

FLIPPED CLASSROOM AND ITS IMPACT ON LEARNER ACHIEVEMENT AND
LEARNER SATISFACTION IN AN UNDERGRADUATE TECHNOLOGY LITERACY
COURSE

By

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To my family

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Abstract of Thesis Presented to the Graduate School
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The blended learning environment, which combines the strengths of the online learning environment and the face-to-face learning environment, is becoming more prominent than ever in higher education. With the many affordances of improved technology and the countless pedagogical options that blended learning offers, it is imperative to examine blended learning practices to try and find the optimal set of circumstances that allow higher education learners to succeed in different contexts. This study examined the impact of one specific form of blended learning, the flipped classroom model, on learner achievement and satisfaction for undergraduate learners in a technology literacy course at a major university. The flipped classroom model has learners view course content and web lectures prior to a face-to-face meeting in the online environment, then the learners arrive at the face-to-face meeting prepared for instructor-supported practice, collaborative learning activities, and more in-depth use of classroom time. This study employed a quasi-experimental pre-test/post-test design consisting of two groups: the treatment condition (sections in which instructors implemented the flipped classroom model for the module that was the focus of the study) and control condition (sections in which instructors lectured in the face-to-face

meeting, then learners completed the practice online as homework). Learners in each group received their form of instruction then completed the same instructional activities and surveys, then these activities and surveys were collected as data and analyzed. Results indicated that there was no significant difference between the two groups in terms of learner achievement. In terms of learner satisfaction, however, there was a significant difference in which participants favored the control condition. This suggests that the treatment group had a more difficult time receiving instruction through the online lecture, possibly due to learners being preconfigured to prefer instructional methods they are accustomed to or deficiencies in the design of the lecture video.

CHAPTER 1 INTRODUCTION

As technological advancements continue to occur, learning environments in higher education are evolving. With the affordances that these innovations offer, learning environments that include the use of technology are approaching “instructional territory” that used to be possible only through traditional, face-to-face instruction (Bonk & Graham, 2006, p. 6). As this shift is occurring, it is vital to study the best practices and the latest opportunities offered by the learning environments that are becoming more prominent.

Blended learning (BL), also called hybrid learning, combines the online learning environment and the traditional, face-to-face learning environment (Bonk & Graham, p. 5). BL has become one of the most popular trends in higher education. Norberg, Dzuiban, and Moskal (2011) predicted that BL would become “the new normal” for the delivery method of higher education courses (p. 4). According to the NMC Horizon Report: 2017 Higher Education Edition, BL designs in courses and programs is considered one of six “key trends” in higher education (Adams-Becker, Cummins, Davis, Freeman, Hall-Giesinger, & Ananthanarayanan, 2017, p. 18).

While the basic concept of BL is the combination of face-to-face and online learning, many focus on the opportunity for improved learning rather than just differentiated teaching methods. Sloman (2007) states that understanding BL “must be as much about varying learning methodology as it is about training delivery” (p. 318). Sloman goes on to discuss how BL practices can be strategically designed to foster to “what motivates learners, what support they need and how these supportive

interventions can take place” (p. 318). This view of BL presents an exciting opportunity to explore different techniques to improve learning.

One specific BL technique that is examined in this study is the flipped classroom (FC) model. The FC model “builds on web-based lectures that are studied prior to face-to-face classroom sessions” (Thai, De Wever, and Valcke, 2017, p. 3). This allows for learners to enter class meetings more prepared, and these face-to-face class meetings to be used for more “higher-order activities” in which the instructor is present to give feedback and support (Thai et al., p. 3). This is significantly different from what face-to-face meetings are frequently used for in higher education, which is often delivery of content in the form of a lecture.

Context

EME2040: Introduction to Educational Technology (will be referred to as “EME2040”) is an undergraduate, technology literacy (often referred to as computer literacy) course with educational and professional applications. It is offered at the University of Florida (UF) by the College of Education (CoE). On the Course Descriptions page of the Educational Technology portion of the UF CoE website, it states that EME2040 “aims to help you refine, redefine, and reshape your perspectives and views of technology as they relate to your future career, society, teaching, learning, and training.” The 15 modules this course covers are as follows:

- Module 1: Introduction
- Module 2: All About Computers and the Digital Divide
- Module 3: Media Literacy, Copyright, and Plagiarism
- Module 4: Presentation Skills
- Module 5: All About Images (Part 1)
- Module 6: All About Images (Part 2)
- Module 7: Digital Identity
- Module 8: Digital Storytelling (Part 1)

- Module 9: Digital Storytelling (Part 2)
- Module 10: Online Education and Jobs in the 21st Century
- Module 11: Mobile Apps
- Module 12: Google Tools
- Module 13: Web 2.0 Tools
- Module 14: Websites and Blogs (Part 1)
- Module 15: Websites and Blogs (Part 2)

This course employs a BL format. For each module, there is a face-to-face component in which the instructor lectures about that module's topic, usually followed by a discussion or an activity regarding the topic. The BL format of the EME2040 allows for "reduced seat time" (Bonk & Graham, 2006, p. 9), meaning the amount of time spent by instructors and learners in the face-to-face classroom is reduced. While this is a three credit-hour course, learners and instructors only meet for one hour per week. The rest of the module (the other two credit-hours earned each week by learners) is completed by the learners asynchronously in the online environment, which can include more activities, discussions, and projects. Once the next face-to-face meeting occurs, the next module begins. In this study, this method of instruction in which the face-to-face meeting marks the beginning of each module with a lecture on that module's topic will be referred to as "typical EME2040 instruction." Figure 1-1 below displays this instruction. Each module lasts one week, making this a 15-week course.

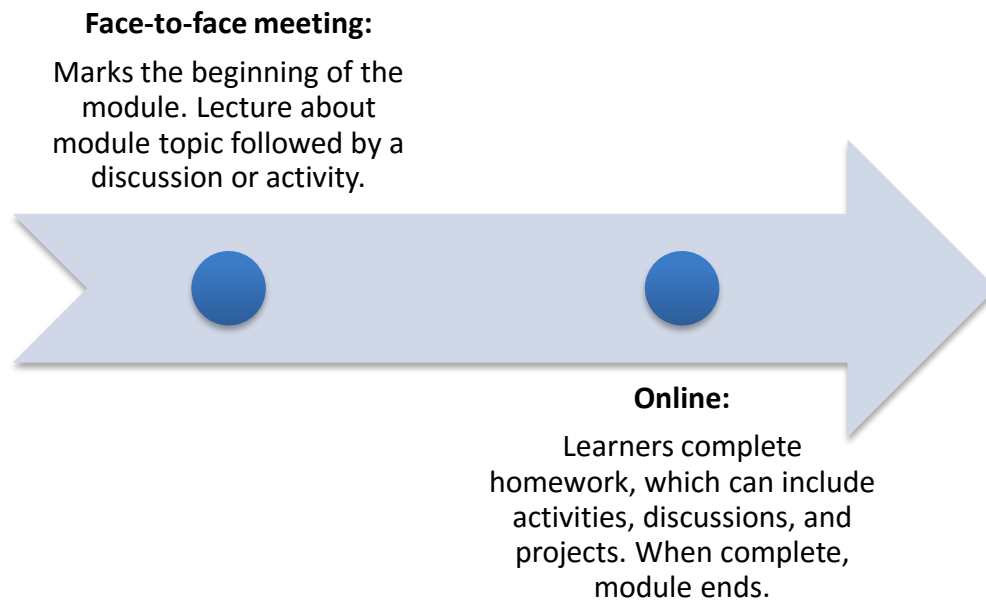


Figure 1-1. Typical EME2040 Instruction

Enrollment for EME2040 is open to all undergraduate learners at UF, regardless of their age, their major, or how close they are to graduation. This allows the population of learners that take EME2040 to include a wide range of academic and cultural backgrounds. Because EME2040 is a critical tracking course for students studying education at UF, the course roster is often made up of a majority of education students; however, many learners pursuing other assorted majors and minors sign up for this course as well. This is because the course fulfills a General Education requirement at UF, making it a useful course for learners of all academic backgrounds. As for cultural backgrounds of learners, the EME2040 course rosters typically reflect the diverse cultural backgrounds that make up the undergraduate population of UF.

Our study took place from Module 4 to Module 7, but it focused specifically on “Module 5: All About Images (Part 1).” In this module, learners experienced the

Photoshop application, learning skills and concepts necessary to using it effectively, then practicing these skills by following step-by-step instructions to manipulate graphics and use tools to generate a specific image. The goal of the module was for learners to develop skills using Photoshop so they can apply these skills to edit and create original images in future course modules and, ultimately, their professional careers. The typical EME2040 instruction described earlier included the instructor lecturing to introduce Photoshop and its tools, then the learners engaged in a practice assignment on their own as homework, following the face-to-face meeting. For this study, however, a revised condition was introduced in which the FC model was implemented. For this FC model, the learners watched a recorded lecture online asynchronously prior to Module 5 the face-to-face meeting. The learners then engaged in the practice assignment during the face-to-face meeting, with the instructor encouraging collaboration and present to answer questions and offer support as needed.

Problem

With BL possibly becoming the norm in higher education, it is imperative to study the most effective strategies and instructional design methods of this teaching format. The nature of the problem that this study addresses derives from an instructional design approach. Peterson (2003) states that the first step in the instructional design process is to “determine the needs of the audience” (p. 228). In the case of this study, the audience is current and future technology literacy course learners and the need is to find the optimal set of instructional circumstances for those learners. While the current instructional circumstances may be considered sufficient, instructional designers and educators must ask themselves, “Is it as effective and ideal for the learners as it possibly can be?” Finding this optimal set of circumstances is especially important

regarding BL environments. This is because of the countless options and multimedia tools available to instructors using this type of format, and the endless possibilities of combinations of instructional activities and strategies that can shape a BL lesson plan. Determining the FC model's impact on learner achievement and learner satisfaction in comparison to the typical EME2040 instruction can put us one step in the right direction towards finding the best practices in the BL environment for this particular context.

In this situation, the context at hand is an undergraduate introductory-level technology literacy course. In the 21st century, this type of course is a common component of higher education curricula. Today, with technology all around us, "digital literacy has become increasingly critical to success in any educational discipline or occupation" (Murray & Perez, 2014, p. 88). With employers putting an increased emphasis on hiring employees who contain technology skills and technology literacy, courses like EME2040 are offered more than ever before. Within the last thirty years, many institutions of higher education "implemented computer literacy as a requirement and often placed a requirement of this literacy into the school's liberal education (general education) core requirements for all graduates" (Kleen, Rodriguez, & Fanguy, 2011, p. 162).

While these courses may have been required for three decades, the technological advancements of recent years provide affordances that were not available years ago. This presents us with a new need, and with this need a new opportunity, to explore more pedagogical options to achieve the most effective instructional design and course strategies for the context at hand.

Problem Statement

Due to the rapid increase in technological advancements that have contributed to the many options and possibilities in the BL environment, investigation into optimal circumstances and instructional design in the undergraduate, technology literacy context is necessary and needed. Examining the impact of the FC model is imperative because it will put us one more step in the right direction towards discovering the best practices in the BL environment for the context of this study.

Purpose

The purpose of this study was to examine what impact a specific form of BL, the FC model, can have on learner achievement and learner satisfaction in an undergraduate, technology literacy course.

Significance

Examining the FC model's impact on learner achievement and learner satisfaction, compared to the typical EME2040 instruction, can shed light on preferences and effectiveness of instruction for learners in the undergraduate, technology literacy course context. Gaining insight on this information can take us one step closer to the optimal circumstances for these types of learners in this type of course. The findings from this study can then be applied to comparable situations across the country or the world, in which similar types of learners are taking similar types of courses. This is a great opportunity because of the large population of diverse undergraduate learners worldwide along with the abundance of technology literacy discipline courses offered worldwide, making the work of this study relevant and significant.

Research Question

This study seeks to find the answer to the following question: what impact does implementing a FC model have on learner achievement and learner satisfaction in an undergraduate, technology literacy course?

Literature Review

Blended Learning

This study examined the BL environment; EME2040 is a course taught using a BL format. As stated earlier, BL is gaining popularity in higher education. In the most recent *NMC Horizon Report: Higher Education Edition*, BL is regarded as one of the trends “driving educational technology adoption in higher education for the next one to two years” (Adams-Becker, Cummins, Davis, Freeman, Hall-Giesinger, & Ananthanarayanan, 2017, p. 9).

There are various definitions of BL that share a similar theme. In *The Handbook of Blended Learning*, Bonk and Graham (2006) simply define BL systems as those that “combine face-to-face instruction with computer-mediated instruction” (p. 5). Some classify BL by setting parameters for the amount or ratio of instruction that takes place online versus face-to-face. Allen, Seaman, and Garrett (2007), for example, define BL as “having between 30 and 79 percent of the course content delivered online” (p. 5). Some believe BL should not just be defined as a simple combination or a ratio of instructional methods, but as “a shift in instructional strategy” (Watson, 2008, p. 5). When considering BL environments, Osguthorpe and Graham (2003) state that “the central purpose that should drive all other motives is to improve student learning” (p. 231). This is supported by Garrison and Vaughan (2008), who explain that BL occurs when “face-to-face oral communication and online written communication are optimally

integrated such that the strengths of each are blended into a unique learning experience congruent with the context and intended educational purpose” (p. 5). These definitions all apply to the BL instruction that is being explored in this study, as it combines online instruction with face-to-face instruction, includes a ratio of 30 to 79 percent online, and aims to combine the strengths of the face-to-face environment with the strengths of the online environment. For the purpose of this study, we will use Garrison and Vaughan’s simple yet effective definition from *Blended Learning in Higher Education* that is a concise combination of these previous definitions: “BL is the thoughtful fusion of face-to-face and online experiences” (p. 5).

There are multiple reasons why institutions implement BL courses and programs. The main reasons BL is implemented is to improve pedagogy, to increase access and flexibility, and increase cost-effectiveness (Bonk & Graham, p. 8). Examples of frameworks that use BL to attempt to improve pedagogy include the Community of Inquiry (Col), the Multimodal Model, and the FC model. BL that follows the Col framework uses the affordances of the online learning environment and the face-to-face learning environment to establish a social presence, a cognitive presence, and a teaching presence (Garrison & Arbaugh, 2007, p. 159). The Multimodal Model uses “multiple modalities” to blend approaches, activities, and environments to “be most effective for and appeal to a wide range of students” (Picciano, 2009, p. 14). The FC model will be described in detail in the next section. These are just three examples; there are countless approaches that use BL to attempt to improve pedagogy. Garrison and Vaughan describe the reason for having a framework guide the practice of BL,

stating that “the openness of BL redesigns, in terms of the range of possibilities, demands a strong theoretical foundation and framework” (p. 13).

The flexibility and the increased access to learning and information has also contributed to the increased adoption of BL practices. Bonk and Graham (2006) reference many programs in *The Handbook of Blended Learning* that “would not be possible if students were not able to have a majority of their learning experiences at a distance from instructors and/or other students” (p. 9). Flexibility is becoming more important as access to learning increases now that there are “more mature learners with outside commitments such as work and family” (Bonk & Graham, p. 9). BL’s ability to increase access to learning and learner flexibility without surrendering face-to-face social interaction makes it an attractive choice for many courses and programs. As access to learning increases with BL practices, cost-effectiveness does as well. BL provides “an opportunity for reaching a large, globally dispersed audience in a short period of time with consistent, semi-personal content delivery” (Bonk & Graham, p. 10). According to Garrison and Kanuka (2004), providing interactive learning experiences to learners “in ways that are accessible and cost effective” is a defining characteristic of BL (p. 100).

Flipped Classroom

The FC model is a specific type of “blend” that has been found in literature since 2000 (Lage and Platt, 2000, p. 11). The FC gained popularity in education ever since 2007, when two chemistry teachers in Colorado implemented the FC model in their high school classrooms (Tucker, 2012, p. 82).

The basic concept of the FC model is that learners view web-based lectures prior to their face-to-face meetings and then, when the meeting occurs, they can engage in

“group-based interactive learning activities in the classroom” (Thai, De Wever, & Valcke, 2017, p. 1). A graphic to describe the FC model and how it differs from traditional instruction can be seen in Figure 1-2. Some simply define FC as a reversal of roles of locations: typical face-to-face components of instruction (lecture or direct instruction) being completed outside of class, and typical out-of-class components of instruction (practice) being completed within the classroom (Bishop & Verleger, 2013, p. 5). While this is accurate, this “merely represents a re-ordering of classroom and at-home activities” instead of the “expansion of the curriculum” that the FC aims to achieve (Bishop & Verleger, p. 5).

