience and success. Many of these students come from urban areas in Eastern Pennsylvania, i.e., Philadelphia. The enrollment at this regional campus is small, with an average of 200 students, thus allowing increased intrusive advising and support. Due to the intrusive support such as required study times and frequent advisor meetings, the success rate in 2014 of students completing their first year in good academic standing from this campus is 80% (L. Faust, personal communication, May 15, 2015).

The theoretical foundation for this study is the cognitive theory of multimedia learning with its focus on the improved retention of information shared using both graphically and text-based materials that support each other.

Hypotheses

The following are the null hypotheses related to this study.

- $H_0 1$ – The design of a syllabus has no impact on the retention of course information.

- $H_0$2 – Retention of course information is not impacted by student demographics.
    - $H_0$2a - Gender
    - $H_0$2b – Age
    - $H_0$2c – Academic college
    - $H_0$2d - Hometown economic status
    - $H_0$2e - Familiarity regarding syllabus use.
- $H_0$3 – Retention of course information is not impacted by student academic preparation
    - $H_0$3a – Reflected by high school overall grade point average (GPA)
    - $H_0$3b – Reflected by combined score on standardized testing.
- $H_0$4 – Graphics have no impact on course information retention.
- $H_0$5 – Color has no impact on course information retention.

Assumptions

It is the assumption of this study that millennial students prefer multimodal communication over monomodal communication. As millennial students communicate utilizing both graphics and text in their daily lives via various social media and interaction applications, they would respond to and retain information presented in that format. Thus, the assumption is that syllabus information will be processed and retained with greater efficacy when presented utilizing a multimodal framework, e.g., graphics with text.

This assumption is based on three points. First, is that research into the preferences of communication styles of millennial students clearly highlights their utilization of social media and its embedded multimodal communication capabilities (Howard, 2011). Millennial students take advantage of these functions and are more receptive to information incorporating both

graphics and text, due to exposure to large amounts of graphic and web content (Geck, 2006). Thus, it is assumed, if a course syllabus is presented using a multimodal framework, the millennials will be more receptive to the syllabus and thus will more readily interpret and incorporate the syllabus information into long-term memory.

The second assumption is that the principles of visual literacy highlight the functionality and utilization of multimodal communication. Visual literacy indicates that individuals create the meaning of what is visually presented. Thus, individuals use a language learning process to evaluate the world visually, similar to how one evaluates the world via text (Avgerinou, 2009; Trumbo, 1999,).

Third, research on multimodal communication suggests that individuals generally learn best from a combined graphic and textual presentation than one that is solely text focused (Mayer, 2014b). Unfortunately, higher education is mired in a text focused framework of instruction which is at odds with their customers, the millennial students' preferences.

Significance of the Study

There is a dearth of empirical research regarding the efficacy of syllabus design. Research on the syllabus and its design is based on learning theory and informed conjecture (Snyder, 2002). Most syllabus related research emphasizes how a syllabus models and achieves the course pedagogical objectives. Rubin (2013) indicates that most syllabi are not written with the undergraduate students needs and concerns as a consideration, but for an audience of subject related experts. Additionally, the role of multimodal communication utilized by the net generation and its impact on student learning has only recently been studied. Provision of a

syllabus in multimodal forms may enhance the integration of the material based on visual literacy and cognitive theory of multimedia learning principles (Mocek, 2012).

Definition of Terms

The following items have been defined to ensure understanding of the study.

"At-risk" - There is not one single definition or standard for the determination of who are classified as "at-risk" or under-prepared (Mulvey, 2009). For the purposes of this study, at-risk is indicated by GPA of 2.25 or lower and/or composite SAT score below 740.

Essential processing - The required cognitive processing needed based upon the complexity of the material to represent the material in working memory (Mayer, 2014a).

Extraneous processing - The result of poor instructional design requiring cognitive processing that does not support learning (Mayer, 2014a).

Generative processing - Making sense of the essential instructional material within the cognitive processing system. Impacted upon by the amount of effort exerted by the learner and their motivation (Mayer, 2014a).

Heuristic - Enabling a person to discover or learn something for themselves (Heuristic, 2015).

Infographic - A visual image such as a chart or diagram used to represent information or data (Infographic, 2015).

Integrating - Building connections between the information within working memory based upon the visual and verbal material, and prior knowledge stored in long-term memory (Mayer, 2014a).

Long term memory - Permanent storage system within the brain that holds a large amount of information (de Jong, 2010).

Millennials - The timeframe associated with this group changes based on the literature reviewed but generally refers to individuals born after 1980 (Hartman, & McCambridge, 2011; Howard, 2011; Sweeney, 2006). A sub-group generally known as generation Z is noted to be born after 1995 (Generation Z, n.d). Though there are some differences between the various groups, for the purpose of this paper, the overall term of millennials will be used.

Multimedia - A message presentation containing both pictures and words that is designed to foster learning (Mayer, 2002; Mayer, 2014a; Mayer, 2014b).

Multimedia instructional message - A communication intended to foster learning that is composed of both words and pictures (Mayer, 2014a).

Multimedia principle - Learning is deeper when the information is both visual (pictures) and verbal (words) than when presented with words alone (Mayer, 2014b).

Multimodal - Refers to a message that incorporates more than one method of conveying and representing information, e.g. via pictures and via text (Mastroberardino, Santangelo, Botta, Marucci, & Belardinelli, 2008).

Multimodal text - Text composed of more than one mode including visual images, design elements, written language, and other semiotic information (Serafini, 2012).

Phonological loop - Deals with acoustic or speech-based input along with what is termed internal speech (Baddeley, 1992)

SAT - The acronym SAT has had multiple meanings including Scholastic Aptitude Test, SAT Reasoning Test, Scholastic Achievement Test and is currently termed as the SAT Subject Tests (What does SAT stand for?, 2009).

Sensory memory - "A memory store that holds pictures and printed text impinging on the eyes as exact visual images for a very brief period and that holds spoken words and other sounds impinging on the ears as exact auditory images for a very brief period" (Mayer, 2014b, p. 68).

Syllabus creep - The addition of legal or rule-based language to a syllabus designed to close policy or procedural loopholes (Fornaciari, & Dean, 2014; Wasley, 2008)

Visual-spatial sketchpad - Processes both visual and special information. These two processes are separate but processed conjointly (Baddeley, 1992).

Working memory - A limited-capacity memory store that utilizes active consciousness to hold and manipulate images and sounds. It is a brain function that allows for the temporary storage and manipulation of information that is then applied to complex cognitive tasks. (Baddeley, 1992; Mayer, 2014b).

Organization of the Remainder of the Study

The remainder of this manuscript is divided as follows. Chapter Two presents (1) a critical evaluation of the literature associated with research and purposes of higher education syllabi, (2) the principles of the cognitive theory of multimedia learning, its application, and its impact, (3) characteristics of traditional higher education students, as well as the students that are identified as "at-risk", (4) the cognitive changes related to media use, and (5) the principles of visual literacy and visual information sharing via infographics.

Chapter Three delineates and discusses the research design used to carry out the study. It presents the chosen research methodology to conduct the study, the population and sampling, the instrumentation used to conduct the study, content, and design of the instructional infographic and quizzes given in week 3 and week 10, along with ethical considerations.

Chapter Four contains a presentation and analysis of the research findings and an analysis of data collected. First, demographic data are presented as frequencies and descriptive statistics. Second, the results from statistical tests of difference are shown in the context of the research null hypotheses.

Chapter Five presents the interpretation of results, discussion and conclusions, limitations of the study, and recommendations for further research.

CHAPTER TWO

LITERATURE REVIEW

Organization and Content of Literature Review

A comprehensive review of the literature indicates that there have not been any studies that looked specifically at the design of a syllabus and its effectiveness. Linda Nilson (2007) examined the functionality of changing the syllabus format via an organizational chart or graph; however, there was not an empirical study of its effectiveness. A recent article by Taguchi & Ackerman (2014) examines infographic use in higher education, including the use of infographic syllabi; however, the focus of the article is on the use of infographics vs. the effectiveness of the medium.

There are five major sections of this literature review. The following is the order of presentation: 1) a critical discussion and historical overview of higher education syllabus function and uses; 2) a review of the characteristics and preferences of traditional higher education students and those identified as “at-risk”; 3) an examination of cognitive changes related to technology and the possible impact on millennial students and ultimately, higher education, 4) an overview of the principles of visual communication, visual literacy and the functionality of the specific visual medium of an infographic, and 5) a review of theories related to the study, with specific focus on the cognitive theory of multimedia learning. Note that throughout the literature review, passages from a previously published paper by the researcher on this topic will be used. The citation for these sections is: Mocek, E. (2012). Visual literacy and higher education's syllabus. In *Society for Information Technology & Teacher Education International Conference*, 2012(1), 2977-2982.

Syllabus

Syllabus Overview

What is a syllabus? A syllabus is a document that fulfills multiple roles within education. Syllabi are one of the oldest and most recognizable institutions of academia and are an inherent and expected aspect of the college experience (Afros, & Schryer, 2009; Fink, 2012; Husen & Postlethwaite, 1985). The word syllabus comes from the Greek word *sittyba* for parchment label. It entered the English language in reference to a table of contents in 1656 (Parkes, & Harris, 2002). There are many definitions of 'syllabus' found within the literature research, which range from a broad definition to one with a narrow scope. The focus of the definition also varies from being geared toward the student's role and activities, to one that guides the instructor. Some of the definitions include: (1) "a document by which faculty members define learning outcomes for students and the methods by which those outcomes will be realized" (Afros, & Schryer, 2009, p. 224); (2) "a syllabus includes activities that a teacher does…it is advice to teachers…it includes methods, techniques, and teaching principles that make a teacher become successful" (Efe, 2009, p. 71); and (3) "A syllabus is generally defined as a plan that states exactly what students at a school or college should learn in a particular subject." (Tolkatli, & Kesli, 2009, p. 1491). For the purpose of this study, the syllabus definition utilized is as an overall course plan for the student (Fink, 2012).

The role of the syllabus has transitioned from its first genesis in 1870 as an outline of topics discussed in a Harvard history class, to the current iteration of objectives, calendar, assignments, and rules for a class (Rudolph, 1977; Snyder, 2002). It was not until the 20th century that any additional information was added to a syllabus beyond a listing of objectives

(Wasley, 2008). Policies and contractual elements were added to syllabi in the 1970's in response to legal challenges (Slattery, & Carlson, 2005). By the 1980s, syllabi were considered not just a list of expectations for students, but also a powerful tool for instructors (Wasley, 2008). In essence, the syllabus is a roadmap for a course or an outline of subjects within a course of study (Saville, Zinn, Brown, & Marchuk, 2010; Syllabus, 2015). As syllabi and curriculum are closely interrelated, it is important to examine the role of each within higher education.

Curriculum vs. syllabus design. Formal higher education is a structured setting. Curriculum is viewed as a basic part of the entire package of higher education, focusing on content and activities within a wide range of programming and courses (Roberts, 2015; Rudolph, 1977). Curriculum is defined by each institution's vision, mission, and goals and is considered a more macro view of programming than specific instructional programming (Roberts, 2015). "Curriculum is concerned with the planning, implementation, evaluation, management, and the administration of education programs. Syllabus, on the other hand, focuses more narrowly on the selection and grading of content" (Nunan, 1988, p.. 8). Within higher education syllabi are viewed as a subsidiary component of curriculum design. The issue is that curriculum reform is frequently focused on course content vs. a holistic review of programs. Therefore, the creation of a syllabus serves as the major curriculum developmental efforts for most educational systems ((Eberly, Newton, & Wiggins, 2001; Wasley, 2008).

An important component of both curriculum design and syllabus creation is pedagogy. Pedagogy is a concept that guides the process of attaining knowledge. It is more than a teaching style; it is a concept that guides the process of attaining knowledge with the focus on "how" that knowledge is gained (Lusted, 1986). It is intertwined with what and how information is taught,

along with how students learn. An area of discussion in higher education is the tension between instructors, who focus on pedagogy, and those that focus on andragogy. The major difference between the two is andragogy focuses on adult education while pedagogy focuses on child education (Fornaciari, & Dean, 2014). Pedagogy is instructor focused, whereas andragogy is focused on what adults need (Fornaciari, & Dean, 2014). Much of higher education curriculum is founded in pedagogy, however as the students are adults, the principles associated with andragogy may better serve higher education, as the role of the syllabus is to enhance learning through engaging students as active participants in the learning process.

As pedagogy is the foundational practice within higher education, the syllabus reflects that instructor focused approach. The current iteration of the syllabus emerged in the early 20th century (Wasley, 2008). Pick up most syllabi from the 50's or 60's, and you will find it has similar functions and features the contemporary syllabus given to students today (Snyder, 2002). A generally accepted practice in higher education is a review of the course plan and syllabus on the first day of class. This dedicated time allows the faculty member to convey what they deem as important, articulating the connections between expected outcomes and assignments, as well as give an indication of the tone of the course (Cummings, Bonk, & Jacobs, 2002; Fornaciari, & Dean, 2014; McDonald et al., 2010).

Roles and Functions of Syllabi

When considering syllabi, it is important to understand that they serve multiple audiences and purposes. Syllabi are basic to teaching, however, the disciplines, goals, and teaching methods vary. Syllabi are as individualistic as the instructors that create them (Rubin, 2013; Sidorkin, 2012; Wasley, 2008). They play an important role not only in teaching and learning,

but also serve as documentation of scholarly excellence to a variety of entities both within and outside the institution (McDonald et al., 2010; Sidorkin, 2012; Snyder, 2002). There are three primary goals of a syllabus: 1) to provide motivation to the students within the educational process; 2) to provide a foundation or structure to the course; and 3) to provide evidence to internal and external entities to a university e.g. accreditation body or as part of a tenure review (Ludwig, Bentz, & Fynewever, 2011; McDonald et al., 2010; Slattery, & Carlson, 2005). The purpose of syllabi is changing as they are used with increasing regularity as part of the accreditation and validation of a program and of the institution (Eberly, Newton, & Wiggins, 2001).

Role of the syllabus. The syllabus has three major roles that have been identified in the literature. These roles include: 1) a guide for students indicating the organization and scope of the course, along with specific rules and policies that the faculty member assigns; 2) a planning tool for faculty in course design and curriculum development; and 3) an artifact or record for the instructor and program of what was taught (Berrett, 2012; Fink, 2012). The most recognizable role is that of a guide to students within a course. The syllabus provides the students with information regarding the direction and expectations for a specific course, while it also serves as an indicator of the teaching style of the faculty member (Eberly, Newton, & Wiggins, 2001; Parkes, & Harris, 2002; Thompson, 2007). As a faculty planning tool, it allows for the definition of specific goals and learning outcomes for a course, but equally important is its role to facilitate communication between the faculty member and the student (Habanek, 2005; Ludwig, Bentz, & Fynewever, 2011; Slattery, & Carlson, 2005). This is the student's first impression of a course and its faculty member. Thus, it may serve as a mechanism to demonstrate the instructor as

competent and caring while supporting a culture of engagement between the instructor and student (Lusted, 1986; Saville et.al., 2010). The final role is as evidence. The syllabus is an important artifact for faculty members both as a record of the specifics i.e. what was covered and expected within a course, but also as a demonstration of the effectiveness and growth of the instructor (Afros, & Schryer, 2009; Fink, 2012; Lusted, 1986).

Functions of a syllabus. There are three identified functions of a syllabus in literature. These functions are: the syllabus as a contract, the syllabus as a permanent record, and the syllabus as a learning tool (Parkes, & Harris, 2002).

Syllabus as a contract. The preponderance of the literature outlines the first function – as a contract. Many of the articles indicate the contract function as the paramount consideration in the creation of a syllabus (Eberly, Newton, & Wiggins, 2001; Fink, 2012; Habanek, 2005; McDonald et al., 2010; Parkes, & Harris, 2002; Thompson, 2007; Tolkatli, & Kesli, 2009). Generally, most syllabi provide information regarding course objectives, organization of subject matter, and evaluation methodology, while simultaneously delineating the responsibilities of the student and faculty member (Parkes, & Harris, 2002; Wasley, 2008). There is a yin and yang approach to syllabus construction. The syllabus provides enough detailed information to head off potential issues and provides flexibility for unexpected issues throughout the course. (Habanek, 2005; Parkes, & Harris, 2002; Wasley, 2008). Unfortunately, the contemporary syllabus is more like a legal document, full of policies and procedures, versus an explanation of the intellectual objectives for a class (Wasley, 2008). The changes in the syllabus to include more 'fine print' has been a 'CYA'(cover your @ss) reaction to the litigious nature of society. The contractual nature of the syllabus is viewed as a basis for decision making in petition cases, such as a grade

appeal. Therefore, ‘syllabus creep’ is prevalent with the addition of legal language to a syllabus designed to close policy or procedural loopholes (Fornaciari, & Dean, 2014; McDonald et al., 2010; Wasley, 2008). It is important to understand that a syllabus does not qualify as an enforceable contract under the law. Students never acknowledge or sign agreement, thus it is a unilateral document from the faculty member to the student (Reed, n.d.).

Syllabus as a permanent record. When addressing the function as a permanent record, it is important to recognize that while the syllabus author strives to make a clear outline of a course, the logic of the syllabus may not be self-evident to anyone other than the author (Snyder, 2002). The syllabus serves as a document of record for a course to provide an artifact for accountability (Parkes, & Harris, 2002; Snyder, 2002). It provides a description of the course while also providing details of course content and expectations. These details are utilized with increased regularity as evidence of effectiveness not only by the individual instructor, as well as by the program and/or institution (Eberly, Newton, & Wiggins, 2001; Parkes, & Harris, 2002).

Syllabus as a learning tool. The syllabus serves as a constructive facilitator to promote student learning. Through its construct, a syllabus provides a framework to direct students to learning opportunities and expectations both within and outside of the classroom environment (Parkes, & Harris, 2002). The syllabus facilitates learning through outlining the skills and information required within the course (Biktimirov, & Nilson, 2003). A well-designed syllabus provides students with a cornerstone in creating strategies for effective learning (Afros, & Schryer, 2009; Cardozo, 2006; Parkes, & Harris, 2002).

Table 1

Syllabus functions (Compiled from Parkes, & Harris, 2002, p. 56)

As a Contract	As a Permanent Record	As a Learning Tool
• Clear and accurate course calendar • Grading policies: components and weights • Attendance policy • Late assignment policy • Make-up exam policy • Policies on incompletes and revisions • Academic dishonesty policy • Academic freedom policy • Accommodation of disabilities policy	• Title and date(s) of course • Department offering course • Credit hours earned • Title and rank of instructor • Pre- and co-requisites • Course objectives linked to professional standards • Description of course content • Description of assessment procedures	• Planning and self-management skills • Time to spend outside of class • Tips on how to do well on assessments • Common misconceptions or mistakes • Specific study strategies • Availability of instructor(s) and teacher assistants • Campus resources for assistance • Offices that aid students with disabilities • Relevance and importance of the course to students • A model of high-quality work.

Components of a syllabus. As indicated previously, much of the literature concerns the functional use of a syllabus as a contract. However, the other major focus of syllabus research is upon the component parts of a syllabus. Little to no research is done on the design of those component parts as a whole. The basic view of a syllabus is as a plan for the student that demonstrates the efforts of the faculty member to plan and prepare a quality course (Berrett, 2012; Fink, 2012; Tokath, & Kesli, 2009). What is generally not acknowledged is the fact that

much of syllabi content is handed down from one generation of faculty to another (Cardozo, 2006).

When considering syllabus content there are four questions syllabi must answer:

1) Why should a student take the course?

2) What are the objectives of the course, where do they lead, and why are they important?

3) What is the order of the course and how do the parts of the course create a whole?

4) How is the course structured? (Rubin, 2013).

These questions are addressed in the identified four major sections of a syllabus. They include: 1) course expectations and objectives, 2) assignments and grading processes, 3) course policies and procedures, including a disclaimer for changes, and 4) course schedule (Boldt, 2014; Slattery, & Carlson, 2005). Grunert (1997) outlined seventeen component parts that should be present in any syllabus. These components include: the title page, a table of contents, instructor information, a letter to the students, the purpose of the course, course description, course and unit objectives, resources, readings, course calendar, course requirements, evaluation, grading procedures, instructions on how to use the syllabus and how to study for the course, content information, and learning tools (p. 24). These components are only a guide; therefore, the make-up of individual syllabi is highly variable (Afros, & Schryer, 2009; Sidorkin, 2012). There is no single researched design framework for syllabi that has been examined for effectiveness.

Syllabus design research is focused on various ‘based’ designs. This allows for a focused research approach to the syllabus, but is not an examination of the specific design properties of

the syllabus or its effectiveness (Cardozo, 2006; Estes, 2007; Fornaciari, & Dean, 2014; Green, & Stortz, 2006; Habanek, 2005; Ludwig, Bentz, & Fynewever, 2011; Snyder, 2002; Thompson, 2007). Types of 'based' syllabi range from a comprehensive or 'kitchen-sink' approach, to task-oriented, and finally, to a learner-centered approach. A comprehensive or rule-based syllabus is one that is perceived as protecting the faculty member by defining all the rules and regulations of the class. It is geared toward the small minority students who seek to circumvent the process and are viewed as the whiniest and most dishonest (Wasley, 2008). A task-oriented syllabus focuses upon the specific activities and tasks within a course. Generally, the tasks are associated with real world activities that have practical application for students (Flowerdew, 2005). A learner-centered, or learner-based syllabus, is one that focuses on the specifics to be learned within a course. The focus is on the students and the learning outcomes (Parkes, & Harris, 2002; Robb, 2012). One of the major components of a learner-centered syllabus is its focus upon andragogy vs. pedagogy and thus, a collaborative style of syllabus that involves the students within the syllabus design (Fornaciari, & Dean, 2014; Robb, 2012).

Syllabus Perceptions

An important consideration when examining the design of a syllabus is what students and faculty view as important. The research is geared in one of two ways, either as a comparison of faculty and student perceptions regarding syllabus components, or personal reflections by individual faculty members on their syllabus design (Cardozo, 2006; Efe, 2009; Estes, 2007; Grigorovici, Nam, & Russill, 2003; McDonald et al., 2010). Students expect dynamic interaction with both the instructor and course material (Rockenbach & Fabian, 2008). The syllabus is the first impression that a student has of an instructor and that impression can be a lasting one

(Habanek, 2005; Slattery, & Carlson, 2005). Fornaciari and Dean (2014) indicated "The nonverbal and subtle messages that are communicated via syllabus design and instructor interaction have become even more compelling because we also understand that students tend not to read syllabi all that closely for content" (p. 709). The issue at its core is the level of interpretation or synthesis of the information achieved by students. Price's (2007) statement "students (are) focused on the text itself, i.e. *the sign*, demonstrating surface level processing, while lecturers concentrate on the intention, i.e., *what is signified*, demonstrating a deep-level processing" (p. 332) indicated the depth of the differences between students and instructors. The syllabus is key for student success; however, literature shows that students are inattentive to the syllabus, while the faculty are creating longer and more detailed syllabi (Becker, & Calhoon, 1999; Thompson, 2007; Wasley, 2008; Weimer, 2014).

What students indicate as important within a syllabus is impacted by where they are in their college experience. Factors which impact the student's experience include: age, class standing, time of the semester, first semester or continuing student, as well as if they are a first generation student or non-traditional student (Becker, & Calhoon, 1999; Wasley, 2008). McDonald et.al (2010) has identified four ways that students use a syllabus: as a reference tool, as a time management tool, as a study tool, and as a documentation tool. The primary uses were as a reference and as a tool for time management. Research indicates when examining a syllabus, student focus on: exam dates, course schedule, assignments and student responsibilities, grading criteria and course expectations (Becker, & Calhoon, 1999; Iannarelli, Bardsley, & Foote, 2010; McDonald et al., 2010). Students prefer a syllabus they can navigate through quickly so they can determine if they want to stay in the course. The preferred syllabus design highlights key items

of interest e.g. how grades are calculated, and does not include information that can be obtained through other sources, such as withdrawal policies (Becker, & Calhoon, 1999; Brink, 2009; McDonald et al., 2010).

When the syllabus's critical function identified by the faculty is contrasted with the students perception of the syllabus function a disconnect is evident. Instructors use the syllabus as a means to define learning outcomes, identify how those outcomes will be assessed, and what specifically must be accomplished to successful complete the course (Afros, & Schryer, 2009; Becker, & Calhoon, 1999). Instructors are focused on the pedagogical concerns and anticipate and expect a deep study of the course material. Students, on the other hand, take a surface approach and are more focused upon tangible items such as the layout of information and format (Price, 2007). A syllabus can be a reflection of an instructors personality and priorities within a class. The syllabus can provide a sense of what the students should take away at the end of a course. However, it is ultimately what the students do, not what the instructors do, that determines whether the outcome of the course is positive or negative (Eberly, Newton, & Wiggins, 2001; Snyder, 2002; Wasley, 2008).

Millennial Students

Current students in higher education are a unique group. Though there are some differences between the groups, for the purpose of this paper, the term millennial will be used. Millennials make up the largest cohort of students currently enrolled in US colleges and universities, however, this group is not homogenous. They are very diverse in both their skills and their educational needs, along with their expectations (Bennet, 2012; Hartman, & McCambridge, 2011). Today's young adults have grown up in a technologically rich world

resulting in an intense exposure to, and natural integration with, visual technologies such as the Internet and television (Aarsand 2007; Felten, 2008; Messaris, 1996; Spalter & van Dam, 2008). As technology, including the Internet, is perceived to play such an important role in an individual's daily life, there is a substantial shift in the preferred communication style and interaction. This shift is directly related to the nature of technology (Hummerston, 2008; Spalter & van Dam, 2008).

Who are the Millennial Students?

When trying to describe the current generation of students attending institutions of higher education, there is a multitude of labels that may be applied. Some of the labels include: the Net Generation, the Google Generation, Millennials, Generation Z, Generation Y, Echo Boomers, Nintendo Generation, digital natives and Nexters (Bracy, Bevill, & Roach, 2010; Hartman, & McCambridge, 2011;Helsper, & Eynon, 2009; Howard, 2011; Margaryan, Littlejohn, & Vojt, 2011; McGee, n.d.; Prensky, 2009). Though there are some differences between the groups, for the purpose of this paper, the term millennial will be used. The timeframe associated with this group changes based on the literature reviewed but generally refers to individuals born after the late 1980's (Hartman, & McCambridge, 2011; Howard, 2011; Sweeney, 2006). A sub-group generally known as Generation Z is noted to be born after 1995 (Generation Z, n.d). These two groups make up the majority of students currently in higher education. The estimated size of this group ranges from 75-100 million individuals and are currently the largest generation making up 36-40% of the U.S. population (Bracy, Bevill, & Roach, 2010; Brown, 2011; Finch, 2015). Additionally, they are the most ethnically diverse group, with estimates of up to 31% identifying themselves as having minority status (Brown, 2011, Merlino, & Rhodes, 2012). Millennials is a

generational label, however, the group is not homogeneous in either their skills or expectations (Bennet, 2012; Jones, Ruslan, Cross, & Healing, 2010). When examined, both the Millennials and Generation Z share common attributes, however, they are also the most diverse of all the various generations (Chitiga, Chogugudza, & Chitiga, 2011).

Characteristics of millennial students. As this group is such a large group, generalizing characteristics in many ways limits or minimizes the diverse nature of the population. However, there are some perceived commonalities among the literature. The two major themes noted in the literature were the ethnic diversity of the group, thus, they embrace diversity more so than previous generations; and are overall more comfortable with technology and computers (Bracy, Bevill, & Roach, 2010; Jones et. al., 2010). Millennial students have grown up with the web and a culture that is constantly changing in its technological capabilities (Geck, 2006; McGee, n.d.; Worley, 2011). This group was born into a digital world, therefore, has had more technological exposure than previous generations, and are constantly connected through that technology (Bracy, Bevill, & Roach, 2010; Geck, 2006; Hartman, & McCambridge, 2011; Howard, 2011; Sweeney, 2006).

Millennials have always had access to their technologic gadgets including cell phones and computers, and are lost without access to them (Department of Education, 2010; Scheid, & McDonough, 2010; Worley, 2011). As they are so technologically attuned, this impacts both the type and manner of communication they prefer. Millennials prefer instant communication, and interaction in a technologically-mediated manner via social networking (Jones et. al., 2010; McGee, n.d.; Worley, 2011). When communicating, short and immediate is the preferred style, with texting or instant messaging the method of choice (McGee, n.d.; Scheid, & McDonough,

2010; Worley, 2011). Howard (2011) reports that 75% of Millennials have some type of social media presence. As Millennials are comfortable in virtual spaces, they utilize these social sites to both collaborate, as well as build their own personal style, that allows them to differentiate themselves from others (Brown, 2011; Finch, 2015; Jones et. al., 2010).

When researching the personality traits and characteristics of millennials, a number of themes emerge. This group as a whole is perceived to be more demanding, self- centered, and highly confident; while at the same time they are more sheltered and reliant on parents than previous generations (Bracy, Bevill, & Roach, 2010; Chitiga, et.al., 2011; Finch, 2015; Merlino, & Rhodes, 2012). They crave instant and continuous feedback and rewards. They expect their opinions to be considered and acted upon, and prefer structure with clear rules that are upheld (Brown, 2011; Hartman, & McCambridge, 2011; Sweeney, 2006). Millennials have no tolerance to what they perceive as delays, expecting instant gratification and service (Finch, 2015; Hartman, & McCambridge, 2011; Sweeney, 2006). Millennials have grown up in a world where vast amounts of information are instantly available, and there is a wide range of options for personalization and customization of products to reflect their individual and changing needs (Finch, 2015; Sweeney, 2006; Worley, 2011). As Millennials learn to contend with their limitless options, their attention span has decreased significantly as they quickly sort through enormous amounts of information (Finch, 2015). Finch (2015) indicates that this group has developed what he terms as ‘eight-second’ filters, where they turn to compilation or trending pages within apps to collect information to be consumed in a finite amount of time.

Millennials in Higher Education

Higher education is a melting pot of the various generations with at least four generations interacting within an institution's confines (Chitiga, et al., 2011). College faculty, staff, and administration generally come either from the Baby Boomer generation or from Generation X, with a group identity of being individualistic, and risk takers. This group is staying in the workplace longer than the previous generations, and are thus, by necessity more open to new ways of doing business (Chitiga, et al., 2011). The majority of students are classified as either Millennial or Generation Z (Chitiga, et al., 2011). The life experiences between the faculty and those they teach are vastly different (Worley, 2011). Brenda Gourley's opening address to the VC Open University on September 26, 2008, outlines the challenges being faced in higher education.

> Most of our students, moreover, are part of what we now describe as the Net Generation. This is a generation who think IM, text and Google are verbs not applications! They expect to be engaged by their environment, with participatory, sensory-rich, experiential activities (either physical or virtual) with opportunities for input. They are more oriented to visual media than previous generations – and prefer to learn by doing rather than by telling or reading. They prefer to discover rather than be told. Is education 1.0 ready for Web 2.0 students? (as cited in Jones, Ruslan, Cross, & Healing, 2010, p. 723.)

Millennial learning styles and preferences. Millennials make up the largest cohort of students currently enrolled in U.S. colleges and universities, however, this group is not homogenous. They are very diverse in both their skills and their educational needs and expectations (Bennet, 2012; Heisserer, & Parette, 2002). A major difference from previous

generations is the viewpoint that higher education is a commodity that is purchased vs. the attainment of a specific goal (Worley, 2011). The students are focused on the ultimate goal of a college degree and are not as concerned with the work required to attain that degree (Worley, 2011). Many students have high expectations when entering college, but are not prepared to do the work on topics in which they do not see an immediate practical value (Merlino, & Rhodes, 2012; Worley, 2011). Therefore, they are resistant to traditional higher education activities that require a focused attention such as reading large amounts of material or writing papers, and only doing what is required for their desired grade (Merlino, & Rhodes, 2012; Worley, 2011).

As technology has played such a pivotal role in millennials lives, they are perceived to have a high capacity for multi-tasking (Jones et. al., 2010). It is not unusual to see students manage multiple electronic tasks simultaneously i.e. texting, talking on the phone, searching the Internet and listening to music (Bracy, Bevill, & Roach, 2010; Geck, 2006). Digital tools and mobile technology is holding increased prevalence in students' lives and thus into the classroom (Bennet, 2012; Jones et. al., 2010; Prensky, 2009). Millennial learners are viewed to be: 1) tech savvy, visually oriented preferring graphics over text; 2) preferring collaboration over individual work; 3) uses data from multiple perspectives, however is not always accurate in determining the validity of the information;, and 4) expects the learning process to be fun and engaging (Bracy, Bevill, & Roach, 2010; Brown, 2011; Howard, 2011; Merlino, & Rhodes, 2012).

Teaching millennial students. The needs, skills and expectations of millennial students are slowly changing the educational landscape. In 2002, Cummings, Bonk, & Jacobs wrote "Few things are certain about teaching and learning in the 21st century. One obvious certainty is that there will be new players in the educational process and new forms of interaction among those

participants" (p. 16). Currently, there are generational differences between the student's preferred learning style and the faculty member's preferred teaching style (Merlino, & Rhodes, 2012; Worley, 2011). These profound differences are resulting in a reexamination of pedagogy and teaching strategies, especially in regards to the role of technology and engagement (Chitiga, et al., 2011). Millennial students strongly prefer active learning to text or lecture. They need to feel engaged and participatory in the learning process and prefer a constructionist framework to learning (Brown, 2011; Cummings, Bonk, & Jacobs, 2002; Hartman, & McCambridge, 2011; Sweeney, 2006). As students demonstrate a reliance and comfort with technology, utilization of technological tools and types of technology aid in engaging millennial students in the learning process (Bracy, Bevill, & Roach, 2010; Howard, 2011; Margaryan, Littlejohn, & Vojt, 2011). It is important for instructors to realize that millennial students feel that all knowledge is accessible through technology and an instructor's role is to guide and facilitate learning (McGee, n.d.).

"At-risk" Students

A large subset of millennial students are those that are identified as "at-risk". The No Child Left Behind Act (2002) established parameters for the determination of academic rigor (Schnee, 2008). There is not one single definition or standard for the determination of who are classified as "at-risk" or under prepared (Mulvey, 2009). Factors that are generally recognized as determining a student as "at-risk" are: identification as an ethnic minority, low socioeconomic status, low standardized testing scores, diagnosis of a physical, mental, or emotional disability, identification as academically disadvantaged, and those individuals that are first-generation college students. Additional risk factors include a family history of dropping out of high school or college, single-parent family, and bilingual students (Arum, & Roksa, 2011; Darensbourg, &

Blake, 2013; Garrison, & Gardner, 2012; O'Keeffe, 2013; Mulvey, 2009; Sandoval-Lucero, 2014; Schnee, 2008; Tinto, 1975).

The preparation and skills of freshman students, and especially those classified as "at-risk" varies. The ACT National Curriculum survey (2012), indicates that most high school instructors feel that the students they teach and graduate are well or very well prepared for college-level work. However, this survey also indicates that college instructors feel that only one-fourth of the students are prepared. Students' expectations and outcomes are impacted by a variety of factors, including race, ethnicity, income and gender (Schene, 2008). The ability of an individual to assume the role of a higher education student is critical to retaining them beyond the first year, especially those classified as "at-risk". Students must learn to identify both the resources available to them, along with the expectations of both the faculty and the institution as a whole (O'Keefe, 2013).

Many millennial students, especially those identified as "at-risk" believe that college is synonymous with high school and that everyone can succeed based on the skills previously learned (Arum, & Roksa, 2011). Advanced preparation, however, is only one component to eventual success. A challenge is that "at-risk" students deal with a combination of high levels of stress and poor self-worth as they are low-achieving (Sandoval-Lucero, 2014; Weisburg, Hirsh-Pasek, Golinkoff, & McCandliss, 2014). Each individual brings their own perceptions and experiences to the learning environment. Those unique viewpoints color the information and experience, and ultimately how the experiences is perceived (Keeling, & Hersh, 2011).

College readiness. Students are attending institutions of higher education with the expectation that the experiences and skill sets learned in high school, will align with those in the

post K-12 environment (ACT Survey, 2009; Arum, & Roksa, 2011). Academic success indicators include: achievement in high school and a demonstrated ability on standardized tests of verbal and mathematic aptitude (Larose, Robertson, Roy, & Legault, 1998). Successful college students are viewed to be individuals who have "…higher high school grade point averages, higher class rank, higher admission test scores, a higher number of honors, AP, and advanced classes, and those who have earned more dual enrollment credits. Students with one or multiple of these attributes succeed in college at greater rates than those who are lower in any or all of these categories" (Habley, Bloom, & Robbins, 2012, p. 130).

Success in college is far from guaranteed. The issue is that when individuals fail to attain a college degree, it is difficult to then find success through alternative methods in the labor market (Habley, Bloom, & Robbins, 2012; Myers, & Pavel, 2013). Attrition rates in the United States are among the highest in the world (Myers, & Pavel, 2013). One of the explanations for the large attrition of students from higher education is that students that come to post-secondary institutions who are academically challenged or under-prepared (Kreysa, 2006).

Each student, whether they are classified as "at-risk" or as an honor student, bring unique qualities, expectations, and needs with them to college. Academic success is founded on: 1) the motivation and commitment of the student; 2) a mastery of the student role and maneuvering in the college environment; 3) understanding faculty expectations and applying existing skills to meet those expectation; and 4) making a commitment to success by taking responsibility for individual performance (Collier, & Morgan, 2008; Habley, Bloom, & Robbins, 2012; Larose et.al. 1998; Moore, Moore, Grimes, Millea, Lehman, Pearson, & Thomas, 2007; Tinto,1993). "Readiness to learn is a complex construct that engages physical, psychological, emotional,

social, and perhaps, spiritual health; other determinants include motivation, the level of expectations set, and the quality of preparation for the learning task." (Keeling, & Hersh, 2011, p. 79). Learning to assume the role and responsibilities of a college student is critical in the ultimate success of any student.

Cognition and Technology

The human brain has the ability to perceive data, process the received information, and then organize that information into meaningful components. Humans have a difficult time separating information that is important from that which is trivial, thus the amount of processing required is fatiguing (Levitin, 2014). Human brains are geared or hardwired to enjoy knowledge. Information is garnered via the senses, and then the brain imposes a structure to that information to allow for multiple interpretations of the information. This is the foundation of human learning (Levitin, 2014). Once information is processed, knowledge is based on what is able to be recalled or memory (Carr, 2010).

Brain Organization

The requirement to organize information is an evolutionary imperative. Animals instinctively organize their environment so as to be aware of potential dangers and food sources. Within the human mind, organization also allows for good decision making (Levitin, 2014). Levitin (2014) shared the term "satisficing" that is attributed to Nobel Prize winner Herbert Simon, one of the founders of the fields of organizational theory and information processing. Dr. Simon defines satisficing as follows: "Satisficing is one of the foundations of productive human behavior; it prevails when we don't waste time on decisions that don't matter, or more accurately, when we don't waste time trying to find improvements that are not going to make a

significant difference in our happiness or satisfaction" (Levitin, 2014, p.4). In essence humans seek and retain information that is deemed as important or fulfilling. The issue is that with the advent of technology, the amount of information has exponentially grown. "In 1939, the historian James Truslow Adams commented, as the number of sensations increase, the time which we have for reacting to and digesting them becomes less…Speed has become an integral component of our lives" (Restak, 2003, p. 51). Carr (2010) in his book *The Shallows, What the Internet is Doing to our Brains* references Dr. Gary Small's (2008) research that found that individuals brains have been changed by the use of technology and the Internet, due to the copious amount of information accessed.

In today's society, most American children born after 2000 will never know the world without the Internet. Like television in the mid-20th century, the Internet will have a transformative impact on society and how the world is viewed (Pesce, 2000). The issue is the amount of information that is available via this technology. Levitin (2014) indicates the following:

> In 2011, Americans took in five times as much information every day as they did in 1986 – the equivalent of 175 newspapers. During our leisure time, not counting work, each of us processes 34 gigabytes or 100,000 words every day. The world's 21,274 television stations produce 85,000 hours of original programming every day as we watch an average of 5 hours of television each day, the equivalent of 20 gigabytes of audio-video images. That's not counting YouTube, which uploads 6,000 hours of video every hour. And computer gaming? It consumes more bytes

than all other media put together, including DVD's, TV, books, magazines, and the Internet (p. 6).

The world today is dominated by technology both at home and at work (Greenfield, 2003). Due to this constant stimulation, the brain is changing as it reflects the experiences of each person. These experiences are both cognitive in nature and those that are actually physically experienced. They also reflect the culture that surrounds them (Greenfield, 2003; Restak, 2003). The brain is constantly changing in response to the world around an individual and the stimuli they receive, this normal adaptation of the brain is termed as "plasticity" (Carr, 2010).

Prensky (2009) indicates that as the brain is constantly adapting to the input it receives, interaction with technology restructures the brain of the individuals who utilizes technology. Thus, the impact of technology will be different for each person based both on the technology used, and the experiences that individual had (Helsper, & Eynon, 2009; Prensky, 2001b; Restak, 2003). The effects to the brain will be slow and subtle, and will change over the life of the individual, reflecting the experiences of that person (Carr, 2010; Restak, 2003). This individualization of the brain make-up is based on the sensory input of daily life including feelings, actions and thoughts of the individual (Greenfield, 2003; Restak, 2003). Today's teachers are dealing with students with different cognitive abilities. Millennial's brain processing has changed and higher education needs to understand this change in order to meet the needs of the students.

Brain Design

The make-up of the brain or the architecture of the connection's organization within the brain is known as neuroplasticity (Carr, 2010; Greenfield, 2003; Prensky, 2001b; Restak, 2003).

Each brain has a unique organizations system, however, the enormous amounts of stimulation or information overload impact the effectiveness of that organizational system (Restak, 2003 Levitin, 2014). Cognition of stimuli involves a higher level of cortical functioning within the brain. Human brains have two distinct hemispheres, each with unique functioning; however, cognition is conjointly done by both hemispheres (Restak, 2003).

When considering cortical brain functioning, the right and left hemisphere of the brain perform very different functions, however, the actual functioning is conjoined between the hemispheres (Jensen, 2008; Restak, 2003). The left brain is considered the logical part of the brain, actively involved with verbal communication, verbal thinking, and language e.g. parts of a whole, language, and sequencing (Dake, 2007; Hopper, 2003; Jensen, 2008). The right brain is viewed as the emotional side and is more holistic in nature whose functioning is frequently unconscious in nature and intuitive (Dake, 2007; Hopper, 2003). Therefore, the left brain is thought to be related to verbal communication and the right brain is visual or non-verbal (Hopper, 2003; Levitin, 2014). Each hemisphere of the brain serves unique functions; however, brain research indicates that humans use both sides of the brain most of the time (Jensen, 2008, Levitin, 2014; Restak, 2003). Whole brain learning emphasizes activities that utilize the strengths of both hemispheres and their conjoined functioning (Jensen, 2008).

Brain Structuring

Humans inherently impose structure on the world and how we interpret the stimuli from that world (Levitin, 2014). The primary structuring mechanism is the categorization of information. This categorization allows for the brain to encode a great deal of information with minimal effort while giving the information meaningful context (Glenberg, 2006; Levitin, 2014).

The brain attempts to create a context of what it sees and thus interprets. Restak (2008) demonstrated how the brain imposes a context on visual images through the presentation of five line drawings with and without contextual explanation.

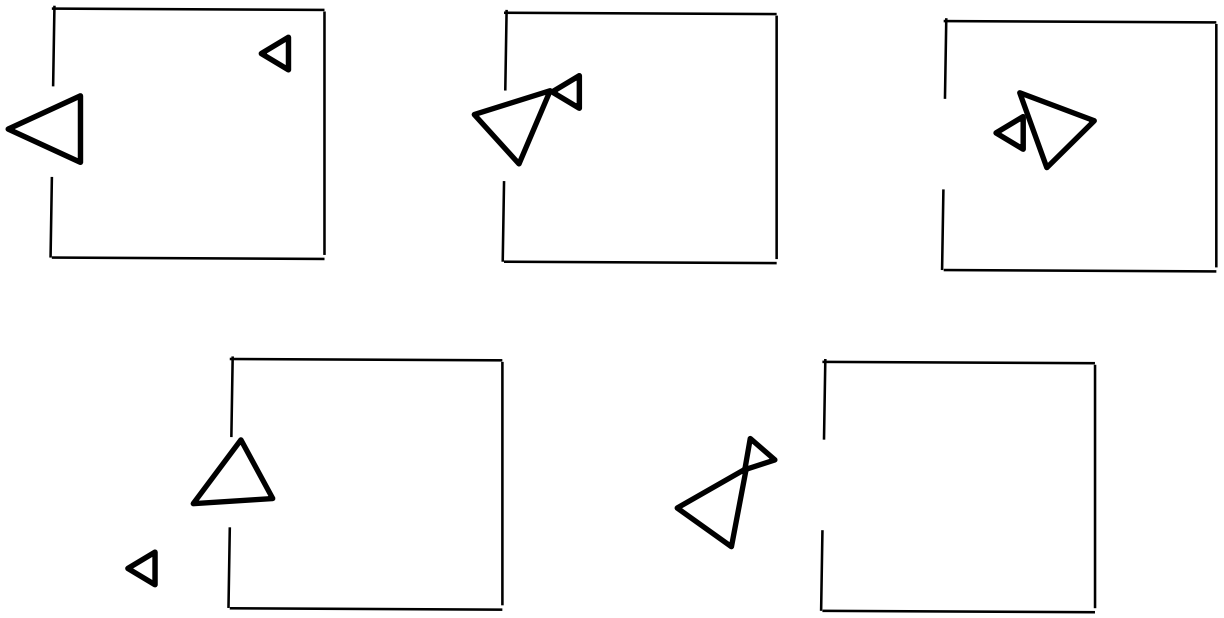


Figure 1: Graphics without textual context

Viewing the images above without any textual context, individuals impose their own context based on their experiences (Restak, 2006; Serafini, 2012). The ability to create context from multiple cues and information stored within our memory is called relational memory (Levitin, 2014). Individuals tend to create a gestalt of information by placing it into categories (Levitin, 2014). A gestalt is when an organized whole is perceived more than the sum of the individual detailed parts (Gestalt, 2015). Generally, there are three ways humans categorize information; gross to fine appearance, based on a functional equivalence when objects lack similarity of appearance; and finally in conceptual categories that address particular situations (Levitin, 2014). Symbols do not have an arbitrary meeting, but they serve as a representation for

the concept being portray (Glenberg, 2006). Humans use heuristics or shortcuts to piece together an understanding of the world, and it sometimes gets things wrong (Levitin, 2014). When text is added as a construct for the story the images take on a specific meaning related to the juxtaposition between the text and the image. See figure 2 for example.

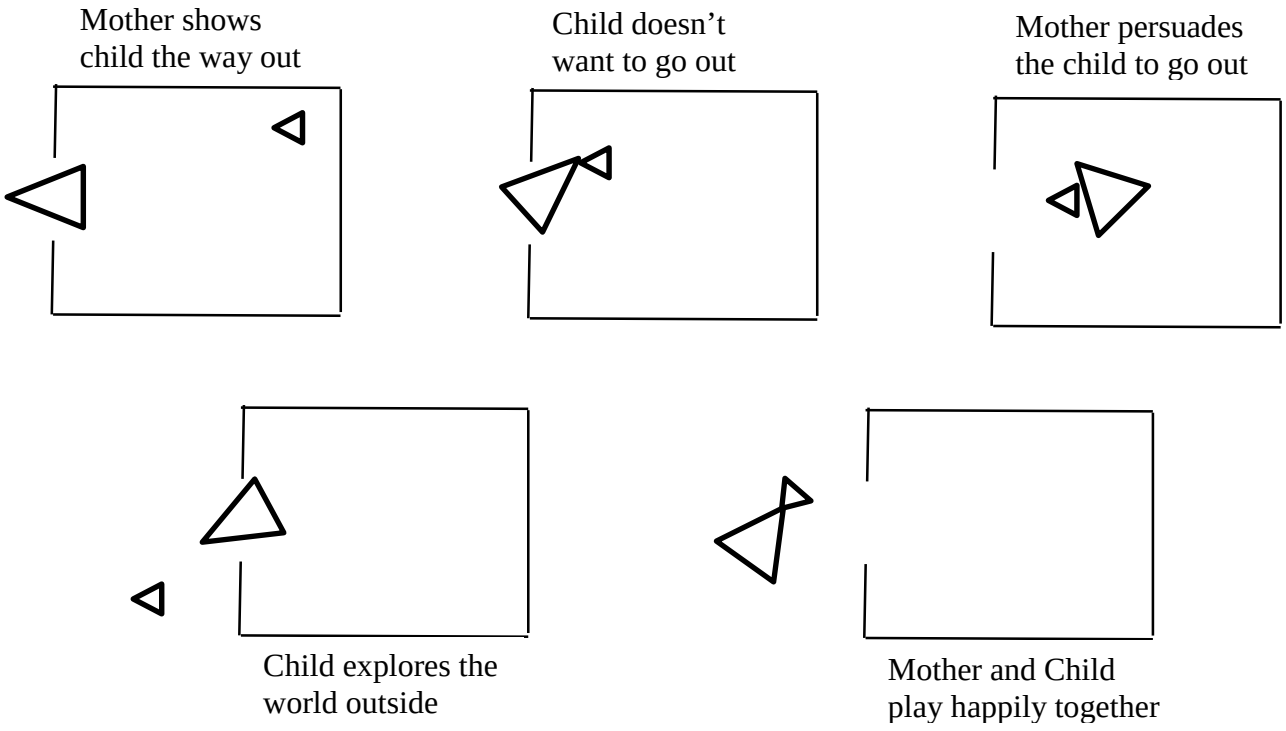


Figure 2: Graphics with textual context

Familiarity is a key concept to the creation of a construct and ultimately to the ability to remember the information (Restak, 2006). When there is a multimodal presentation of material, readers see to a large degree what they are told to see in an image or groups of images (Avgerinou, 2011).

Visual and Multimodal Literacy

There are few aspects of daily life that do not include a visual component (David & Glore, 2010). “This is an increasingly visual world. Without the proper tools to understand those visuals, society is likely to be less literate, and the images are more likely to fall on lazy eyes that look but do not truly see” (Emanuel, 2013, p.19). Visual literacy is more than understanding what is seen, it is making meaning of what is visually presented. Visual literacy must follow a language learning process to evaluate the world, similar to how one evaluates the world via text (Avgerinou, 2009; Trumbo, 1999). The addition of visual elements requires the reader to interpret both the visual and textual components of a message (Serafini, 2012). Images impact individuals both holistically and emotionally (Avgerinou, 2011). Although individuals are familiar with expressions of the world visually, many lack the skills to comprehend and fully analyze what is presented (Avgerinou, 2009).

Visual Images

The use of visual images to reflect life has occurred as long as there have been humans on earth. Throughout history, images have always been an important tool for humans to make meaning out of the world around them (Felten, 2008; Pettersson, 2007). Humans have created meaningful visual images for thousands of years with cave drawings as one of the earliest examples of the use of visual representation for communication (Felten, 2008; Natharius, 2004; Pettersson, 2009). Examples of this include ancient cultures placing images of deities on their temples, Pythagoras and Plato using images to teach geometry, as well as Aristotle using graphic representations to visualize astronomy and the human body in medicine (Pettersson, 2007). It is important however, to realize that the regular use of visual imagery has only been in effect for

approximately 200 years with the advent of photography (Burmark, 2002). Contemporary culture is innately visual, using visual data to communicate a message that can be perceived universally across diverse peoples and societies (David & Glore, 2010; Felten, 2008; Metros, 2008).

Images are a part of today's world and are often more powerful than words. Visual literacy requires the ability to understand, produce, and use images meaningfully; as well as understand the image's meaning, and assess the impact both to the individual and society (Braden, & Hortin, 1982; Emanuel, 2013; Felten, 2008; Zambo, 2009). A visually literate individual must be able to examine and interpret the message being delivered by an image, as well as apply design concepts and technology in the creation of a message (Burmark, 2002; Frey, & Fisher, 2008). Visual learning and communication are slowly being recognized as an important component to learning (Matusitz, 2005). Therefore, the instruction of visual literacy through the critiquing of images is as important as verbal literacy (Brumberger, 2011; Zambo, 2009). There is a direct relationship between what we see and what we process, with the manner in which we think (Moore, 2003).

The cognitive integration of visual information requires both an unconscious interpretation of stimuli and higher cortical reasoning. Visual cognition is the physical process of visual perception involving actively seeing an image and constructing meaning to what is seen (Felten, 2008). The brain categorizes, labels the images, and recognizes them in relation to real world objects, such as a circle, square, and triangle is related to a ball, a box, and a pyramid (Dake, 2007). Robert Lindstrom (1999) indicated the following regarding visual cognition:

> Eyes are the most powerful information conduit to the brain. They send information to the cerebral cortex through two optic nerves, each consisting of

> 1,000,000 nerve fibers. By comparison, each auditory nerve consists of a mere 30,000 fibers. Nerve cells devoted to visual processing….account for about 30% of the brain's cortex, compared to 8% for touch and 3% for hearing. With all the bandwidth to the brain, it's no wonder we perceive the world and communicate in visual terms (Lindstrom cited in Frey & Fisher, 2008, p.7).

In visual literacy, the eye is a critical part of the process and works conjointly with the higher level cortical functions (Dake, 2007). Visual stimuli can result in an emotional response secondary to the application of aspects of processing by the right hemisphere of the brain (Dake, 2007). Each side of the brain provides complementary skills to allow for an individual's smooth functioning in their environment (Jensen, 2008). When presented with a visual image, the right side of the brain will provide an emotional response to the image, whereas the left side is sequencing and categorizing the image to previous learning (Jensen, 2008).

Color vs Black and White

Unless they have a disability that impacts vision, most humans utilize their visual sense to synthesize a large amount of information. Vision may be more important to an individual's interpretation of the world than other senses like hearing (Matusitz, 2005). An important component of human vision is the ability to see color. Color adds a subtle variable that can impact an individual's ability to extract and retain information (Hoadley, 1990). Color can provide a structure and meaning to learning aids, and provides an attention-getting impact that black and white lacks (Lamberski, & Dwyer, 1983). The company 3M outlined the impact of color in their presentation *The power of color in presentations*. In this presentation, they

indicated how color impacts advertising and thus human behavior. 3M indicates that color:

- Increase willingness to read.
- Increase motivation and participation.
- Enhances learning and improves retention.
- Accounts for the acceptance or rejection of an object and is a critical factor in the success of any visual experience.
- Using color in advertising outsells black and white.

Within the learning process, color has a unique role. Color has multiple variables that impact the information message such as brightness, contrast, hue, and shade. The relevant cues within an image may be impacted by the designer decisions related to color (Frey, & Fisher, 2008; Hoadley, 1990; Lamberski, 1980). Color in instructional materials has been found to aid in focusing attention and increasing motivation, increased comprehension of material, and enhancing recall and retention of information when compared with information shared in black and white (Hoadley, 1990; Lamberski, 1980; Lamberski, & Dwyer, 1983). Color has been found to provide contextual cues, thus significantly enhancing the recall of images or image/text combinations (Lamberski, 1980).

Images vs. Text

Words and pictures communicate information in completely different ways. “Images speak directly to us, in the same way, experience speaks to us, that is, emotionally and holistically” (Avgerinou, 2011, p. 7). Conversely, a written text imposes the logic of time and sequence to the message, while also allowing for the buffer of an individual’s imagination to create a picture based on the text (Serafini, 2012). In today’s society, the previously dominant

mode of written communication is being overshadowed by the visual messages (Dondis, 1973; Serafini, 2010). Visual images dominate our lives, where individuals are exposed to images daily throughout the course of one's life requiring us to constantly code the information both consciously and unconsciously (Boutin, Lacelle, Lebrun, & Lemieux, 2013; Eitel, Scheitier, & Schuler, 2012; Lamberski, & Dwyer, 1983; Serafini, 2010). There is a direct relationship between what we see and how we think (Moore, 2003). When individuals process images, they may recognize what an image represents, but may not perceive any meaning beyond that representation (Boling, Eccarius, Smith, & Frick, 2004; Matusitz, 2005). When processing images, an individual must first extract the gist or overall details of the image, and then as time allow, concentrate on the nuances within the picture (Eitel, Scheitier, & Schuler, 2012).

Multimodal communication. In multimodal communication, both text and images are an integral part of the message design. Images are used as a non-verbal means of representing objects, experiences and feelings; whereas text utilizes a verbal code to convey the message e.g. long or short phrases or spoken directions (Boutin et al., 2013; Burmark, 2002; Eitel, & Scheiter, 2015). Texts and images have different purposes within multimodal messages. Text expresses information but it is difficult to create a spatial mental picture solely on text, whereas pictures provide a spatial context and details (Eitel, Scheitier, Schuler, & Nystrom, 2013) "From the 19th century towards today, we evolved slowly but surely from a basically monomodal world – distinctly dominated by oral OR printed communication, to a strongly heterogeneous communicative environment where multimodality has become the [almost] perfect key for media communication" (Boutin et.al., 2013, p. 70). Multimodal text conveys the message through a combination of both written language and visual image that is influenced by an individual's

personal experiences, prior knowledge, and socio-cultural contexts (Serafini, 2010). It is believed that the pictures and text complement each other and contribute to an individual's creation of a mental model of the information in the message (Eitel et al., 2013).

Multimodal messages are becoming ubiquitous in today's society. Individuals are confronted daily with multimodal texts that contain visual images, graphic design elements, and other semiotic information with greater frequency than text solely (Serafini, 2011; Serafini, 2012). The presence of visuals along with text, provide two sources of information for the learner to draw information and thus context. The interaction between the two modalities of picture and text provides a type of association between the two modes, and facilitates comprehension and learning (Eitel, & Scheiter, 2015; Erfani, 2012). There are four ways that pictures interact with the text: (1) as a reinforcement of the text, (2) to provide a further description to enhance understanding, (3) provide greater detail, especially in storytelling, about the characters or setting, (4) carry a parallel story (O'Neil, 2011).