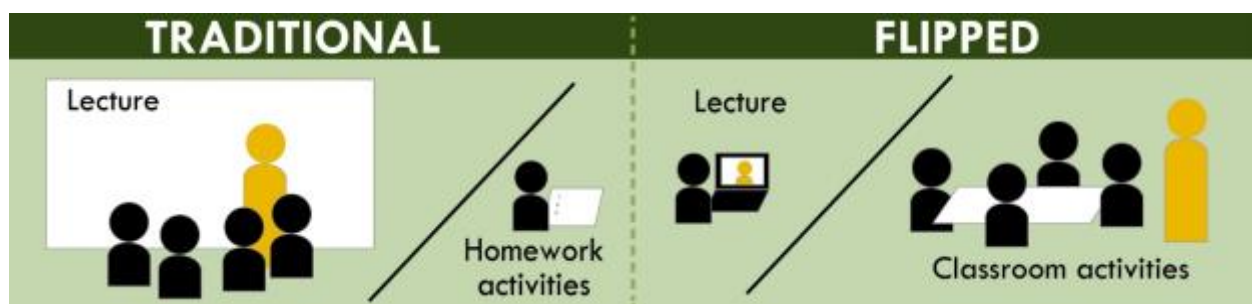


Figure 1-2. Traditional instruction versus flipped classroom (University of Washington, 2017)

The “expansion of the curriculum” that is discussed above includes a couple of different aspects of instruction that the FC can enhance. The initial improvement occurs outside of the classroom in the online environment; with FC, learners can “use the video resources provided, along with other materials, to learn concepts and complete tasks on their own, at their own pace, and at locations convenient” to them (Davies, Dean, & Ball, 2013, p. 3). This provides individualized instruction in which learners “can focus their efforts on their individual learning needs so they are not left behind by class discussions that go too fast or become bored by class time that is spent covering content they already know” (Davies et al., p. 3).

The other component of instruction that is enhanced with FC is what occurs inside of the classroom. Because the direct instruction (lecture in most traditional subjects) is completed asynchronously outside of the classroom, the face-to-face meeting can now be used “either to help students grasp especially challenging concepts or to help students engage in higher orders of critical thinking and problem solving” (Davies et al., p. 3). These in-class meetings “are no longer used for information transmission such as lecturing but, instead, become opportunities to diagnose student misconceptions, foster critical dialogue, and support peer instruction” (Garrison & Vaughan, 2008, p. 117). This further provides individual instruction to learners, as they can ask specific questions from the online material, engage in collaborative activities, and complete more “value-added activities” that would not have previously been possible (Asef-Vaziri, 2015, p. 72). In this study, we will refer to FC as the strategic blend of web-based, asynchronous direct instruction outside of the classroom and collaborative, deeper-level learning activities in the classroom.

These benefits of the FC affect both learners and instructors. Learners benefit from the increased choice in their individualized instruction of the web-based portion of the instruction through increased freedom to complete the work when convenient, options as to where to complete the work, and personal selection of how thoroughly to study instructional materials. Herreid and Schiller (2013) stated that using the FC model also benefitted instructors through finding more time for in-depth learning activities due to the learners coming into class with content knowledge (p. 62). Fulton (2012) states that instructors can require learners to complete pre-assignments about the content to help instructors adjust their lessons to fit the needs of the learners (p. 20) The FC model

also allows instructors to easily see learning preferences of the class and modify lessons accordingly, provide an effective solution for absences (learners can still view and complete the web-based component of the class), and make it easier to create an environment in which “students are more actively engaged in the learning process” (Herreid & Schiller, p. 62).

Along with these benefits, there are some aspects of the FC model that instructors may view as negative. According to Sahin, Cavazoglu, and Zeytuncu (2015), some learners initially have trouble or are resistant because they are accustomed to traditional approaches (p. 144). They also mention that “preparing a good quality video can be very time consuming for teachers and some teachers can be resistant because of their lack of experience with the necessary technology” (Sahin et al., p. 144). Finally, Sahin et al. warn that if materials are not of high quality or do not match with the learners’ level, issues can arise (p. 144). This indicates that the FC model may require extra work on the front-end of creating lesson plans for courses.

Technology Literacy

While EME2040: Introduction to Educational Technology is required for education majors at UF and includes an emphasis on education, the overarching focus and discipline of the course could be described using the term “technology literacy.” It is important to understand what technology literacy is and why it is significant in the domain of higher education. Technology literacy is sometimes used synonymously with computer literacy and digital literacy (Davies, 2011, p. 46). In this study, however, technology literacy is considered to encompass computer literacy; this is because literacy of technology in general includes “terms that focus on specific aspects of technology literacy,” like computer literacy (Davies, p. 46).

Burkhardt, Monsour, Valdez, Gunn, Dawson, Lemke, Coughlin, Thadani, and Martin (2003) define technology literacy as “knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals” (p. 15). Davies states that “technology literate people know what the technology is capable of, they are able to use the technology proficiently, and they make intelligent decisions about which technology to use and when to use it” (p. 47). Ezzaine (2007) describes computer literacy, which is a component of technology literacy, as “understanding computer characteristics, capabilities, and applications as well as the ability to implement this knowledge in the skillful, productive use of computer applications to individual roles in society” (p. 178). All of these definitions and descriptions are indicative of the discipline of the course in this study. In this study, we will refer to technology literacy as awareness and knowledge of technological tools and purposes paired with practical, professional application skills.

We consider the course in which this study took place, EME2040: Introduction to Educational Technology, to be a technology literacy course that covers computer literacy. This type of course is an important component of education. Ezzaine states how “computer literacy is one of the most important skills a person can have in today’s competitive environment” (p. 178). Siegle describes how technology literacy in the 21st century now requests learners to be able to achieve quick processing, critical thinking, and creative productivity through the affordances that technology offers (p. 34). While some believe that learners today are more technologically literate than generations in the past, Davies warns that this is an “incomplete” assumption because “exposure to technology does not make someone a technology expert any more than living in a

library makes a person a literary expert” (p. 47). There is no doubt that this type of course is necessary in today’s educational system.

While the objectives of instruction in technology literacy courses may vary depending on the program or institution, there are a few themes that surface from multiple sources. These include instilling learners with an awareness of the availability and basic purpose of technology, an understanding of the ethics of personal and social technology use, and the skills to implement and practice using technology to complete various tasks, such as solving problems, creating projects, and communicating with others (Davies, p. 47; Siegle, p. 33).

The module that is the focus of this study (Module 5: All About Images [Part 1]) aims to achieve these objectives through instruction and practice using the Photoshop application. One objective of this module is to have learners become more visually literate, which Stokes (2002) describes as having “skills for reading and writing visually in order to derive meaning from what is being communicated” (p. 13). The Module 5 introduction webpage on the EME2040 course website states that “regardless of your profession, visual media surrounds you and it is in your best interest to better understand it.” This module aims to achieve its objectives through learners getting experience with and learning the basic purposes of a popular image-editing software (Photoshop), understanding “composition and creative elements” to consider while using this software, and developing skills in the implementation and practice of using Photoshop to complete tasks and create projects (from the EME2040 course website).

Learner Achievement

This study measured learner achievement, also referred to as learner performance, as a factor to determine the impact of the FC model on EME2040:

Introduction to Educational Technology. In this study, learner achievement refers to what the learner is able to achieve on a specific performance task after participating in the instruction. The way we measured learner achievement is by looking at performance on pre- and post-assessments, a practice assignment, and a transfer or application assignment. We assessed learner achievement to compare the effectiveness of the different pedagogical approaches (FC model versus traditional EME2040 instruction). Harlen's (2005) study of summative practices and assessment showed measuring learner achievement helped instructors "reflect on the adequacy of the learning opportunities being provided" (p. 215).

Learner achievement can be measured in a number of ways, as it depends on what the instructor believes is "relevant evidence for a particular purpose" (Harlen, p. 207) and the learning objectives for the module or lesson. While there are many options when it comes to assessing learner achievement, there are some guidelines that can support a strong, dependable assessment. Fry, Ketteridge, and Marshall (2008) state that reliable assessment "focuses on the development of real-world skills, active construction of creative responses, and the integration of a variety of skills into a holistic project" (p. 134). Harlen describes that "the extent to which the assessment tasks, and the criteria used in judging them, are specified are key variables affecting dependability. Where neither tasks nor criteria are well specified, dependability is low. Detailed criteria, describing progressive levels of competency, have been shown to be capable of supporting reliable assessment by teachers" (p. 213). A tool that instructors can use to express detailed criteria in progressive levels of competency is a scoring rubric. A scoring rubric consists of "a fixed scale and a list of characteristics describing

performance for each of the points on the scale” (Marzano, Pickering, & McTighe, 1993, p. 29). Marzano et al. goes on to explain that “rubrics also promote learning by offering clear performance targets to students for agreed-upon standards” (p. 29).

Within a scoring rubric, “greater dependability is found where there are detailed, but generic, criteria that allow evidence to be gathered from the full range of classroom work” (Harlen, p. 213). Marzano et al. created a generic rubric for assessing procedural standards, which can be seen below in Figure 1-3. Because this study measures learner achievement of a Photoshop module in which learners follow a procedure presented to them by detailed instructions and use their skills to perform the task at hand, this generic rubric is similar to the scoring rubric used in the study.

B. Generic Rubric for Procedural Standards

- 4 Demonstrates mastery over the strategy or skill specific to the task or situation. Can perform the strategy or skill without error and with little or no conscious effort.
- 3 Carries out the strategy or skill specific to the task or situation without significant error.
- 2 Makes a number of errors when performing the strategy or skill specific to the task or situation but can complete a rough approximation of it.
- 1 Makes many critical errors when performing the strategy or skill specific to the task or situation.

Note that this generic rubric must be rewritten to include the specifics of the information in a procedural standard, as in the example shown here:

Figure 1-3. Generic Rubric for Procedural Standards (Harlen, p. 66)

Finally, something that should be considered when assessing learner achievement is bias. Instructors must be careful not to insert any bias into their measurements of learner achievement due to “taking into account information about non-relevant aspects of students’ behavior or being apparently influenced by gender, special educational needs, or the general or verbal ability” of a learner (Harlen, p. 213).

Learner Satisfaction

The other factors examined to determine the impact of the FC model on a technology literacy course are learner satisfaction. This study specifically investigates learner satisfaction of the instructor, along with aspects of the course materials. Merriam-Webster simply defines satisfaction as “fulfillment of a need or want.” Oxford dictionaries describes it as “fulfilment of one’s wishes, expectations, or needs, or the pleasure derived from this.” In this study, we will refer to learner satisfaction as the fulfillment of learners’ instructional needs and instructional preferences, and the enjoyment of the learners that come as a result.

Observing learner satisfaction is “a widely-used strategy based on the premise that perceptions matter and often influence behaviors” (Jurczyk, Kushner-Benson, and Savery, 2004, p. 1). Because the learners are providing their own input on their satisfaction, “meaningful and active participation” of the survey that collects their satisfaction is critical (Chen & Hoshower, 2003, p. 72). Surveys, traditional course evaluations, and questionnaires are among tools that educators can use to collect learner satisfaction (Jurczyk et al., p. 1).

Conceptual Framework

The literature review above can be summarized in this study’s conceptual framework. The conceptual framework displays how key concepts and theories relate to BL, the FC model, learner achievement, and learner satisfaction in a technology literacy discipline for undergraduate learners (Figure 1-4).

Blended learning

This study took place in the BL environment. BL is the deliberate mixture of face-to-face and online instructional strategies, attempting to use the strengths of each

educational environment to improve learning (Garrison and Vaughan, p. 5). With BL growing in popularity in higher education (Norberg et al., p. 4), the need to study its pedagogical methods and instructional design continue to grow. The unlimited combinations of strategies and the countless design possibilities makes BL an especially important topic to study.

Bonk and Graham discuss “reasons for creating BL” and describe seven of the most imperative characteristics of learning that led to the development of BL (p. 23). One of these characteristics is that “learning is social” (p. 25). This concept that social interactions can benefit learning sets the stage for this study in terms of the study’s organization and methodology. The theoretical background for social learning, which include Piaget’s (1964) constructivist theory and Vygotsky’s (1978) work with cultural and social interactions, helps to explain the expected relationships between the variables in this study and the impact that FC model may have.

Flipped classroom

The FC model has learners view web-based content prior to meeting for class. This allows the face-to-face meeting to include more “group-based interactive learning activities in the classroom” (Thai, De Wever, & Valcke, 2017, p. 1), rather than just information being presented from the instructor to passive learners.

The FC model can be viewed as a result of a few of Bonk and Graham’s “reasons for creating BL” (p. 23), including the idea that learning is a social process. This focus on social interaction and learning using the FC model reflects ideas presented by Piaget and Vygotsky. Their theories of social learning and constructivism help explain the facilitation of content and material in the FC model that takes place in

this study, and the methodology for exploring the depending variables that could be impacted by the FC model.

Learner achievement and learner satisfaction

This study was informed by guidelines and approaches of other studies that employed a comparison of different instructional methods and designs. It also used assessment strategies and survey techniques that have been used in studies that explore learner achievement and learner satisfaction variables. Finally, instructional design concepts, such as Gagne's nine events of instruction (1965), also helped shape the organization of content within this study.

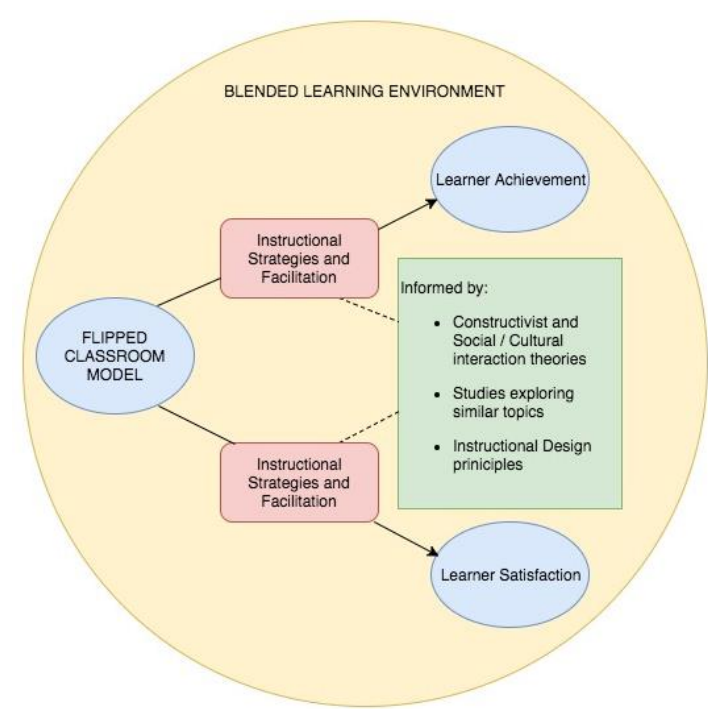


Figure 1-4. Conceptual Framework

Chapter 1 Summary

The purpose of this study was to examine the impact the FC model (web-based lectures viewed prior to class meeting, collaborative practice with instructor support during class meetings) had on learner achievement and learner satisfaction in an

undergraduate, technology literacy course. Participants enrolled in the BL course EME2040: Introduction to Educational Technology, offered by the College of Education at UF, where one module implemented a FC model in the BL environment. With all of the technological advancements of the past few years, the need to explore instructional design options that aim to achieve the optimal circumstances for learners in different contexts continuously surfaces. This study looks to see if the FC model is a more optimal method of instruction for undergraduate learners in a technology literacy course than the typical EME2040 BL instruction (live lecture during class meetings, practice occurring asynchronously as homework). Examining the learner achievement and learner satisfaction of the FC model compared to the typical EME2040 instruction can shed light on preferences and effectiveness of instruction for learners in this context, taking us one step closer to the optimal circumstances for these types of learners in this type of course. This information can then be applied to situations across the country or the world in which similar types of learners are taking similar types of courses. This study explored how the variables learner achievement and learner satisfaction can be measured and analyzed in the BL environment, using the FC model, and within the technology literacy discipline.

CHAPTER 2 METHODS

Research Design

The researcher drew data from one blended learning (BL) undergraduate course at a major public university in the southeast United States during the Fall 2017 semester. The study was designed to examine what impact the flipped classroom (FC) model had on learner achievement and learner satisfaction.

This study employed a quasi-experimental pre-test/post-test design consisting of two groups: the treatment condition (sections in which instructors implemented the FC model for the module that was the focus of the study) and control condition (sections in which instructors taught the module using typical EME2040 instruction). The implementation of the FC model was the independent variable in this study, while the dependent variables included learner achievement and learner satisfaction.

Learner achievement dependent variable collection materials comprised of a pre-test, a practice assignment, a transfer assignment, and a post-test. Learner satisfaction dependent variable collection materials included a learner satisfaction survey. These data collection instruments will be described in detail in the “Instruments” section later in this chapter.