Literacy, whether it is visual or textual, is an active cognitive process. The physiological process of actually seeing and processing images is complex (Sanders-Bustle, 2003; Spalter & van Dam, 2008). Multimodal processing and visual literacy, like all knowledge, requires active cognitive functions, the processing of visual and special details, and the natural processes in the brain to interpret what is seen (Dake, 2007). Textual literacy requires left brain functions to construct the meaning of language through a linear sequential process (Natharius, 2004). Fluidity of thought is important in visual literacy, and neuroscientists have determined that this draws on processing within the right hemisphere of the brain (Dake, 2007; Natharius, 2004).

Infographics

Visual images have been used throughout history to document life, along with enhancing and augmenting an individual's understanding. One of earliest graphical representations or infographic was created by Florence Nightingale titled *Rose*. This infographic illustrated the death rate of soldiers due to poor sanitation as compared to enemy action during the Crimean war (Featherstone, 2014). Graphic messaging, using visual images, follows similar principles of verbal and textual communication related to message design. It is important that the message conveyed via an infographic, especially when complex information is involved, is easily accessible to a large audience (Lee & Kim, 2015). Visual images, however, are heuristic in nature in that they are individually interpreted, thus, the message received will be personal to the receiver. The experience of the receiver does impact the interpretation of a visual message.

Graphical information to communicate visually has been used in multiple applications throughout history. There are multiple examples of the use of infographics in society. The earliest examples were the cave drawings, but the Pioneer Plaque that was sent to space in 1972 was an infographic designed to be understood by beings with no common language with humans (Information graphic, n.d.). Other examples include video games, David Macaulay's *The Way Things Work* books, and the genre of manga novels. Games tell stories via embedded visual images, and manga use imagery to visualize and enhance a narrative story (Diakopoulos, Kivran-Swaine, & Naaman, 2011; Poitras, 2008).

Infographics are used as visual shorthand via the presentation of visual representations that present information using text and images and thus quickly and efficiently allow the individual to gain knowledge (Huang & Tan, 2007, Lankow, Crooks, & Ritchie, 2012). Edward

Tufte (2006) indicates that the utilization of visual evidence through visual displays opens an expanded view of evidence that brings the process of thinking and seeing together. Infographics instruct, inform, illuminate, and communicate complex concepts in a manner that is fast and easily understood (Wisniewski & Fichter, 2007). Decoding of an infographic requires an individual to construct meaning to an image, contextualize the data, and make a personal analysis of the data presented (Diakopoulos, Kivran-Swaine, & Naaman, 2011; Rockenbach & Fabian, 2008).

The creation of a meaningful infographic message must consider both the message and the intended audience. Message design is as important in communication via the use of visual images as with text (Pettersson, 2009). Both textual messages and visual images, such as infographics, require cognitive abilities to label and categorize the images that create the message (Natharius, 2004). There are three considerations when using an infographic (1) it must appeal to the intended audience, (2) It must provide the information in a clear and understandable manner, (3) the knowledge should be memorable (Lankow, Crooks, & Ritchie, 2012). Visual composition including design, aesthetics, and point of view all play a role in the viewer's perceived response to an image used for communication (David & Glore, 2010; Messaris, 1996). The design of the message, including color and relationship between elements along with aesthetics, impact how, and to what extent, a user perceives, judges, values, and uses an image (David & Glore, 2010). A good design communicates the message and ideas in a functional and aesthetically pleasing manner (Swann, 1999). The point of view within an image can change the emotional response to the presented material (Messaris, 1996). An example of the effective use of point of view can be found in political images of an opponent where the photo is looking

down on the subject matter, thus giving the perception of smaller and less important. Aesthetics such as point of view act as the bridge between emotions and the visual image (David & Glore, 2010).

Cognitive Theory of Multimedia Learning

When considering a theoretical framework for this study, there are a number that can apply. These include: visual literacy, information processing theory, dual coding theory, working memory theory, and cognitive load theory. The theory that was chosen was the cognitive theory of multimedia learning. The cognitive theory of multimedia learning (CTML) incorporates many of the principles and functions from the various other theories, however, it expands to address specific aspects related to multimodal communication.

The following chart outlines each of the theories in general, the rationale for their inclusion/exclusion related to this study and the selection of the foundational theory for this study.

Table 2

Theoretical Constructs

Theory	Importance of theoretical concept to study	Rationale
Visual Literacy (Burmark, 2002)	Visual literacy is the process of studying how images characteristics give it meaning and then interpreting that image via a cognitive process. “The degree to which a person is visually literate is determined by their ability to recognize an image, to understand its meaning, to analyze and evaluate the image, and to assess its significance both personally and socially.” (Emanuel, 2013, p. 11). The principles related to visual literacy and this study were outlined in the previous section of this literature review.	There are foundations for visual literacy in each of the following theories however the issue is that visual literacy has multiple functions beyond a theory. It involves skills, competencies and abilities, and, therefore, is holistic in nature and difficult to apply as unifying theory for this study (Avgerinou, 2011)

Theory	Importance of theoretical concept to study	Rationale
Information Processing Theory (Miller, 1956)	Miller examined the amount of information that could be maintained in short-term memory and the strategies used by individuals to accomplish this task. He found that individuals "chunked" information into groups that had a similar theme or as he defines meaningful unit. Then he determined that short-term memory could only hold 5-9 of new information (seven plus or minus two). This short term memory information is not information that can be paired with any previous information stored in long-term memory via prior learning. The concept regarding the limited nature of information processing within short term memory has become a foundational element of subsequent theories of memory.	Information processing theory has become a general theory of human cognition. Therefore is too broad based to be utilized as the foundational theory for this study.
Dual Coding Theory (Paivio, 2014)	There are two major ways that an individual receives messages for learning: via verbal messages or via a visual image. The focus is upon the representational structures that deal with the verbal and visual stimuli. Representational units that are generated consciously from words and images are term as: Logogen – verbal – sequential and hierarchical in nature e.g. progress from letters to words to sentences and beyond. Imagen – pictorial representation. Within the Dual Coding Theory, the stimuli provided by the logogen and the imagen are then transitioned into a mental representation and a meaning is assigned by the individual.	Though this theory is specifically concerned with the way information is learned and how it is presented either visually or verbally, Dual Coding Theory does not take into account that the cognition processing may be impacted by something other than words and images. There is an indication that there are dual memory codes based upon the stimulus, however, the focus is solely on the response to the stimulus versus the role that memory has.

Theory	Importance of theoretical concept to study	Rationale
Working Memory Theory (Baddeley, 1992; Baddeley, 2000; Baddeley, & Logie, 1999) Other citations related to this theory (Cowan, Saults, & Blume, 2014; Schuler, Scheiter, & van Genuchten, 2011; Sweller, 2004; Sweller, Van Merrienboer, & Paas, 1998)	Working memory theory delineates the stimulus into two distinct groups i.e. verbal and visual, however, the focus is on the processing of those two stimuli. The two systems that process information are: Phonological Loop – which is responsible for maintaining and manipulating information that is speech-based or verbal. Visuospatial Sketch Board – is responsible for maintaining and manipulating information that is visual or image-based. Both of these systems are considered as "slave" systems with the Central Executive serving to integrate the information into memory. In 2000, the Episodic Buffer was added to the theory as a temporary interface between the two systems and long-term memory. This interface is viewed as a limited capacity temporary storage system that integrates information from various sources and is controlled by the central executive. Baddeley describes and outlines what is meant by the term "working memory". Working memory is what was previously termed as short term memory and is very small in capacity. Additionally, he outlines what the term long term memory indicates. The differences between working memory and long-term memory is that working memory is under conscious control and has limited capacity for storage and the information is maintained only for a finite period of time; whereas long-term memory has unlimited capacity, however, is not under conscious control of the individual.	Provides a foundation for the processing of stimulus that is presented in either through the phonological loop or the visuospatial sketch board. The addition of both the central executive and episodic buffer aids in the processing and the impact on both working and long-term memory. This theory addresses the process of memory and the role of the various systems in memory, however, is less concerned with the functionality of the memory in the recall and application of the material. The working memory theory is used as a foundational theory for the CTML.

Theory	Importance of theoretical concept to study	Rationale
Cognitive Load Theory (Ayers, & Paas 2012; Paas, & Sweller, 2014) Other citations related to this theory (Ayres, & Paas, 2007; de Jong, 2010; Paas, 1992; Sweller, 2004; Sweller, Van Merrienboer, & Paas, 1998)	In the cognitive load theory, there is not a focus upon the type of information, but the focus is upon the construct of the information. There are three types of load that inhibit or support learning. Intrinsic Load – Inherent characteristics of what is being learned Extraneous Load – disruptive influences that harm learning/information not related to the learning process Germane Load – load imposed by the learning process Sweller also indicates that schemas are utilized to organize information to maximize the amount of information that can be processed cognitively. This allows for automation of information so learned actions can occur without conscious thought e.g. reading. It bypasses working memory allowing more capacity for information to be processed cognitively. This builds upon Miller's work and information processing. He also cites and utilizes the principles of working memory theory in that he postulates that working memory is impacted by intrinsic and/or extraneous cognitive load that can be addressed via the design and materials related to the learning.	Cognitive load theory and cognitive theory of multimedia learning share many principles and foundations as the cognitive load theory is one that Richard Mayer utilizes as a baseline for his theory. The major difference is that Sweller focuses upon the cognitive load of the learning whereas Mayer focuses on the cognitive processing of the different aspects of the material being learned.

Theory	Importance of theoretical concept to study	Rationale
Cognitive Theory of Multimedia Learning (Mayer, 2001; Mayer, 2002; Mayer, 2014a Mayer, 2014b)	People must create mental associations or representations for the information for multimedia learning to occur. People learn and retain information better when words and pictures are presented together and that learning is measured by the retention of information and transfer of learning to new tasks. CTML assumes that the human mind uses two information processing systems, one for visual information and one for verbal. Presenting materials in both text and pictures allows the brain and learner twice the opportunity and exposure to information. Multimedia instructional messages with the goal of promoting learning via both presentations involving words, as well as that which is present via pictures. Deeper understanding and learning occurs when students are able to connect information from both verbal and pictorial representations. Thus, students learn deeper from multimedia explanations than one from a single source, specifically verbal.	As the focus of this study is upon the cognitive processing of specific aspects of learning material along with the functionality of the type of information and medium; the cognitive theory of multimedia learning was chosen as the foundational theory for this study.

Historically, education has used both spoken and printed communication as the primary format for instruction and research (Christensen, & Eyring, 2011; Mayer, 2014a). Many higher education students' lives outside of the classroom are filled with technology that incorporates and enables the access, creation and sharing of multimodal communication (Mastroberardino et al., 2008). The terms multimedia and multimodal are frequently viewed as synonymous in the research literature. For the purposes of this study, the definitions are not combined and are as follows: Multimodal refers to a message that incorporates more than one method of conveying and representing information e.g. via pictures and via text (Mastroberardino et al., 2008). This

definition is consistent with Alan Paivio's dual coding theory and the utilization of two separate channels for the cognitive processing of information; one for visual-pictorial, and one for auditory-verbal (Mayer, 2002; Mayer, 2014a; Paivio, 2014). Multimedia refers to the format or medium through which a message is conveyed e.g. via lecture, online and through handouts that specifically incorporates multiple forms of information that use words and pictures (Mayer, 2002). This definition is consistent with Baddeley's working memory theory where the focus is on the modality or stimulus of the message and its impact on the cognitive processing of that stimulus (Baddeley, 1992; Baddeley, & Logie, 1999; de Jong, 2010).

Cognitive Theory of Multimedia Learning Overview

In the cognitive theory of multimedia learning, Richard Mayer specifically defines multimedia as a message presentation that is presented in multiple forms, containing both pictures and words that are designed to foster learning (Mayer, 2002; Mayer, 2014a; Mayer, 2014b). This theory is concerned with bimodal or multimodal message design, however, terms it a multimedia.

Table 3

Cognitive Theory of Multimedia Learning Foundations and Principles

Cognitive Science Principles of Learning (Mayer, 2014a, p. 43)	Types of Memory (Mayer, 2014a)	How Material Presented (Mayer, 2014b)	Design Principles (Lajoie, 2014,p. 624-625)
- *Dual-channel assumption* -Dual channels for processing visual/pictorial and auditory/verbal	*Sensory memory* - retain impressions of sensory information.	*Delivery media mode* – 2 or more devices e.g. computer screen, speakers and voice (lecture)	*Multimedia principle*: Students learn better from words and pictures than from words alone

Cognitive Science Principles of Learning (cont.)	Types of Memory	How Material Presented	Design Principles
- *Limited capacity assumptions* – each channel has limited capacity for processing - *Active processing assumption* – active learning requires cognitive processes to be coordinated during learning	*Working memory* – primary for CTML. Used for holding information and manipulating information actively/consciously *Long Term memory* - storage of unlimited amount information over a long period of time	*Presentation mode* – Verbal and pictorial representations e.g. printed text and images *Sensory mode* – requires auditory and visual senses – e.g. lecture with slides	*Spatial contiguity principle*: Students learn better when corresponding words and pictures are presented near, rather than far from, each other on page or screen. *Temporal contiguity principle*: Students learn better when corresponding words and pictures ae presented simultaneously rather than successively *Coherence principle*: Students learn better when extraneous words, pictures, and sounds are excluded. *Modality principle*: Students learn better from animation and narration than from animation and on-screen text. *Redundancy principle*: Students learn better from animation and narration than from animation, narration, and on-screen text. *Individual differences principle*: Design effects are stronger for low-knowledge learners than for high-knowledge learners and for high-spatial learners than for low-spatial learners.

How information is processed through the cognitive theory of multimedia learning. The major focus of instruction is to expand the knowledge of the student and input information into the stored knowledge within the long term memory. The primary assumption of the CTML is that individuals are able to achieve a deeper understanding and retention of information when it is presented utilizing both a verbal and pictorial representations (Mayer, 2002; Mayer 2014b). When information is presented using a multimodal framework, the students learn deeper with more information stored in long term memory than when the information is from a single source, specifically verbally (Mayer, 2002). The assumption is that presenting materials both verbally - text-based (written or spoken), and pictorially - pictures/graphics/videos/animations; the brain and learner have twice the opportunity and exposure to the information and is able to use two information processing systems to retain the data (Mayer, 2014b).

This assumption is supported by Hegarty and Just (1993) who analyzed eye movements to investigate how the processing of text affects processing of a picture when the learning material utilized both texts and pictures. The individuals in the study processed the information in the text, then processed the information found in picture related to that section of text. Following completion of reading the text they then looked at the picture as a whole. The sequencing by the learner in inspecting the various portions of a picture (for the study it was a pulley), was guided and predicated on the text related to that picture. In the CTML, it is assumed that the pictures and text serve a complimentary function and together contribute to the creation of a mental model that allows for a comprehensive analysis of the content as a whole.

Principles of learning within the Cognitive Theory of Multimedia Learning. Richard Mayer (2014a) identifies three cognitive science assumed principles of learning related to the

Cognitive theory of multimedia learning. These principles are: (1) dual-channel assumption, (2) limited capacity assumption, and (3) active processing assumption. All three assumptions are critical to this theory and the acquisition of knowledge. The dual-channel assumption indicates that there are two separate channels for processing information. The representation-mode is focused on the format of the stimulus e.g. is it verbal or non-verbal and is founded upon the work of Alan Paivio. The stimulus-mode is focused on the modality of the stimulus e.g. text or picture and utilizes the principles of Baddeley's visuospatial sketch board and the phonological loop (Mayer, 2002; Mayer, 2014a). The limited capacity assumption is that the brains cognitive system has limited capacity for knowledge and for the manipulation of knowledge.

This is founded upon principles both Baddeley's working memory theory and Sweller's cognitive load theory (Mayer, 2002; Mayer, 2014a). The final assumption – active processing assumption, is that individuals actively are engaged in making sense of the material through the construction of a mental representation of the material. In this assumption, individuals actively process information through the selection, organization and integration of the information garnered from the two separate channel, and then combine the information with prior knowledge which results in meaningful learning (Mayer, 2002; Mayer, 2014a). To have meaningful outcomes from active learning the student must both behaviorally engage through participating in the learning, as well as cognitively engage to allow learning to occur (Mayer, 2014b).

Multimodal learning and the Cognitive Theory of Multimedia Learning. Mayer (2014b) identifies how the multimodal information must provide the learner with the ability to: (1) the individual must select relevant words from the material, (2) select relevant images, (3) organize the selected words into a verbal representation that is coherent to the individual, (4)

organize the selected images into a coherent visual representation, and finally (5) Integrate the verbal and visual representation with previous knowledge in long-term memory achieve learning (Lusk, Evans, Jeffery, Palmer, Wikstrom, & Doolittle, 2009; Mayer, 2014a; Schuler, Scheiter, & van Genuchten, 2011). Figure 3 provides a graphical representation of this process.

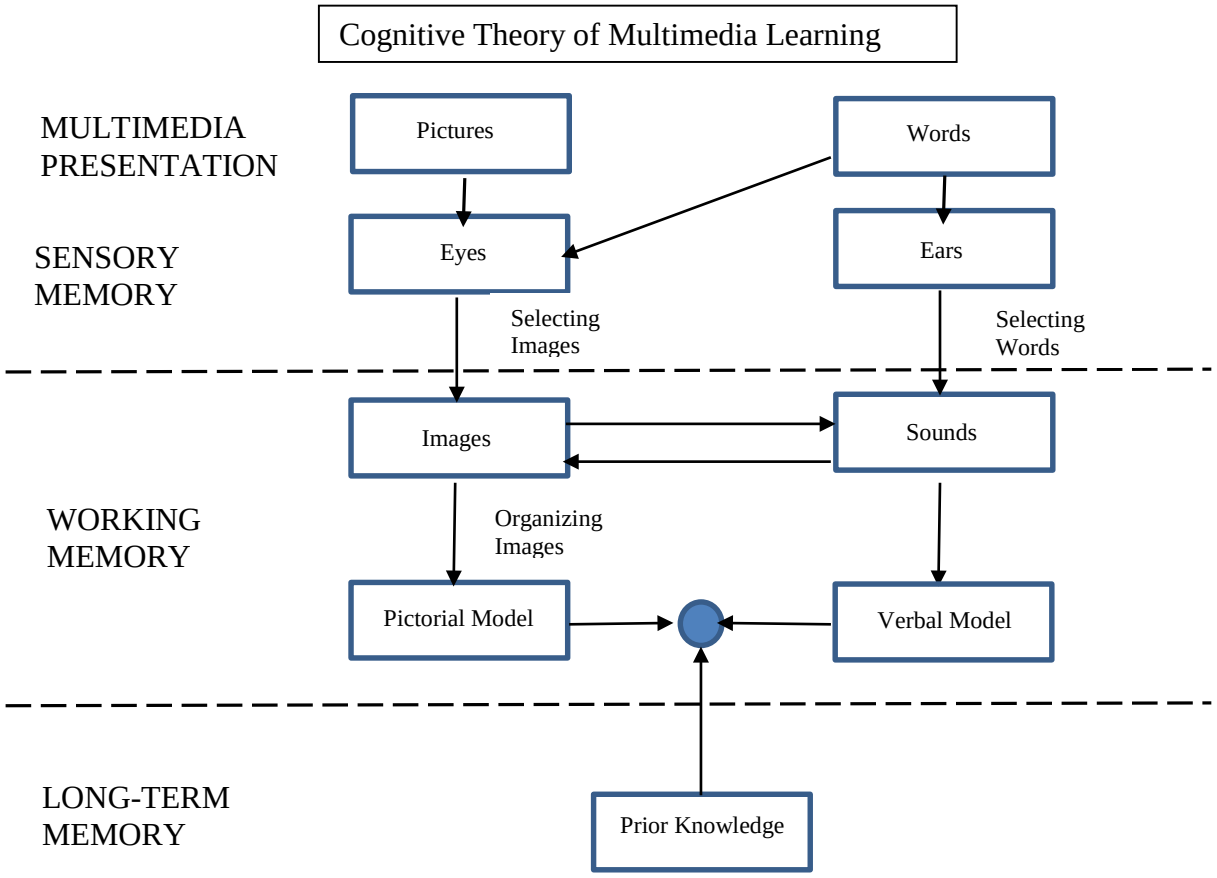


Figure 3 – Graphical representation of the Cognitive Theory of Multimedia Learning based on graphic p. 47 (Schuler, Scheiter, & van Genuchten, 2011).

Therefore, for active processing to occur, the learning material must have both a coherent structure that can be followed and also provide guidance for the learner to create such a structure into their own memory (Mayer, 2014a). CTML indicates there are three types of memory that

contribute to learning: (1) sensory memory which is the actual sensory input from the senses, primarily visual and auditory, (2) working memory – this is the primary memory for CTML which allows for the active and conscious manipulation of information gathered via the sensory memory, and (3) long-term memory – where prior learning is added to the manipulated information in working for the ultimate goal of new knowledge (Mayer, 2014a).

Within the CTML seven design principles are outlined that promote the best learning. This study utilizes five of the seven principles. The two not utilized deal with animation and narration. The five principles that are applicable are: (1) multimedia principle which indicates that individuals learn better when words and pictures are utilized vs the utilization of words alone. (2) spatial contiguity principle that indicates that when pictures are used along with words, they are best in close proximity to each other. (3) temporal contiguity principle indicates that words and pictures should correspond with each other. (4) coherence principle indicates that students learn better when extraneous words, pictures, and/or sounds are excluded. Finally (5) individual difference principle that indicates that low-knowledge learners and those that are high-spatial learners respond stronger to the multimodal design effects than high-knowledge/low-spatial learners (Lajoie, 2014; Mayer, 2002).

Conclusion

The one theme noted in much of the literature is that provision of materials in a multimodal manner is both desired and expected by millennial students and has a strong pedagogical support via the improved acquisition and retention of information. Using a multimodal message, the retention of information is founded upon CTML principles whereas the effectiveness of the message is based on visual literacy. The issue is that education, especially

higher education, is bound by tradition, so the predominant manner of presenting information remains via one mode – verbal or text-based (Greenfield, 2003; Mayer, 2014b). A learner-centered visually oriented approach to information has been a preferred method of teaching for children since the first instructional book in 1658 by Comenius titled *Orbis Pictus* (Mayer, 2014b). In McLuhan's (1962) *Gutenberg Galaxy*, books were the center of society. Students currently attending higher education institutions have come to expect visually focused information due to their immersion in technology, and the research has demonstrated that illustrations help novices grasp information, especially when it is supported by the text (Davis, 2013; Price, 2007). How students access information and how that information is shared and obtained is substantially different than for previous generations (Carr, 2010). It is a reality that millennial students manage information differently and thus the institutional focus on text is an issue. Students are not recognizing the value, and frequently are not even reading class syllabi, expecting the information to be accessible in other forms such as on the web (Fornaciari, & Dean, 2014). Millennial students are living demonstrations of the principles of convergence in practice. There is a transformed form of communication in multimodal messaging whose impact has not yet been fully understood.

The goal of this study is to maximize the cognitive load of the student through the construction of relationships between the text and pictures on an infographic syllabus addendum. The expectation is that the information presented on the addendum will support a student's organizing and classifying the information into their long term memories.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

Introduction

This study asked "what are the effects of an infographic syllabus design on the course information retention by "at-risk" first-semester freshman students at Indiana University of Pennsylvania?" The premise of the study was that the design of a syllabus would have no impact on the retention of course information. Additionally, this impact is not influenced by either student demographics or student academic preparation. Thus, the method in which the information was imparted via the syllabus, either via text or a multimodal manner, would not impact the retention of material. Also, when the information was presented via a multimodal design, color would have no impact.

Research Design

The study design was quasi-experimental that used two experimental groups with a total of 73 participants (34 in Monday's classes and 39 in Wednesday's classes) and a single control group of 27 participants in a Tuesday class. A quasi-experimental design as defined by Creswell (2008) is one that uses non-randomized subject sampling. As the sampling was related to a specific class, the subjects were randomized solely by the enrollment into a specific section vs a sampling designed by the researcher. Additionally, students in the experimental groups received both the text-based and the infographic syllabus addendum. This design principle was used to protect the students in the experimental groups from any perceived risk. If the students had been provided solely with an infographic syllabus, institutional concerns regarding equity and

uniformity of information sharing could have negatively impacted the student if an issue had arisen requiring a grade appeal.

The control and experimental groups were garnered from five different sections of DVST 150 at the Punxsutawney Regional Campus. DVST 150 – Introduction to Higher Education met for 50 minutes once a week for 15 weeks. Two sections each, meeting on Monday (9:05 am and 10:10 am) received both the text-based syllabus and a black and white infographic syllabus addendum. Two sections, each meeting on Wednesday (9:05 am and 10:10 am) received both the text-based syllabus and a color infographic syllabus addendum. The control group who met on Tuesday (12:30 pm), received the text-based syllabus only. All sections completed a quiz at three weeks (posttest 1) into the traditional 15 week semester and then repeated the test seven weeks later (posttest 2).

Participants

Students at the Punxsutawney regional campus are primarily freshman (first year in higher education) students who have been identified as "at-risk." This population was chosen as they were assumed to have little to no knowledge or experience with higher education syllabi. Study participants were between the ages of 18 and 25. This age range is based on the demographics of the majority of undergraduate students at the Indiana University of Pennsylvania. Students were registered for DVST 150 – Introduction to Higher Education at the Punxsutawney Regional campus during fall 2015 semester. A single faculty member participated in the study, which aided in controlling for bias within the study. The participants were garnered from the five sections of the defined class taught by that faculty member. The sample is both purposive and convenient based upon enrollment in a specific course. Cresswell (2008) indicates

that purposive sampling is a type of non-random selective sampling process. This study's sampling was purposive in that the participants are identified as first-semester freshman and many have a designation of "at-risk." It is convenience in nature as the participants are those enrolled in the selected classes and not generated via other sampling methods.

Location of Study

The study was conducted at the Punxsutawney regional campus of the Indiana University of Pennsylvania, a state system university within Pennsylvania. This regional campus is a residential campus with a total student population of 200 freshman students (Fall 2015 Indiana University of Pennsylvania Enrollment, n.d.). The majority of the student population are a racial minority with a large percentage from the urban regions of Harrisburg, Allentown, and Philadelphia. Students complete their first year of study at the regional campus with increased support services to promote success and programming to encourage successful academic skills such as required study halls throughout the week. As the population is small, individualized support can be provided to the students to promote success with a retention rate at the Punxsutawney Regional Campus of 80% in academic good standing after one year.

Sample Population

The sample population is comprised of students enrolled in the DVST 150 Introduction to Higher Education course. This course is designed to develop student skills in assuming the role of a successful college student. Students, especially those identified as "at-risk", must learn to play the role of a higher education student as it is critical in retaining students beyond the first year (O'Keeffe, 2013). Students enrolled at the Punxsutawney Regional Campus are classified as "at-risk" based upon either their high school GPA and/or their combined SAT scores. Students

are directly admitted to this campus with a minimum 740 SAT/15 ACT and a 2.25 (or lower) high school grade point average. Additional identified factors for “at-risk” include ethnicity, disability, socioeconomic status and mental health issues (O’Keeffe, 2013). Most of the students enrolled at the Punxsutawney Regional Campus are considered to be “at-risk” academically based upon their performance on national examinations such as the SAT and/or their high school cumulative GPA, as well as demographic factors. These students were selected with the assumption that they do not possess significant experience with higher education syllabi. The instructor in the targeted courses was contacted via email and permission was obtained to include his class(es) in the study (see appendix H for the email from the instructor).

Novice vs. Experienced Students

Research has demonstrated that instructional design principles that are effective for novice students may not be as effective for expert or advanced learners (Mayer 2014). This is related to the fact that the working memory functionality and the information that is stored in the long-term memory are not comparable (de Jong, 2010; Sweller, 2004). Additionally, the learning process engages each group of learners with a different generative cognitive focus. Thus, the expert is actively engaged with the material while the novice student is engaged only utilizing rote memorization (de Jong, 2010; Mayer, 2014). The sample for this study is strictly novice students. Thus, the cognitive load is uniform for the sample; however, this can limit the generalizability to a larger population.

Instrument/Treatment

Infographic

Infographics allow for the visualization of information, thus supports both quick and efficiently gained knowledge (Lankow, Crooks, & Ritchie, 2012). The purpose of an infographic is to communicate messages visually, presenting ideas both functionally and aesthetically (Swann, 1999). Visual information makes a strong and indelible impact, such as an individual's first impression of people and places. Pictures and text frequently do not tell an exact same story but complement each other (Frey & Fisher, 2008). Infographics are frequently presented online within a multimedia framework. To control the number of variables related to this study, the infographic was presented in a paper format rather than online. However, the infographic itself is multimodal as it incorporates both text and graphics in the syllabus addendum. The exact same information is presented in both treatment infographics. The information presented on the infographic is what research indicates students focus up, specifically: contact information for the faculty member, exam dates, course schedule, assignments and student responsibilities (Becker, & Calhoon, 1999; Iannarelli, Bardsley, & Foote, 2010; McDonald et al., 2010). The only difference between the two treatments is color. The primary colors used were blue as the background, red as emphasis, and yellow. The rationale for utilizing red as the color to emphasize areas is based on the research done by Lamberski and Dwyer (1983).

The design of the infographic was done in collaboration with student designers in the Indiana University of Pennsylvania's Center for Media Production. The design followed established graphic design principles including:

1) Utilization of the “golden mean” where the elements are balanced within a design that is broken into thirds both vertically and horizontally (Swann, 1999)

2) The information is presented in consideration of the research of how individuals scan information. Thus, an F-shaped pattern was utilized allowing individuals to search content via a quick darting search across text or graphics (Rosen, 2008)

3) Graphics were supported by text (Lankow, Crooks, & Ritchie, 2012)

4) Consideration of text characteristics including font size, spacing and typeface (Devoss, & Lebeau, 2010)

5) The impact of color, both of the text and graphics. Color can focus attention on specific areas, as well as promote a subliminal effect on an individual’s emotions (Frey, & Fisher, 2008; Lamberski, & Dwyer, 1983).

Pilot Studies

Two pilot studies were completed. Both studies received IRB approval and were conducted in conjunction with faculty at Indiana University of Pennsylvania (Appendices F and S). All individuals involved in the two pilot samples signed informed consent and were volunteers. An initial pilot study was utilized to refine the infographic treatment, and the second study examined the assessment tool. The first pilot study utilized a Qualtric survey to review individual perceptions regarding the infographic design and the provision of syllabus information via an infographic. The second pilot study was done using students participating in an accelerated five-week version of the same course as the study group in the summer of 2015.

Treatment pilot study. A convenience sample was utilized to request participation in this pilot study. Individuals were registered students in either COMM 101 or COMM 249 during

the spring 2013 semester. A total of 29 individuals completed the Qualtric survey. The participants were predominately female (23) between the ages of 19-21. All of the students had some level of experience with higher education coursework (six second-semester freshman, nine sophomore, ten juniors, and four seniors). The primary feedback regarding the pilot study concerned the makeup, organization, and colors utilized in the pilot infographic. Primarily the comments concerned the timeline or class schedule and the colors used. Sample comments include:

- "I liked everything except the page with the weekly things due. It was kind of confusing with not quite enough information. It had week numbers but no dates. So no one remembers what week of the semester we are on without a date."
- "I did not like the timeline it was confusing and hard to follow and just messy. I did like the front cover it was pleasing to the eyes and easier to read. I would pick more eye pleasing colors tho [sic]."
- "I liked the visual syllabus because it was easier and faster to go through the traditional syllabus. I did not like the layout of the visual syllabus though. I felt it was a little cluttered."
- "I liked the visual syllabus because it was straight forward and everything was easy to see and understand. One thing I disliked about it was that I felt as though there was too much color to it. Overall I did really like this visual aid much more than the traditional syllabus."

Appendix T is the infographic utilized for this pilot study.

Assessment instrument pilot study. Again, a purposive convenience sample was utilized to request participation in this pilot study. Individuals were registered students in three sections of DVST 150 – Introduction to Higher Education as part of the Punxsutawney Advance College Experience (PACE) during the 2015 summer session II. This program provides first semester students enrolled at Punxsutawney an opportunity to earn credits before their first full academic semester. The program and its associated coursework were completed in a five-week period of time.

As this study is tied to coursework in which first-semester freshman students were the subject pool, it is possible that individuals may be age 17. To exclude the individuals that were not yet 18, instructions that only those individuals over the age of 18 participate with the student signature indicating and verifying that the particular study subject was over the age of 18. There was a total of 23 students that participated in the assessment pilot study.

A quiz with a total of 20 questions was developed. Each question was worth .5 points for a total of 10 points possible, therefore, 10 points equaled 100. The exact same quiz was given using a similar time frame as the research study. Due to the abbreviated five-week time frame for this course, the initial quiz was given after 24 hours and the second quiz after 4 weeks in the course.

Table 4

Pilot 2 Quiz Average Scores

Treatment	Low	High	Quiz 1 Mean Grade	Low	High	Quiz 2 Mean Grade
B&W	5.5	8.5	68%	6.5	9	77%
Text	5	7.5	63%	5	9.5	71%
Color	5	9	75%	6	9	77%

Note – A total of 10 points possible for each quiz.

Review of the range and mean participant scores on both quizzes in Table 4 appears to demonstrate that the assessment had face validity, as there was consistency in the mean scores across all three sections of the course. The scores across the three sections for the first quiz ranged from a minimum of 50 to a maximum of 90. On the second quiz there was a minimum score of 60 to a maximum of 95. The mean score across the three sections for the first quiz was a 68 and a mean score for the second of 75. This suggests that the retention of the material did occur giving face validity to the research topic. As the participants are students predominantly identified as academically "at-risk", the lower mean scores for the quizzes were expected.

Study Protocol

The researcher visited the designated classrooms of the faculty member and asked for volunteers to participate in the study. The invitation to participate in the study was presented to the students (Appendix I.) Interested students were given an informed consent form (Appendix J.) An incentive for participation was offered, specifically a chance to win a 20 dollar gift card, one for each section of the course.

Students who completed the informed consent were provided a demographic survey to complete. The complete surveys, along with the informed consent, were returned to the instructor. The instructor sent the complete surveys and informed consent forms to the researcher. All student identifying information was scrubbed via a randomly generated ID numbers assigned by the researcher. All data analysis was done using the anonymous IDs numbers to preserve confidentiality. The completed survey, along with both quizzes were identified with that number. All potentially identifying information was removed. Information regarding the student's SAT and high school GPA was obtained from the instructor and aggregated. Again all identifying information was removed.

Treatment Instrument

The treatment for this study utilized an infographic syllabus addendum. This infographic was distributed to the students in the experimental groups, along with the text-based syllabus. There were two infographic addendums, both had the exact same information. The only difference between the two infographics was color. One was in black and white while the other was in color (Appendices L – O).

There were five sections of the DVST 150 course during the fall 2015 semester. This class met once a week for 15 weeks. Two classes met Mondays at 9:05 am and 10:10 am, one met on Tuesday at 12:30 pm and two met on Wednesdays again at 9:05 am and 10:10 am. There was a total of 34 of possible 35 participants from the Monday classes; all 27 students from Tuesday's class agreed to be participants; and of the 39 possible participants from Wednesday classes, 37 agreed to participate. As the groups were relatively proportional in size, the Tuesday

class was chosen as the control group, the class sections on Monday and Wednesday were designated as the experimental groups.

All the sections, both the control and experimental groups, received the traditional text-based syllabus in conjunction with the faculty member verbally reviewing the information housed within the syllabus. There were two experimental groups. One experimental group - the sections that met on Monday - received an additional black and white infographic syllabus addendum, while the other - the sections that met on Wednesday - received an additional color infographic syllabus addendum. Both infographic addendums were identical in nature, the only difference was color. The faculty member verbally reviewed the information housed within the traditional text-based syllabus with both experimental groups, and the researcher reviewed how the infographic addendum modeled the text-based syllabus.

Assessment Tool

There were two paper-based quizzes (posttests) scheduled as part of the course requirements. The first was scheduled for the second week of class, however due to a death in the faculty member's family, was delayed until week three. The second quiz, exactly the same as the one given previously, was given in week ten. The time frame was chosen to examine long-term memory, both within a shorter time frame and over an extended period of time. The overall goal of this study is to examine the impact of syllabus design on the germane cognitive load or the construction and retention of internal schemas into long-term memory (de Jong, 2010)

The cognitive load theory indicates that information is maintained within the working memory for a brief time (de Jong, 2010). For learning to occur, the information follows along a continuum from working memory to long-term memory (Paas, & Sweller, 2014). Knowledge is

stored in long-term memory (LTM) in schemas which categorizes the information based on how it is used (Sweller, Van Merrienboer, & Paas, 1998). These schemas allow multiple elements of information to be treated as a single element, allowing more complex learning to occur (Ayres, & Paas, 2007). Meaningful learning occurs when individuals are able to integrate the information from the working memory with prior knowledge stored in the long term memory (Mayer, 2002).

The quizzes all used the same 20 questions, however, to assure academic integrity and discourage cheating, the order of the questions differed for each class. The nineteenth question (#19) differed between the first and second quiz. The question concerned specific feedback to the instructor. The initial quiz question #19 asked if the student had any questions for the instructor and the second quiz asked about the student's impression of the class based on the syllabus. Appendix R is an example of the first and second quiz questions given to each class.

Risks/Benefits

The expected risks from this study were minimal as participants were asked for minimal and general information regarding impressions of an infographic or text syllabus. Specific concerns regarding the possible negative impact on the student overall course grade was a potential risk. The scores for the quiz was worth a total of 20 points of a possible total of 300 points or 7% of the course grade. The benefit to this study is the purposeful examination of the design of the syllabus and empirical data outlining best practices.

Ethical Consideration

When subjects were first introduced to the project on the first day of class, they were told that participation is voluntary and that they may decide to terminate their participation at any time. Students were presented with a hard copy of the informed consent statement on Indiana

University of Pennsylvania letterhead. The students were asked to sign a copy of the consent which also permitted data related to the quizzes and their high school GPAs and SAT scores to be shared as they related to the experiment. If the student did not sign an informed consent, none of the data – quiz scores, GPA or SAT scores were shared with the researcher.

CHAPTER FOUR

RESULTS

Introduction

This study examined the effects of syllabus design on the retention and recall of information from the syllabus. Two types of designs were examined. The first is the traditional text only syllabus and the second, an infographic syllabus addendum along with the traditional syllabus. The addendum provided information identified via research as important to students including: contact information for the faculty member, exam dates, course schedule, assignments and student responsibilities, grading criteria and course expectations (Becker, & Calhoon, 1999; Iannarelli, Bardsley, & Foote, 2010; McDonald et al., 2010). From the literature, it is apparent that the utilization of multimodal communication methods allows the working memory to effectively move information to long-term memory, promoting learning (Baddeley, 2000; Paas & Sweller 2014). Mayer (2014 a) indicates that people learn and retain information best when that information is presented utilizing a combination of words and pictures. The cognitive theory of multimedia learning (Mayer 2002; Mayer 2014a), along with principles of Visual Literacy (Burmark, 2002) and cognitive load theory (Paas & Sweller, 2014) form the foundation of this study. To test the retention of syllabus information, a posttest only experimental design was utilized, where two posttests were used to measure retention and learning.

Overview of the Study

This study was a quasi-experimental study that used two experimental groups and a single control group. The control group received only the traditional text-based syllabus, while students in the experimental groups received the same text-based syllabus as the control group,

along with an infographic syllabus addendum. The design principle of providing all three groups with the text-based syllabus was used to protect the students in the experimental groups from any perceived risk. The infographic syllabus addendums were identical in content, however, one experimental group received an addendum where the text and graphics were only in black and white while the other experimental group's addendum was in color. All groups completed a quiz at three weeks (posttest 1) into a traditional 15 week semester and then repeated the test seven weeks later (posttest 2). Both posttests were timed to all for the examination of long term information retention. Three weeks would necessitate information to move beyond working memory (also frequently known as short term memory) and move into long-term memory. For the purposes of this analysis, the three week timeframe will be termed as intermediate and the ten weeks is defined as long-term.

Table 5

Description of the Stimuli

Group	Treatment
Control	Text-based syllabus only (Text)
Treatment 1	Text-based syllabus and black and white infographic (B&W)
Treatment 2	Text-based syllabus and color infographic (Color)

Profile of the Sample

The sample population is comprised of students enrolled in the DVST 150 Introduction to Higher Education course at the Punxsutawney Regional Campus of Indiana University of Pennsylvania. This course is designed to develop student skills in assuming the role of a successful college student. Many of the students enrolled at the Punxsutawney Regional Campus are classified as "at-risk" based upon either their high school GPA and/or their combined SAT

scores. Students are directly admitted to this campus with minimum a 740 SAT/15 ACT and a 2.25 (or lower) high school grade point average (GPA). Additional identified factors for "at-risk" include ethnicity, disability, socioeconomic status and mental health issues (O'Keeffe, 2013). Most of the students enrolled at the Punxsutawney Regional Campus are considered to be "at-risk" academically based upon their performance on national examinations such as the SAT and/or their high school cumulative GPA, as well as demographic factors. These students were selected for this study with the assumption that they do not possess significant experience with higher education syllabi.

There were five sections of DVST 150 – Introduction to Higher Education offered during the fall 2015 semester at the Punxsutawney Regional Campus of Indiana University of Pennsylvania. The five sections met for 50 minutes each week for 15 weeks, on the following days/times: 1) Monday's at 9:05 am; 2) Monday's at 10:10 am; 3) Tuesdays at 12:30 pm; 4) Wednesday's at 9:05 am; and 5) Wednesday's at 10:10 am.

Table 6

Section Where Subjects Were Recruited

Treatment	Day/Time Of Class	# Enrolled	# in Sample	% of Sample
Black & white infographic	Monday/9:05	19	19	100
Black & white infographic	Monday/10:10	16	15	94
Text only	Tuesday/12:30	27	27	100
Color infographic	Wednesday/9:05	20	19	95
Color infographic	Wednesday/10:10	19	18	95
		101	98	98%

To create the experimental and control groups, the course enrollment was reviewed. Table 6 indicates the population and sample participants. When the two Monday classes were

combined, and the two Wednesday classes were combined each had a total of 35 ±2. The Tuesday class had the largest single enrollment of 27 and served as the control group. Monday and Wednesday classes were the experimental groups. Monday receiving the black and white infographic treatment, and Wednesday classes receiving the color infographic treatment.

Quiz Results

Table 7

Quiz Completion by Section

Treatment	Day/Time Of Class	# in Sample	# Complete Test 1	% Complete Test 1	# Complete Test 2	% Complete Test 2
B&W	Monday/9:05	19	17	89	17	89
B&W	Monday/10:10	15	12	80	15	100
Text	Tuesday/12:30	27	26	96	25	93
Color	Wednesday/9:05	19	17	89	12	63
Color	Wednesday/10:10	18	14	77	16	89
		98	86	88%	85	87%

Note – Students were only allowed to take the quiz on testing day – no makeup tests were permitted per participating faculty class rules.

Table 8

Quiz Average Scores

Treatment	Day/Time Of Class	Quiz 1	Mean Grade	Quiz 2	Mean Grade	% grade Improved
B&W	Monday/9:05	15.35	76.8%	16.89	84.4%	7.6%
B&W	Monday/10:10	15.75	78.8%	17.20	86.0%	7.2%
Text	Tuesday/12:30	14.42	72.1%	15.92	79.6%	7.5%
Color	Wednesday/9:05	14.94	74.7%	17.64	88.2%	13.5%
Color	Wednesday/10:10	15.21	76.0%	16.75	83.8%	7.8%

Note – A total of 20 points possible for each quiz.

Table 7 indicates the number of students who took the quizzes and Table 8 indicates the mean scores for all three groups. The mean scores appear to improve over time. The

experimental groups both at 3 weeks and at 10 weeks had higher mean scores on the quiz than the control group. This suggests that when compared to a text-based syllabus, the use of a multimodal method of communication via the infographic aids in the retention of syllabus material and information over time. Examination of the effectiveness of an infographic syllabus design as an addendum to text-based syllabi is the focus of this study.

Statistical Analysis

RQ: What are the effects of an infographic syllabus design on the course information retention by at-risk first-semester freshman students at Indiana University of Pennsylvania?

To answer the research question, a series of null hypotheses were developed. The null hypotheses are as follows: $H_0$1 looks at the specific design of the syllabus; $H_0$2 examines the effect of student demographics on information retention; $H_0$4 examines the effectiveness of graphics in promoting information retention and $H_0$5 examines the impact of color. For each of the previously listed hypotheses, a two-way ANOVA was run using SPSS Version 23. The scores for both quiz one and quiz two were measured using ratio data.

A correlational analysis was utilized to examine $H_0$3, the role of both high school grade point average and composite SAT scores on the retention of information. For each of the ANOVA tests, a Levene's test of variance homogeneity was performed. If significance was determined ($p<.05$), then a Welch's F-test was used to determine if the variance was statistically significant. Statistical significance utilizing the Welch's F was found for $H_0$1 (syllabus design), $H_0$4 (graphics), and $H_0$5 (color). There also was a positive correlation found between the scores on the quizzes and an individual's high school GPA for $H_0$3.

$H_0$1: The Design of a Syllabus has no Impact on the Retention of Course Information

Based on the literature, anything retained longer than 2 weeks is considered long-term. As this study utilized a three week and 10 week posttest, both are long-term. For this study results for the three week posttest (quiz 1) will be indicated as an "intermediate" time frame. It is assumed that the modality utilized to provide information would impact the retention of the information both for intermediate recall and over a longer period of time. Mayer (2002) indicates that learning is supported and enhanced when information is garnered from more than one source e.g. via text combined with graphics, thus enhancing long-term memory. Therefore, an individual is able to utilize two information processing systems to obtain and retain the data (Mayer, 2014b).

Table 9

Syllabus Type and Recall On Quiz 1 – ANOVA

Syllabus Type	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Text	26	14.423	1.9631	.3850	F=1.76 df=(2,83)	p=.176
Black & White	29	15.517	2.2932	.4258		
Color	31	15.065	2.1746	.3906		
Total	86	15.023	2.1746	.2345		

Note: Levene's = .689 (df=2,83) p = .505

The results in Table 9 indicate that in the intermediate term (3 weeks), there was no significant difference (p=.176), in the recall of information between the control and experimental groups. While the mean score for both groups that received the infographic addendum was higher than the students that received the text only syllabus, the relatively large standard deviations indicate a great degree of variability within groups. However, while not statistically

significant, it is interesting to note that the students who received the black and white addendum had the highest mean score, leading to questions concerning the impact of color on recall.

Table 10

Syllabus Type and Recall On Quiz 2 – ANOVA

Syllabus Type	N	Mean	Std. Dev.	Std. Error	Welch's F	Significance
Text	25	15.920	1.9774	.3955	F=3.323 df=2,50	p=.044*
Black & White	32	16.875	2.3521	.4158		
Color	27	17.111	1.2195	.2347		
Total	84	16.667	1.9778	.2158		

Note: Levene's = 5.990 (df=2,81) p = .004

The results in Table 10 indicate statistical significance with a p-value of .044 when the Welch's F-test was completed. This indicates syllabus design may influence the longer term retention of information. Both treatment groups had higher mean scores than the text-based control. The significant Welch's F-test (p=.044), indicates that students demonstrate greater long-term retention of the material when it is presented in a multimodal manner. In contrast to the results found at 3 weeks, color had the greatest recall of information as indicated by the means. Increased retention was also noted for individuals who received the black and white infographic. However, the standard deviation was also larger for the group with black and white treatment as compared to the mean for those who received the color treatment.

Table 11

Fishers Least Statistical Difference Test (LSD)

Dependent Variable				Sig.	Mean Difference	Std. Error
Quiz1	LSD	Text	B&W	.064	-1.0942	.5820
			Color	.266	-.6414	.5731
		Black & White (B&W)	Text	.064	1.0942	.5820
			Color	.418	.4527	.5567
		Color	Text	.266	.6414	.5731
			B&W	.418	-.4527	.5567
Quiz2	LSD	Text	B&W	.068	-.9550	.5171
			Color	.030	-1.1911*	.5377
		Black & White (B&W)	Text	.068	.9550	.5171
			Color	.642	-.2361	.5063
		Color	Text	.030	1.1911*	.5377
			B&W	.642	.2361	.5063

Statistical analysis using a post hoc Fisher's Least Statistical Difference test (LSD) (Table 11) indicates that difference between the means of the text-based syllabus student quiz scores and those of the group that received the color infographic are statistically significant (p=.03) for quiz two. This supports the findings of statistical significance of the Welch's F of p=.044. The scores of the black and white infographic do not meet the required p-value for significance. However, the difference is .068, suggesting that there may be increased learning when contrasted to that of the group who only received the text-based syllabus.

$H_0$1 postulates that syllabus design does not impact information retention. The results were split over time. For the intermediate time frame (3 weeks) the null hypothesis was supported as the ANOVA was not statistically significant. However when the results for long-term retention was examined, the null hypothesis was rejected based on the significant findings (p=.044) following a Welch's F-testing of the data. The significance was found only for quiz two

indicating that syllabus design does have a long-term impact on the retention of information, but not for retention over an intermediate time period. Mayer's (2014) cognitive theory of multimedia learning indicates that learning is enhanced when information is presented in a multimodal format, and long term memory is supported. The results of quiz one suggest that syllabus design does not impact the cognitive load regarding retention of the syllabus material at an intermediate time frame, but does promote learning by incorporating information into long-term memory.

$H_0$2: Retention of Course Information is not Impacted by Student Demographics

The literature indicates that student demographics, specifically those related to identification as academically 'at risk', impacts students' overall performance and retention in higher education. The following self-revealed student demographics were explored to determine if they impacted the retention of course information. It is assumed that a student's demographics would not have an impact on the retention of information.

$H_0$2a: Retention of course information is not impacted by student demographics - Gender.

Table 12

Gender and Information Recall on Quiz 1 – ANOVA

Gender	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Male	33	14.636	2.1768	.3789	F=1.709	
Female	53	15.264	2.1586	.2965	df=1,84	p = .195
Total	33	14.636	2.1768	.3789		

Note: Levene's = .623 (df=1,84) p = .432

Table 13

Gender and Information Recall on Quiz 2 – ANOVA

Gender	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Male	32	16.250	2.3555	.4164	F=2.331 df=1,82	p = .131
Female	52	16.923	1.6785	.2328		
Total	84	16.667	1.9778	.2158		

Note: Levene's = 3.424 (df=1,82) p = .068

The purpose of this hypothesis was to explore if gender impacted information recall either at an intermediate time frame (3 weeks) or over an extended time frame (10 weeks). As can be seen in both Table 12 and Table 13, the F-value indicates no significant difference in information recall in terms of gender.

$H_0$2b: Retention of course information is not impacted by student demographics - Age.

Table 14

Age and Information Recall on Quiz 1 – ANOVA

Age	N	Mean	Std. Dev.	Std. Error	F-value	Significance
18	56	14.964	2.2071	.2949	F=.564 df=4,66	p = .690
19	10	15.600	1.8379	.5812		
20	3	16.000	1.0000	.5774		
21	1	17.000				
31+	1	16.000				
Total	71	15.141	2.1064	.2500		

Note: Levene's = .987 (df=2,66) p = .378 - Groups with only one case are ignored in computing the test of homogeneity of variance for quiz one

Table 15

Age and Information Recall on Quiz 2 – ANOVA

Age	N	Mean	Std. Dev.	Std. Error	F-value	Significance
18	55	16.582	2.0248	.2730	F=.479 df=4,62	p = .751
19	7	16.429	2.0702	.7825		
20	3	16.333	2.8868	1.6667		
21	1	18.000				
31+	1	19.000				
Total	67	16.612	2.0297	.2480		

Note: Levene's = .381 (df=2,62) p = .692 - Groups with only one case are ignored in computing the test of homogeneity of variance for Quiz 2

Null hypothesis - $H_0$2.b considers how age affects a student's information retention. Tables 14 and 15 indicate that no significant difference was found on either quiz. It is interesting to note that on quiz one, there is a 1 point difference between the mean scores for students age 18 and 20, with the older students demonstrating increased retention. This difference however does not appear over the long term. The students age 19 and 20 progressively having slightly lower mean scores than the 18-year-old students on quiz two.

$H_0$2c: Retention of course information is not impacted by student demographics - Academic college.

There are over 130 possible majors for a student to choose from at Indiana University of Pennsylvania. To allow for statistical analysis, student majors were lumped into one of the six appropriate colleges based on declared major, or classified as undeclared when a specific major had not yet been determined/declared.

Table 16

College and Information Recall on Quiz 1 – ANOVA

College	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Education	6	14.500	1.6432	.6708	F=.921 df=6,79	p = .485
Business	12	14.083	2.6097	.7534		
Fine Arts	1	16.000				
Health	31	15.548	2.1578	.3875		
Humanities	6	14.833	.7528	.3073		
Science	13	14.538	2.0255	.5618		
Undeclared	17	15.294	2.4435	.5926		
Total	86	15.023	2.1746	.2345		

Note: Levene's = 1.538 (df=5,79) p = .188 - Groups with only one case are ignored in computing the test of homogeneity of variance for quiz 1

Table 17

College and Information Recall on Quiz 2 – ANOVA

College	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Education	6	16.833	.9832	.4014	F=.601 df=6,77	p = .729
Business	11	16.182	2.2724	.6851		
Fine Arts	2	17.000	2.8284	2.0000		
Health	27	17.037	1.6980	.3268		
Humanities	6	17.000	2.0976	.8563		
Science	12	16.917	1.3114	.3786		
Undeclared	20	16.100	2.6137	.5844		
Total	84	16.667	1.9778	.2158		

Note: Levene's = 1.738 (df=6,77) p = .123

Students who did not take the test were not part of the calculation of means, as they were not allowed to make up exams. This is the reason for the increase from one to two students from the college of fine arts when reviewing Table 16 compared to Table 17. This also accounts for variation in the total numbers for each of the other groups on both tables. The F-value indicates there is no statistical difference in terms of academic college and the retention of information. However, it is interesting to note that for quiz one, the students who are undeclared had one of

the highest mean scores (15.2), but had the lowest score in quiz two. Also interesting is the fact that the mean scores for students who have a declared business major are either the lowest (quiz one) or next to the lowest (quiz two) in information retention.

$H_0$2d: Retention of course information is not impacted by student demographics - Hometown economic status.

Economic status was not explicitly explored, however, hometown was requested. Graduating high school poverty rate level is an indicator of an area's economic status.

> The free- and reduced-price lunch (FRPL) program is a federal initiative that provides free or inexpensive lunches to children from low-income families. Students must demonstrate eligibility to participate, and schools receive cash subsidies from the U.S. Department of Agriculture to pay for the food. The program's enrollment data serves as one of the best sources of data on low-income students. As such, the data is also used to determine funding for various federal and state programs targeted to students from low-income families. (Center for Public Education, 2016).

A proxy measure of what is considered as low-income for a school district is the percentage of students eligible for free or reduced-price lunch (FRPL) under the National School Lunch Program (Institute of Education Science, 2015). District's with a poverty rate 20% or greater are considered low income.

Table 18

Hometown and FRPL income indicator

Hometown	Number	Poverty rate
York	2	42
Chester	1	39
Johnstown	2	38
Erie	1	36
Philadelphia	38	36
West Philadelphia	2	36
Lebanon	1	33
Lewistown	1	33
Pittsburgh	13	29
Cranberry Township	1	25
Punxsutawney	12	25
Meadville	1	24
New Kensington	1	22
Bowdertown	1	21
Tyrone	1	21
Sewickley	1	20
Total	79	

Hometown	Number	Poverty rate
Clearfield	1	19
Kittanning	1	19
Washington D.C.	1	18
Apollo	2	17
Berlin	1	17
Carlisle	1	16
Pottsville	2	15
Zelienople	1	14
Bellefonte	1	13
West Brandywine	1	11
Coatesville	2	10
Lititz	1	10
Mountain Top	1	9
Sterling, Virginia	1	7
Kennett Square	1	6
Orange County, Virginia	1	6
Springfield	1	5
Total	20	

Note: School district poverty rates found at Lancasteronline as part of Wolfe's 2014 article. The rates utilized the 2012 US census data.

Economic status is an indicator for students to be deemed as academically at risk. The data in Table 18 indicates that of the 99 students who indicated hometown, 79 of the student's home school district have a poverty rate of 20% or greater. This indicator, however, is reflective of income level within the district that the students came from, not that of an individual student.

Table 19

Hometown and Information Recall on Quiz 1 – ANOVA

Hometown	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Not low income	37	14.919	1.9491	.3204	F=1.48	
Low income	49	15.102	2.3474	.3353	df=1,84	p = .701
Total	86	15.023	2.1746	.2345		

Note: Levene's = .807 (df=1,84) p = .371

Table 20

Hometown and Information Recall on Quiz 2 – ANOVA

Hometown	N	Mean	Std. Dev.	Std. Error	F-value	Significance
Not low income	33	16.576	1.9370	.3372	F=.114	
Low income	51	16.725	2.0207	.2830	df=1,82	p = .737
Total	84	16.667	1.9778	.2158		

Note: Levene's = .006 (df=1,82) p = .940

Even with a significant portion of the student participants coming from school districts identified as low income, the significance level does not reach p=.05 for both quiz one (p=.701) and quiz two (p=.737) indicating that there is no statistical difference in terms of hometown and information retention.

$H_0$2e: Retention of course information is not impacted by student demographics - Familiarity regarding syllabus use.

The familiarity of a syllabus's use could be an indicator of academic preparation. If a student is familiar with a syllabus, it may indicate that the student was introduced to the syllabus as an academic tool in high school.