For the module that was the focus of this study (Module 5: All About Images [Part 1]), instructors used two different lesson plans for each of their sections: one lesson plan that implemented the FC model for the treatment condition group and one that employed the typical EME2040 instruction for the control condition group. Both lesson plans contained the same instructional events: a lecture on the content of the module, a minor activity to ensure the lecture was reviewed, a short discussion about the content

and the future assignments, and the practice assignment. However, the instructional events took place at different times and/or in different places (either synchronously during the face-to-face meeting or asynchronously before or after the face-to-face meeting) for the two groups. Other events that occurred in the study (demographic/academic survey, pre-test, transfer assignment, post-test, learner satisfaction survey) occurred either before or after this module and were held constant between the two groups. Figure 2-1 displays a synopsis of the lesson plans for the two groups for this module; this module, along with all events that made up the study, will be discussed in more detail later in this chapter, in the “Procedure” section.

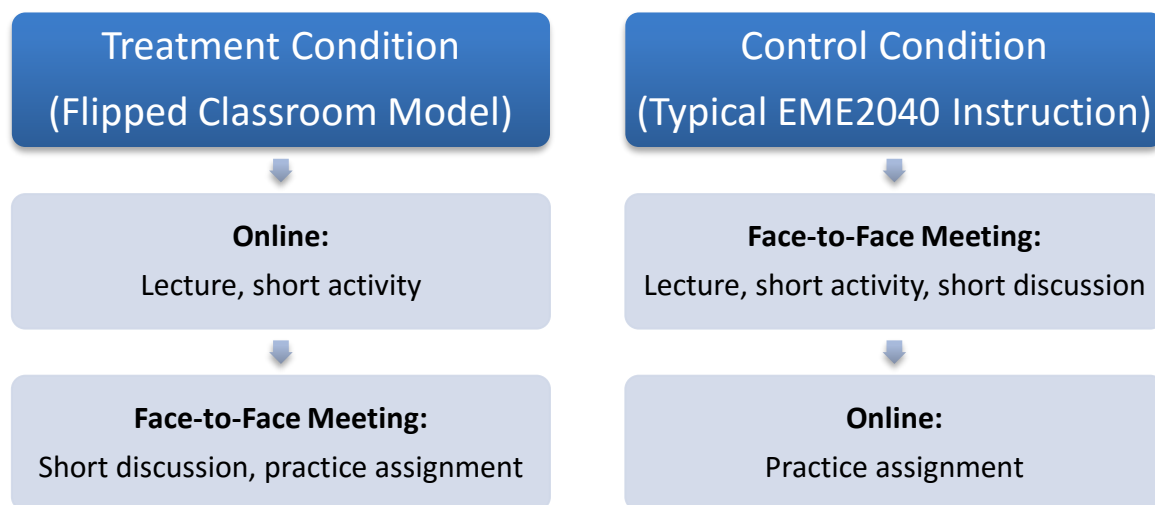


Figure 2-1. Module 5 treatment condition and control condition lesson plan synopsis

Participants

The participants in this study were the individuals enrolled in the course Introduction to Educational Technology (EME2040) at the University of Florida (UF) during the Fall 2017 semester. Enrollment for EME2040 is open to all undergraduate

learners at UF, regardless of their age, their major, or how close they are to graduation. This course consists of five sections (separate classes) and three instructors (two of the instructors teach two sections, one of the instructors teaches one section). Learners chose which section they are in through the UF course registration process without any knowledge of this study taking place. Three of the EME2040 sections were designated as the treatment condition, and two of the sections were designated as the control condition.

In the fourth face-to-face class meeting of the semester (one week before Module 5: All About Images [Part 1]) for this BL course, a short survey was collected to gather demographic and academic information of the participants. The survey also asked learners to how they would describe their experience in using Photoshop, giving them four options: no experience, limited experience, moderate experience, and extensive experience.

The updated Microsoft Excel spreadsheet kept on the researcher's laptop after data collection was complete included 103 total participants. Data for fifteen participants was then deleted due to not completing Informed Consent Forms, then another fifteen were deleted due to not completing the Demographic/Academic Survey. Finally, one more participant's data was deleted because they did not complete the Photoshop Post-test.

This left the researcher with data for 72 participants; 41 (56.9%) in the treatment condition group and 31 (43.1%) in the control condition group. Fifty-seven (79.2%) of the participants identified as female, and 15 (20.8%) of the participants identified as male. The mean age of the participants was 19.72 years old ($SD = 1.50$), with a

minimum of 18 years old and a maximum of 28 years old. Forty-one (56.9%) participants reported their ethnic background as White/Caucasian, followed by 18 (25%) Asian/Pacific Islander, 6 (8.3%) Hispanic/Latino, 5 (6.9%) Black/African American, 1 (1.4%) Native American, and 1 (1.4%) Other.

As for the academic information collected by the survey, 29 (40.3%) participants reported their major at UF as Elementary Education, followed by 12 (16.7%) Sports Management, 10 (13.9%) Telecommunications, 6 (8.3%) Public Relations, 5 (6.9%) Advertising, 3 (4.2%) Journalism, 3 (4.2%) Exploratory, and 1 (1.4%) of each of the following: Health Science, Pre-School Education, Spanish, Art Education, History, Business, and Family, Youth, and Community Service (the count adds up to more than 72 because some participants have multiple majors). Fourteen (19.4%) participants reported that they have minors, with 5 (6.9%) Business minors and 1 (1.4%) participant each with the following minors: Spanish, Photography, Sociology, Mass Communications, Non-Profit Organizational Leadership, Education, Theatrical Performance, Communication Studies, and Disabilities. As for prior Photoshop experience, 29 (40.3%) participants reported they had no experience, 30 (41.7%) said they had limited experience, 13 (18.1%) said they had moderate experience, and no participants said they had extensive experience.

Because EME2040 is an undergraduate course that consists of learners from a wide range of demographic and academic backgrounds, this sample is a strong representation for the target audience for this study. This mix of undergraduate learners with diverse backgrounds represents the same type of mix that make up the target

audience for this study and for general education technology literacy classes across the country.

Instruments

This study included various data collection instruments to attempt to answer the research question. These data collection instruments and their rationale related to the research question are summarized in Table 2-1:

Table 2-1. Data collection instruments and rationale related to the research question

Data Collection Instruments	Rationale
Demographic/Academic Survey	This survey recognized whether the sample represents the target population.
Photoshop Pre-test	This pre-test gathered baseline scores for the participants. This helped determine the impact of the method of instruction on learner achievement.
Practice Assignment	This assessment examined how the participants performed on a practice instructional task to explore if there is a correlation between score and the method of instruction.
Transfer Assignment	This assessment further examined how the participants performed on a transfer instructional task to explore if there is a correlation between score and the method of instruction.
Photoshop Post-test	This post-test gathered final scores that were compared to the baseline scores determined by the pre-test. Comparing these two scores for participants will help determine the impact of the method of instruction on learner achievement.
Learner Satisfaction Survey	This survey gathered the participants' satisfaction of the instructor and aspects of the module to observe if there is a correlation between learner satisfaction and the method of instruction.

Below, each data collection instrument is described in detail in terms of their components, their purpose, and their source or design rationale:

Demographic/Academic Survey

The Demographic/Academic Survey was presented to participants before the study began and collected online using Qualtrics. This survey is available in Appendix A. While the original plan was to collect this data on the computer-lab computers in the EME2040 classroom, circumstances out of the researcher's control required the researcher to send participants a link to the survey to be completed asynchronously on their personal laptops (aside from one section). More about this will be explained in the "Procedure" section. The primary purpose of this survey was to determine if the sample being used was representative of the target audience of the study (undergraduate learners of diverse ethnicities and various academic backgrounds), so appropriate items were presented.

The first item presented on the survey was a unique identification (ID) code for each participant. This ID was used throughout the entire study; participants used their unique IDs for all data collection instruments to easily link each participants' data together, and so participants can remain anonymous to the researcher. Following the ID, this survey consisted of five items questioning the participants about demographic information (including age, gender, and ethnic background), academic information (what majors and minors participants are pursuing at UF), and information about their Photoshop experience. For the question pertaining to Photoshop experience, it asked learners how they would describe their backgrounds in using Photoshop, giving them four options: no experience, limited experience, moderate experience, and extensive experience. This information was gathered for data analysis later in the study pertaining

to Photoshop experience playing a role in learner achievement on assessments and assignments during the study.

Photoshop Pre-test

The Photoshop Pre-test was completed by participants prior to the study beginning, also using Qualtrics. This pre-test is available in Appendix B. Once again, the original plan was to collect data on the computer-lab computers in the EME2040 classroom but instead, links to the survey were sent to participants (aside from one section). This pre-test was designed and used in this study for two reasons; the first being to collect a baseline score from each participant. This would be helpful when considering learner achievement and comparing this baseline score to the score participants receive on their post-test that was taken following the study. The other reason this pre-test was used was to “check on the equivalence of the groups” (treatment condition and control condition) (Gribbons & Herman, 1997, p. 3). This is useful because if results on the learner achievement measures later in the study show one group performing better than the other, the researcher “can rule out initial differences” as a description of the results (Gribbons & Herman, p. 3).

The Photoshop Pre-test was an eight-item multiple choice assessment. It was designed by the researcher (who is an EME2040 instructor) based on the learning objectives for the Photoshop lesson delivered in the EME2040 Photoshop lecture and assignments that follow. It includes questions pertaining to underlying Photoshop concepts, starting a Photoshop project, Photoshop tools, and completing a Photoshop project. The KR-20 for this pre-test was measured as .53. This is a result of the assessment being designed by the researcher without having the time or resources for

field or pilot testing prior to the launch of the study. The short number of assessment items could have also contributed to this score (Onuegbuzie & Daniel, 2002, p. 93).

Practice Assignment

The Practice Assignment (entitled the “Shoes Assignment” in EME2040) was the key assessment during Module 5: All About Images (Part 1). The directions for this assignment is available in Appendix C, and the rubric for this assignment is available in Appendix D. This assignment was taken from the EME2040 content, as it has been used for this Photoshop module in this course for several years. This instrument was used to gather scores to contribute to analyze learner achievement in the study and to examine what the impact of different instructional methods was on participants’ ability to practice the skills they learned from the lecture.

For this assignment, detailed instructions and all of the materials needed were posted within the module on Canvas. Learners were to follow the directions exactly to create a specific image (four types of shoes, with labels, and a specific background and title). The Practice Assignment had learners download four pictures of shoes and use these pictures along with assorted Photoshop tools to create several layers within Photoshop and manipulate their new image in various ways. Within Module 5 on the Canvas course website, learners could either view or download the Practice Assignment directions. Learners were to follow these directions precisely to create the correct final image and receive full credit. This assignment acted as a practice assessment for the participants, which Kruse (2009) describes as “an opportunity for learners to confirm their correct understanding” and to use the repetition of practice to increase retention of skills learned (p. 2).

This is a strong assessment to measure learner achievement in terms of practicing new skills because of the specificity of the final product. This limited the possibility of subjectivity influencing scoring the learner achievement on the assessment. This resulted in a reliable assessment because “the extent to which the assessment tasks, and the criteria used in judging them, are specified are key variables affecting dependability” (Harlen, 2005, p. 213).

The criteria used to assess the Practice Assignment was specified in a detailed rubric, which was also posted in Module 5 on Canvas. The rubric used eight “Essential Components” of the final image to assess the learners on their achievement. This is useful for learners because they can check to make sure these components are involved, and is beneficial for instructors because it is a straightforward, non-biased way to score the assignment.

Transfer Assignment

The Transfer Assignment (entitled the “Visual Image Project” in EME2040) was the key assessment in Module 6: All About Images (Part 2). The directions for this assignment are available in Appendix E, and the rubric for this assignment is available in Appendix F. This assignment was taken from the EME2040 content, as it has been used for this Photoshop module in this course for several years. This instrument was used to gather scores to contribute to analyze learner achievement in the study and to examine what the impact of different instructional methods was on transferring skills to application.

While the Practice Assignment was detailed in directions and protocol, the Transfer Assignment was open-ended and did not give participants specified instructions about exactly what to do. Instead, the directions simply asked participants

to “design an image that correlates to an aspect or theme related to your field of study or area of interest” (from the Visual Image Project directions on the EME2040 Canvas course website). While the Practice Assignment assessed practicing the skills gained from viewing the Module 5 lecture, the Transfer Assignment assessed the participants’ ability to transfer those skills to a creative application. Ford, Smith, Weissbein, Gully, and Salas (1998) describe transfer of learning to occur when learners “acquire knowledge, skills, and attitudes and then apply these capabilities to other contexts” (p. 218). Kruse (2009) states that the final instructional event of Gagne’s (1965) Nine Events of Instruction includes improving retention and transferring knowledge, and further describes this step as “retrieval and generalization of learned skill to new situation” (p. 1). In this study, the purpose of this assessment is to examine learner achievement in terms of participants retrieving knowledge from the previous module and applying the skills they learned to this new, creative project.

The criteria used to assess the Transfer Assignment was specified in a detailed rubric, which was also posted in Module 6 on Canvas for participants to review prior to submitting their assignment. The rubric is consistent with the directions in that it is more open-ended than the Practice Assignment rubric. This rubric examines the participants’ “ability to find and use Photoshop tools to manipulate the various images and layers,” their ability to portray “a clear theme, purpose, or message,” and their ability to produce a high-quality, professional looking image to assess the learners on their achievement (from the Visual Image Project rubric on the EME2040 Canvas course website). This is useful for learners because they can check to see the criteria in which they are being

assessed, and is beneficial for instructors because it gives a direction and focus for scoring the assignment.

Photoshop Post-test

The Photoshop Post-test was completed by participants following the end of the study, using Qualtrics on the computer-lab computers in the EME2040 classroom. This post-test is available in Appendix G. This post-test was designed to collect a final score for considering learner achievement by comparing it to the baseline score from the pre-test. This is considered a “gain score,” and Dimitrov and Rumrill (2003) state that “the reliability of gain scores is high in many practical situations” (p. 164).

The Photoshop Post-test was an eight-item multiple choice assessment. The items were the same as the items on the pre-test used before the study began, but the questions were presented in a different order than those on the Photoshop Pre-test. Also, the multiple-choice answer distractors for each question were presented in a different order on the post-test. The same items were used on the post-test as the pre-test to ensure consistency between the two assessments. The researcher did not want differences in the assessments to impact the results of the study. Also, because the two assessments are taken by participants exactly three weeks apart from one another with multiple instructional events in-between, the researcher believed participants would not be able to remember individual items from the pre-test when they are completing the post-test. Finally, participants never received feedback from their pre-test, so they did not gain knowledge about those specific assessment items in terms of if they were correct or incorrect on the pre-test. The KR-20 for this post-test was measured as .24. This is a result of the assessment being designed by the researcher without having the time or resources for field or pilot testing prior to the launch of the study. The short

number of assessment items could have also contributed to this score, along with having basic, easy items that did not differentiate between participants (Onuegbuzie & Daniel, p. 93).

Learner Satisfaction Survey

The Learner Satisfaction Survey was presented to participants following the end of the study and collected using Qualtrics on the computer-lab computers in the EME2040 classroom. This survey is available in Appendix H. The purpose of this survey was to collect information on the satisfaction of the learners in terms of the instructor and aspects of the material in order to determine what impact the different instructional methods had on learner satisfaction.

This survey was taken from a similar study that Lim, Morris, and Kupritz conducted in 2007. These researchers used their survey to compare the learner satisfaction of participants in online learning instruction with the satisfaction of those taking part in BL instruction. While the study being described in this paper compares two forms of BL instead, the component of the survey that is being used still captured learner satisfaction and allowed the researcher to analyze the data to compare two methods of instruction.

The Learner Satisfaction Survey is a 10-item Likert scale type of survey, with the participants choosing a response for each item on a five-point scale. A Likert scale type of survey was implemented as part of the study because these surveys are “so widely used in the social sciences, both as research tools and in practical applications” (Matell & Jacoby, 1971, p. 657). Each item brings attention to an aspect of the instructor or the module material, and the participants are to select their perception of that aspect of instruction from “ineffective” to “very effective.” The range of responses (from 1-5,

respectively) are: “ineffective,” “somewhat effective,” “moderately effective,” “effective,” and “very effective.” The survey items include instructor helpfulness, concern, willingness to listen to learners, use of examples, availability of extra help, use of questioning, command of the subject matter, presentation of information, ability to summarize important points, and use of web technologies in instruction. Cronbach’s α for this survey was measured as .93.