Table 21

Syllabus Familiarity and Information Recall on Quiz 1 – ANOVA

Prior Familiarity/use of Syllabus	N	Mean	Std. Dev.	Std. Error	F-value	Significance
No	57	15.263	2.0574	.2725	F=.974 df=1,69	p = .327
Yes	14	14.643	2.3074	.6167		
Total	71	15.141	2.1064	.2500		

Note: Levene's = .142 (df=1,69) p = .707

Table 22

Syllabus Familiarity and Information Recall on Quiz 2 – ANOVA

Prior Familiarity/use of Syllabus	N	Mean	Std. Dev.	Std. Error	F-value	Significance
No	55	16.745	2.0658	.2785	F=1.335 df=1,65	p = .252
Yes	12	16.000	1.8091	.5222		
Total	67	16.612	2.0297	.2480		

Note: Levene's = .121 (df=1,65) p = .729

The larger proportion of the student participants reported that they did not have prior familiarity with a syllabus and its use. Tables 21 and 22 indicate, however, that lack of familiarity had no statistical significance to information retention on either quiz one or quiz two.

$H_0$2 postulates that information retention is not impacted by student demographics. The overall null hypothesis is supported by the ANOVA testing for each of the subcategories (gender, age, college, hometown, and familiarity with syllabus) as not statistically significant.

$H_0$3: Retention of Course Information is not Impacted by Student Academic Preparation

As the students participating in the study are for a large part classified as academically "at risk", the consideration of prior academic performance on the study results is important. Students enrolled at the Punxsutawney Regional Campus are classified as "at-risk" based upon

either their high school GPA and/or their combined SAT scores. Students are directly admitted to this campus with a minimum of a 740 SAT and a 2.25 high school grade point average. Academically "at-risk" is characterized in part by low standardized test score, or poor performance in K-12 education, evidenced by high school GPA (Arum, & Roksa, 2011; Darensbourg, & Blake, 2013; Garrison, & Gardner, 2012; O'Keeffe, 2013; Mulvey, 2009; Sandoval-Lucero, 2014; Schnee, 2008; Tinto, 1975).

Table 23

Average High School GPA and Composite Test Scores

Treatment	High School GPA	Composite Standardized Score
Black & White	2.89	793
Text	2.70	782
Color	2.78	781

Table 24

Mean GPA and Test Scores of Study Participants

	N	Mean	Std. Deviation
HS GPA	98	2.79	.47623
Composite	98	786	93.5093
Quiz1	86	15.023	2.1746
Quiz2	84	16.667	1.9778

As many of the students are deemed to be at risk, it is interesting that the mean scores of student participants are well above the criteria for direct admission to the Punxsutawney Regional Campus. The stated criteria is a minimum of a 740 composite score on standardized testing and a 2.25(or lower) high school grade point average.

$H_0$3a: Retention of course information is not impacted by student academic preparation - Reflected by high school overall grade point average (GPA).

Table 25

Correlation of HS GPA to Quizzes

		Quiz1	Quiz2
HS_GPA	Pearson Correlation	.243	.214
	Sig. (2-tailed)	.024*	.050*
	N	86	84

In Table 25 there is a positive correlation between the scores on each of the quizzes and high school GPA. Both are significant at p = .024 for quiz 1 and p = .050 for quiz two. Therefore, there is a positive correlation between the variables of high school GPA and scores on each of the quizzes. Review of the data indicates that there is not a very strong relationship between high school GPA and the scores on either quiz one or two. The Pearson's r is closer to zero (0), for quiz one (r = .243) and for quiz two (r = .214), indicating a weak/modest relationship between each of the variables.

$H_0$3b: Retention of course information is not impacted by student academic preparation - Reflected by combined score on standardized testing (SAT).

Table 26

Correlation of SAT to Quizzes

		Quiz1	Quiz2
	N	86	84
Composite	Pearson Correlation	-.049	.114
	Sig. (2-tailed)	.652	.300
	N	86	84

Review of the data in Table 26 indicates that there is not a strong relationship between composite score on standardized testing and the scores on either quiz one or two. The Pearson's r

is closer to zero (0), indicating a weak relationship between the two variables. Of interest is that for quiz one, there is a very slight difference in the relationships, with quiz one presenting a slightly negative relationship (r= -.049), whereas quiz two has a slightly positive relationship (r=.114). The data essentially indicates very little relationship at almost 0.0 for both quiz one and quiz two. There is also not a significant correlation between the scores on either of the quizzes and standardized test composite score. Both are not significant at p = .652 for quiz one and p = .300 for quiz two. Therefore, there is no correlation between the standardized testing composite score and scores on either of the quizzes.

The null hypothesis for $H_0$3 is that the retention of course information is not impacted by academic preparation has partially been rejected. There was not a correlation found between student performance on either quiz one or quiz two with the composite standardized test scores. However, there was a positive correlation found for both quizzes and high school GPA. In both cases (GPA and standardized test scores) the relationship between the variables and the quiz results was weak. The correlation between high school GPA and performance on activities supports a growing body of research that indicates that high school GPA is a good predictor of student success. An example of this is Belfield and Crosta's (2012) report that "high school GPAs are useful for predicting many aspects of students' college performance. High school GPA has a strong association with college GPA" (p.2).

$H_0$4: Graphics Have no Impact on Course Information Retention

Based on the literature, it is assumed that information provided by an infographic syllabus addendum would impact the retention of syllabus information both for intermediate recall and over a longer period of time. Infographics instruct, inform, illuminate, and

communicate complex concepts in a manner that is fast and easily understood, allowing the individual to efficiently gain knowledge (Huang & Tan, 2007, Lankow, Crooks, & Ritchie, 2012; Wisniewski & Fichter, 2007).

Table 27

Graphics and Information Recall on Quiz 1 – ANOVA

Graphics present	N	Mean	Std. Dev.	Std. Error	F-value	Significance
No	26	14.423	1.9631	.3850	F=2.902 df=1,82	p = .092
Yes	60	15.283	2.2254	.2873		
Total	86	15.023	2.1746	.2345		

Note: Levene's = .112 (df=1,84) p = .739

The results in Table 27 indicate that in the intermediate term (3 weeks), there was no significant difference (p=.092), in the recall of information between the control and experimental groups. While, the mean score for both groups that received the infographic addendum was higher than the students that received the text-only syllabus, the relatively large standard deviations indicate a great degree of variability within groups.

Table 28

Graphics and Information Recall on Quiz 2 – ANOVA

Graphics present	N	Mean	Std. Dev.	Std. Error	Welch's F	Significance
No	25	15.920	1.9774	.3955	F=5.183 df=1,82	p = .028*
Yes	59	16.983	1.9073	.2483		
Total	84	16.667	1.9778	.2158		

Note: Levene's = .032 (df=1,82) p = .858

The results in Table 28 indicate statistical significance with a p-value of .028 when the Welch's F-test was calculated. This indicates graphics do influence students' retention of information. The significant Welch's F-test (p=.028), indicates that students demonstrate greater

long-term retention of the material when it is presented in a multimodal manner incorporating graphics to support the text.

Like $H_0$1, $H_0$3 demonstrates split results over time. $H_0$3 postulates that the use of graphics does not impact information retention. For the intermediate time frame (3 weeks) the null hypothesis was supported as the ANOVA was not statistically significant. However, when the results for long-term retention was examined, the null hypothesis is rejected based on the significant findings (p=.028) following a Welch's F-testing of the ANOVA findings. The significance was found only for quiz two indicating that graphics do have a long-term impact on the students' retention of information but not for retention over a shorter time period. Mayer's (2014) cognitive theory of multimedia learning indicated that learning is enhanced when information is presented in a multimodal format with the utilization of words and pictures. This premise was supported by the current study as the results indicated that information was moved into long-term memory, promoting learning. The results of quiz one suggest that the use of graphics does not impact the intermediate cognitive load regarding retention of the syllabus material. However, the significant results found on quiz two suggests that graphics promote learning by incorporating information into long-term memory.

$H_0$5: Color has no Impact on Course Information Retention

The impact that color has on information retention has not been studied to any significant degree since the early 1990's. Lamberski and Dwyer (1983), and Hoadley (1990) found that the use of color can impact an individual's ability to extract and retain information, as well as enhance the recall and retention of information. Lamberski (1980) found that color (specifically

red) significantly enhances the recall of images or image/text combinations. It is assumed that the color infographic will have the best information recall based on prior research.

Table 29

Color and Information Recall on Quiz 1 (including text-based syllabus) – ANOVA

Color	N	Mean	Std. Dev.	Std. Error	F-value	Significance
No	55	15.000	2.1943	.2959	F=.017	
Yes	31	15.065	2.1746	.3906	df=1,84	p = .896
Total	86	15.023	2.1746	.2345		

Note: Levene's = .676 (df=1,84) p = .413

Table 30

Color and Information Recall on Quiz 2 (including text-based syllabus) – ANOVA

Color	N	Mean	Std. Dev.	Std. Error	Welch's F	Significance
No	57	16.456	2.2286	.2952	F=3.016	
Yes	27	17.111	1.2195	.2347	df=1,80	p = .086
Total	84	16.667	1.9778	.2158		

Note: Levene's = 12.321 (df=1,82) p = .001

The purpose of this hypothesis was to explore if color impacted information recall either at an intermediate time frame (3 weeks) or over an extended time frame (10 weeks). As can be seen in Tables 29 and 30, the F-value reported no significant difference in information recall related to color. However, this analysis included the text-based syllabus as part of the "no color" analysis data. An analysis of only the infographics, black and white vs color also indicates no significant difference as well as evidenced in Table 31 and 32.

Table 31

Color and Information Recall on Quiz 1 (excluding text-based syllabus) – ANOVA

Color	N	Mean	Std. Dev.	Std. Error	F-value	Significance
No	29	15.517	2.2932	.4258	F=.601 df=1,58	p = .436
Yes	31	15.065	2.1746	.3906		
Total	60	15.283	2.2254	.2873		

Note: Levene's = 1.133 (df=1,58) p = .292

Table 32

Color and Information Recall on Quiz 2 (excluding text-based syllabus) – ANOVA

Color	N	Mean	Std. Dev.	Std. Error	Welch's F	Significance
No	29	15.517	2.2932	.4258	F=.245 df=1,48	p = .623
Yes	31	15.065	2.1746	.3906		
Total	60	15.283	2.2254	.2873		

Note: Levene's = 13.106 (df=1,57) p = .001

$H_0$5 postulated that color had no impact on course information retention. The ANOVA testing supported the acceptance of this null hypothesis. The Levene's significance (p=.001) for both quiz two analyses, with and without the inclusion of the text-based syllabus in the no color group, indicated a lack of homogeneity of the variances. A Welch's F-test was then run to address this inequality and p-values were comparable to that found by the ANOVA. The premise that color impacts information retention is not supported.

Conclusion

The purpose of this study was to understand the impact of syllabus design on the course information retention over time by "at-risk" students. This chapter indicates the results of the study utilizing a series of ANOVA tests and correlational analysis. There were five null hypotheses related to this study. The first indicated that the overall design of a syllabus does not impact a student's retention of the information on the syllabus. Information retention over the

long term was demonstrated to be significantly impacted by syllabus design. Interestingly, syllabus design did not demonstrate significant findings over the intermediate time frame of 3 weeks.

The second null hypothesis indicated that demographics had no impact on information retention. Each of the five areas: gender, age, academic college, hometown and familiarity with the syllabus, were found not to significantly impact information retention. The third hypothesis indicated that a student's prior academic preparation, reflected in either the high school grade point average or on the composite standardized test score, would not impact the retention of course information. A positive correlation was found between the GPA and the retention of course information both at three weeks and at ten weeks. However, only modest relationships were found between course information retention for either the GPA or standardized testing composite score.

The premise that graphics have no impact on course information retention was the fourth null hypothesis. Like syllabus design, information retention over the long term was demonstrated to be significantly impacted by the use of graphics. Interestingly, over the intermediate frame of three weeks, the use of graphics did not demonstrate significant findings. As color is related to graphics, the last null hypothesis that color does not impact information retention would have been expected to mimic the results of graphics. Surprisingly, information retention was not significantly impacted by the use of color at three weeks, nor at ten weeks. Results and implications will be examined further in Chapter 5.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The design of a syllabus is an area that has not been researched to any significant degree. Various discrete aspects of the syllabus such as the learning objectives have received a large portion of syllabus research, however, the functional design of the syllabus has not been actively investigated (Snyder, 2002). This study focused on the design of the syllabus and its impact on the learning of "at-risk" students. Specifically, this study examined the impact of an infographic syllabus design on the retention of course related information. Three different versions of the syllabus were utilized to present the course information. The traditional text-based syllabus was provided to all participants to protect the students from any perceived risk. The treatment was a syllabus infographic that provided specific information from the syllabus in a multimodal manner. Participants were solicited from multiple sections of a single class taught at the Punxsutawney Regional Campus of the Indiana University of Pennsylvania. Ninety-eight students participated in the study. The study consisted of a demographic survey, provision of the syllabi and infographic addendum, and then the students participated in two posttests embedded in their class. The first posttest was given at three weeks, and the final posttest was given at ten weeks. The findings were presented in Chapter 4.

The overarching research question focused on the effect of an infographic syllabus on the course information retention. The population tested were primarily classified as "at-risk" due to their enrollment at the Punxsutawney Regional Campus. Students are directly admitted to this campus with a minimum of a 740 SAT/15 ACT and a 2.25 (or lower) high school grade point

average. The study examined course information recall by examining specific variables (design, demographics, GPA/SAT score, graphics, and color) and their impact on retention. The timing of the post- tests, at three weeks, and at ten weeks, were specifically timed to test intermediate and long-term memory recall and retention.

The cognitive theory of multimedia learning is a theory that addresses the manner in which an educational message is presented, specifically combining pictures and text, in a manner that fosters learning (Mayer, 2002; Mayer, 2014a; Mayer, 2014b). This theory was used as the foundation for this study as it addresses both message design and the impact of that design on long-term retention and recall of information. The primary assumption of the cognitive theory of multimedia learning is that individuals are able to achieve a deeper understanding and retention of information when it is presented utilizing both verbal and pictorial representations (Mayer, 2002; Mayer 2014b).

Discussion of Findings

As indicated previously, there has been a dearth of research into the effectiveness of the current design of the syllabus. The current iteration of the syllabus emerged in the early 20th century and has changed little over the years (Wasley, 2008). There are three primary goals of a syllabus. One is to provide motivation to the students within the educational process, the second is to provide a foundation or structure to the course. The final goal of the syllabus is to provide evidence to internal and external entities to a university e.g. accreditation body or as part of a tenure review (Ludwig, Bentz, & Fynewever, 2011; McDonald et al., 2010; Slattery, & Carlson, 2005). The focus of this study was to examine the second role of the syllabus - a foundation or

structure of a course, communicating the organization and scope of the course, as well as specific rules and policies that the faculty member assigns (Berrett, 2012; Fink, 2012).

The infographic syllabus addendum was designed specifically to address the information identified by students in prior research as important. Becker and Calhoon (1999); Iannarelli, Bardsley and Foote (2010); and McDonald et al., (2010) each indicated that what students' focus upon are exam dates, course schedule, assignments and student responsibilities, grading criteria and course expectations. The infographic specifically highlighted each of these points in a multimodal format. Research has demonstrated that illustrations help individuals grasp information, especially when it is supported by text. (Davis, 2013; Price, 2007).

This study focused on five different variables and their impact on information retention. Two of the variables were student centered (demographics and prior academic performance) and three related to the design of the syllabus and the treatment.

The role of demographics, specifically those related to classification as academically "at-risk" were reviewed. Individuals are deemed as academically "at-risk" if they identify as an ethnic minority, have a low socioeconomic status, have low standardized testing scores, are diagnosed with a physical, mental, or emotional disability, identify as academically disadvantaged, or are a first-generation college students (Arum, & Roksa, 2011; Darensbourg, & Blake, 2013; Garrison, & Gardner, 2012; O'Keeffe, 2013; Mulvey, 2009; Sandoval-Lucero, 2014; Schnee, 2008; Tinto, 1975).

Demographic information e.g. age, gender, hometown, major was self-disclosed or obtained from the university by the researcher with the students' permission. The information obtained from the university were high school GPA and composite scores on standardized testing

required for admission to the university. The study found that the self-disclosed demographic information had no significant results related to information retention. Composite standardized test scores were also found to have a weak relationship and no correlation with long-term retention of information. There was a significant positive correlation between the study participants high school GPA and information retention. However, the relationship between high school GPA and information retention was modest.

The use of graphics was examined and was found to be significant over a longer time frame to the recall of information. Mayer (20002) indicates that when information is presented using a multimodal framework, students learn more deeply, storing more information in long term memory than when the information is from a single source, specifically verbally. Additionally, the use of pictures and text provides learners with two different cognitive processing systems to enhance the retention of data (Mayer 2014b). In the cognitive theory of multimedia learning, it is assumed that the pictures and text serve a complimentary function and together contribute to the creation of a mental model that allows for a comprehensive analysis of the content as a whole. This study supports the findings of Mayer (2014) and the cognitive theory of multimedia learning's indication that the combined use of graphics and text promote increased retention of material and learning. This study, however, found that the use of multimodal information was not statistically significant in information retention at an intermediate time frame. The notable difference in significance may be related to the students using the graphics to support the creation of internal classification of the information supporting the creation of a germane cognitive load.

Color was not found to be statistically significant in the retention of information. This finding was unexpected as prior research indicated that color enhanced the recall of information (Lamberski, 1980; Lamberski & Dwyer, 1980; and Hoadley, 1990). The scores for the color groups were higher both on quiz one and quiz two than the text-based control group. However, color mean scores were lower on quiz one than the group that received the black and white infographics syllabus addendum. It is clear from this study, color was not a significant factor in the course information retention.

Mayer (2002 & 2014a) indicates that the use of multimodal communication through the use of both graphics and text promotes active learning. This active learning requires individuals to process information through the selection, organization and integration of the information garnered from the two separate channels, and then combine the information with prior knowledge which results in meaningful learning (Mayer, 2002; Mayer, 2014a). The utilization of an infographic syllabus addendum, through its provision of information in a multimodal format combining text and graphics, was the focus of the final study variable examining the design of the syllabus.

Lajoie (2014) outlines four CTML principles that were foundational in the design of the infographic addendum. These principles are:

1. *Multimedia principle*: Students learn better from words and pictures than from words alone;
2. *Spatial contiguity principle*: Students learn better when corresponding words and pictures are presented near, rather than far from, each other on page or screen;

3. *Temporal contiguity principle*: Students learn better when corresponding words and pictures ae presented simultaneously rather than successively;
4. *Coherence principle*: Students learn better when extraneous words, pictures, and sounds are excluded.

This study found that syllabus design did impact student retention of the material over the long term. Statistically significant findings found that the color infographic syllabus design did have an impact on students' retention of the course material. Of note, both treatment groups (who received the infographic addendum whether black and white or color) scored higher on both quizzes than the text-only control group. Additionally, the scores were a full grade higher than the control group on the final quiz. On quiz one, the control group had a very low C grade mean of 72.1%, whereas both of the treatment groups mean was at least 74.7%. While not statistically significant, the higher grades suggest increased retention of the material. The control group's mean grade on quiz two was a 79.6 % or a high C grade, whereas the treatment groups were 83.8% or higher or a B grade. The results of this study indicate that the manner in which the information is presented does impact the retention of the material.

Limitations

While this study produced significant results, there were some limitations to the study that should be considered. The study did not utilize all the principles of cognitive theory of multimedia learning, however, the overarching framework did fit. The presentations were not what is traditionally considered multimedia i.e. animation or computer based. However, the materials were multimodal in presentation, with a combination of pictures and text and used in

conjunction with verbal descriptions. The study did meet the criteria outlined by Mayer (2014) within his multimedia principle – use of words and pictures rather than words alone.

This study utilized a significant sample of the total population of the Punxsutawney Regional Campus (49%); however, the population is not reflective of the general population of traditional college freshman. The use of a specific population of students classified as academically at risk does limit the generalizability of the results to a larger group. Conversely, if students that are academically challenged are able to increase retention of information through the use of multimodal syllabus format, the non-challenged student may be equally supported.

The posttest format of the study had limitations in that students were aware of the scheduled time for the post tests. Students had the opportunity to refresh their memories of the syllabus information prior to the scheduled quizzes. To limit the confounding variable of refreshed knowledge, “pop” quizzes or unexpected testing of knowledge would be more reflective of long-term retention of information.

The paper-based format of the syllabus and infographic addendum should be mentioned as a possible limitation. The utilization of paper-based documentation limits the examination of the delivery mode outlined in the CTML. The delivery mode indicates that information should be provided via two or more devices/methods. This study meets the spirit of this aspect of the CTML through the provision both in paper and via a verbal description of the material by the faculty member and researcher. To increase the rigor of the study, utilization and comparison of paper-based materials versus online distribution should be considered. This would strengthen the delivery media mode aspect of the CTML.

Further Research

As indicated both in Chapter 4 and earlier in this chapter, there are areas that could and should be researched in the future based on the findings of this study. The cognitive theory of multimedia learning's multimedia principle indicates that individuals learn better when a combination of word (text) and pictures (graphics) are used to convey the information. This study supports the premise that retention of information (learning) over the long term is enhanced when the word/picture combination is utilized. This study examined the effects of an infographic syllabus on a specific population, namely novice student that have been designated as "at-risk". Further research should be conducted examining the effects on both traditional college students, as well as non-traditional students e.g. older than 25.

Infographic syllabi are currently a popular fad with a variety of examples readily apparent with a brief Google search. However, like the traditional syllabus, the effectiveness of this medium has not been examined beyond the scope of this study. Further research into the effectiveness should focus on how students retain the information of a variety of course syllabi over the course of a semester, as well as the effectiveness of infographics on the long-term retention of course content should be conducted. This study supported the premise that students retain information over the long-term when graphics supplement the text based information. This support of Mayer's (2014) cognitive theory of multimedia learning principles should be extended to other aspects of a course beyond the syllabus. Segmentation of the material allows students to process the information more deeply as they control the flow of information and are not overloaded (Lusk et al., 2009). This segmentation may enhance learning, however, further

research is needed to determine the extent and amount of segmentation regarding the infographic's effectiveness.

Frequently, on the first day of class, students are handed a paper syllabus as the overview of the course (Cummings, Bonk, & Jacobs, 2002; Fornaciari, & Dean, 2014; McDonald et al., 2010). As this study used paper-based infographics' to provide the syllabus information; a comparison between a syllabus infographics that is provided online versus a paper-based should also be examined. Research indicates that segmentation of the material allows the learner to control processing of information. Technology supports this through the user controlling the amount of information accessed and the flow of information (Lusk et al., 2009). Will the retention be further enhanced through the use of online modalities that allow the students the opportunity to control the amount of information and its access?

One of the limitations noted with this study is the prior knowledge of post testing's impact on the evaluation of memory retention. Further research regarding information effectiveness related to an infographic syllabus should be conducted through an unscheduled examination of material retained over time. This would provide a more rigorous examination of information retention in the short-term, as well as over time, both in an intermediate and long-term timeframe.

Conclusion

Innovation with the sole consideration of the user limits function, e.g. only considering what a small subset of a population may need. What needs to be considered is the job or task we want the user to do (Christensen, & Eyring, 2011). The creation of an infographic does take time and effort by the faculty. The use of an infographic will require the faculty to plan and develop

the syllabus in a new way. Higher education is mired in tradition, however in the case of the syllabus, that tradition's effectiveness has not been studied. This research has begun an examination of the design of the syllabus, its effectiveness and the impact of multimodal methods of communication on the retention of information. This study found that an infographic syllabus design does enhance retention of information over time and that graphics play a role in learning. The role of higher education is to promote the education of individuals. Examination and revision of methods used to provide information on the path to learning is key to supporting students. The potential transition to an infographic syllabus would be considered a disruptive innovation. This study reveals that professors/scholars should consider changing the way they view sharing critical information on a syllabus. This research supports such a conclusion for "at-risk" students, and along with Mayer's (2014) work with the cognitive theory of multimedia learning. This suggests its potential for all students. A syllabus, as highlighted through the literature serves multiple roles for the student, instructor, program, and educational institution. The provision of an infographic addendum, specifically focused on what is viewed as important to students, while preserving the traditional text-based syllabus to serve the other needs of instructor, program and institution is a win-win for both students and higher education.

References

Aarsand, P. A. (2007). Computer and video games in family life: The digital divide as a resource in intergenerational interactions. *Childhood, 14*(2), 235-256.

ACT Survey (2009). ACT national curriculum survey. Retrieved from http://www.act.org/research-policy/national-curriculum-survey/

ACT Survey (2012). ACT national curriculum survey: Policy implications on preparing for higher standards. Retrieved from http://www.act.org/research-policy/national-curriculum-survey/

Afros, E., & Schryer, C. F. (2009). The genre of syllabus in higher education. *Journal of English for Academic Purposes*, *8*(3), 224-233.

Alptekin, C., Erçetin, G., & Bayyurt, Y. (2007). The effectiveness of a theme-based syllabus for young L2 learners. *Journal of Multilingual and Multicultural Development*, *28*(1), 1-17.

Arum, R., & Roksa, J. (2011). *Academically Adrift: Limited Learning on College Campuses.* Chicago, IL: University of Chicago Press.

Avgerinou, M. D. (2009). Re-viewing visual literacy in the "Bain d'Images" era. *TechTrends: Linking Research & Practice to Improve Learning, 53,* 28-34.

Avgerinou, M. D. (2011). Toward a cohesive theory of visual literacy. *Journal of Visual Literacy, 30*(2), 1-19.

Ayres, P, & Paas, F. (2007). Making instructional animations more effective: A cognitive load approach. *Applied Cognitive Psychology, 21*(6), 695-700.

Ayers, P., & Paas F. (2012). Cognitive Load Theory: New directions and challenges. *Applied Cognitive Psychology, 26*(6), 827-832.

Baddeley, A. (1992). Working memory. *Science, 255*(5044), 556-559.

Baddeley, A. D. & Logie, R. H. (1999). Working memory: Multiple-component model. In A. Miyake & P. Shah (Eds), *Models of working memory: Mechanisms of active maintenance and executive control*. Cambridge University Press.

Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, *4*(11), 417-423.

Becker, A. H., & Calhoon, S. K. (1999). What introductory psychology students attend to on a course syllabus. *Teaching of Psychology, 26*(1), 6-11.

Beetham, H., & Sharpe, R. (Eds.). (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning*. (2nd Edition). Florence, KY, USA: Routledge.

Belfield, C., & Crosta, P. M. (2012). Predicting success in college: The importance of placement tests and high school transcripts. Retrieved from: http://academiccommons.columbia.edu/catalog/ac:146486

Bennet, S. (2012). Digital Natives. In Z. Yan (Ed.) *Encyclopedia of Cyber Behavior, Volume 1*. pp 212-219. United States: IGI Global.

Berkovitz, R. A., & O'Quin, K. (2006). Predictors of graduation of readmitted" at risk" college students. *Journal of College Student Retention: Research, Theory, and Practice*, *8*(2), 199-214.

Berrett, D. (2012). A new journal brings peer review to the college syllabus. *The Chronicle of Higher Education*, June 19, 2012.

Biktimirov, E. N., & Nilson, L. B. (2003). Mapping your course: Designing a graphic syllabus for introductory finance. *Journal of Education for Business*, *78*(6), 308-312.

Blythe, J. (2012). Part 4: Promotion: The Schramm model of communication. In *Key Concepts in Marketing (ebook).* Boston, Mass: Credo Reference. 9781780344874 (online)

Bok, D. (2007). *Our Underachieving Colleges*. Princeton, NJ: Princeton University Press.

Boldt, J. (2014). Syllabus design for dummies. *Vitae* – Online journal. Retrieved 11/9/2014 from https://chroniclevitae.com/news/754-syllabus-design-for-dummies?cid=at&utm_sources=at&utm_medium=en.

Boling, E., Eccarius, M., Smith, K., & Frick, T. (2004). Instructional illustrations: Intended meanings and learner interpretations. *Journal of Visual Literacy, 24*(2), 185-204.

Boutin, J. F., Lacelle, N., Lebrun, M., & Lemieux, N. (2013). Analyzing students' comprehension of multitexts: The mobilization of images (visual mode) in the language classroom. *The International Journal of the Image, 3*(4), 69-78.

Bracy, C., Bevill, S., & Roach, T. D. (2010, July). The millennial generation: Recommendations for overcoming teaching challenges. In *Proceedings of the Academy of Educational Leadership, 15*(2), 21-25.

Braden, R. A., & Hortin, J. A. (1982). Identifying the theoretical foundations of visual literacy. *Journal of Visual Verbal Languaging*, 37-42.

Braunstein, A. W., Lesser, M. H., & Pescatrice, D. R. (2008). The impact of a program for the disadvantaged on student retention. *College Student Journal*, *42*(1), 36.

Braxton, J. M., Milem, J. F., & Sullivan, A. S. (2000). The influence of active learning on the college student departure process: Toward a revision of Tinto's theory. *Journal of Higher Education*, 569-590.

Brink, T. L. (2009). Review of book *The Graphic Syllabus and the Outcomes Map: Communicating Your Course,* by Linda B. Nilson. *Teaching Theology & Religion, 12*(3), 292-294.

Brown, P. (2011). Teaching the millennial students. In *Proceedings of the American Society of Business and Behavioral Sciences annual conference. 18*(1), Las Vegas.

Brumberger, E. (2011). Visual literacy and the digital native: An examination of the millennial learner. *Journal of Visual Literacy, 30*(1), 19-48.

Burmark, L. (2002). *Visual Literacy: Learn to See, See to Learn.* Alexandria, VA: Association for Supervision and Curriculum Development.

Burmark, L. (2011). *They Snooze, You Lose: The Educator's Guide to Successful Presentations.* San Francisco, CA: Jossey-Bass Publishers.

Bush, V. (1945). As we may think. *The Atlantic.* Accessed from http://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881

Cardozo, K. M. (2006). At the museum of natural theory: The experiential syllabus (or, what happens when students act like professors). *Pedagogy: Critical Approaches to Teaching Literature, Language, Composition, and Culture, 6(*3), 405-433.

Carmer, A. (2013). Information visualization: Why infographics are everywhere. New Visual Studies, Spring 2013. http://fir.ferris.edu:8080/xmlui/handle/2323/3455

Carr, A., & Ly, P. (2009). "More than words": Screencasting as a reference tool. *Reference Services Review, 27*(4), 408-420.

Carr, N. (2010). *The Shallows: What the Internet is Doing to Our Brains*. New York, NY: W.W. Norton & Company, Inc.

Center for Public Education (2016). Data first: What is the poverty level of our school(s)? Retrieved from http://www.data-first.org/data/what-is-the-poverty-level-of-our-schools/

Chandler, D., & Munday, R. (2011). *A Dictionary of Media and Communication.* Online version. eISBN: 9780191727979. doi: 10.1093/acref/9780199568758.001.0001. Oxford University Press.

Chitiga, M., Chogugudza, P., & Chitiga, T. (2011). Teaching outside one's comfort zone: Helping diverse millennials succeed. *Faculty Working Papers from the School of Education, Paper 23*. Retrieve from http://digitalcommons.uncfsu.edu/soe_faculty_wp/23

Christensen, C. M., & Eyring, H. J. (2011). *The Innovative University: Changing the DNA of Higher Education from the Inside Out.* San Francisco, CA: Jossey-Bass.

Clark, R. E., & Feldon, D. F. (2014). Ten common but questionable principles of multimedia learning. In R. E. Mayer (Ed), *The Cambridge Handbook of Multimedia Learning* (pp. 151-173). New York: Cambridge University Press.

Collier, P. J., & Morgan, D. L. (2008). "Is that paper really due today?" Differences in first-generation and traditional college students' understandings of faculty expectations. *Higher Education, 55*(4), 425-446.

Coomber, E. (2008). The visual advantage. *Communication World, 25*(5), 36-38.

Cowan, N., Saults, J. S., & Blume, C. L. (2014). Central and peripheral components of working memory storage. *Journal of Experimental Psychology, 143*(5), 1806-1836.

Creswell, J. W. (2008). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, California, USA: Sage Publications, Inc.

Cummings, J. A., Bonk, C. J., & Jacobs, F. R. (2002). Twenty-first century college syllabi: Options for online communication and interactivity. *The Internet and Higher Education, 5*(1), 1-19.

Dake, D. M. (2007). A natural visual mind: The art and science of visual literacy. *Journal of Visual Literacy, 27*(1), 7-28.

Darensbourg, A. M., & Blake, J. J. (2013). Predictors of achievement in African American students at risk for academic failure: The roles of achievement values and behavioral engagement. *Psychology in the Schools, 50*(10), 1044-1059. DOI:10.1002/pits.21730

David, A., & Glore, P. (2010). The impact of design and aesthetics on usability, credibility, and learning in an online environment. *Online Journal of Distance Learning Administration, 8*(4).

Davis, A. (2013). *Improving multimedia foundations: Design of a micro-syllabus for integrating multimedia modules into college courses at the University of Delaware*. (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (AAT 3612973)

Davis, M., & Quinn, D. (2014). Visualizing text: The new literacy of infographics. *Reading Today, 31*(3), 16-18.

de Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science, 38*(2), 105-134.

Department of Education (2010). *Transforming American education: Learning powered by technology: National Education Plan 2010.* Washington, D.C.: Education Publications Center.

Devoss, D. N., & Lebeau, P. R. (2010). Reading and composing Indians: Invented Indian identity through visual literacy. *The Journal of Popular Culture, 43*(1), 45-77.

Diakopoulos, N., Kivran-Swaine, F., & Naaman, M. (2011). Playable data: Characterizing the design space of game-y infographics. *Proceedings of SIGCHI Conference on Human Factors in Computing Systems* (pp.1717-1726), Vancouver, BC, Canada.

Dondis, D.A. (1973). *A Primer on Visual Literacy*. Cambridge, Mass., MIT Press.

Eberly, M. B., Newton, S. E., & Wiggins, R. A. (2001). The syllabus as a tool for student-centered learning. *The Journal of General Education, 50*(1), 56-74.

Echoboomer (2013). In *World Wide Words.org*. Retrieved September 21, 2013, from www.worldwidewords.org/turnsofphrase/tp-ech1.htm

Efe, H. (2009). Evaluation of English language teaching syllabuses introduced in the first year of secondary schools in northern Cyprus. *Journal of Graduate School of Social Sciences, 13*(1), 69-76.

Effort. (2015). In *Oxford Dictionary.com*. Retrieved August 2, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/effort

Eitel, A., & Scheiter, K. (2015). Picture or text first? Explaining sequence effects when learning with pictures and text. *Educational Psychology Review, 27*(1), 153-180. DOI 10.1007/s10648-014-9264-4.

Eitel, A., Scheitier, K., & Schuler, A. (2012). The time course of information extraction from instructional diagrams. *Perceptual & Motor Skills: Learning & Memory, 115*(3), 677-701.

Eitel, A., Scheitier, K., Schuler, A., & Nystrom, M. (2013). How a picture facilitates the process of learning from text: Evidence for scaffolding. *Learning and Instruction, 28*, 48-63.

Emanuel, R. (2013). Visual literacy and the digital native: Another look. *Journal of Visual Literacy, 32*(1), 7-26.

Erfani, S. M. (2012). Pictures speak louder than words in ESP, too! *English Language Teaching, 5*(8), 164-169.

Estes, T. (2007). Constructing the syllabus: Devising a framework for helping students learn to think like historians. *The History Teacher, 40*(2), 183-201.

Fall 2015 Indiana University of Pennsylvania Enrollment. (n.d.). Retrieved from http://www.iup.edu/planningandassessment/ October 25, 2015.

Featherstone, R. M. (2014). Visual research data: An infographics primer. *Journal of the Canadian Health Libraries Association, 35*(3), 147-150. doi:10.5596/c14-031.

Felten, P. (2008). Visual literacy. *Change: The Magazine of Higher Learning, 40*(6), 60-64.

Finch, J. (2015, August 8). What is Generation Z, and what does it want? [Web log comment]. Retrieved from http://www.fastcoexist.com/3045317/what-is-generation-z-and-what-does-it-want.

Fink, S. B. (2012). The many purposes of course syllabi: Which are essential and useful? *Syllabus, 1*(1). Online journal - http://www.syllabusjournal.org/article/view/10147

Flowerdew, L. (2005). Integrating traditional and critical approaches to syllabus design: the 'what', the 'how' and the 'why?' *Journal of English for Academic Purposes, 4*(2), 135–147.

Fornaciari, C. J., & Dean, K. L. (2014). The 21st-century syllabus: From pedagogy to andragogy. *Journal of Management Education, 38*(5), 701-723.

Frey, N., & Fisher, D. (2008). *Teaching Visual Literacy: Using Comic Books, Graphic Novels, Anime, Cartoons, and More to Develop Comprehension and Thinking Skills*. Thousand Oaks, CA: Corwin Press.

Garrison, N. J., & Gardner, D. S. (2012, November 15). *Assets first generation college student bring to the higher education setting.* Paper presented at Association for the Study of Higher Education (ASHE) Annual conference, Las Vegas, Nevada.

Geck, C. (2006). *The Generation Z Connection: Teaching Information Literacy to the Newest Net Generation.* Retrieved October 5, 2013, from http://www.redorbit.com/news/technology/397034/the_generation_z_connection_teaching_information_literacy_to_the_newest/

Generation Z. (n.d.). In *Wikipedia.org*. Retrieved October 5, 2013, from http://en.wikipedia.org/wiki/Generation_Z

Gestalt (2015). In *Oxford Dictionary.com*. Retrieved August 2, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/gestalt

Glenberg, A. M. (2006). Radical changes in cognitive process due to technology: A jaundiced view. *Pragmatics & Cognition, 14*(2), 263-274.

Goldman, S. R. (1997). Learning from text: Reflections on the past and suggestions for the future. *Discourse Processes, 23*(3), 357-398.

Green, B., & Stortz, M. (2006). The syllabus as a passport into a common culture of teaching and learning: Developing and assessing strategies for dealing with diversity. *Teaching Theology and Religion, 9*(4), 221–228.

Greenfield, S. (2003). *Tomorrow's People: How 21st-Century Technology is Changing the Way We Think and Feel.* London, England: Penguin Books

Grigorovici, D., Nam, S., & Russill, C. (2003). The effects of online syllabus interactivity on students' perception of the course and instructor. *Internet and Higher Education 6*(1), 41–52.

Grunert, J. (1997). *The Course Syllabus: A Learning-centered Approach.* Bolton, MA: Anker Publishing Company, Inc.

Habanek, D. V. (2005). An examination of the integrity of the syllabus. *College Teaching, 53*(2), 62-64.

Habley, W. R., Bloom, J. L., & Robbins, S. (2012). *Increasing Persistence: Research-based Strategies for College Student Success.* San Francisco, CA: John Wiley & Sons, Inc.

Hallett, T. L., & Faria, G. (2006). Teaching with multimedia: Do bells and whistles help students learn? *Journal of Technology in Human Services, 24*(2/3), 167-179.

Hammond, H. (2012). Graphic novels and multimodal literacy: A high school study with American born Chinese. *Bookbird: A Journal of International Children's Literature, 50*(4), 22-32.

Hartman, J. L., & McCambridge, J. (2011). Optimizing millennials' communication styles. *Business Communication Quarterly, 74*(1), 22-44.

Hegarty, M., & Just, M. A. (1993). Constructing mental models of machines from text and diagrams. *Journal of Memory and Language, 32*(6), 717-742.

Heisserer, D. L., & Parette, P. (2002). Advising at-risk students in college and university settings. *College Student Journal, 36*(1), 69.

Helsper, E. & Eynon, R. (2010) Digital natives: where is the evidence? *British Educational Research Journal, 36*(3), 503-520.

Herring, S. C. (2008). Questioning the generational divide: Technological exoticism and adult constructions of online youth identity. In D. Buckingham (Ed.), *Youth, Identity, and Digital Media* (pp. 71-92). Cambridge, MA: The MIT Press.

Heuristic. (2015). In *Oxford Dictionary.com*. Retrieved June 26, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/heuristic

Hoadley, E. (1990). Investigating the effects of color. *Communications of the ACM, 33*(2), 120-125.

Hopper, C. (2003). *Learning styles*. Retrieved from http://frank.mtsu.edu/~studskl/hd/learn.html

Howard, E. A., (2011). *How do Millennial Engineering and Technology Students Experience Learning Through Traditional Teaching Methods Employed in the University Setting?* Department of Computer Graphics Technology Degree Theses. http://docs.lib.purdue.edu/cgttheses/1

Huang, W., & Tan, C. L. (2007, August). A system for understanding imaged infographics and its applications. In *Proceedings of the 2007 ACM Symposium on Document Engineering* (pp. 9-18). ACM. Winnipeg, Manitoba, Canada.

Hughes, J. M., King, A., Perkins, P., & Fuke, V. (2011). Adolescents and "autographics": reading and writing coming-of-age graphic novels. *Journal of Adolescent & Adult Literacy, 54*(8), 601-612.

Hummerston, A. (2008, December). *Digital world digital life*. Retrieved from http://www.tnsglobal.com/assets/files/TNS_Market_Research_Digital_World_Digital

Husen, T. & Postlethwaite, N. T. (1985). *International Encyclopedia of Education: Research and Studies* (Vol. 8). Pergamon Press.

Iannarelli, B. A., Bardsley, M. E., & Foote, C. J. (2010). Here's your syllabus, see you next week: A review of the first day practices of outstanding professors. *The Journal of Effective Teaching, 10*(2), 29-41.

Infographic. (2015). In *Oxford Dictionary.com*. Retrieved June 26, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/infographic

Information graphics (n.d). In *Wikipedia.org*. Retrieved April 21, 2011, from http://en.wikipedia.org/wiki/Information_graphics

Inquiry. (2015). In *Oxford Dictionary.com*. Retrieved June 26, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/inquiry?q=Inquiry

Institute of Education Science (2015). The condition of education. Retrieved from http://nces.ed.gov/programs/coe/indicator_clb.asp

Jensen, E. (2008). *Brain-based Learning: The New Paradigm of Teaching*. Thousand Oaks, California: Corwin Press.

Jones, C., Ruslan, R., Cross, S., & Healing, G. (2010). Net generation or digital natives: Is there a distinct new generation entering university? *Computers & Education, 54*(3), 722-732.

Keeling, R. P., & Hersh, R. H. (2011). *We're Losing Our Minds: Rethinking American Higher Education*. New York, NY: Palgrave McMillan.

Kreysa, P. G. (2006). The impact of remediation on persistence of under-prepared college students. *Journal of College Student Retention: Research, Theory, and Practice, 8*(2), 251-270.

Lajoie, S. P. (2014). Multimedia learning in cognitive processes. In R. E. Mayer (Ed), *The Cambridge Handbook of Multimedia Learning* (pp. 623-646). New York: Cambridge University Press.

Lamberski, R. J. (1980, May). A comprehensive and critical review of the methodology and findings in color investigations. Presented at the *Annual Convention of the Association for Educational Communications and Technology*, 338-380, Denver, CO.

Lamberski, R. J., & Dwyer, F. M. (1983). The instructional effect of coding (color and black and white) on information acquisition and retrieval. *Educational Communication and Technology, 31*(1), 9-21.

Lankow, J., Crooks, R., & Ritchie, J. (2012). *Infographics: The Power of Visual Storytelling*. Hoboken, NJ, USA: John Wiley & Sons.

Larose, S., Robertson, D. U., Roy, R., & Legault, F. (1998). Nonintellectual learning factors as determinants for success in college. *Research in Higher Education, 39*(3), 275-297.

Lee, E. J., & Kim, Y. W. (2015). Effects of infographics on news elaboration, acquisition, and evaluation: Prior knowledge and issue involvement as moderators. *New Media & Society*, 1-20. doi: 10/1177/1461444814567982.

Levitin, D. (2014). *The Organized Mind: Thinking Straight in the Age of Information Overload*. Penguin Group, US. (Kindle Edition)

Load. (2015). In *Oxford Dictionary.com*. Retrieved August 2, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/load

Ludwig, M. A., Bentz, A. E., & Fynewever, H. (2011). Your syllabus should set the stage for assessment for learning. *Journal of College Science Teaching, 40*(4), 20-23.

Lusk, D. L., Evans, A. D., Jeffery, T. R., Palmer, K. R., Wikstrom, C. S., & Doolittle, O. E. (2009). Multimedia learning and individual differences: Mediating the effects of working memory capacity with segmentation. *British Journal of Educational Technology, 40*(4), 636-651.

Lusted, D. (1986). Why pedagogy? *Screen, 27*(5), 2-16.

Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education 56*(2), 429–440

Mastroberardino, S., Santangelo, V., Botta, F., Marucci, F. S., & Belardinelli, M. O. (2008). How the bimodal format of presentation affects working memory: an overview. *Cognitive Processing, 9*(1), 69-76.

Matusitz, J. (2005). The current condition of visual communication in colleges and universities in the United States. *Journal of Visual Literacy, 25*(1), 97-112.

Mayer, R. E. (2001). *Multimedia Learning.* New York: Cambridge University Press.

Mayer, R. E. (2002). Cognitive theory and the design of multimedia instruction: An example of the two-way street between cognition and instruction. *New Directions for Teaching and Learning*, *89*, 55-71.

Mayer, R. E. (2014a). Cognitive Theory of Multimedia Learning. In R. E. Mayer (Ed), *The Cambridge Handbook of Multimedia Learning* (pp. 43-71). New York: Cambridge University Press.

Mayer, R. E. (2014b). Introduction to multimedia learning. In R. E. Mayer (Ed), *The Cambridge Handbook of Multimedia Learning* (pp. 1-26). New York: Cambridge University Press.

Mayes, T., & de Freitas, S. (2013). Technology-enhanced learning the role of theory. In H. Beetham, & R. Sharpe (Eds.). (2013). *Rethinking Pedagogy for a Digital Age: Designing for 21st century Learning*. (2nd ed.) (pp 17-30). Florence, KY, USA: Routledge.

McDonald, J., Siddal, G., Mandell, D., & Hughes, S. (2010). Two sides of the same coin: Student-faculty perspectives of the course syllabus. *Collected Essays on Learning and Teaching, 3,* 112-118.

McGee, J. B. (nd). Teaching Millennials [PowerPoint presentation]. Retrieved from www.ame.pitt.edu/documents/McGee_Millennials.pdf on November 11, 2014

Merlino, N., & Rhodes, R. (2012). Technology in the 21st century classroom: Key pedagogical strategies for millennial student in university business courses. *Journal of Supply Chain and Operations Management, 10*(1), 113-130.

Messaris, P. (1996). Video ergo cogito: Visual education and analogical thinking. *Young. 4*(2), 46-59.

Metros, S. E. (2008). The educator's role in preparing visually literate learners. *Theory Into Practice, 47*(2), 102-109.

Miller, G. A. (1956). The magical number seven, plus or minus two. Some limits on our capacity for processing information. *Psychological Review 63*(2), 81-97.

Mocek, E. (2012). Visual literacy and higher education's syllabus. In *Society for Information Technology & Teacher Education International Conference, 2012*(1), 2977-2982.

Moore, K. (2003). Overlooking the visual. *The Journal of Architecture, 8*(1), 25-40.

Moore, R. S., Moore, M., Grimes, P. W., Millea, M. J., Lehman, M., Pearson, A., & Thomas, M. K. (2007). Developing an intervention bridging program for at-risk students before the traditional pre-freshman summer program. *College Student Journal, 41*(1), 151.

Mulvey, M. E. (2009). Characteristics of under-prepared students: Who are "The under-prepared"?, *Research and Teaching in Developmental Education*, 29-58.

Myers, C. B.; Pavel, D. M. (2013) Increasing access to post baccalaureate education among at-risk students. *Journal of Educational Research & Policy Studies, 13*(3), 87-109.

Naisbitt, J. (1982). *Megatrends: Ten New Directions Transforming Our Lives*. New York: Warner Books

Natharius, D. (2004). The more we know, the more we see: The role of visuality in media literacy. *American Behavioral Scientist. 48*(2), 238-247.

National Center for Education Statistics. (2015). *The Condition of education: 2015*. Washington, DC: U.S. Department of Education.

Nilson, L. B. (2007). *The Graphic Syllabus and the Outcomes Map: Communicating Your Course.* San Francisco, CA: Jossey-Bass.

Norman, R. R. (2012). Reading the graphics: what is the relationship between graphical reading processes and student comprehension? *Reading and Writing, 25*(3), 739-774.

Nunan, D. (1988). *Syllabus Design*. Oxford New York: Oxford University Press.

O'Keeffe, P. (2013). A sense of belonging: Improving student retention, *College Student Journal*, *47*(4), 605-613.

O'Neil, K. E. (2011). Reading pictures: Developing visual literacy for greater comprehension. *The Reading Teacher*, *65*(3), 214-223.

Osgood, R. J., & Hinshaw, M. J. (2009). *Visual Storytelling: Videography and Post Production in the Digital Age*. Boston, MA: Wadsworth Cengage Learning.

Paas, F. (1992). Training strategies for attaining transfer of problem-solving in statistics: A cognitive load approach. *Journal of Educational Psychology*, *84*(4), 429-434.

Paas, F., & Sweller, J. (2014). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed), *The Cambridge Handbook of Multimedia Learning* (pp. 27-42). New York: Cambridge University Press.

Paivio, A. (2014). Intelligence, dual coding theory and the brain. *Intelligence*, *47*, 141-158.

Parkes, J., & Harris, M.B. (2002). The purposes of a syllabus. *College Teaching*, 50(2), 55-61.

Peddiwell, J. A., & Benjamin, H. R. W. (1939). *Saber-tooth Curriculum: Including Other Lectures in the History of Paleolithic Education*. New York: McGraw-Hill.

Pesce, M. (2000). *The Playful World: How Technology is Transforming Our Imagination*. New York, NY: Ballantine Books.

Pettersson, R. (2006). Research in information design. *Journal of Visual Literacy*, *26*(1), 77-88.

Pettersson, R. (2007). Visual literacy in message design. *Journal of Visual Literacy*, *27*(1), 61-90.

Pettersson, R. (2009). Visual literacy and message design. *TechTrends: Linking Research & Practice to Improve Learning*, *53*(2), 38-40.

Pettersson, R. (2010). Information design: Principles and guidelines. *Journal of Visual Literacy, 29*(2), 167-182.

Poitras, G. (2008). What is manga? *Knowledge Quest, 36*(3), 49.

Prensky, M (2001a) Digital natives, digital immigrants: Part 1. *On the Horizon, 9*(5), 1 - 6.

Prensky, M. (2001b). Digital natives, digital immigrants part II: Do they really think differently? *On the Horizon, 9*(3), 1-6.

Prensky, M. (2009). H. Sapiens Digital: From digital immigrants and digital natives to digital wisdom. *Journal of Online Education, 5*(3). Retrieved from http://eric.ed.gov/?id=EJ834284

Price, L. (2007). Lecturers' vs. students' perceptions of the accessibility of instructional materials. *Instructional Science, 35*(4), 317-341. DOI 10.1007/sl11251-006-9009-y.

Reed, D. (nd). *Is the syllabus a contract?* Retrieved online 9/15/13 from https://www.coursehero.com/file/10619755/Is-a-Syllabus-a-Contract/

Reed, S. K. (2006). Cognitive architectures for multimedia learning. *Educational Psychologist, 41*(2), 87-98.

Restak, R. (2003). *The New Brain: How the Modern Age is Rewiring Your Mind*. New York, NY: Rodale.

Restak, R. (2006). *The Naked Brain: How the Emerging Neurosociety Is Changing How We Live, Work, and Love*. New York, NY: Harmony Books.

Roberts, M. (2015). Curriculum development: An overview http://oak.ucc.nau.edu/mr/cte592/Module_1/Curriculum_Development_An_Overview.html.

Robb, M. (2012). The learner-centered syllabus. *The Journal of Continuing Education in Nursing, 43*(11), 489-490.

Rockenbach, B., & Fabian, C. A. (2008). Visual literacy in the age of participation. *Art Documentation, 27*(2), 26-31.

Rosen, C. (2008). People of the Screen, *The New Atlantis: A Journal of Technology and Society, 22*, 20-32.

Rubin, S. (2013). *Professors, students, and the syllabus*. Retrieved on 9/18/13 from www.colorado.edu/gtp/2013/01/29/professors-students-and-syllabus.

Rudolph, F. (1977). *Curriculum: A History of the American Undergraduate Course of Study since 1636*. San Francisco, CA: Jossey-Bass Publishers.

Sanders-Bustle, L. (2003). *Image, Inquiry, and Transformative Practice: Engaging Learners in Creative and Critical Inquiry Through Visual Representation*. New York, NY: Peter Lang.

Sandoval-Lucero, E. (2014). Serving the developmental and learning needs of the 21st century diverse college student population: A review of literature. *Journal of Educational and Developmental Psychology, 4*(2), 47-64.

Saville, B. K., Zinn, T. E., Brown, A. R., & Marchuk, K. A. (2010). Syllabus detail and students' perceptions of teacher effectiveness. *Teaching of Psychology, 37*(3), 186-189.

Scheid, J & McDonough, M. (2010). Types of communication styles: Bridging the generation gap. Retrieved from http://www.brighthub.com/office/home/articles/76498.aspx on September 21, 2013

Schnee, E. (2008) “In the real world no one drops their standards for you”: Academic rigor in a college worker education program. *Equity and Excellence in Education, 41*(1). 62-80.

Schüler, A., Scheiter, K., & van Genuchten, E. (2011). The role of working memory in multimedia instruction: Is working memory working during learning from text and pictures? *Educational Psychology Review, 23*(3), 389-411

Serafini, F. (2010). Reading multimodal texts: Perceptual, structural and ideological perspectives. *Children’s Literature in Education, 41*(2), 85-104.

Serafini, F. (2011). Expanding perspectives for comprehending visual images in multimodal texts. *Journal of Adolescent & Adult Literacy, 54*(5), 342-350.

Serafini, F. (2012). Expanding the four resources model: Reading visual and multimodal texts. *Pedagogies: An International Journal, 7*(2), 150-164.

Shen, H. (2014). Exploration on the data visualization based on the case of infographics. *Advanced Materials Research, 909*, 375-378. doi:10.4028/www.scientific.net/AMR.909.375

Sidorkin, A. M. (2012). Syllabus, the genre. *Syllabus, 1*(1), 1-4.

Slattery, J. M., & Carlson, J. F. (2005). Preparing an effective syllabus: Current best practices. *College Teaching, 53*(4), 159-164.

Snow, D. A (2001). Extending and broadening Blumer’s conceptualization of symbolic interactionism. *Symbolic Interaction, 24*(3). 367-377.

Snyder, J. A. (2002). *Brief history of the syllabus with examples*. Derek Bok Center for Teaching and Learning Harvard University. Retrieved from http://isites.harvard.edu/fs/html/icb.topic58495/syllabushistory.html.

Snyder, T. D., & Dillow, S. A. (2012). *Digest of Education Statistics 2011*. National Center for Education Statistics.

Spalter, A. M., & van Dam, A. (2008). Digital visual literacy. *Theory Into Practice, 47*(2), 93-101.

Spohn, J., & Kallenbach, S. (2004). Pathways to college for academically under-prepared students. *Focus on Basics, 6*, 28-29.

Strasser, A. A., Tang, K. Z., Romer, D., Jepson, C., & Cappella, J. N. (2012). Graphic warning labels in cigarette advertisements: Recall and viewing patterns. *American Journal of Preventative Medicine, 43*(1), 41-47.

Swann, A. (1999). *How to Understand and Use Design and Layout*. Cincinnati, Ohio: North Light Books.

Sweeney, R. (2006). *Millennial Behaviors & Demographics*. Retrieved from: http://certi.mst.edu/media/administrative/certi/documents/Article-Millennial-Behaviors.pdf

Sweller, J. (2004). Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture. *Instructional Science, 32*(1-2), 9-31.

Sweller, J., Van Merrienboer, J. J., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational psychology review, 10*(3), 251-296.

Syllabus. (2015). In Oxford Dictionary.com. Retrieved June 26, 2015, from http://www.oxforddictionaries.com/us/definition/american_english/syllabus

Symonds, W. C., Schwartz, R. B., & Ferguson, R. (2011). Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century. *Cambridge, MA: Pathways to Prosperity Project at Harvard Graduate School of Education*.

Taguchi, K., & Ackerman, L. (2014). The infographic: Is there a place in higher education? *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, 2014(1), 1901-1905.

The power of color in presentations by 3M (nd). Retrieved from http:/www.3rd-force.org/meetingnetwork/readingroom/meetingguide_power_color.html.

Thompson, B. (2007). The syllabus as a communication document: Constructing and presenting the syllabus. *Communication Education, 56*(1), 54-71.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 89-125.

Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition* (2nd ed.). Chicago, IL: University of Chicago Press.

Tolkatli, A. M., Kesli, Y. (2009). Syllabus: How much does it contribute to the effective communication with the students? *Procedia Social and Behavioral Sciences, 1*(1), 1491-1494.

Trumbo, J. (1999). Visual literacy and science communication. *Science Communication, 20*(4), 409-425.

Tufte, E. R. (2006), *Beautiful Evidence*, Graphics Press LLC.

Vang, C. T. (2005). Minority students are far from academic success and still at-risk in public schools. *Multicultural Education, 12*(4), 9.

Verma, S. (2014, February 23). Images are eating the Web: The rise of the visual enterprise. [Web log comment]. Retrieved from http://www.piqora.com/blog/images-are-eating-the-web-and-the-rise-of-visual-enterprise/.

Wasley, P. (2008). The syllabus becomes a repository of legalese. *The Chronicle of Higher Education 54*(27). Retrieved from http://chronicle.com/article/The-Syllabus-Becomes-a/17723

Weimer, M. (2014). New ideas about an old teaching tool. *The Teaching Professor*, *8*(10), 3.