Procedure

Prior to the Fall 2017 semester beginning, the researcher (who is also one of the EME2040 instructors) met with the other two EME2040 instructors to discuss plans for the study in the upcoming semester. The purposes of this meeting were to inform the other instructors of the study that would be taking place in the upcoming semester and to designate which EME2040 sections would be part of the treatment condition (using the FC model for instruction) and which sections would be part of the control condition (using typical EME2040 instruction). To limit the likelihood that the time of the day may act as an extraneous variable in the study, it was attempted to assign as close to an equal amount of morning and afternoon classes to each type of instruction as possible. The result of this was having three treatment condition sections (one morning, one midday, and one afternoon) and two control condition sections (one morning and one afternoon). This step was taken because Johnson and Christenson (2008) state that an extraneous variable “makes the interpretations of the research findings very difficult” (p. 42). The researcher and one instructor each taught one treatment condition section and one control condition section, and the third instructor taught only a treatment condition section (to make up five sections total).

As for informing the other two EME2040 instructors of the study that would be taking place in the following semester, the following table (Table 2-2) was presented by the researcher at this meeting and acts as a synopsis for the instructional events that took place from weeks 4-7 during the Fall 2017 semester, regarding the study. Module 4 and Module 7 topics are not included in this table because while events occurred for the purposes of the study, the topics of these modules were unrelated to the study. Module 5: All About Images (Part 1) is the module in which the different instructional methods will be implemented.

Table 2-2. Weeks 4-7 Instructional Events

Control Condition: Typical EME2040 Instruction	Treatment Condition: Flipped Classroom Model
MODULE 4: 1. Demographic/Academic Survey 2. Photoshop Pre-test	MODULE 4: 1. Demographic/Academic Survey 2. Photoshop Pre-test
MODULE 5: All About Images (P. 1) <ul style="list-style-type: none"> • In-Class <ol style="list-style-type: none"> 1. Face-to-face Lecture 2. Photoshop Tools Handout 3. Short Discussion • Online <ol style="list-style-type: none"> 4. Practice Assignment 	MODULE 5: All About Images (P. 1) <ul style="list-style-type: none"> • Online <ol style="list-style-type: none"> 1. Web-based Lecture 2. Photoshop Tools Handout • In-Class <ol style="list-style-type: none"> 3. Short Discussion 4. Practice Assignment
MODULE 6: All About Images (P. 2) 1. Transfer Assignment	MODULE 6: All About Images (P. 2) 1. Transfer Assignment
MODULE 7: 1. Photoshop Post-test 2. Learner Satisfaction Survey	MODULE 7: 1. Photoshop Post-test 2. Learner Satisfaction Survey

Following this EME2040 instructors meeting, the Fall 2017 semester began. The first event of the study did not take place until the fourth week of the semester, during the Module 4 face-to-face class meeting.

Before each EME2040 face-to-face class meeting throughout the study, the researcher met with the other two EME2040 instructors to discuss plans for the study and to train the instructors to ensure consistency between the instructors. For the Module 4 face-to-face meeting, the researcher informed the instructors prior to this class meeting that the only aspects of the study that had to be completed that week were the Demographic/Academic Survey and the Photoshop Pre-test.

The original plan was for participants to arrive at the face-to-face meeting for Module 4 and log onto the computer-lab computers (there is one computer located at each seat) in the designated EME2040 classroom to complete the Demographic/Academic Survey and the Photoshop Pre-test. The type of computers in this computer-lab classroom are 26 – 27" iMac, 2.9GHz quad-core Intel Core i5, 1TB HDD, 8GB 1600MHz DDR3 memory, 4 USB 3.0, 2 Thunderbolt, SDXC Card reader. However, due to a hurricane resulting in UF cancelling classes for Monday, Tuesday, and Wednesday of week 4 of the Fall 2017 semester, and then a pipe bursting in the same building as the EME2040 computer lab classroom resulting in the room being unusable for a period of time, adjustments had to be made.

Four of the five EME2040 sections that took part in this study had their Module 4 face-to-face meeting cancelled; the section that was not cancelled was forced to switch locations due to the burst pipe. The new location was not a computer lab, so data collection occurred using the participants' personal laptops instead of the computer-lab computers. For the sections that did not meet for Module 4, the Demographic/Academic Survey and the Photoshop Pre-test were emailed to each participant, along with

detailed instructions on how to complete these surveys and that they were due prior to the next face-to-face meeting (Module 5).

The Demographic/Academic Survey was presented online using Qualtrics. Instructors provided each participant with a unique identification (ID) code; for the sections who did not meet for Module 4, these ID codes were sent to participants through emails. The instructors provided the participants with files that contained these ID codes to use as a reference, as this ID code will be used instead of participant names for all study events and materials. Instructors also kept these files on hand in case participants needed them. ID codes were used in this study instead of names so the data from each participant can be linked throughout the study and the data analysis process, while ensuring anonymity for the participants throughout the study.

After completing this survey, the participants were asked to complete the Photoshop Pre-test. For the sections that did not meet for Module 4, the instructions in the emails sent out told participants to complete this pre-test following the Demographic/Academic Survey. For the one section that did meet for Module 4, this pre-test was also completed online on the participants' personal laptops. This pre-test was also presented to participants online using Qualtrics. Participants inputted their ID codes in the designated area and then completed the eight-item multiple choice pre-test. When finished, Module 4 instruction began, unrelated to the study. Participants in sections in which class was cancelled for Module 4 simply completed the online material associated with this module.

The emailed instructions for those sections that did not have a Module 4 face-to-face meeting had to include different instructions based on whether participants were in

a treatment condition section or a control condition section. For those in the treatment condition sections (using the FC model), instructors gave directions to the participants that their homework was to complete the Demographic/Academic Survey and the Photoshop Pre-test prior to viewing the web-based lecture and completing the Photoshop Tools Handout. All of these instructional tasks were due online by 11:59pm on the day before the Module 5 face-to-face meeting the following week. This would ensure that these participants viewed and completed the proper materials so they would be prepared when arriving at the Module 5 face-to-face meeting. Control condition sections did not have any homework for Module 4 aside from completing the Demographic/Academic Survey and the Photoshop Pre-test.

The one section that had a Module 4 face-to-face meeting was a treatment condition section. At the end of the meeting, the instructor gave directions to the participants that their homework was to view the web-based lecture and complete the Photoshop Tools Handout online by 11:59pm on the day before the Module 5 face-to-face meeting the following week.

Following the conclusion of Module 4, the researcher created two new Microsoft Excel spreadsheets on his 13-inch MacBook Air laptop for data collection and storage. The researcher was the only person with access to this laptop and these spreadsheets. The first spreadsheet consisted of only two data points: the participants' names and their corresponding ID codes. The purpose of this spreadsheet was so EME2040 course credit could be given to participants for completing course assignments following the completion of the study (because ID codes only, instead of participant names, were used for course assignments throughout the study). After this spreadsheet was created

and updated with all of the participants' names and corresponding ID codes, this spreadsheet remained unopened and secure on the researcher's MacBook Air laptop until the data analysis process was complete. Only after the data analysis process was complete did the researcher open this spreadsheet and link the ID codes back to the participants' names so EME2040 course credit can be given.

The second Microsoft Excel spreadsheet that was created by the researcher following the completion of Module 4 was the data collection spreadsheet. At the time of creation, this spreadsheet contained the participants' ID codes, their Demographic/Academic Survey data, and their correlating pre-test scores. As each data collection instrument was used, the corresponding scores from those instruments were added to this spreadsheet throughout the study. This spreadsheet was also stored and secure on the researcher's MacBook Air laptop in which only he had access.

The next instructional events that occurred during the study were those included in Module 5: All About Images (Part 1). For the treatment condition sections, homework was assigned to watch the web-based lecture and complete the Photoshop Tools Handout prior to the Module 5 face-to-face meeting. The web-based lecture was led by the researcher and used the screen-capture technology Capto to record the researcher's screen as he discussed and displayed examples of underlying Photoshop concepts, starting a Photoshop project, Photoshop tools, and completing a Photoshop project. The lecture lasted 26 minutes and 30 seconds. In Gagne's (1965) Nine Events of Instruction, this lecture played the role of the fourth event, "where new content is actually presented to the learner" (Kruse, 2009, p. 2). This lecture was posted online for viewing in the Module 5 section of the EME2040 Canvas course website for the

treatment condition sections; learners could watch it whenever convenient for them, as long as it was prior to the Module 5 face-to-face class meeting.

Along with viewing the web-based lecture, learners in the sections implementing the FC model were to complete the Photoshop Tools Handout asynchronously prior to the Module 5 face-to-face meeting. The Photoshop Tools Handout, which can be found in Appendix I, was an activity to give the learners an opportunity to practice minor aspects of what they learned from the lecture. This assignment is not worth a significant amount of points, and was not collected as data for the study. Instead, it was simply reviewed by EME2040 instructors as “complete” or “incomplete.” It also helped learners with their future assignments by introducing them to using the Photoshop application and its interface. It asked learners to find fourteen Photoshop tools on the Photoshop interface and to insert screenshots of these tools in a table. All of the tools that the learners were required to find in the handout were used at some point in the Practice Assignment assessment that occurred later in the study. Garrison and Vaughan (2008) describe activities that act as a bridge between the content and the future activity as instructional events “that provide entry points for connecting new information with the recall of prior, related learning experiences” (p. 114). This handout was made available and completed by participants asynchronously through Module 5 of the EME2040 Canvas course website.

For the control condition sections (those employing typical EME2040 instruction) the lecture and the Photoshop Tools Handout took place during the Module 5 face-to-face course meeting. Prior to this face-to-face meeting, the researcher met with the other two EME2040 instructors to train them on how to best deliver the lecture, facilitate

the short discussion, and organize the rest of the instruction for Module 5. As part of the training, the two instructors viewed the web-based lecture that the researcher had recorded and were supplied with the same script that the researcher used to present the web-based lecture (this lecture script can be found in Appendix J). The researcher also informed the other instructors to explain and display through a projector the on-screen actions taken while giving the lecture, providing the instructors with explicit instructions on examples to show participants as they lecture about Photoshop. The instructors were also told by the researcher to encourage the learners to follow along by performing the same examples being explained on their own computers. As for the short discussion, the researcher gave each instructor a script that included the topics that the discussion should cover (this discussion script can be found in Appendix K). This EME2040 instructors' meeting ensured that the different instructors would be consistent in their face-to-face lectures and discussions, so all participants receive consistent instruction.

Module 5: All About Images (Part 1) was the EME2040 module in which the implementation of the two instructional methods occurred. Table 2-3 provides a summary of the two different conditions and the instructional events that take place.

Table 2-3. Module 5 Treatment and Control Condition Instructional Events

Treatment Condition Sections	Control Condition Sections
Before the face-to-face meeting (Online):	During the face-to-face meeting:
1. View web-based lecture on Photoshop tools	1. Live Lecture on Photoshop tools
2. Photoshop Tools Handout completed online	2. Photoshop Tools Handout completed in EME2040 classroom
	3. Short discussion on the material and the upcoming assignment
During the face-to-face meeting:	After the face-to-face meeting (Online):
1. Short discussion on the material and the upcoming assignment	1. Practice Assignment (assessment)
2. Practice Assignment	

Control condition sections of EME2040 received their lecture from their respective instructors during the Module 5 face-to-face class meeting. This lecture lasted about the same amount of time as the web-based lecture (25-30 minutes), as instructors explained the various Photoshop concepts and provided examples projected on the screen in the front of the EME2040 classroom. Participants were encouraged by their instructors to follow along on their own computers. This lecture occurred in a different room than the original EME2040 classroom (due to the burst pipe mentioned earlier), but the new classroom was another computer lab with the same models of computers at each seat. Following the live lecture, participants in the control condition sections completed their Photoshop Tools Handout on the computer-lab computers. For the final five minutes of the face-to-face meeting, the instructor facilitated a short discussion. The topics of this discussion included “learner questions from the lecture or Photoshop Tools Assignment,” “possible challenges while using Photoshop,” “possible professional applications of using Photoshop,” and “a look ahead to Practice Assignment and Transfer Assignment.” This discussion covered the learners’ questions from the lecture and the Photoshop Tools Handout while also acting to “establish communication with the learners so that they are clear about the rationale and expectations” for the upcoming Practice Assignment (Garrison & Vaughan, p. 115). Finally, the face-to-face meeting for the control condition sections concluded with the instructor assigning the Practice Assignment to be completed asynchronously as homework. This assignment was to be completed by participants individually any time before the next face-to-face meeting (Module 6). Instructors also reminded participants to label their assignments with only their ID codes instead of their names.

As stated earlier, treatment condition sections of EME2040 viewed the web-based lecture and completed the Photoshop Tools Handout activity asynchronously, prior to attending the Module 5 face-to-face meeting. Just like for the control condition sections, treatment condition Module 5 meetings could not be held in the original EME2040 classroom (due to the burst pipe). Two treatment condition sections were held in the same computer lab as the Module 5 control condition sections (with the same computer lab computers as the typical EME2040 classroom. The final treatment condition section, however, was held in a classroom that did not have computers (due to UF classroom-scheduling conflicts). For this class, participants worked on their personal laptops instead of computer-lab computers.

This face-to-face meeting in these FC model sections began with the same short discussion that the control condition sections ended with, covering the same topics to ensure consistency. Following the conclusion of the discussion, the rest of the face-to-face meeting time was used for participants to complete the Practice Assignment. While the participants were in the act of completing the assignment, the instructor provided support and assistance to learners while also encouraging learners to have discussions, assist one another, communicate, and collaborate (this was also part of the training that the researcher shared with other EME2040 instructors prior to this module). The researcher informed the instructors to do this to take advantage of the FC model's "learner-centered opportunities in class for greater teacher-to-student mentoring and peer-to-peer collaboration" (Roehl, Reddy, and Shannon, 2013, p. 46). Most participants completed their Practice Assignment during the Module 5 face-to-face meeting; those who did not, however, finished it as homework prior to the Module 6 face-to-face

meeting. Instructors also reminded participants to label their assignments with only their ID codes instead of their names.

After the participants submitted their Practice Assignments via the EME2040 Canvas course website, files were immediately downloaded so that only the ID codes labelling the assignments could be viewed by instructors instead of the participants' names. The instructors assessed each assignment based on the Practice Assignment Rubric. When finished with grading, the instructors sent the participants' ID codes and correlating Practice Assignment scores to the researcher for data storage in the Microsoft Excel spreadsheet on the researcher's MacBook Air laptop. For the EME2040 sections in which the researcher taught, however, all Practice Assignments were assessed with the assistance of one of the other EME2040 instructors. This ensured that bias did not influence the results, and helped contribute to more consistent grading between instructors. When assessment of the Practice Assignments was complete, the scores were saved securely with the correlating ID codes in the Microsoft Excel spreadsheet.

For the rest of the study, the events for both the treatment condition sections and the control condition sections were held constant. For the next module, Module 6: All About Images (Part 2), participants arrived at their Module 6 face-to-face meeting and received directions about the Transfer Assignment, the next instructional event of the study. Instructors also reminded participants to label their assignments with only their ID codes instead of their names. The rest of the Module 6 face-to-face meeting was dedicated to allowing participants to brainstorm ideas for this Transfer Assignment and start to work on it for those who were ready. After this meeting, participants were to

complete the Transfer Assignment asynchronously and submit it via the EME2040 Canvas course website prior to the Module 7 face-to-face meeting.

After the participants submitted their Transfer Assignments, files were immediately downloaded so that only the ID codes labelling the assignments could be viewed by instructors instead of the participants' names. Prior to grading these Transfer Assignments, the researcher met with the other two EME2040 instructors to discuss consistency using the Transfer Assignment Rubric. Because this assignment and its rubric were more open-ended and subjective than the Practice Assignment, it was necessary to find consistent, common ground in grading and establish inter-rater reliability among instructors (Gwet, 2014, p. 4). To do this, the researcher and the two other EME2040 instructors independently graded the first 28% (20 out of 72) of the Transfer Assignments that were submitted. Scores for each individual submission were discussed in-depth, with conversations between instructors covering the rubric, professional appearance, theme, and proof of mastery over Photoshop concepts. This lead to vastly improved consistency in grading among instructors by the end of the meeting.

The instructors assessed the rest of the Transfer Assignments independently. When finished grading, the instructors sent the participants' ID codes and correlating Transfer Assignment scores to the researcher for data storage in the Microsoft Excel spreadsheet on the researcher's MacBook Air laptop. For the EME2040 sections in which the researcher taught, however, all Transfer Assignments were assessed with the assistance of one of the other EME2040 instructors. When assessment of the Transfer

Assignments was complete, the scores were saved securely with the correlating ID codes in the Microsoft Excel spreadsheet.