Weisburg, D. S., Hirsh-Pasek, K., Golinkoff, R. M., & McCandliss, B. D. (2014). Mise en place: setting the stage for thought and action. *Trends in Cognitive Sciences*, *18*(6), 276-278.

What does SAT stand for. (2009). Retrieved from http://www.eduers.com/sat/whatissat.htm.

Wisniewski, J., & Fichter, D. (2007). Saying it visually. *Intranet Librarian*, Nov/Dec, 57-60.

Wolfe, P. (February 17, 2014). Mapping poverty: Wealthiest and poorest school districts in Pennsylvania. *Lancaster Online.* Retrieved from http://lancasteronline.com/news/local/mapping-poverty-wealthiest-and-poorest-school-districts-in-pennsylvania/article_53d4e55a-9810-11e3-8d0a-001a4bcf6878.html

Worley, K. (2011). Educating college students of the net generation. *Adult Learning*, *22*(3), 31-39.

Yen, J. C., Lee, C. Y., & Chen, I. J. (2012). The effects of image-based concept mapping on the learning outcomes and cognitive processes of mobile learners. *British Journal of Educational Technology*, *43*(2), 307-320.

Zachry, M., & Thralls C. (2004). An interview with Edward R. Tufte. *Technical Communications Quarterly*, *13*(4), 447–462.

Zambo, D. M. (2009). Using visual literacy to help adolescents understand how images influence their lives. *Teaching Exceptional Children, 41*(6), 60-67.

Zhang-Kennedy, L. (2013). *Improving Mental Models of Computer Security through Information Graphics.* (Doctoral dissertation Carlton University, Ottawa)

Appendix A

Initial IRB Approval of Dissertation

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

May 1, 2015

Evelyn Anne Mocek
259 South Walnut Street
Blairsville, PA 15717

Dear Ms. Mocek:

Your proposed research project, "The effects of syllabus design on course information retention by at-risk first semester college students," (Log No. 15-128) has been reviewed by the IRB and is approved. In accordance with 45CFR46.101 and IUP Policy, your project is exempt from continuing review.

You should read all of this letter, as it contains important information about conducting your study.

Now that your project has been approved by the IRB, there are elements of the Federal Regulations to which you must attend. IUP adheres to these regulations strictly:

1. You must conduct your study exactly as it was approved by the IRB.
2. Any additions or changes in procedures must be approved by the IRB before they are implemented.
3. You must notify the IRB promptly of any events that affect the safety or well-being of subjects.
4. You must notify the IRB promptly of any modifications of your study or other responses that are necessitated by any events reported in items 2 or 3.

The IRB may review or audit your project at random *or* for cause. In accordance with IUP Policy and Federal Regulation (45CFR46.113), the Board may suspend or terminate your project if your project has not been conducted as approved or if other difficulties are detected

Although your human subjects review process is complete, the School of Graduate Studies and Research requires submission and approval of a Research Topic Approval Form (RTAF) before you can begin your research. If you have not yet submitted your RTAF, the form can be found at http://www.iup.edu/page.aspx?id=91683 .

While not under the purview of the IRB, researchers are responsible for adhering to US copyright law when using existing scales, survey items, or other works in

Appendix B

Request for Change – June 2015

Revision: 02/15

REQUEST FOR CHANGE IN PROTOCOL

INDIANA UNIVERSITY OF PENNSYLVANIA
Institutional Review Board for the Protection of Human Subjects (IRB)

- **All information must be typed.**
- **Submit with signatures electronically to irb-research@iup.edu or one hard copy to IRB Chair, 113 Stright Hall**

TITLE OF RESEARCH PROTOCOL:

_The effects of syllabus design on course information retention by at-risk first semester college students

____IRB#_15-128_____

PRINCIPAL INVESTIGATOR:_Evelyn Anne Mocek_____

DEPARTMENT/COLLEGE:_Comm Media/Education___ E-MAIL:_LMOCEK@iup.edu_____

ADDRESS:__259 South Walnut Street, Blairsville, PA 15717_____

TELEPHONE NUMBER(S):_724-599-6251(cell); 724-357-3001 (work)_____

DESCRIPTION OF PROPOSED CHANGES (Use additional pages as necessary. If the proposed changes include adding students to this research project, you must append their CITI completion reports to this document.):

Per Tim Runge when feedback provided regarding IRB on 4/30/15 - *It is noted, however, that this submission included draft versions of the infographic syllabus (Appendix E) and quiz (Appendix J). I understand that both of these are still in development and will be finalized prior to the start of your study. Therefore, it is very likely that you will need to submit a Request for Change in IRB Protocol once those two appendices are finalized.*

JUSTIFICATION OF PROPOSED CHANGE(S):

The finalized faculty syllabus, syllabus infographics and quiz questions are attached.

SIGNATURE OF INVESTIGATOR — DATE 6/23/15

On file Email to Julie — SIGNATURE OF FACULTY ADVISOR (IF STUDENT INVESTIGATOR) — DATE 6/23/15

Consent Form: Are there required consent form changes? Yes__ No_x_ If the consent form requires revision, a copy of the revised consent form with the changes highlighted should be attached.

Appendix C

Approval of Request for Change – June 2015

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

June 29, 2015

Evelyn Anne Mocek
259 South Walnut Street
Blairsville, PA 15717

Dear Ms. Mocek:

Your proposed modifications to your previously approved research project, "The effects of syllabus design on course information retention by at-risk first semester college students," (Log No. 15-128) have been reviewed by the IRB and are approved. In accordance with 45CFR46.101 and IUP Policy, your project is exempt from continuing review in addition to the approval of your request for changes.

You should read all of this letter, as it contains important information about conducting your study.

Now that your project has been approved by the IRB, there are elements of the Federal Regulations to which you must attend. IUP adheres to these regulations strictly:

1. You must conduct your study exactly as it was approved by the IRB.
2. Any additions or changes in procedures must be approved by the IRB before they are implemented.
3. You must notify the IRB promptly of any events that affect the safety or well-being of subjects.
4. You must notify the IRB promptly of any modifications of your study or other responses that are necessitated by any events reported in items 2 or 3.

The IRB may review or audit your project at random or for cause. In accordance with IUP Policy and Federal Regulation (45CFR46.113), the Board may suspend or terminate your project if your project has not been conducted as approved or if other difficulties are detected.

While not under the purview of the IRB, researchers are responsible for adhering to US copyright law when using existing scales, survey items, or other works in the conduct of research. Information regarding copyright law and compliance at

Appendix D

Request for Change – July 2015

Subject: Fwd: IRB Questions - Mocek - 15-128
From: Lynnan <lmocek@iup.edu>
Date: 3/5/2016 1:46 PM
To: Me - Lynnan Mocek <lmocek@iup.edu>

-------- Forwarded Message --------
Subject:IRB Questions - Mocek - 15-128
Date: Tue, 14 Jul 2015 09:34:40 -0400
From: Lynnan <lmocek@iup.edu>
To: Roberts, Jennifer J <Jennifer.Roberts@iup.edu>
CC: Bassaro, Julia <jbassaro@iup.edu>, Start, Jay <Jay.Start@iup.edu>

Dr. Roberts,
I am inquiring if I should submit another Request to Change form for my IRB. Unfortunately, I was unable to get enough participation this summer session and must repeat the study with a larger group in the fall.

I will be working with the same faculty member, with the same treatment and testing.

Please advise!!!

--
****
Lynnan Mocek
Executive Staff Assistant to the Provost
Provost Office
203 Sutton Hall
Indiana, PA 15705-1046
724-357-3001 (phone)
724-357-2498 (fax)
724-599-6251 (cell)
lmocek@iup.edu

Appendix E

Approval of Request for Change – July 2015

Subject: Fwd: Fwd: IRB Questions - Mocek - 15-128
From: Lynnan <lmocek@iup.edu>
Date: 3/5/2016 1:03 PM
To: Me - Lynnan Mocek <lmocek@iup.edu>

-------- Forwarded Message --------
Subject: Fwd: IRB Questions - Mocek - 15-128
Date: Tue, 14 Jul 2015 21:03:21 -0400
From: Jennifer Roberts <jroberts@iup.edu>
To:jbassaro@iup.edu, lmocek@iup.edu

Greetings Lynnan!

Given how small this change in (using the next semester in addition to this one for the exact same project), we'll just let this email serve as your request. Your request is approved.

Best,
Jen Roberts
Professor and Chair, Institutional Review Board
Indiana University of Pennsylvania
Department of Criminology
208 Wilson Hall
Indiana, PA 15705
Office: 724-357-5604
Fax: 724-357-4018

--- the forwarded message follows ---

—ForwardedMessage.eml———————————————————————————————

Subject: IRB Questions - Mocek - 15-128
From: Lynnan <lmocek@iup.edu>
Date: 7/14/2015 9:34 AM
To: "Roberts, Jennifer J" <Jennifer.Roberts@iup.edu>
CC: "Bassaro, Julia" <jbassaro@iup.edu>, "Start, Jay " <Jay.Start@iup.edu>

Dr. Roberts,
I am inquiring if I should submit another Request to Change form for my IRB. Unfortunately, I was unable to get enough participation this summer session and must

Appendix F

Request for Change – August 2015

Revision: 02/15

REQUEST FOR CHANGE IN PROTOCOL

INDIANA UNIVERSITY OF PENNSYLVANIA
Institutional Review Board for the Protection of Human Subjects (IRB)

- **All information must be typed.**
- **Submit with signatures electronically to irb-research@iup.edu or one hard copy to IRB Chair, 113 Stright Hall**

TITLE OF RESEARCH PROTOCOL:

_The effects of syllabus design on course information retention by at-risk first semester college students

____IRB# 15-128 _____

PRINCIPAL INVESTIGATOR: _Evelyn Anne Mucek_____

DEPARTMENT/COLLEGE: Comm Media/Education___ E-MAIL: _LMOCEK@iup.edu_____

ADDRESS: __259 South Walnut Street, Blairsville, PA 15717_____

TELEPHONE NUMBER(S): _724-599-6251(cell); 724-357-3001 (work)_____

DESCRIPTION OF PROPOSED CHANGES (Use additional pages as necessary. If the proposed changes include adding students to this research project, you must append their CITI completion reports to this document.):

The informed consent has been revised to request access to use High School GPA and SAT scores as part of the data collected.

JUSTIFICATION OF PROPOSED CHANGE(S):

To provide additional data to correlate results based on academic achievement and skill level.

SIGNATURE OF INVESTIGATOR — DATE 8/14/15

SIGNATURE OF FACULTY ADVISOR (IF STUDENT INVESTIGATOR) — DATE

Consent Form: Are there required consent form changes? Yes__X__ No___ If the consent form requires revision, a copy of the revised consent form with the changes highlighted should be attached.

Appendix G

Approval of Request for Change – August 2015

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

August 17, 2015

Evelyn Anne Mocek
259 South Walnut Street
Blairsville, PA 15717

Dear Ms. Mocek:

Your proposed modifications to your previously approved research project, "The effects of syllabus design on course information retention by at-risk first semester college students," (Log No. 15-128) have been reviewed by the IRB and are approved. In accordance with 45CFR46.101 and IUP Policy, your project is exempt from continuing review in addition to the approval of your request for changes.

You should read all of this letter, as it contains important information about conducting your study.

Now that your project has been approved by the IRB, there are elements of the Federal Regulations to which you must attend. IUP adheres to these regulations strictly:

1. You must conduct your study exactly as it was approved by the IRB.
2. Any additions or changes in procedures must be approved by the IRB before they are implemented.
3. You must notify the IRB promptly of any events that affect the safety or well-being of subjects.
4. You must notify the IRB promptly of any modifications of your study or other responses that are necessitated by any events reported in items 2 or 3.

The IRB may review or audit your project at random *or* for cause. In accordance with IUP Policy and Federal Regulation (45CFR46.113), the Board may suspend or terminate your project if your project has not been conducted as approved or if other difficulties are detected.

While not under the purview of the IRB, researchers are responsible for adhering to US copyright law when using existing scales, survey items, or other works in the conduct of research. Information regarding copyright law and compliance at

Appendix H

Email from Faculty Agreeing to Participate in Study

Subject: Your study
From: Luke Faust <Luke.Faust@iup.edu>
Date: 4/18/2015 9:38 AM
To: Lynnan <lmocek@iup.edu>

Lynnan,
You have my permission to use my class this summer to conduct your study. I currently have a syllabus quiz in the first week to stress the importance of the document to the success of a new student. The data and scores from this quiz will be made accessible to you to serve as a secondary source. You can come to my class and invite participation in the study and the second quiz. I am fine with you offering an incentive of a 25 dollar visa gift card to encourage participation. I will assist if needed in gathering informed consent, and for agreeing participants. I am fine with you accessing their D2l information for the course. Without the consent form, I will clear individual and identifying data before releasing the information to you.

Luke Faust

--
Luke E. Faust

Educational Advisor/ Instructor
Department of Developmental Studies
P: 724-357-2729
F:724-357-6940

"Failing students don't fail alone" -unknown-

http://motivated2bhighlyeducated.blogspot.com/

Appendix I

Invitation to Participate in Study

Invitation to Participate/Script for Presentation

Hello everyone!

My name is Lynnan Mocek and I'm a Ph.D. candidate in the doctoral program in the Communications Media and Instructional Technology I am currently working on my dissertation and need your help!

My dissertation is about the presentation of information and retention of information based on the way it is presented. I'm looking for students who will allow me access to the data related to one of your quizzes. I am not concerned with your grades or how you are doing in the class. I am looking at what choices you make on a quiz and the amount of time it takes to answer the questions.

I am going to go over the document that is being passed around. This document is what is called "informed consent". I will be going over what is on the paper related to my study. Part of my study analysis will be hopefully making some comparisons of my study results and high school GPA and SAT scores. This information is protected under federal law, and for me to use this information I will need your permission. The reason that I am asking for access to this data, is it give an indication of your academic preparation for college and I would be comparing my study results to students' academic preparation. If you grant approval, the individual who will be providing this information to me will be Mr. Faust. Please note that the data related to the high school grade point and SAT scores will be combined, so there will be no individual or identifying information.

I need individuals who are 18 or over. Unfortunately, if you are not yet 18, you cannot participate. After I have gone over the information, if you are willing to participate, please sign the document that you have received and place them in the box provided. If you do not wish to participate, just place the blank sheet in the box. I will be giving you two copies, one to hopefully sign and one to keep for information.

Your participation is voluntary. Individual responses will be kept confidential and will not be tied with any identifying information. You may also withdraw from the study at any time. Individuals who choose to participate will be in the running for a $20 gift card.

This project has been approved by the Indiana University of Pennsylvania's Institutional Review Board for the Projection of Human Subjects. They can be contacted at 724-357-7730. If you have any questions regarding this study, I would be happy to address them now or you can email me at lmocek@iup.edu or reach me by phone at 724-357-3001 or 724-599-6251.

Thank you for your time!

Appendix J

Informed Consent

Thank you for participating in this research study. The purpose of this study is about the presentation of information and retention of information based on the way it is presented. The study is looking at the data related to one of your quizzes. The study investigates choices made on a quiz and the amount of time it takes to answer the questions. Additionally I am requesting permission to view and use your high school grade point and SAT scores as part of my data collection. As this is protected information through Federal Law, your permission is required for access to/ and use of this information. Your signature on this document constitutes that permission.

Your participation is voluntary. Individual responses will be kept confidential and will not be tied with any identifying information. You may also withdraw from the study at any time. Individuals who choose to participate will be in the running for a $20 gift card. There are no known risks if you decide to participate, nor are there any costs for participating in the study. If at any time you do not wish to continue, you may discontinue your participation by contacting the student researcher at the number below. If you do not choose to continue participation, your responses and information will be excluded from the study.

If at any time during the course of this research new information is presented to the researcher which may impact your willingness to participate, you will be informed. You will receive a copy of the informed consent. If you have any questions, please see the contact information of the principal investigator below.

Student Researcher:
Ms. Evelyn Mocek
Ph.D. Candidate
COMIT program cohort one
Department of Communications Media
Indiana University of Pennsylvania
Phone: 724-599-6251
lmocek@iup.edu

Faculty Sponsor:
Dr. Jay Start
Associate Professor
Department of Communications Media
B 36 Davis Hall
Indiana University of Pennsylvania
Phone: 724-357-2490
Jay.Start@iup.edu

This project has been approved by the Institutional Review Board for the Protection of Human Subjects at Indiana University of Pennsylvania. Phone number 724-357-7730.

I have read the statement of Informed Consent above, I agree to participate in this study. I understand that I have the right to discontinue my participation at any time and that my personal information will be kept confidential.

Signature _____ Name (print) _____

Date _____ Email _____

Appendix K

Text Syllabus – Fall 2015

DVST 150: Introduction to Higher Education
Fall 2015

Instructor: Luke E. Faust
Office: 109
Email Luke.Faust@iup.edu

Office Hours (walk-in & by appointment)
Monday 8-9 a.m. 11-3:00
Tuesday 10:15-11:00 12:45-1:30
Wednesday 9:30-12:30 (By appointment only) 1:20-2:00

Course Overview: Introduces students to the system of higher education and to skills that promote effective educational planning and academic success. Orients students to the systems, resources, policies, and procedures of IUP and to the Liberal Studies curriculum. Emphasizes goal setting, decision making, self monitoring, and time-management skills.

Course Objectives: Upon successful completion of the course, students will demonstrate both an *understanding* and *application* of the topics covered:

- Higher education as a developmental process, including academic, social, and personal adjustment issues of first-year students.
- Decision-making issues, including a model of active involvement, time management techniques, reading and note taking strategies, and goal setting.
- Selected issues in college student adjustment, including problem solving strategies, academic policies/procedures, students' rights/responsibilities, behavioral/disciplinary policies.
- Curriculum overview, including liberal studies or core curriculum requirements, major/minor requirements, placement test results, and an individual plan of study.
- Academic and personal assessment and planning.

Required Materials:
- IUP Undergraduate Catalog
- 5 dollars on ICARD reserved for printing class assignments
  First year common Reader Joe Martin's "Tricks of the Grade"

COURSE POLICIES AND PROCEDURES

Expectations
Students will be held PERSONALLY ACCOUNTABLE for their actions within the class.
Students will be on-time and present for every class.
Students will treat everyone with respect and help each other to become more active learners.
Students will have all of the necessary materials for class (pen, paper, planner, book, an open mind.)
Students will contribute to the class in positive ways.
Students will relax and have fun while learning and expanding their potential as a learner.

Course Attendance Policy
You are expected to attend every class. Attendance will be taken or in-class assignments will be collected. You are permitted (1) unexcused absence without penalty. After 1 unexcused absence the attendance/ participation grade will fall by 10 points per day. In case of an illness or emergency, please contact me through email (recommended) or by office phone. You are expected to see a classmate and/or me directly for missed work. Students will receive attendance points for attending certain preannounced 6 oclock series events. It will be mandatory to attend the 6 oclock series with Craig Dillaman to discuss Career and Major exploration.

Class Cancellations
If the campus is closed due to weather or other circumstances, the information will be broadcast on the stations listed in the university catalog. If I must cancel a class, I will make every effort to contact the students. The assignments for a cancelled class will be due at the next class meeting as well as the assignments for that class. If class is cancelled on the day of a quiz, the quiz will be given the next time the class meets.

Cell Phones
Please turn your cell phone on silent or off during class. If you need to be available for an important call, put your phone on vibrate and leave the room if it is received. Do NOT text, tweet, Instagram or facebook during class – this breaks your concentration as well as the concentration of those around you. **Anyone who breaks the cell phone policy will be marked absent from class and not given points towards class participation.**

ASSIGNMENTS AND ASSESSMENT

Syllabus is subject to change with notification from instructor

UNLESS NOTED BY MR. FAUST, ALL WRITING ASSIGNMENTS ARE TO BE TYPED AND PLACED INTO YOUR PORTFOLIO ON THEIR DUE DATE. FAILURE TO HAVE THEM IN THE PORTFOLIO ON DUE DATE IS REASON ENOUGH FOR ME NOT TO GRADE THE GIVEN ASSIGNMENT.

Attendance – 100 points
Much of your learning will take place in class. Also, for you to gain the most benefit from this course you need to be an active learner and participant. Therefore, class attendance **and** participation is an important part of your success.

Study Labs – 45 points
Students will be required to attend at least two study labs per week. Attendance at these sessions will be recorded and you will receive 3 points per week. In order to receive the 3 points, student must go to study lab 3 times in a week.

Career and Major Assignment- This assignment will include completing the Focus 2 Inventory and attending a six o'clock series.

Time Management Assignment 30 points- To be handed in during individual Midterm Meeting
For this assignment, we will develop skeleton schedules. You will be responsible for providing evidence of the application of the three step process for time management and implementing it for the assigned week. The last portion of this assignment is a one page reflection. More details will be given in class.

College Adjustment Reflections 3 X 10= 30 Points
These will be reflective writing assignments that will require students to write one page reflections on topics given during class. These topics will surround the personal adjustment to college. These will be printed and placed into portfolio on due dates and will be graded during portfolio checks

Joe Martin Journaling 5 X 10 points
Throughout the course students will write journal entries on the assigned readings from the Joe Martin textbook. These journal entries will also be placed into your portfolio when due. They may be spot checked that day, but will not be thoroughly graded until portfolio turn in.

Online syllabus Quizzes- 20 points

Final Assignment – 45 points

ASSESSMENT		GRADING SCALE (total points 350)
Attendance	100	
Joe Martin Journaling	50	
Career/Major assignment	20	A *(100 - 90%)*
Labs	45	B *(89 - 80%)*
Time Management	30	C *(79 - 70%)*
College Adjustment Reflections	30	D *(69 - 60%)*
Online syllabus quizzes	20	F (59% and below)
Final Paper	45	
Total	**350**	

Name _____

DVST 150- Introduction to Higher Education (Faust)

Study Lab Attendance Sheet

Week 2: Days Attended, Initials of supervisor	_____	_____	_____
Week 3: Days Attended, Initials of supervisor	_____	_____	_____
Week 4: Days Attended, Initials of supervisor	_____	_____	_____
Week 5: Days Attended, Initials of supervisor	_____	_____	_____
Week 6: Days Attended, Initials of supervisor	_____	_____	_____
Week 7: Days Attended, Initials of supervisor	_____	_____	_____
Week 8: Days Attended, Initials of supervisor	_____	_____	_____
Week 9: Days Attended, Initials of supervisor	_____	_____	_____
Week 10: Days Attended, Initials of supervisor	_____	_____	_____
Week 11: Days Attended, Initials of supervisor	_____	_____	_____
Week 12: Days Attended, Initials of supervisor	_____	_____	_____
Week 13: Days Attended, Initials of supervisor	_____	_____	_____
Week 14: Days Attended, Initials of supervisor	_____	_____	_____

Detailed Calendar of the course

Week 1	Week 2	Week 3
Class topic: • Introduction to the course • Explanation of assignments • Introductions **Homework** • Start reading the Joe Martin Text…p 1-20 • Study for Syllabus Quiz	**Class topic:** Why did you come to college? Active vs. Passive **Homework**: • Identify 5 active behaviors and 5 passive behaviors that you observe. • Joe Martin Journal Entry due	**Class topic:** • High School Vs. College • Challenges and How to deal • Reading reflections Homework: One page reflection on the biggest adjustments from high school to college.
Week 4	**Week 5**	**Week 6**
Class Topic • Are you in the right Major? • Focus 2 Inventory • **Homework** • Read Joe Martin pages 21-41 •	**Class Topic** • Time Management • Three Step Process • Planners, Skeleton Schedule, To do Lists **Homework** • Fill in Planner for the rest of semester • Bring in your Fall Class Schedule • Journal entry on JM pages 21-41	**Class Topic** • Time Management assignment given • Liberal Studies curriculum plans **Homework** • Design a skeleton schedule for Fall Semester • Begin working on Time Management assignment • Timemanagement assignment will be handed in during week 8 Meeting
Week 7 Scheduling workshop MUST ATTEND	**Week 8** Midterm Individual Meetings -During this meeting we will discuss your progress in the course, progress in other courses, your	**Week 9** Individual Meetings Continued

	current course grade and your portfolio and study lab sheet will be checked. Please be prepared or you will receive 0 points for this activity. At this point of the semester your portfolio should have: 2 Joe Martin Entries 1 Adjustment Narrative Time management activity/reflection	
Week 10 **Class Topic:** • Note taking • Dealing with difficult lecturers **Homework:** Journal entry on JM pages 41-61	**Week 11** **Class Topic** • Using Textbooks • Thinking like a Professor • Joe Martin Discussion **Homework** College adjustment Narrative 2	**Week 12** **Class Topic:** • The Undergraduate Catalog • Vocabulary **Homework**: Journal For JM Pages 62-82
Week 13 **Class Topic**: • IUP policies and Procedures • Joe Martin Literature Circles **Homework:**	**Week 14** **Class Topic:** • Campus Resources • GPA calculations • Goal Setting **Homework:** • College Adjustment Narrative #3. • Final Paper must be completed and handed in Thursday Journal for Joe Martin	• **Final's Week** **Hand in Final, portfolio and study lab sheet.**

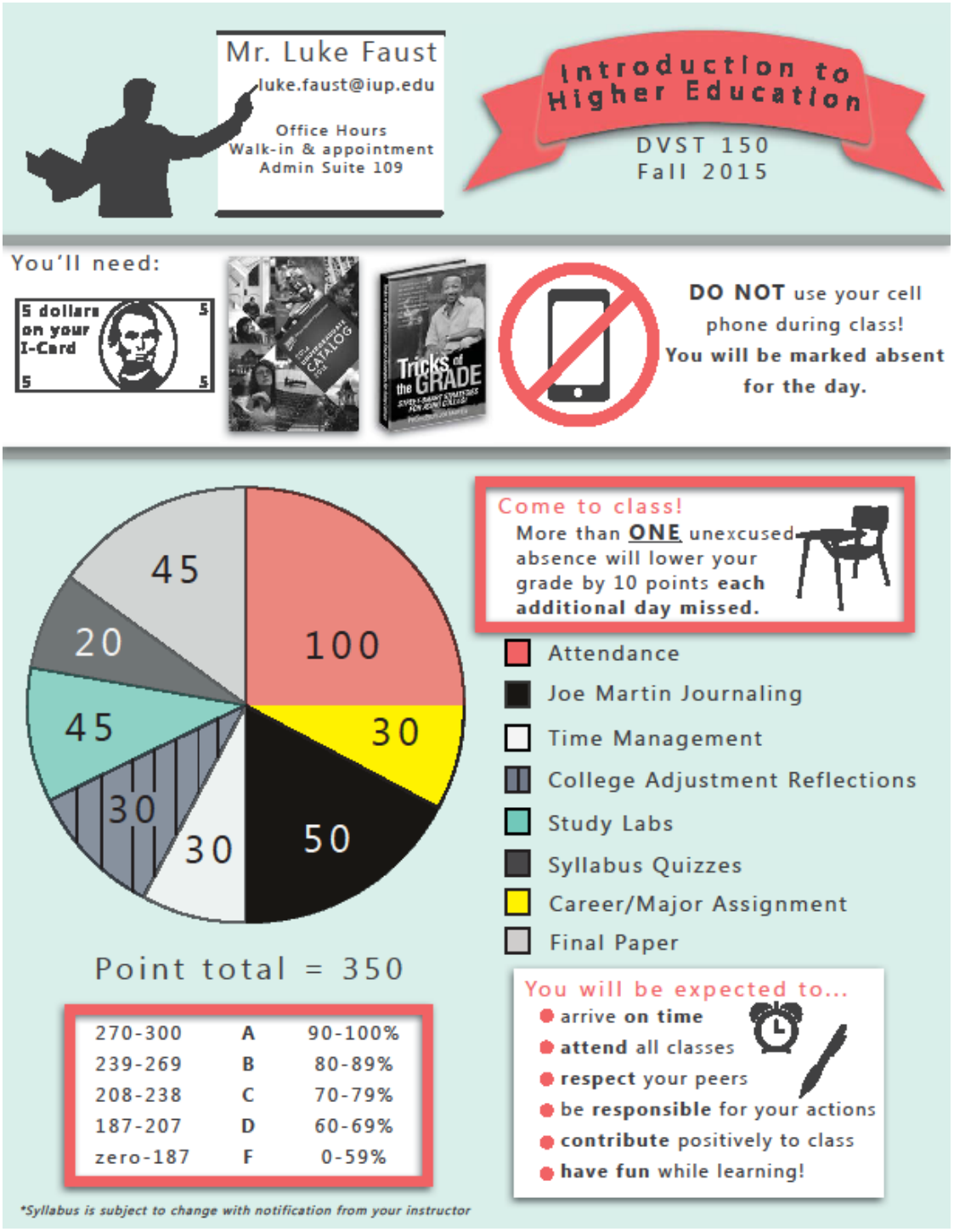
Indiana University of Pennsylvania and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project.

Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the Department of Human Services (1-800-932-0313) and University Police (724-357-2141).

Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at:
http://www.iup.edu/socialequity/policies/title-ix/

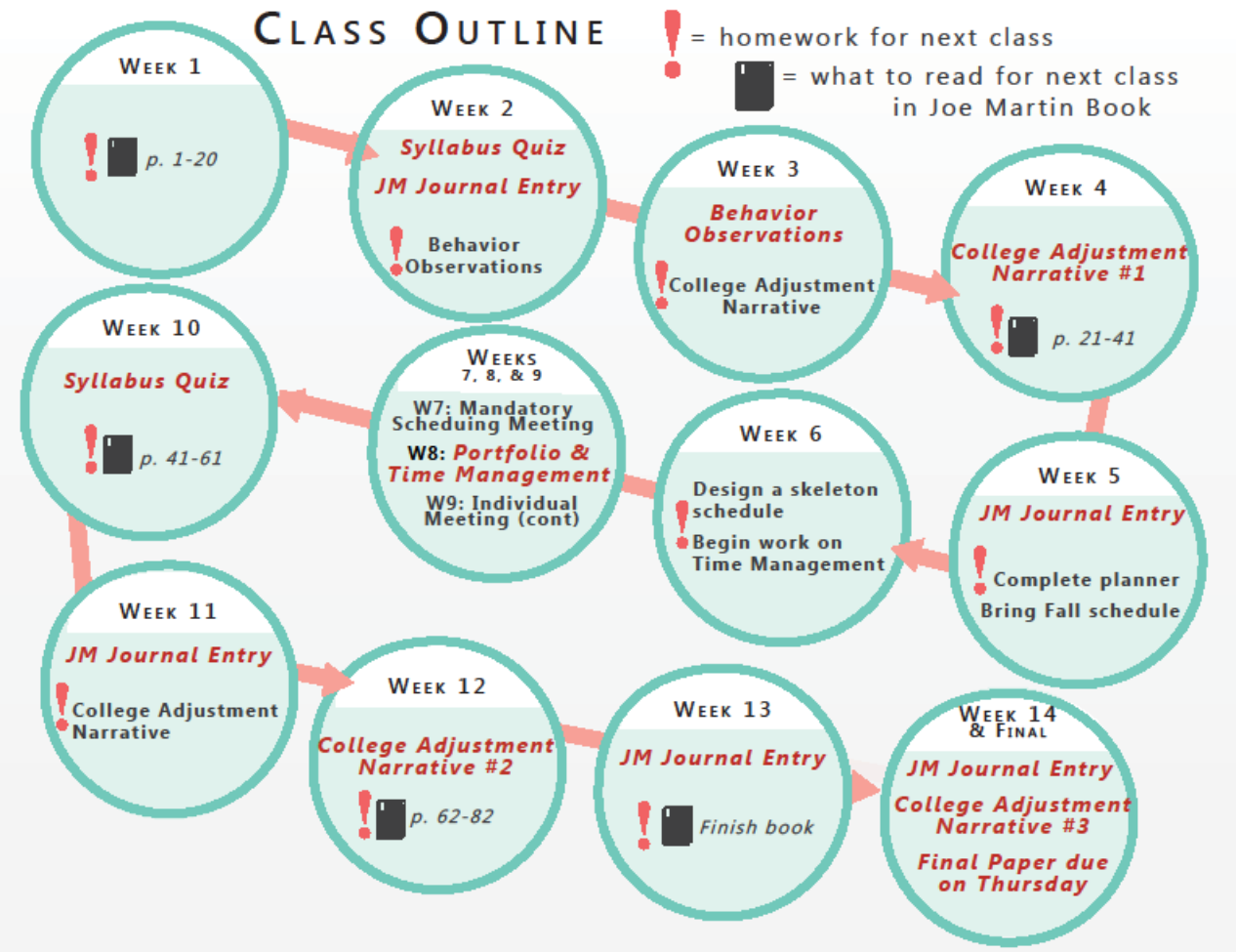
Appendix L

Color Infographic Front



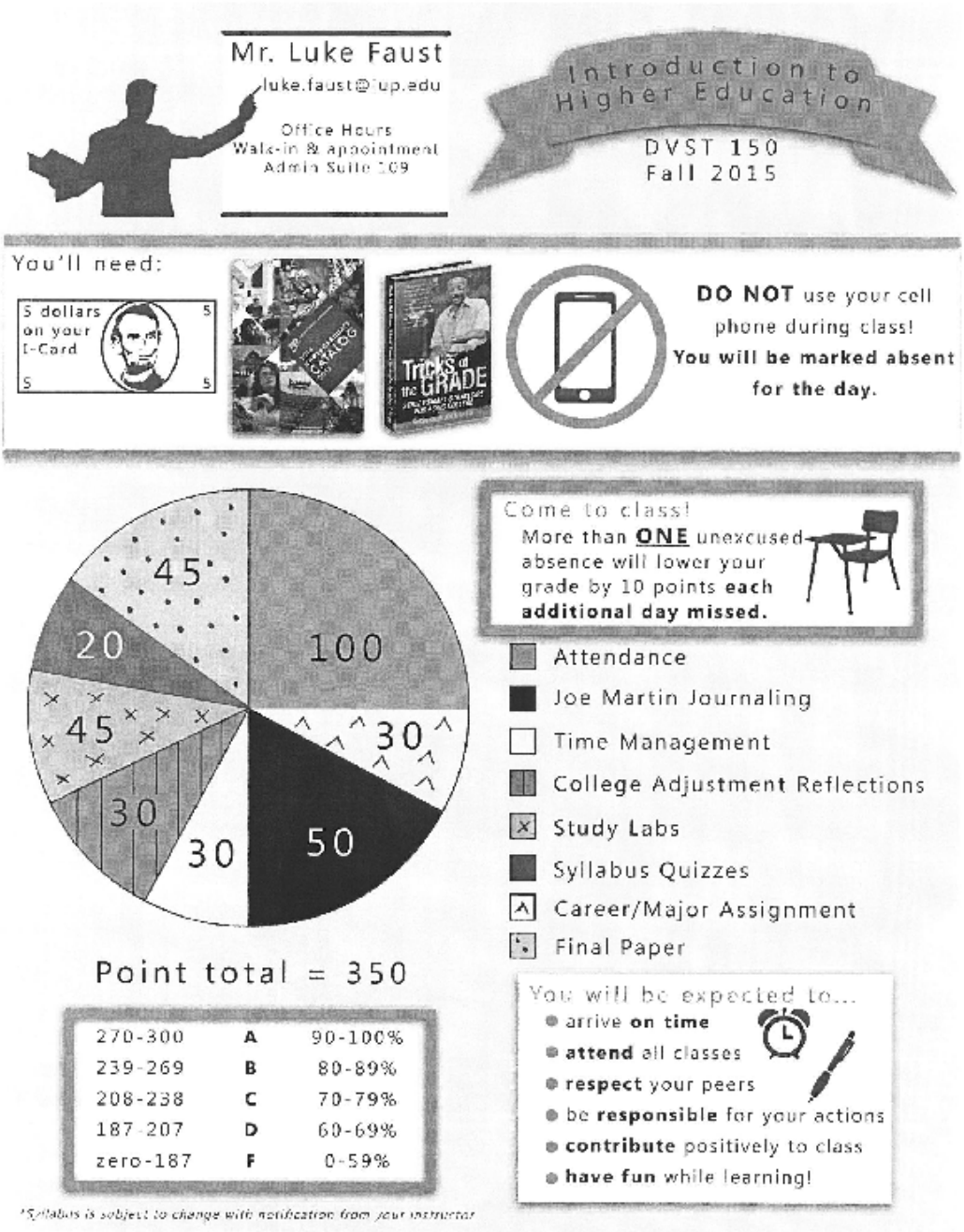
Appendix M

Color Infographic Back



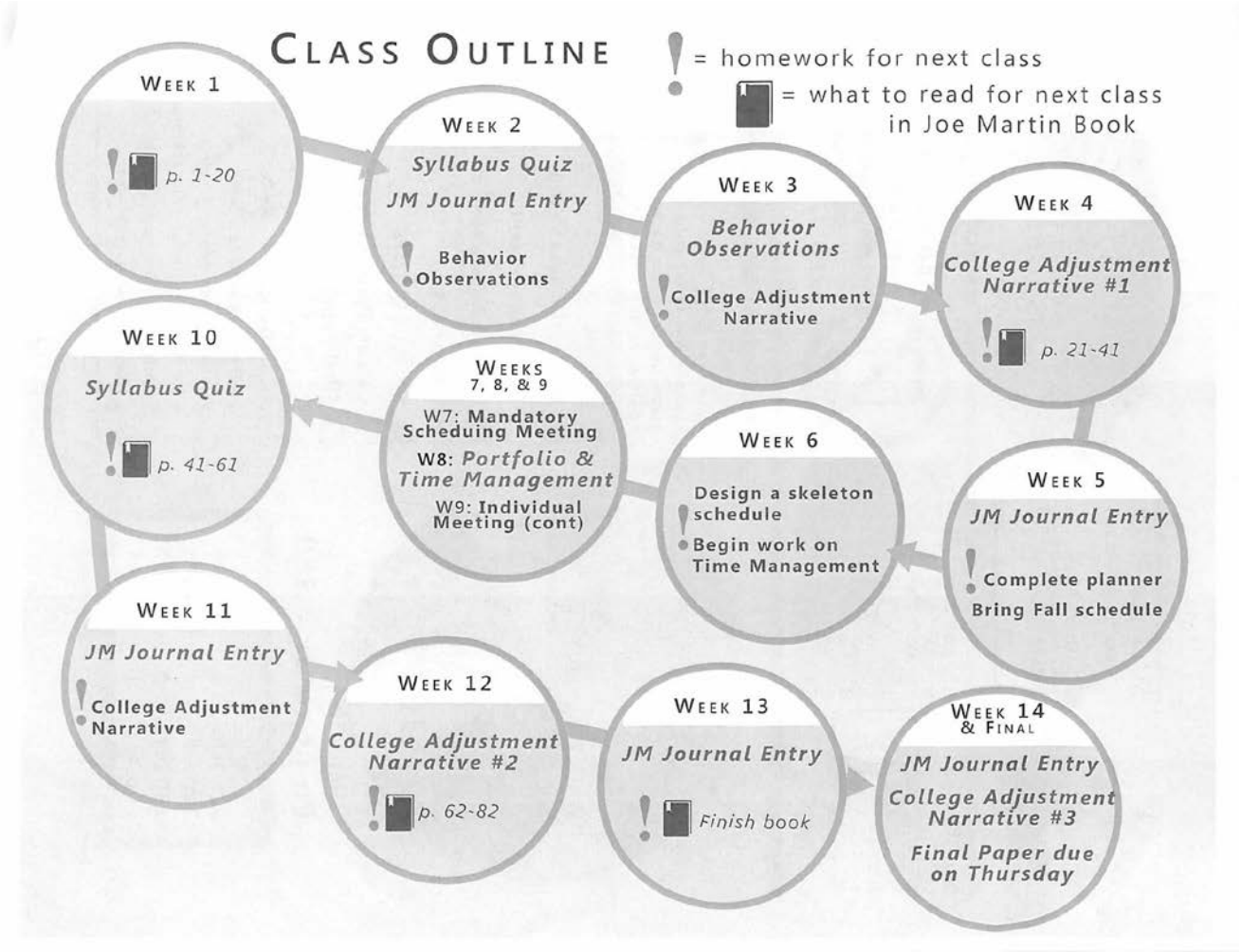
Appendix N

Black and White Infographic Front



Appendix O

Black and White Infographic Back



Appendix P

Demographic Survey Front

Demographic Survey

1) What is your name? (Once the data is compiled, ALL identifying information like your name is removed prior to analysis to maintain anonymity)

First Name _____

Last Name _____

2) What is your gender?
- ❍ Male
- ❍ Female

3) What is your race?
- ❍ White/Caucasian
- ❍ African American
- ❍ Hispanic
- ❍ Asian
- ❍ Native American
- ❍ Pacific Islander
- ❍ Other
- ❍ Prefer not to answer

4) Indicate which section of DVST 50 you are in:
- ❍ Monday 9:05 am - 9:55 am
- ❍ Monday 10:10 am - 11:00 am
- ❍ Tuesday 12:30 pm - 1:20 pm
- ❍ Wednesday 9:05 am - 9:55 am
- ❍ Wednesday 10:10 am - 11:00 am

5) Where is your hometown? _____

6) What is your major? _____

Appendix Q

Demographic Survey Back

7) What is your current age?

- ❍ Under age 18 (Birthday AFTER December 1, 2015)
- ❍ 18
- ❍ 19
- ❍ 20
- ❍ 21
- ❍ 22
- ❍ 23
- ❍ 24 - 25
- ❍ 26 - 30
- ❍ 31+

8) Have you taken other college level courses?

- ❍ Yes
- ❍ No

9) Have you seen or used a syllabus before in a class?

- ❍ Yes
- ❍ No

10) How would you rank the Information/syllabus you received? (Place an X in the box)

	Not helpful	Not Very helpful	Somewhat helpful	Helpful	Very helpful
Information provided					
Ease of use					
Aid in identifying important course components					
Remembering important course components					
Overall impression					

11) Any additional comments?

Appendix R

Quiz With Answers Highlighted

Note – Quiz 1 and Quiz 2 the same for each class, however the order changed for each class to augment academic integrity.

Tuesday 12:15 pm ***Students are to use answer sheet – Do not write on the quiz***

1. This class is titled:
   a. Introduction to Information Literacy
   b. Learning Strategies
   c. Information in the Digital Age
   d. Introduction to Higher Education
2. Mr. Faust's office hours are on
   a. Monday, Tuesday, Wednesday
   b. Tuesday and Thursday only
   c. Tuesday, Wednesday, and Thursday
   d. By appointment only
3. Mr. Faust's office is located
   a. Where the faculty offices are on the second floor
   b. In the administrative suite
   c. In the classroom in between classes
   d. In Indiana
4. The class objectives include everything EXCEPT:
   a. Decision Making
   b. Time Management
   c. Curriculum Assessment
   d. Goal Setting
5. Additional required items for this class are:
   a. Graduate catalog and money on Icard
   b. Undergraduate catalog and money on Icard
   c. Icard and flashdrive for printing
   d. Nothing

6. The text we will use for this class is titled

a. Tricks of the Grade
b. Making the Grade
c. Tricks of College
d. College Grade

7. Which of the following is NOT an expectation of this class:

a. You are prepared for class
b. You contribute positively to the class
c. Your peers are your friends
d. You have fun while learning

8. Fill in the blank. Each student will be held _____accountable.

9. The attendance policy states that each student can miss_____ number of classes before being penalized.

a. 1
b. 2
c. 3
d. 4

10. If caught using a smart phone or any other device during class without being instructed to do so:

a. The student will be permanently removed from class
b. The student will be reported to the dean
c. The student will be marked absent for the class
d. The student will be have 10 points deducted from grade

11. The largest portion of the grade will come from:

a. Journal entries
b. In class assignments
c. Homework
d. Attendance

12. Students in the class are required to attend_____ Study sessions per week for the entire semester.

a. 10
b. 3
c. 7
d. 8

13. Throughout the course, students in this class will have to write ___ journal entries on the text.

a. 3
b. 5
c. 2
d. 7

14. We will also write ___ College adjustment reflections/ narratives

a. 1
b. 2
c. 3
d. 4

15. This course will be worth a total of

a. 300 points
b. 200 points
c. 50 points
d. 350 points

16. Journals and narratives are always to be turned in

a. By placing them in your portfolio on the due date to be checked at random
b. By the end of the semester
c. To Mr. Faust on the due date
d. Through email

17. In the Joe Martin book, students are responsible for reading each time:

a. 25 pages
b. 10 pages
c. 20 pages
d. 50 pages

18. Mr. Faust's sole purpose is

a. To be hard on us
b. To help us adjust to the demands of college in order to be successful students
c. To make us do as much work as possible for only one credit
d. I don't know

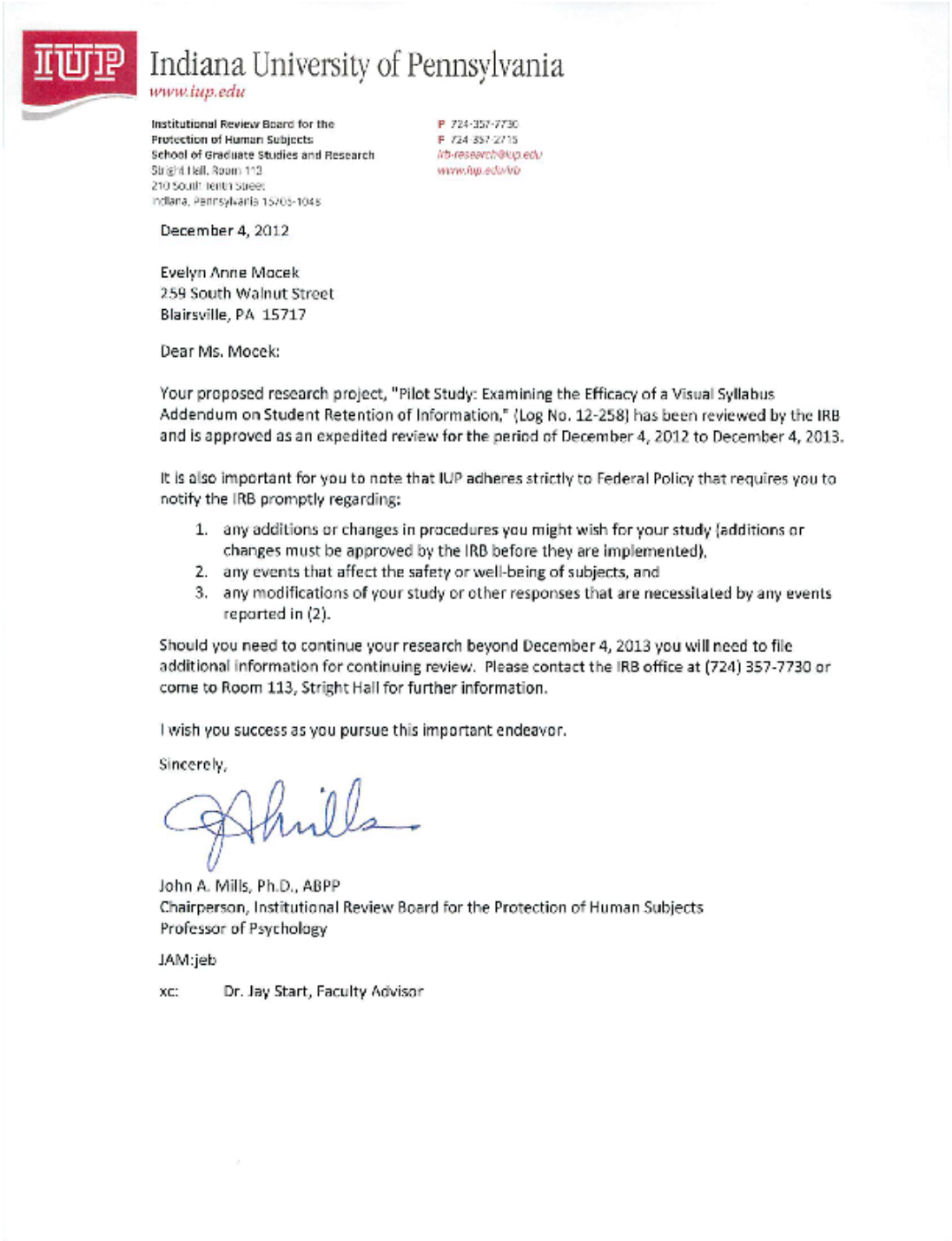
19. One question I have for Mr. Faust is.... (Please write on answer sheet).

20. Based on the information in the syllabus, I anticipate this class to be: (Note - no wrong answer - this is your perception. Please explain why - write on answer sheet)

a. Interesting
b. Boring
c. Challenging
d. Fun

Appendix S

Pilot IRB Approval



Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

December 4, 2012

Evelyn Anne Mocek
259 South Walnut Street
Blairsville, PA 15717

Dear Ms. Mocek:

Your proposed research project, "Pilot Study: Examining the Efficacy of a Visual Syllabus Addendum on Student Retention of Information," (Log No. 12-258) has been reviewed by the IRB and is approved as an expedited review for the period of December 4, 2012 to December 4, 2013.

It is also important for you to note that IUP adheres strictly to Federal Policy that requires you to notify the IRB promptly regarding:

1. any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented),
2. any events that affect the safety or well-being of subjects, and
3. any modifications of your study or other responses that are necessitated by any events reported in (2).

Should you need to continue your research beyond December 4, 2013 you will need to file additional information for continuing review. Please contact the IRB office at (724) 357-7730 or come to Room 113, Stright Hall for further information.

I wish you success as you pursue this important endeavor.

Sincerely,

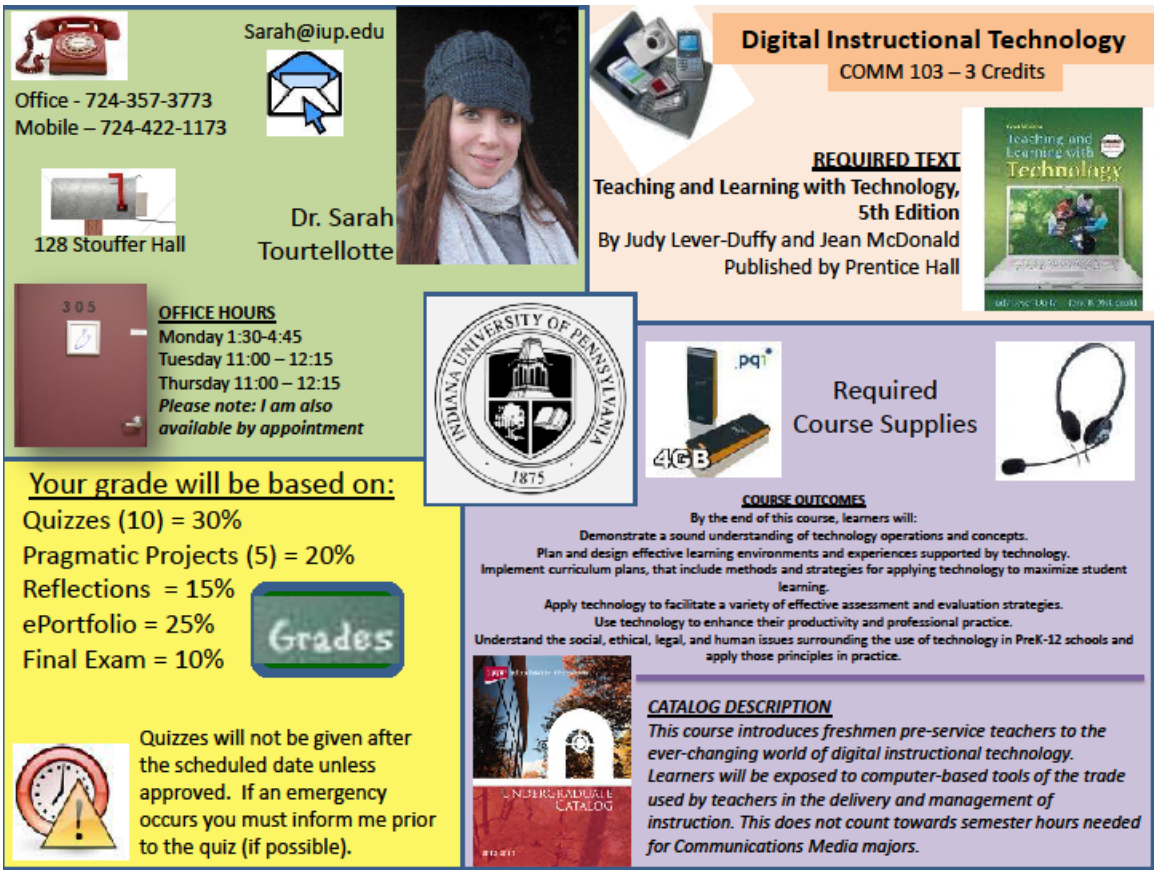
John A. Mills, Ph.D., ABPP
Chairperson, Institutional Review Board for the Protection of Human Subjects
Professor of Psychology

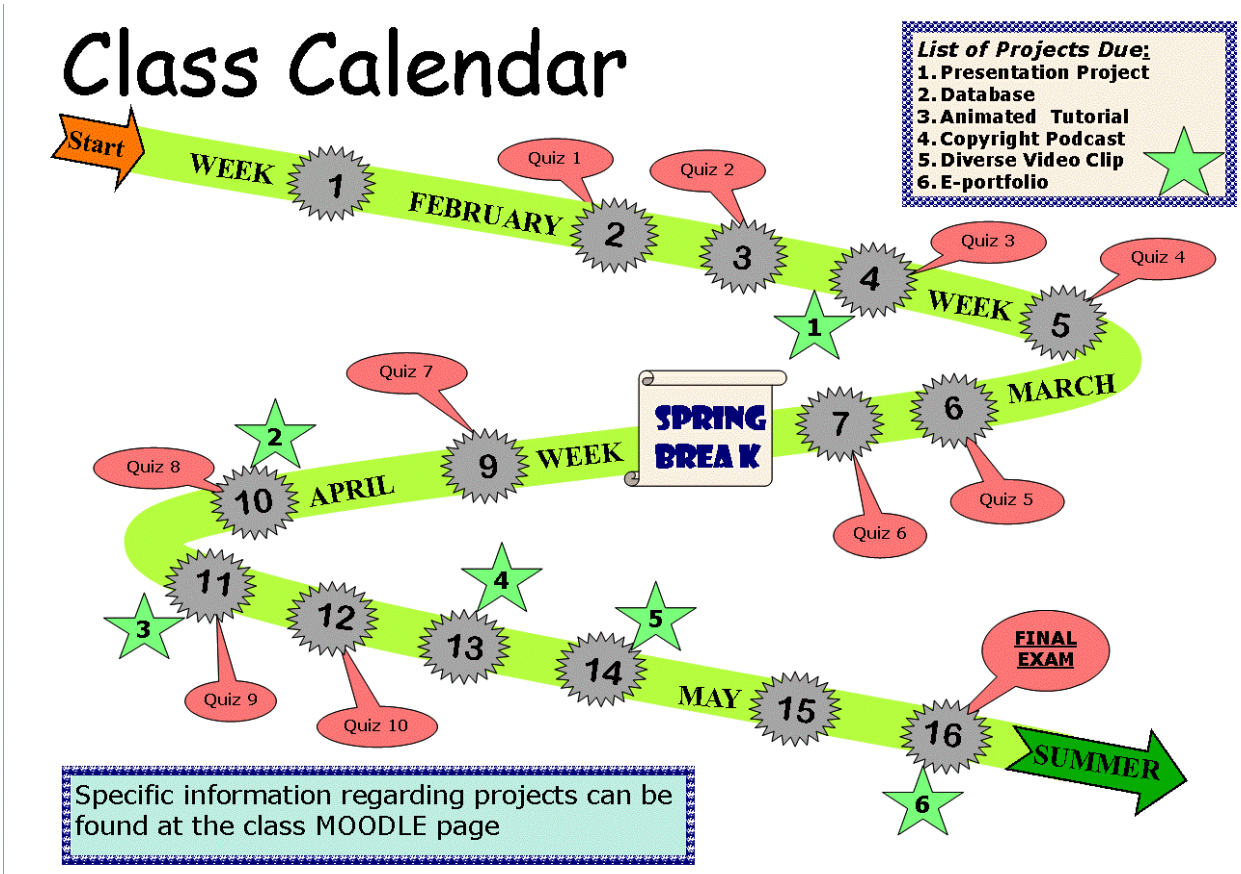
JAM:jeb

xc: Dr. Jay Start, Faculty Advisor

Appendix T

Pilot Infographic




Class Calendar
List of Projects Due:
1. Presentation Project
2. Database
3. Animated Tutorial
4. Copyright Podcast
5. Diverse Video Clip
6. E-portfolio
Start
WEEK 1
FEBRUARY
2
3
4
WEEK 5
MARCH
6
7
SPRING BREAK
WEEK 9
APRIL
10
11
12
13
14
MAY
15
16
FINAL EXAM
SUMMER
Quiz 1
Quiz 2
Quiz 3
Quiz 4
Quiz 5
Quiz 6
Quiz 7
Quiz 8
Quiz 9
Quiz 10
1
2
3
4
5
6
Specific information regarding projects can be found at the class MOODLE page


Absenteeism
If you have a perfect attendance, you will receive a 1% increase in your final grade
I take attendance every day!
Rules
WARNING: DUE DATES ARE CLOSER THAN THEY APPEAR
PLEASE NO TEXTING
You are welcome to complete up to 5 EXTRA CREDIT projects.
As this class is about Educational Technology the extra credit is to provide an overview about technology NOT DISCUSSED IN CLASS
- Identify the technology
- Outline the pros/cons of this technology in teaching
- Identify the potential costs to implement the technology in the classroom
- ONE PAGE ONLY
ALL EXTRA CREDIT PROJECTS MUST BE SUBMITTED BEFORE THE LAST CLASS.
A+
EXCUSES