The last events of the study for the participants took place during the Module 7 face-to-face meeting. Participants arrived at the meeting, logged on to the computer-lab computers in the EME2040 classroom to complete the Photoshop Post-test.

Participants inputted their ID codes and took this 10-item, multiple choice assessment that was presented online using Qualtrics. After participants completed the Photoshop Post-test, they were asked to complete the Learner Satisfaction Survey. This was also presented online using Qualtrics and completed on the computer-lab computers in the EME2040 classroom. When participants were finished with this survey, events of the study were officially complete. The rest of the Module 7 face-to-face meeting was used for EME2040 instruction that was unrelated to the study.

After the Module 7 face-to-face meetings, the researcher collected the scores from the Photoshop Post-test and the data from the Learner Satisfaction Survey and securely inputted it into the Microsoft Excel data sheet for data analysis. Only after data analysis was complete and results were recorded did the researcher open the original Microsoft Excel spreadsheet that contained the participant names and correlating ID codes to give the participants EME2040 course credit for the assignments that took place during the study. When the data analysis process was complete, the results of the study were recorded, and all participants had received appropriate EME2040 course credit, the researcher deleted both Microsoft Excel spreadsheets permanently.

Data Analysis

This study employed the Analysis of Covariance (ANACOVA) and Analysis of Variance (ANOVA) models to compare the mean response between the treatment

group and the control group in terms of the learner achievement and learner satisfaction quantitative data (Keith, 2014, p. 155). An ANACOVA was run on the learner achievement data from the Photoshop Pre-test/Photoshop Post-test, while ANOVAs were run for the Practice and Transfer Assignments and the Learner Satisfaction Survey. Levene's Test for Equality of Variances was used to test if homogeneity of variance was equal across groups (Brown & Forsyth, 1974, p. 364). The researcher also tested for normality by examination of skewness and kurtosis. The statistical software SPSS Version 24 was used to analyze the data in this study.

Validity and Reliability

Demographic surveys have been used in numerous empirical studies and validated by many researchers. The learner achievement assessments used in the study have specific performance tasks and the rubrics used to score the achievement of the learners have detailed criteria to ensure dependability. The researcher and the other EME2040 instructors met to establish inter-rater reliability (Gwet, 2014, p. 4). The survey used to measure learner satisfaction was used in an empirical study and was validated by researchers. The participants of this study are representative of the target population (undergraduate learners with diverse demographic and academic backgrounds).

Chapter 2 Summary

This study employed a quasi-experimental pre-test/post-test design consisting of two groups: the treatment condition (EME2040 sections in which instructors implemented the FC model for the module that was the focus of the study) and control condition (EME2040 sections in which instructors taught the module using typical EME2040 instruction). The implementation of the FC model was the independent

variable in this study, while the dependent variables included learner achievement and learner satisfaction. Participants were undergraduate students at UF who registered for EME2040 for the Fall 2017 semester. These UF students were not aware of this study existing when they registered to take the course. The three EME2040 instructors (the researcher and two others) met weekly throughout the Fall 2017 semester to discuss the research study plans and for training to increase consistency between instructors. Three EME2040 sections were chosen for the treatment condition (implementing the FC model) and two EME2040 sections were chose for the control condition (typical EME2040 instruction). Data was collected throughout the study, which lasted from week four of the semester to week seven, using a Demographic/Academic Survey, a Photoshop Pre-test, a Practice Assignment, a Transfer Assignment, and Photoshop Post-test, and a Learner Satisfaction Survey. All events of the study were held constant between the treatment and control conditions except for those events occurring during Module 5. For this module, the treatment condition implemented the FC model (a web-based lecture being viewed and a handout being completed prior to class, then a discussion and the Practice Assignment taking place in class) and the control condition employed typical EME2040 instruction (lecture, handout, and discussion taking place in class, then the Practice Assignment completed as homework after class). This study employed the Analysis of Covariance (ANACOVA) and Analysis of Variance (ANOVA) models to compare the mean response between the treatment group and the control group in terms of the learner achievement and learner satisfaction data.

CHAPTER 3 RESULTS

This study examines the research question, “What impact does implementing a flipped classroom (FC) model have on learner achievement and learner satisfaction in an undergraduate, technology literacy course?” The researcher used the statistical software SPSS Version 24 to analyze the responses from the participants on various surveys, assessments, and assignments during the instruction of the undergraduate, technology literacy course Introduction to Educational Technology (EME2040). The instruments used to collect these responses were the Photoshop Pre-test, the Practice Assignment, the Transfer Assignment, the Learner Satisfaction Survey, and the Photoshop Post-test. The control condition group received typical EME2040 instruction while the treatment condition group received instruction using the FC model. Refer to Table 2-2 to view the instructional events that took place throughout this study.

This chapter presents the results from data analysis based on the two dependent variables in this study: learner achievement and learner satisfaction. Each of these dependent variables is broken down into analyses of participant responses from the various instruments used to collect the data pertaining to learner achievement and learner satisfaction.

Learner Achievement

Photoshop Pre-test/Photoshop Post-test

The researcher collected and analyzed data from participants using the same assessment (with questions and multiple-choice answers in a different order) both prior to and following the instruction that was the focus of the study. The researcher coded responses from these assessments as correct (1) or incorrect (0). The maximum

amount of points that could be achieved on each of these assessments was eight. The assumption of homogeneity was met, indicated by Levene's Test of Equality of Error Variances at $F(1,67) = 2.91, p = .09$. There were no severe departures from normality for the post-test, as skewness was $-.30$ and kurtosis was $-.78$.

The descriptive statistics (mean and standard deviation) for these assessments can be seen in Table 3-1. The difference between the treatment and control groups on the Photoshop Post-test while controlling for the Photoshop Pre-test was not statistically significant at $F(1,69) = 0.22, P = .64$.

Table 3-1. Photoshop Pre-test/Post-test Descriptive Statistics

	Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Control	3.10	1.51	6.55	1.06
Treatment	3.53	1.87	6.51	1.23

Practice Assignment

The researcher collected and analyzed graded scores from the EME2040 Practice Assignment, which had participants follow specific directions to create an image using the Photoshop application. The researcher and EME2040 instructors graded these assignments based on a rubric with a range of 0-4 points, using increments of 0.5 points. The assumption of homogeneity was not met, as Levene's Test of Equality of Error Variances was statistically significant at $F(1,69) = 4.58, p = .04$. Procedures required to overcome the assumption of homogeneity not being met were beyond the scope of this study. For the Practice Assignment, skewness was -2.52 and

kurtosis was 9.17. Because this was a straightforward and simple assignment for participants, scores were very high, resulting in the distribution being high.

The descriptive statistics (mean and standard deviation) for this assignment can be seen in Table 3-2. For this assignment, the difference between the treatment and control groups was statistically not significant at $F(1,71) = 0.52, p = .47$.

Table 3-2. Practice Assignment Descriptive Statistics

	<i>M</i>	<i>SD</i>
Control	3.62	.69
Treatment	3.71	.35

Transfer Assignment

The researcher collected and analyzed graded scores from the EME2040 Transfer Assignment, which had participants creatively apply the knowledge they gained from instruction and practice to an open-ended project. Ford, Smith, Weissbein, Gully, and Salas (1998) describe transfer of learning to occur when learners “acquire knowledge, skills, and attitudes and then apply these capabilities to other contexts” (p. 218). The researcher and EME2040 instructors graded these assignments based on a rubric with a range of 0-4 points, using increments of 0.5 points. The assumption of homogeneity was met, indicated by Levene’s Test of Equality of Error Variances at $F(1,69) = 0.03, p = .87$. There were no severe departures from normality for this assignment, as skewness was -.06 and kurtosis was -.49.

The descriptive statistics (mean and standard deviation) for this assignment can be seen in Table 3-3. For this assignment, the difference between the treatment and control groups was statistically not significant at $F(1,71) = 0.13, p = .72$.

Table 3-3. Transfer Assignment Descriptive Statistics

	<i>M</i>	<i>SD</i>
Control	2.82	.68
Treatment	2.88	.75

Learner Satisfaction

Learner satisfaction survey: The researcher collected and analyzed responses from the Learner Satisfaction Survey, which gathered information pertaining to the participants' perceptions of the instructor and the instruction. It was a Likert-scale type survey, with responses coded as ineffective(1), somewhat effective(2), moderately effective(3), effective(4) very effective(5). The maximum score possible on this survey is 50, with a minimum of 10. Levene's Test of Equality of Error Variances was statistically significant at $F(1,70) = 11.70$, $p = .001$; therefore, the assumption of homogeneity was not met. Procedures required to overcome the assumption of homogeneity not being met were beyond the scope of this study. There were no severe departures from normality for this assignment, as skewness was -1.28 and kurtosis was 1.88.

The descriptive statistics (mean and standard deviation) for this survey can be seen in Table 3-4. For this survey, the difference between the treatment and control groups was statistically significant at $F(1,72) = 8.77$, $p = .004$, in favor of the control condition.

Table 3-4. Learner Satisfaction Survey Descriptive Statistics

	<i>M</i>	<i>SD</i>
Control	47.19	3.04
Treatment	43.85	5.69

Chapter 3 Summary

This study aimed to answer the research question, “What impact does implementing a FC model have on learner achievement and learner satisfaction in an undergraduate, technology literacy course?” To do this, the researcher analyzed responses on various instruments that were designed to measure learner achievement and learner satisfaction. These responses came from participants in two groups: the control condition group, which received typical EME2040 instruction, and the treatment condition group, which received instruction using the FC model. The instruments in which the responses were analyzed included the Photoshop Pre-test, the Practice Assignment, the Transfer Assignment, the Learner Satisfaction Survey, and the Photoshop Post-test. It was found that the difference between the treatment and control groups on the Photoshop Post-test while controlling for the Photoshop Pre-test was not statistically significant. Results indicated that the differences between the treatment and control groups on the Practice Assignment and Transfer Assignment were also statistically not significant, demonstrating that there was not a statistically significant difference between groups in terms of the dependent variable learner achievement. In examining learner satisfaction, however, analysis of the Learner Satisfaction Survey demonstrated that the difference between the treatment and control groups was statistically significant in favor of the control condition. Levene’s Test of Equality of Error Variance indicated that the assumption for homogeneity was met for Photoshop Pre-test, the Photoshop Post-test, and the Transfer Assignment; however, this assumption was not met for the Practice Assignment and the Learner Satisfaction Survey. There were no severe departures from normality from any of the instruments aside from the Practice Assignment.

CHAPTER 4 DISCUSSION

With blended learning (BL) environments gaining popularity and even predicted to become the norm in higher education (Norberg, Dzuiban, & Moskal, 2011, p. 4), the researcher aimed to contribute to BL knowledge and shed light on the best BL practices in a specific context through this study. The researcher examined two different BL techniques in an undergraduate, technology literacy course and measured their impacts on learner achievement and learner satisfaction. The researcher collected and analyzed data from the control condition group, in which participants received typical EME2040 instruction (live lecture in class, practice for homework), and the treatment condition group, in which participants received instruction through the flipped classroom (FC) model (web lecture viewed prior to class, practice collaboratively in class). Refer to Table 2-2 to view the instructional events that took place throughout the study for each condition. The goal of this study was to assess the impact of the FC model on learner achievement and learner satisfaction.

Learner Achievement

The first part of the research question that the researcher aimed to answer concerns the impact of the FC model on learner achievement in an undergraduate, technology literacy course. Following data analysis, it was found that there was no statistical significant difference between the treatment group and the control group in terms of learner achievement. The instruments that collected data that measured learner achievement included the Practice Assignment, the Transfer Assignment, and the Photoshop Post-test (while controlling for the Photoshop Pre-test). This indicates

that the FC model had no significant impact on learner achievement in this undergraduate, technology literacy course.

Research reviewed prior to the study proposed many advantages of using the FC model that lead to improvements in learner achievement, such as the individualized instruction opportunities prior to class meetings and the collaborative practice activity opportunities during class meetings (Davies, Dean, & Ball, p. 3; Garrison & Vaughan, 2008, p. 117). However, the results indicated that these proposed advantages either did not occur or did not lead to a significant impact on participants.

One possible reason for these advantages not occurring or not leading to a significant impact on learner achievement is the nature of the content of the Photoshop modules being overly simple and not complex. Sweller, Ayres, and Kalyuga (2011) state that learners process information in working memory, and one of the two categories that can impose a load on working memory is called “intrinsic cognitive load” (p. 57). Intrinsic cognitive load is defined as “the intrinsic nature of the information and that load” that is imposed on working memory (Sweller et al., p. 57). Sweller (1994) states that the primary determinant of intrinsic cognitive load is element interactivity, which is “the extent to which the elements of a task can be meaningfully learned without have to learn the relations between any other elements” (p. 304). Sweller goes on to describe important characteristics that contribute to element interactivity, describing these characteristics to be that a task is simple and that any material that needs to be learned “is simple to learn and largely independent of every other element” (p. 304). The content presented in the Photoshop modules that took place in this study appear follow these descriptions of low element interactivity: tasks were simple (for example, “click the paint

bucket tool to select a foreground and background color”), and each skill that needed to be learned was largely independent of other Photoshop skills (for example, learners did not need to understand how to use the paint bucket tool to understand how to use the text tool). This low element interactivity suggests that the information presented during instruction also had low intrinsic cognitive load.

This low intrinsic cognitive load is also evident from the high mean scores from both groups on the instruments that assessed the participants on their Photoshop knowledge through low-level direct practice and recall (Bloom, 1956, p. 20). This includes the Practice Assignment, which evaluated participants based on their ability to follow directions to practice their new knowledge of Photoshop skills, and the Photoshop Post-test, which assessed participants’ Photoshop knowledge at the conclusion of the study. The researcher is exclusively considering low-level assessments that followed instruction to support this explanation, because low-level assessments can be expected to reflect more directly on the level of complexity of the material (because the learner is asked to perform less-complex tasks [Bloom, p. 20]) and because participants cannot be expected to have knowledge about a topic prior to instruction (no participants reported that they had extensive Photoshop experience prior to the launch of the study). Thus, the Transfer Assignment, which included higher-level Photoshop application rather than a lower-level assessment of Photoshop knowledge (Bloom, p. 20), and the Photoshop Pre-test, which was completed prior to instruction, were not considered in this section.

For the Practice Assignment, the treatment group recorded an average score of 3.71 ($SD = .35$) and the control group recorded an average of 3.62 ($SD = .69$) (the

maximum points possible was four). For the Photoshop Post-test, the treatment group recorded an average score of 6.51 ($SD = 1.23$) and the control group recorded an average of 6.55 ($SD = 1.06$) (the maximum points possible was eight). These high scores in both groups, regardless of the type of instruction, indicate that the Photoshop content presented was not complex, did not have high element interactivity, and did not impose a large load on working memory. Despite any differences in instruction, “intrinsic cognitive load cannot be altered” (Sweller, p. 308). The simplicity of the content and the low intrinsic cognitive load may have eclipsed any differences in instruction as the key factor resulting in the high scores. This is supported by Sweller, who states that “students are readily able to handle low element interactivity material with almost any form of presentation” if intrinsic cognitive load is low (p. 308).

It is worth noting that the other category that imposes a load on working memory that affects learning is “extraneous cognitive load,” which is related to instructional design, the presentation of materials, and “the instructional procedures being used” (Sweller et al., p. 57). Sweller et al. state that the extraneous cognitive load can be high when presentations of information is “unnecessary and extraneous to the learning goals” (p. 57). This is not a relevant factor in this situation, however, as “an extraneous cognitive load may have minimal consequences when dealing with material that has low element interactivity because the total cognitive load may be relatively low” (Sweller, 310).

The fact that the difference between treatment and control groups in terms of learner achievement was statistically not significant, however, is a valuable finding pertaining to the context of this study and the FC model’s potential impact on learners in

this context. An introductory technology literacy course such as EME2040 does not contain highly complex, high intrinsic cognitive load material as components of its curriculum. The results of this study show that these types of courses may not benefit from the FC model, as the form of instruction does not matter when content is simple and has a low intrinsic cognitive load. It is important that educators understand this and evaluate the complexity and the intrinsic cognitive load of the content when considering implementation of the FC model.

Learner Satisfaction

The second part of the research question that the researcher aimed to answer concerns the impact of the FC model on learner satisfaction in an undergraduate, technology literacy course. Following data analysis, it was found that there was a statistically significant difference between the treatment group and the control group in terms of learner satisfaction, with participants favoring the control condition (non-FC model). This was displayed through analysis of the sole instrument of the study that measured learner satisfaction, the Learner Satisfaction Survey. While this survey focused on the effectiveness of the instructor, many of its items apply to the delivery of instruction in general, which stems from the facilitation of course content by the instructor.

The treatment group (FC model) responded with an average score of 43.85 ($SD = 5.69$) on this survey and the control group responded with an average of 47.19 ($SD = 3.04$) (the maximum points possible was 50). This indicates that the FC model had a significant impact on learner satisfaction in EME2040, as participants favored the non-FC model instruction.

Results vary in research when discussing learner satisfaction in using the FC model. For example, Herreid and Schiller (2013) found that learners “really like” the FC model due to learner-centered advantages such as learners moving at their own pace, the more time allotted for more engaging in-class activities, and the easier process for learners who miss class (p. 62). Missildine, Fountain, Summers, and Goselin (2013), however, conducted a study that found that learners were less satisfied with the FC instruction than the other forms of instruction, with learners claiming the FC model “required more work,” and learners did not observe value of the new methods (p. 599). The results of this study indicate that implementing the FC model in a technology literacy class can have a significant impact on learner satisfaction, leaving learners more dissatisfied than through other methods of instruction.

One possible explanation for this finding is that learners “are initially resistant to new teaching methods” (Hawks, 2014, p. 268). This is the idea that learners are preconfigured to prefer what they are accustomed to, and any new method that is introduced will result in some dissatisfaction. This is supported by Herreid and Schiller, who found the FC model to lead to positive satisfaction in the long-term, but warned that learners new to the method of instruction may be initially resistant, which could lead to learners arriving “unprepared for class to participate in the active learning phase of the course” (p. 63). This makes sense in the case of EME2040 during the Fall 2017 semester, as class each week was taught using typical EME2040 instruction (non-FC model), and then the new method was implemented solely for Module 5.

Another possible explanation for the significantly lower learner satisfaction findings from the treatment condition is that the web-based, video lecture used was

poorly designed for the FC model. The lecture that participants watched for the FC model was 26 minutes and 31 seconds long and was comprised exclusively of a recording of the researcher's screen while the researcher narrated the lecture script. According to Guo, Kim, and Rubin (2014), these characteristics being present in an instructional video can have a negative effect on learner engagement (p. 42), which could lead to lower satisfaction scores. Guo et al. state that videos that include the instructor's "talking head" (instructor's upper body put in one of the corners of the video so learners can see facial expressions and cues) and videos that are broken up into shorter chunks of less than six minutes are more engaging (p. 45). Mayer and Moreno (2003) support this, as they found that having a presentation "broken down into bite-size segments" can reduce cognitive overload that can lead to frustration and dissatisfaction of learners (p. 47). Milman (2012) states that it is "very important not only to ensure that videos are short, but also to make certain that all of the steps of the procedure are introduced adequately so students understand it thoroughly" (p. 86). These instructional video design principles were not followed in designing the lecture used in this study, which could have led to the FC model becoming less engaging, inducing cognitive overload, and frustrating the learners more than assisting them.

It is also worth noting, however, that participants had "learner control" when viewing the web-based lecture (Lawless & Brown, 1997, p. 119). This could have been expected to possibly overcome design issues such as having a video that is not broken up into chunks or segments. Learner control pertaining to viewing the web-based lecture includes the learner being able to pause the video, skip ahead, and go back to re-watch aspects of the lecture. It is also expected that the learners in the context of this

study already have the knowledge of how to control a web-based video lecture, as they are a part of the “YouTube Generation” (and the lecture was uploaded and posted to YouTube) (Dreon, Kerper, & Landis, 2011, p. 4).

The web-based, video lecture was essentially the in-class, live lecture but recorded on a computer and posted online for learners to view asynchronously prior to the class meeting. While this was a research design decision to increase consistency between conditions, Bishop and Verleger (2013) warned that when implementing a FC model, it should be more involved than merely employing a “re-ordering of classroom and at-home activities” (p. 5). This statement is made evident in this study, where moving the lecture online without following the appropriate design principles may have resulted in dissatisfaction for learners who partook in the FC model. These findings demonstrate that when implementing a new or different instructional method, it is imperative to make sure all instructional materials and resources are designed to support that new method.

Limitations

While this research was diligently prepared, the researcher is aware of its limitations. One limitation that can have potentially impacted the researcher’s ability to answer the research question is that the material did not have high enough intrinsic cognitive load and was not complex enough to allow for the forms of instruction to make a difference (Sweller, p. 308).

The content of the modules and the assessments being studied in EME2040 was visual literacy, and it was taught through using the Photoshop application. While one must develop certain skills to become proficient at using Photoshop, this is not content that is exceedingly in-depth or difficult. This could have potentially lead to the learner

achievement scores that were predominantly high on the low-level assessments of Photoshop knowledge that followed instruction (Practice Assignment and Photoshop Post-test), regardless of the instruction that the participants received; this resulted in the researcher being unable to evaluate the impact of the different forms of instruction that were examined. This content was chosen despite this limitation so the study could examine a skill-based module in the beginning of the semester. In order for the study to meet deadlines, it had to occur early in the Fall 2017 semester. Out of all of the early modules that make up EME2040, this module regarding visual literacy and Photoshop was selected as the best fit for this study. EME2040 modules that typically occur later in the semester and would require a restructuring of modules were not considered so the EME2040 course schedule (and its instructors) would not be disturbed or inconvenienced by the study.

The instruction delivered in this study was delivered by three different EME2040 instructors: the researcher, and two others. This is considered a limitation because there are inherent differences between the various instructors, resulting in natural differences in delivery and facilitation of instruction. This could have resulted in extraneous variables affecting data. To counter this, the researcher conducted weekly meetings throughout the study in which the three instructors discussed plans for the following module, and the researcher trained the other instructors on delivery of content and grading of assignments to encourage consistency. This included the researcher sharing and discussing lesson plans, assignment rubrics, lecture scripts, and discussion scripts.

This study did also did not include random assignment and selection of participants. This is due to the fact that EME2040 is a course offered at the University of Florida (UF) during the Fall 2017 semester, so learners who needed the course credit registered for this course and eventually became participants (if they agreed to participate). The researcher did not have the resources to conduct a study using participants outside of the course (or content outside of the course), and because the researcher was already an instructor for EME2040, it made sense to conduct the research within this course and use the learners who registered for it as participants. The diverse cultural and academic backgrounds typically seen in EME2040 classes factored into this decision as well.

Another limitation of this study is the fact that the Photoshop Pre-test and Photoshop Post-test were instruments used in this study that were not validated. These were short, eight-item assessments, and included some items that turned out to be too simple. This resulted in KR-20s for these instruments that were not ideal. These instruments were designed by the researcher, and using pilot testing and other validation techniques were outside of the scope of this study. It is also important to note that the Practice Assignment and Transfer Assignment were assessments that were taken from the EME2040 curriculum without any field testing or validation techniques. While field testing is generally conducted prior to launching a study, this was out of the scope of the study due to a lack of time and resources.

Finally, the Learner Satisfaction Survey that was used in the study focused strongly on the instructor (nine out of the ten survey items focused on the instructor). While this survey will give insight on the learners' feelings and satisfaction towards the

instructor, this focus may take away or distract from the goal of gathering learner satisfaction data pertaining to the method of instruction in general. It was decided to use this particular survey, despite its shortcomings, for a couple of reasons. First, it was a satisfaction survey that was already validated in empirical research and used in a study in which different methods of instruction were being compared. The researcher did not have the time or resources to design and develop a new instrument and test it for validity. While the survey focuses on the instructor, the instructor's role is a key difference in the two methods of instruction being studied (the FC model and typical EME2040 instruction). Also, many of its items apply to the delivery of instruction in general, which stems from the facilitation of course content by the instructor. The researcher made the decision that gaining insight on the learners' satisfaction towards the instructor will shed light on their feelings and satisfaction for the instruction in general.

Implications and Recommendations for Practice

As more institutions of higher education are adopting BL techniques and strategies, educators are finding themselves with countless options of how to deliver instruction. When it comes to using the FC model, this study provides insight on its impact on learner achievement and learner satisfaction in the context of an undergraduate, technology literacy course.

The findings of this study demonstrated that the FC model does not have a significant impact on learner achievement when content or learning outcomes are not complex and do not impose a high intrinsic cognitive load on the working memory of learners (Sweller et al., p. 57). In contexts in which the material includes low intrinsic cognitive load content, multiple forms of instruction can be approximately equal in

effectiveness, as the simplicity of the content overcomes any differences in instruction. When making decisions about pedagogical techniques, educators need to consider the content they are teaching and choose a strategy that makes sense for that content. In cases where educators have simple, straightforward material to teach, the FC model may not be worth the time and resources it takes to switch to a new form of instruction.

This study also illustrated that the FC model can have a significant impact on the satisfaction of learners, leaving them dissatisfied of the new method that is implemented. This could occur because learners are preconfigured and resistant to change, or it may occur when instructional materials are not well-designed for the type of instruction that is being used. Educators and decision-makers who are considering implementing a FC model should be aware that learners may be dissatisfied early in the implementation. This should not stop them from considering the FC model, however, as the resistance may occur only recently and learner “satisfaction may not be a good indicator of learning” (Missildine et al., p. 599). Educators and decision-makers should also ensure that if a FC model is going to be implicated, all learning materials and resources must follow multimedia design principles so materials are engaging for learners and do not induce cognitive overload (Guo et al., p. 42; Mayer & Moreno, p. 47).

Recommendations for Future Research

For the future, it would be beneficial to examine the FC’s impact on learner achievement and learner satisfaction using content that is more complex. This would allow the different aspects of the instructional strategies to have more of an impact on learner achievement. It would also be valuable to take the time and resources to have validated instruments and instructional materials to collect data and use learning

materials that are developed following multimedia design principles. Finally, having a study that implements the FC model for a longer period of time would help researchers understand whether the initial dissatisfaction that occurred is temporary or continuous.

Conclusion

Quantitative evidence from this study found that the FC model had no significant impact on learner achievement and a significant impact on learner satisfaction (in favor of non-FC instructional methods) in an undergraduate, technology literacy course. These findings may have been influenced by the ease of the instructional content of the modules in the study or the researcher's design learning materials used in the FC model condition. While the FC model has many advantages and affordances, it does not seem to be the best possible instructional technique in the context of this study. These findings, along with discussion of these findings, suggests that more empirical evidence is needed to investigate implementing the FC model with more difficult content, validated instruments, better designed instructional video, and a longer timetable.

APPENDIX A
DEMOGRAPHIC/ACADEMIC SURVEY

A. Please enter the ID code provided by your instructor.

ID:

What is your age?

Age: _____

What gender do you identify as?
Please circle your answer.

Male

Female

Other

What is your ethnic background?
Please circle your answer.

White/Caucasian

Hispanic/Latino

Black/African American

Native American

Asian/Pacific Islander

Other

What is your current major at UF? Please include
any minors you are pursuing as well.

Major/s: _____

Minor/s (if applicable): _____

How would you describe your experience with
Photoshop? **Please circle your answer.**

No experience

Limited experience

Moderate Experience

Extensive experience

APPENDIX B PHOTOSHOP PRE-TEST

- A. Please enter the ID code provided by your instructor.

ID:

1. When sizing your workspace before starting a project, which of the following should you use if you are planning to create an image used primarily on the web?
 - a. Inches
 - b. Pixels
 - c. Bytes
 - d. Centimeters
2. What is the most efficient way to make a layer that is hidden beneath other layers visible?
 - a. Use the Move tool and select the desired layer to bring it to the front
 - b. Right click on the desired layer in the Layers palette and select "Move to front"
 - c. Flatten the image so all layers are brought together
 - d. Edit the order of layers listed in the Layers palette so the desired layer is visible
3. What must you do before you can edit a layer?
 - a. Select the layer in the Layers palette
 - b. Make all other layers invisible in the Layers palette
 - c. Bring the layer to the front of the image
 - d. Select Options, then Edit Layer
4. If there is a tool you cannot find, where may it be and how would you access it?
 - a. Nested underneath similar tools, must right-click the similar tool to see it
 - b. In the extended toolbox, must search the name of the desired tool
 - c. Nested underneath similar tools, must hover over the similar tool to see it
 - d. In the extended toolbox, must search the Tool Number of the desired tool
5. What is the most efficient way to delete unwanted objects in your image?
 - a. Click the Undo button
 - b. Find and select the unwanted object in the Layers Palette and press Delete
 - c. Find and select the unwanted object in the History Palette and press Delete

- d. Go to the Options palette and select “Delete Object...” then find and select the object you want to delete
- 6. What happens if you apply the Gradient tool to your workspace?
 - a. Creates a blend from one object to another
 - b. Creates a blend from major color to minor color
 - c. Creates a blend from primary color to secondary color
 - d. Creates a blend from foreground color to background color
- 7. How do you move an object in your image?
 - a. Use the Move tool
 - b. Use the Transform tool
 - c. Use the Drag and Drop Tool
 - d. Use the Transport Tool
- 8. When you are saving an image that you are not finished with, what kind of file should you save it as, and why?
 - a. JPEG/GIF; this does not flatten the layers, so you are able to continue to edit layers individually the next time you work on your image
 - b. JPEG/GIF; this flattens the layers, giving you a simplified and more complete image you can return to for more efficient editing
 - c. PSD; this does not flatten the layers, so you are able to continue to edit them individually the next time you work on your image
 - d. PSD; this flattens the layers, giving you a simplified and more complete image you can return to for more efficient editing

APPENDIX C PRACTICE ASSIGNMENT DIRECTIONS

ATTENTION!

Before doing this practice activity you must have all of the following materials saved to your USB:

- runningshoe.gif
- basketballshoe.gif
- soccershoe.gif
- baseballshoe.gif

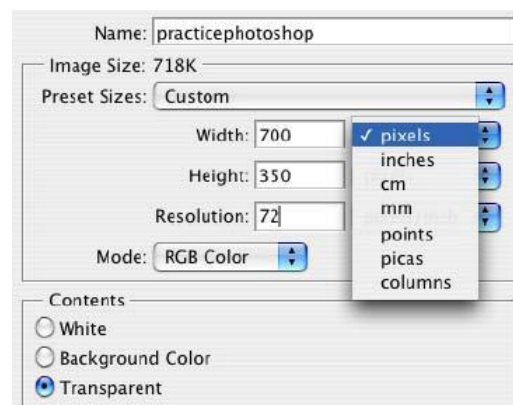
If you do not have these materials saved to your USB already, return to the Practice page on the lab website and follow the directions listed in the Photoshop section.

Do this Practice Activity on a MAC at the computer lab.


Getting Started

1. Finder Applications Adobe Photoshop CS Adobe Photoshop CS
2. If a window pops up that asks if you want to customize your color settings, click No.
3. File New.
4. Name the document practicephotoshop.
5. Adjust the following dimensions accordingly:

- Width: 700 **pixels** (This is an appropriate width for a computer screen. Viewers may have difficulty seeing the entire graphic online if it is any wider than this.)
- Height: 350 **pixels**
- Resolution: 72 pixels/inch (This is the appropriate resolution for web graphics.)
- Mode: RGB color
- Contents: Transparent



6. Click OK. Your workspace will appear. The white and grey checkers indicate that this background layer is transparent.

7. Drag the bottom right hand corner of your workspace down and to the right so that you can get a full view of your workspace.
8. The top of this workspace window should read “practicephotoshop @ 100%.” This tells us that we are looking at the actual size of our workspace. If the listed percentage is higher or lower than 100%, do the following:
 - Locate the Magnifying Glass  on the Tool Palette.
 - Click on it.
 - To increase the view of your workspace, simply click on the workspace until it reaches 100%.
 - To decrease the view of your workspace to 100%, press and hold the Alt key on your keyboard while clicking on the workspace.
9. Make sure that all of the necessary Palettes are open on your screen.
 - In the main menu, click on Window.
 - In the menu that appears, make sure that all of the following are checked:
 - o Tools
 - o Options
 - o History
 - o Layers
10. Make sure that the ruler is activated.
 - In the main menu, click on View.
 - Make sure that “Rulers” is checked. (This will provide the pixel dimensions for both the width and height.) If the ruler does not give you **pixel dimensions** (700 x 350), use the main menu to do the following:
 - o Choose Photoshop > Preferences > Units & Rulers.
 - o For Rulers, choose pixels as the unit of measurement.
11. File Save As.
 - o Save as: practicephotoshop.psd (The “psd” stands for Photoshop document.)
 - o Where: The Practice Folder on your USB
 - o Format: Photoshop (Saving your work as a Photoshop document will allow you to reopen it at a later time to continue working on it, manipulating the layers, etc.)
 - o Click on Save.
 - o NOTE: Saving your graphic as a GIF or JPEG will automatically flatten the layers, making it impossible to move them, reformat them, etc. Therefore, this should be **a last step** in your process.

Renaming Layers

1. Locate the Layers Palette on the right-hand side of your screen.

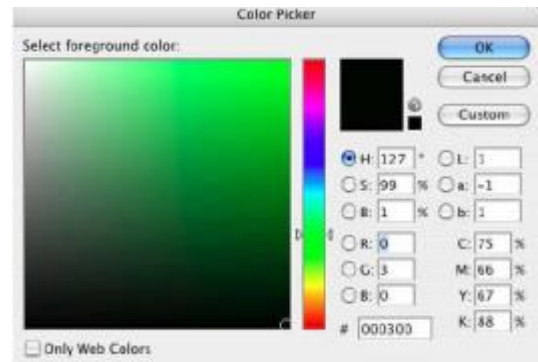
2. At this point, we only have one layer—our transparent background called “Layer 1.”
3. When creating a Photoshop project, it’s very important to name your layers. If you don’t, you will have difficulty keeping track of the layers as you create more and
4. more. To rename this layer, do the following:
 - Double click on **the name** of the layer itself (“Layer 1”). This will highlight the name.
 - Now type in the new name: background.
 - Then press Return on your keyboard.

Using the Paint Bucket to Create a Background Color

1. Locate the Foreground and Background Colors on the Tool Palette.
2. Click one time on the Foreground Color icon.



3. In the Color Picker window that appears, drag the arrow pointing to the spectrum to a blue region.
4. In the main color box, point and click on a light blue color. Then click OK. The Foreground Color icon should now be a light blue color.




5. Next click one time on the Background Color icon.
6. In the Color Picker window that appears, point to a white region (top left-hand corner) in the color box. Then click OK. The Background Color icon should now be white.
7. Now click on the Paint Bucket tool on the Tool Palette. (Some users may need to click and hold on the Gradient tool and then select the Paint Bucket tool from the menu that appears. See pictures.



8. Now click on your workspace. The entire layer will turn light blue.

Creating a Gradient Background

1. Click on the Gradient tool  on the Tools Palette. You may need to click and hold on the Paint Bucket tool to access it. See pictures.
2. Click, hold, and drag a diagonal line from one corner of your workspace to another. Upon releasing your mouse, your workspace will change to a blue and white gradient (a mixture of the Foreground and Background Color you selected).
3. To create different variations of this gradient, experiment with the length and angle of the line you draw on the workspace.

Using Filters to Enhance Layers

1. Click on Filters in the main menu. (A drop down list of various filters will appear.)
2. Select Render Clouds. The blue and white background layer you created should now look like a blue (and slightly cloudy) sky.

Creating New Layers

Photoshop allows you to create multiple layers when making a graphic. This allows you to isolate and manipulate individual elements of your graphic. Thus far, we only have one layer called “background.” We will soon add various layers to this graphic for paint strokes, shapes, pictures, and text. To create a new blank layer, do either **one** of the following:

1. Click on the new layer button on the Layers Palette.



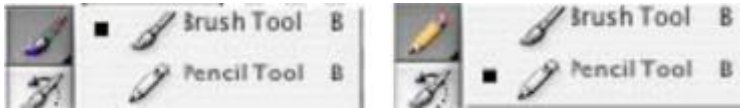
2. You can also add a new layer via the main menu. Layer New Layer.

3. For our purposes, rename this new layer “grass.”

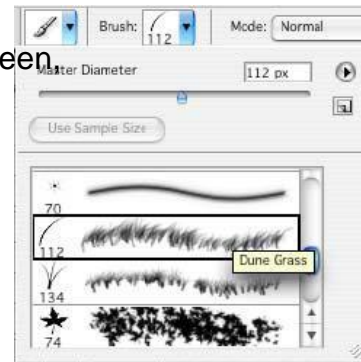
- Double click on **the name** of the layer itself (“Layer 1”). This will highlight the name.
- Now type in the new name: grass.
- Then press Return on your keyboard.

Using Paint Brushes

1. Select the Paint Brush tool in the Tool Palette. (Some users may need to click and hold on the Pencil tool and then select the Paint Brush tool from the menu that appears. See pictures.




2. From the brush menu that is now at the top of the screen, locate the Dune Grass brush (112). You will have to scroll far down in this menu to locate it.



3. Once you find it, double click on it.
4. Locate the Background and Foreground Colors on the Tool Palette.
 - o Set the Foreground color to light green.
 - o Set the Background color to dark green.
5. Make sure that the layer called “grass” is highlighted in the Layers Palette. If this layer is not highlighted, simply click on it one time.
6. Now click, hold, and drag across the bottom of the workspace. A grassy surface will appear.
7. Continue to paint until the bottom half of your workspace is covered with grass. Your graphic should look like the picture below:



Using the Eraser

1. Click on the Eraser tool  in the Tools Palette.
2. In the Layers Palette, make sure that the layer called “grass” is highlighted. If it is not, click on that layer one time.

3. Now click, hold, and drag the eraser to clear out a small circle in the grass.
(Do not repeatedly click your mouse.) See picture.

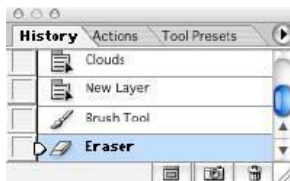


4. Notice that the eraser only erases the grass and not the blue/white background. This is because the “grass” layer is highlighted in the Layers Palette. (It is the active layer.)

Using the History Palette


Photoshop takes into account that people are going to make mistakes while creating graphics. The History Palette allows you to take 15 steps “back in time.” Therefore, if you make anywhere between one and 15 mistakes, you can use your history palette to return to a point when your project was still error free. To get rid of the circle “mistake” we made on the grass layer, do the following:

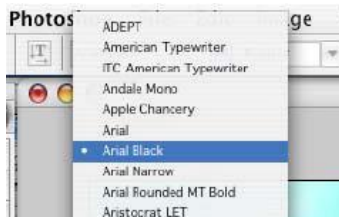
1. Locate the History Palette on the right-hand side of your screen.



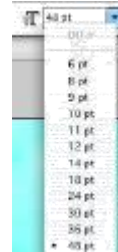
2. Locate the step(s) called “Eraser.”
3. Click on the step that comes right before “Eraser”: Brush Tool. The circle we erased into the grass layer will disappear.

Adding Text

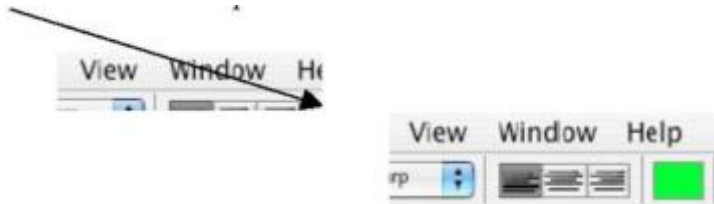
1. Click on the Text tool in the Tools Palette. 
2. From the Font drop down menu at the top of the screen, select Arial Black.



3. In the Font Size drop down menu at the top of the screen, select 48.



4. Click on the Text Color Palette at the top of the screen.



5. From the Color Picker window that appears, select a darker blue as the color. Then click OK.

6. Click inside your workspace (preferable the top left-hand corner). A flashing cursor will appear within the workspace.

7. Type in the following text: Types of Athletic Shoes.

Using the Move Tool

1. Click on the Move Tool  in the Tools Palette.

2. The text layer that you just created should be highlighted in the Layers Palette. If it is not, click on this layer in the Layers Palette one time. **(The Move Tool will only move the layer that is highlighted.)**

3. Now use the Move tool to drag this text layer to the top/center of your workspace.



Changing the Order of Layers

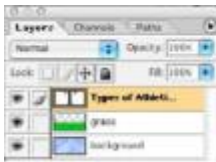
Photoshop allows you to stack your layers in whatever order you want. Thus far, we have three layers: the blue/white background, the grass, and the text. The order that these layers are listed in the Layers Palette indicates which layers are on the top and bottom of your graphic. Therefore, if the text layer is at the top of the list in the Layers Palette, the text will appear on top in your graphic. If it is listed at the bottom, it will be invisible because the blue/white background will cover it up.

1. Click and hold on the text layer in the Layers Palette.

2. Drag the text layer to the bottom of the list in the Layers Palette. The text will disappear in your graphic because it is behind the blue/white background, which takes up the entire workspace.



3. Now click, hold and drag the text layer back to the top of the list in the Layers Palette. The text will reappear in your graphic because it is now on top of the background layer (and the grass layer as well).



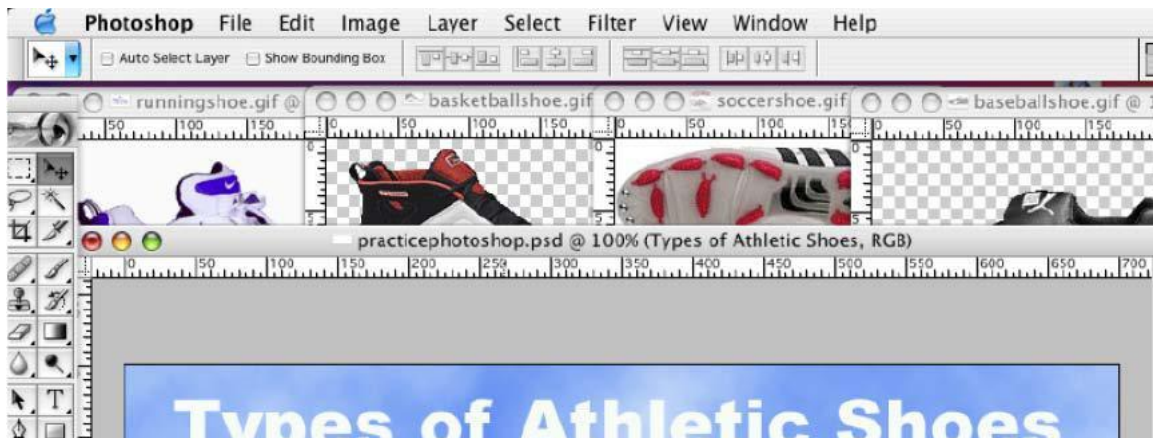
Opening Picture Files to Incorporate into Your Graphic

You will now access the pictures you saved to your USB before starting this activity. If you have not downloaded/saved the necessary pictures for this activity, return to the Practice page on the lab web site. Follow the directions listed in the Photoshop section for downloading/saving the necessary pictures files.


1. File Open.
2. Click on your USB.
3. Double click on baseballshoe.gif. (This picture will open up in a separate window on top of the project you are currently working on.)
4. Repeat steps 1—3 to open up the remaining pictures:
 - basketballshoe.gif
 - runningshoe.gif

- soccer.shoe.gif

5. You now have five windows open within Photoshop. Arrange the five windows in the manner indicated by the picture below.



Copying and Pasting Picture Files into Your Project

1. Click inside the runningshoe.gif window. (This will activate the window and bring it to the forefront of your screen.)
2. Click on the Rectangular Marquee tool  in the Tool Palette.
3. Drag a square around the picture of the running shoe. (In other words, click, hold, and drag from the top left-hand corner of the window to the bottom right-hand corner of the window.) This will highlight the picture itself.
4. Edit Copy.
5. Click inside the “practicephotoshop” window to activate it.
6. Edit Paste. (The picture of the running shoe will appear within your graphic.)
7. Use the techniques described in steps 1—6 to copy and paste the other three pictures into your graphic.
8. Use the Move Tool to move each type of shoe to a different corner of the workspace. (Remember the Move Tool will only move the layer that is highlighted in the Layers Palette.)

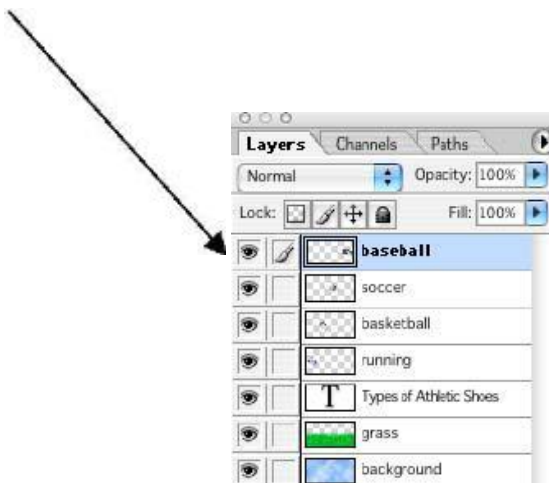
9. Using the info in the chart below, rename each of the shoe layers.

Picture:	Layer Name:
Baseball shoe (PICTURE)	baseball
Basketball shoe (PICTURE)	basketball
Running shoe (PICTURE)	running
Soccer shoes (PICTURE)	soccer

Making Layers Visible/Invisible

Photoshop gives you the option of making any layer visible or invisible. This allows you to block out certain layers of your graphic so that you can just focus on certain aspects of your work.

1. Locate the eyeball icons on the Layers Palette.



2. Clicking the eyeball icon for a particular layer will make that layer disappear and reappear within your graphic.

10. Using this technique, make all of the following layers **invisible**:

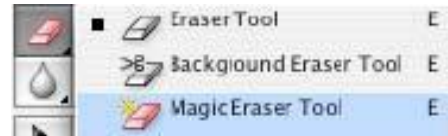
- basketball
- baseball
- Types of Athletic Shoes

Using the Magic Eraser

The magic eraser removes the background color from a layer. The running and soccer layers, for example, have a white background that the magic eraser can easily remove.

1. Click on the “running” layer in the Layers Palette.

2. Click and hold on the Eraser Tool in the Tool Palette. From the pop-up menu, select the Magic Eraser Tool.



3. Click on the white background of the running shoe. The white background will disappear.

4. Use these same techniques from steps 1—3 to get rid of the white background for the “soccer” layer.

Using the Lasso Tool

The lasso tool lets you draw freehand segments of a selection border. This is especially handy for cutting out certain aspects of a layer. The “soccer” layer, for instance, has two shoes while each of the other shoe layers only has one. With the lasso tool, you can easily cut out that second soccer shoe.

1. Make sure the “soccer” layer is still highlighted in the Layers Palette. If it is not highlighted, click on it one time.

2. Click on the Lasso Tool  on the Tool Palette. (PIC)

3. Click, hold, and drag (in a oval-like motion) around the top soccer shoe. Upon releasing your mouse, the top soccer shoe will be highlighted. See picture.



4. Now press Delete on your keyboard. The highlighted soccer shoe will disappear.
5. Click anywhere in your workspace to make the selected region disappear.

Rotating Layers

1. Click on the “baseball” layer. This will automatically make it visible again.
2. Edit Transform Flip Horizontal. (The baseball shoe will point in the same direction as the other shoes.)
3. Click on the “soccer” layer.
4. Edit Transform Rotate. This will put a box around this layer.



5. Hover your cursor about a quarter inch over the top left-hand corner of the box. Click and hold your mouse. Dragging your mouse in different directions will rotate this layer.
6. Rotate this layer until the shoe is completely horizontal like the other shoe layers. Then press Return on your keyboard to make the box disappear.



Resizing Individual Layers within your Graphic

1. Use the Move Tool to arrange the shoes in the manner indicated by the picture below. (Remember the Move tool will only move the layer that is highlighted in the Layers Palette.)



As you can see, the shoes are too large to all fit within the workspace. Luckily Photoshop gives us the capability to resize individual layers within our graphic.

2. Click on the “running” layer.
3. Edit Free Transform. A box will appear around the running shoe.
4. Drag the sides and/or corners of the running shoe so that it is approximately 150 pixels in width and 100 pixels in height. (Use the rulers that surround the workspace to guide this process.)
5. When you are satisfied with the size of the running shoe, press Return on your keyboard.
6. Use these techniques to reduce the size of the other shoe layers as well. Each shoe should be approximately 150 pixels wide and 100 pixels high. When finished resizing each shoe, use the Move Tool to arrange your graphic to look like the picture below.

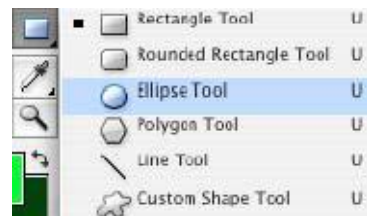


Using the Shapes Tool

The following will show you how to place an oval shape behind each shoe. See Picture.



1. Click on the Ellipse Tool  in the Tool Palette. (Some users may need to click and hold on the Rectangle tool  and then select the Ellipse Tool from the menu that appears.



2. Click, hold, and drag your mouse across the running shoe. An oval outline will appear. Continue to maneuver your mouse until the oval outline is 125 pixels wide and 100 pixels high (Use the rulers that surround your workspace as a guide.)
3. Upon releasing your mouse a solid oval will appear behind or in front of the shoe. If the shape appears in front of the shoe, drag this layer (“Shape 1”) to a position beneath “running” in the Layers Palette. (The color of this oval does not matter at this point.)

4. Use the Move Tool to move this oval to the position indicated by the picture.



Duplicating Layers

1. Make sure the “Shape 1” layer is highlighted in the Layers Palette. If it is not, click one time on “Shape 1” in the Layers Palette.
2. Layer Duplicate Layer OK. The layer will duplicate itself directly on top of itself, so it will appear that nothing happened.

3. Click on the Move Tool in the Tool Palette. Drag the duplicated layer to the location indicated in the picture.



4. Use the duplicating and moving techniques described in steps 1—3, create the picture you see here. (Also remember that the order of the layers in the Layers Palette determines which layers appear on the top of your graphic. You may need to drag the



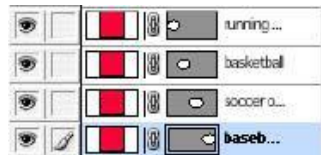
layers in the Layers Palette up or down to create the picture.)

- Use the info in the chart below to rename the shape layers you just created.
NOTE: Activating and deactivating the eyeball icon (which appears on the Layers Palette) for each of the shapes will help you identify which shape is which if you lose track.

Layer (these go left to right across the screen)	New Layer Name
Oval that appears beneath the running shoe	Running oval
Oval that appears beneath the basketball shoe	Basketball oval
Oval that appears beneath the soccer shoe	Soccer oval
Oval that appears beneath the baseball shoe	Baseball oval

Changing the Colors of Shapes


- Click on the “running oval” layer in the Layers Palette.
- Double click on this layer’s Color Palette, which appears to the left of its name.



- In the Color Picker window that appears, select a bright red color and then click OK.
- Now use the info in the following chart to change the color of the remaining ovals.



Layer	Color
Basketball oval	Bright blue
Soccer oval	Bright yellow
Baseball oval	Bright purple

Adding More Text

1. Click on the Text tool  on the Tool Palette.
2. The font type should still be Arial Black. If it is not, choose it from the font menu that appears at the top of your screen.
3. Change the font size to 18. (See the font size menu that now appears at the top of your screen.)
4. Click beneath the running shoe in the graphic. The flashing cursor will now appear in your workspace.
5. Type the following: Running. (The color of the text does not matter at this point.)
6. Click on the Move Tool on the Tool Palette.
7. Move this text label so that it appears directly below the running shoe.
8. Now use the Text and Move tools to create the rest of the graphic's text labels. See picture.



Reformatting Text

1. Locate the Text "Running" layer in the Layers Palette. 
2. Double click on this layer's T icon.  Notice that the label, "Running," is now highlighted in the workspace. The text-formatting bar also appears across the top of the screen.
3. Locate the Color Box that appears in the text-formatting bar and click one time on it.



4. In the Color Picker window that appears, select white as the color (top left-hand corner). Then click OK.
5. Use the techniques described in steps 1—4 to change the remaining text/shoe labels to white.

Adding Effects (Blending Options) to Layers

Photoshop allows you to add a variety of effects to your layers. For your purposes here, you will add a drop shadow effect to all of the text layers and a bevel and emboss effect to the oval shapes.

1. Click on the “Types of Athletic Shoes” layer in the Layers Palette.

2. Click on the Effects button  located on the Layers Palette. This will reveal a variety of effects.



3. Select Blending Options. The Layer Style window will appear.
4. Click on “Drop Shadow” (**the words themselves**, not just the check box). This will reveal a menu of options for adjusting the drop shadow that now appears behind your graphic’s title.
5. Enter the following information:
 - o Distance: 10 px (pixels)
 - o Spread: 10 %
 - o Size: 10 px (pixels)
6. Click on OK.
7. Add a Drop Shadow with the same Distance, Spread, and Size to the remaining text layers in the graphic.
8. Click on the “running oval” layer (the red shape) in the Layers Palette.
9. Click on the Effects button located on the Layers Palette.
10. Select Blending Options. The Layer Style window will appear.
11. Click on “Bevel and Emboss” (**the words themselves**, not just the check box). This will reveal a menu of options for adjusting this effect, which now appears on this shape in the graphic.
12. Enter the following information:
 - o Size: 10 px (pixels)
 - o Soften: 10 px (pixels)
13. Click OK.

14. Add the same Bevel and Emboss effect (including the same size and soften dimensions) to the remaining oval shapes in the graphic.

Saving Your Work as a Photoshop Document

1. File Save As.
 - o Save as: practicephotoshop.psd (The “psd” stands for Photoshop document.)
 - o Where: The Practice folder of Your USB
 - o Format: Photoshop (Saving your work as a Photoshop document will allow you to reopen it at a later time to continue working on it, manipulating the layers, etc.)
 - o Click on Save.
 - o Click on Replace. (This will replace the older version that you saved earlier.)

Saving your Work as a GIF or JPEG

A GIF (or CompuServe GIF) is an appropriate format for a graphic that is “cartoonish.” The JPEG format is more appropriate for photographs. Because the graphic you made contains photograph elements (the shoes), you will save it as a JPEG. (Remember that saving your graphic as a GIF or JPEG will flatten the layers making it impossible to reformat them, move them, etc. Therefore, make sure to also save your work as a Photoshop Document. See Above.)

1. Click on File Save for Web.
2. Under Settings, select JPEG. (This is the most appropriate file format for a photograph.)



3. Click on Save. (The Save Optimized As window will appear.)
4. Name the file: finishedphotopr.jpg (This stands for “finished Photoshop practice.”)
5. Locate your USB the folder called “practice.” Click on it. (Remember that to access your folder, you must click on the arrow that is off to the right of the file name.)



6. Click on Save. This will place the photograph (JPEG) into the folder called “practice.”

APPENDIX D PRACTICE ASSIGNMENT RUBRIC

Points	Criteria
4	Demonstrates mastery over the ability to find and use Photoshop tools to manipulate the various images and layers to PRECISELY create the final shoes image, including all 8 essential components correctly
3	Demonstrates the ability to find and use Photoshop tools to manipulate the various images and layers to APPROXIMATELY create the final shoes image, including 6 essential components correctly
2	Exhibits the ability to find and use Photoshop tools to manipulate the various images and layers to ROUGHLY create the final shoes image, including containing 4 essential components correctly
1	DOES NOT exhibit the ability to find and use Photoshop tools to manipulate the various images and layers to create the final shoes image; includes 2 essential components correctly
0	Either does not turn in assignment or DOES NOT exhibit the ability to find and use Photoshop tools to manipulate the various images and layers to create the final shoes image; includes only 0-1 essential components correctly

Essential Components:

1. Clouds
2. Grass (two colors)
3. Circles
4. Shoes being uniform (facing the same direction and similar sizes)
5. Title text (font/size/color)
6. Shoe label text
7. Circles (size and colors)

Components in correct places and working together in a way that is logical (including shade effect)

APPENDIX E

TRANSFER ASSIGNMENT DIRECTIONS

This assignment will require you to design an image that correlates to an aspect or theme related to your field of study or area of interest. The goal of the project is to help you apply and develop your design skills and technical Photoshop skills. It is also designed to provide you with a portfolio item you can use professionally.

You will be required to upload **3 files**:

1. A .psd file you create in Photoshop (this is the original file showing all of the different layers)
2. A .jpg file you create in Photoshop (this is the image created from the Photoshop project)
3. A Microsoft Word file explaining your image choice, project rationale, significance, and your design process.

Examples of some possible themes include:

Starting a new charter school, business, online journal, blog, online media outlet, public relations firm, classroom, interview portfolio etc.

Examples of some possible products on your theme:

Brochure, media pamphlet, image for a lesson plan, promotional poster, promotional t-shirt design.

The specific requirements for the project are listed in the rubric below. Quality is important, so keep in mind that you should feel perfectly comfortable showing this project to a future hiring/internship manager.

Your image dimensions/size should be at least **800X600 pixels**. You can go higher if you want.

Important reminder: Remember to only use Creative Commons licensed material and to cite your sources in your Word document. You can find a good selection of images from Flickr's Creative Commons area. You probably want to stick with attribution licenses. Of course, you can use your own images as well.

Also, keep in mind that your project needs to have purpose, meaning, and rationale which you will detail in your Word file.

APPENDIX F TRANSFER ASSIGNMENT RUBRIC

Points	Criteria
4	Demonstrates mastery over the ability to find and use Photoshop tools to manipulate the various images and layers to create an image with a clear theme, purpose, or message and a professional, high-quality appearance
3	Demonstrates the ability to find and use Photoshop tools to manipulate the various images and layers to create an image with some type of theme, purpose, or message and a semi-professional, quality appearance
2	Exhibits the ability to find and use Photoshop tools to manipulate the various images and layers to create an image with a distant theme, purpose, or message and an amateur, moderate-quality appearance
1	Exhibits the ability to find and use Photoshop tools to manipulate the various images and layers to create an image with no theme, purpose, or message and a low-quality appearance
0	Either does not turn in assignment or DOES NOT exhibit the ability to find and use Photoshop tools to manipulate the various images and layers to create an image.

APPENDIX G

PHOTOSHOP POST-TEST

A. Please enter the ID code provided by your instructor.

ID:

1. What is the most efficient way to delete unwanted objects in your image?
 - a. Find and select the unwanted object in the History Palette and press Delete
 - b. Click the Undo button
 - c. Find and select the unwanted object in the Layers Palette and press Delete
 - d. Go to the Options palette and select "Delete Object..." then find and select the object you want to delete
2. If there is a tool you cannot find, where may it be and how would you access it?
 - a. In the extended toolbox, must search the name of the desired tool
 - b. Nested underneath similar tools, must hover over the similar tool to see it
 - c. Nested underneath similar tools, must right-click the similar tool to see it
 - d. In the extended toolbox, must search the Tool Number of the desired tool
3. When sizing your workspace before starting a project, which of the following should you use if you are planning to create an image used primarily on the web?
 - a. Pixels
 - b. Inches
 - c. Bytes
 - d. Centimeters
4. When you are saving an image that you are not finished with, what kind of file should you save it as, and why?
 - a. JPEG/GIF; this does not flatten the layers, so you are able to continue to edit layers individually the next time you work on your image
 - b. PSD; this does not flatten the layers, so you are able to continue to edit them individually the next time you work on your image
 - c. JPEG/GIF; this flattens the layers, giving you a simplified and more complete image you can return to for more efficient editing
 - d. PSD; this flattens the layers, giving you a simplified and more complete image you can return to for more efficient editing
5. What happens if you apply the Gradient tool to your workspace?
 - a. Creates a blend from one object to another
 - b. Creates a blend from foreground color to background color
 - c. Creates a blend from major color to minor color
 - d. Creates a blend from primary color to secondary color

6. What is the most efficient way to make a layer that is hidden beneath other layers visible?
 - a. Use the Move tool and select the desired layer to bring it to the front
 - b. Right click on the desired layer in the Layers palette and select "Move to front"
 - c. Edit the order of layers listed in the Layers palette so the desired layer is visible
 - d. Flatten the image so all layers are brought together
7. How do you move an object in your image?
 - a. Use the Transform tool
 - b. Use the Drag and Drop Tool
 - c. Use the Transport Tool
 - d. Use the Move tool
8. What must you do before you can edit a layer?
 - a. Make all other layers invisible in the Layers palette
 - b. Select the layer in the Layers palette
 - c. Bring the layer to the front of the image
 - d. Select Options, then Edit Layer

APPENDIX H
LEARNER SATISFACTION SURVEY

A. Please enter the ID code provided by your instructor.

ID:

Directions: For the following questions, rate your perception about the Module 5 and Module 6 (All About Images) quality according to the following scale. This survey is anonymous.

1	2	3	4	5
Ineffective	Somewhat effective	Moderately effective	Effective	Very effective

1. The instructor's helpfulness and responsiveness to students
1----2----3----4----5
2. The instructor's concern for student progress
1----2----3----4----5
3. The availability of extra help for this class
1----2----3----4----5
4. The instructor's willingness to listen to student questions and opinions
1----2----3----4----5
5. The instructor's use of examples or illustrations during the instruction
1----2----3----4----5
6. The instructor's use of challenging questions during the instruction
1----2----3----4----5
7. The instructor's command of the subject matter
1----2----3----4----5
8. The instructor's ability to make clear and understandable presentations of information
1----2----3----4----5
9. The instructor's way of summarizing or emphasizing important points during instruction
1----2----3----4----5
10. The instructor's use of web technologies as aids in instruction
1----2----3----4----5

APPENDIX I PHOTOSHOP TOOLS HANDOUT

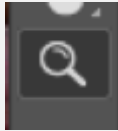
Directions: Download this document and save it as “LastNameFirstName_PSToolsHandout.” Open the Photoshop app and look for the tools in the table below. When you find each tool, take a screenshot of that tool and insert it into the table in the appropriate table cell. This will help you prepare for the Shoes Assignment you will be completing this module (all of these tools will be used in the assignment). See the first row of the table for an example.

Use Google, the resources provided online in this module, or any other resources to help you find the tools in Photoshop. For instructions on how to take a screenshot, click one of the follow links:

- [Windows Screenshot](#)
- [Mac Screenshot](#)

Before you begin, making sure all of the correct palettes are open and available to use on the screen by following these directions:

- In the main menu, click on Window (menu at the very top of the screen).
- In the menu that appears, make sure that all of the following are checked:
 - Tools, Options, History, Layers

Photoshop Tool	Your Screenshot
Magnifying Glass Tool	
Button to add a new layer	

Foreground/background color tool	
Gradient Tool	
Paint Brush Tool	
Dune Grass Brush Tool (number 112 in the paint brush menu)	
Eraser	

Magic Eraser	
History Palette	
Text Tool	
Move Tool	
Lasso Tool	

Ellipse Tool	
Rectangle Tool	
Effects (fx) Button (HINT: it is in the Layers Palette)	

APPENDIX J

INSTRUCTOR LECTURE SCRIPT

Things to include in the lecture (open Photoshop and show examples of doing all of this):

- Intro: describe the purpose of this lecture
 - Hello class, I hope everyone is doing well, thank you for viewing this lecture in preparation for class next week. I wanted to make this short, online lecture for a couple of reasons. First, I want to you guys get started successfully and avoid the serious mistakes in the beginning of starting a Photoshop Document that can lead to having to take a lot of time to go back to fix later, or even waste a lot of time in being forced to start over deep into a project when you figured out that the project was not set up correctly.
 - I also wanted to introduce and discuss a couple of over-arching concepts about exploring Photoshop, like how to start your project, how to gain an understanding of the way Photoshop works by using layers and how to manipulate those layers, how to find various tools, how to navigate the various menus that Photoshop offers, how to undo actions if you make a mistake, how to correctly save a project, and a couple other features
 - Everything I am including in this lecture comes from my experience in teaching this module in the past – this Module has been known to be time-consuming and very frustrating for students. For those who are not familiar with using Photoshop, there are a lot of mistakes that are very easy to make if you are not careful. My goal is for this lecture to be proactive in keeping you guys away from making those mistakes, so please pay attention and we can have a much more efficient, less frustrating module.
 - You do not have to, but it would be helpful if you opened Photoshop on your computer and followed along with what I am doing in this video. Let's begin.

- We will begin by describing how to start the in-class assignment, and what you need to consider going into your assignment. Making a mistake in these early stages where you set the size, the resolution, the view of your window, and more can have a detrimental effect on your assignment and create time-consuming headaches in the future. We want to avoid that, so I will go over how to open a new Photoshop Document. When find the Photoshop App on your computer (it will probably be under apps if you did not specify where to put it), it will ask you if you want to make start a new document or work on an existing document....
 - Setting the document to pixels instead of inches:
 - Width: 700 **pixels** (This is an appropriate width for a computer screen. Viewers may have difficulty seeing the entire graphic online if it is any wider than this.)

- Height: 350 **pixels**
- Resolution: 72 pixels/inch (This is the appropriate resolution for web graphics.)
- Mode: RGB color
- Contents: Transparent
- Reasons why
- Making sure all the correct palettes are open and available to use on the screen
 - In the main menu, click on Window.
 - In the menu that appears, make sure that all of the following are checked:
 - Tools, Options, History, Layers
- Zoom enough to where you can see your workspace easily (use magnifying tool for this).
- Ruler:
 - In the main menu, click on View.
 - Make sure that “Rulers” is checked. (This will provide the pixel dimensions for both the width and height.) If the ruler does not give you **pixel dimensions** (700 x 350), use the main menu to do the following:
 - Choose Photoshop > Preferences > Units & Rulers.
 - For Rulers, choose pixels as the unit of measurement.

Okay, now you will have your Photoshop Document prepared to begin. The size of our document is set, we have all our necessary palettes open on our window, we like the size we are viewing our document at, and the ruler is set. Next, we will go over a couple of over-arching concepts that will help you when you are working on your assignment.

- Tools and how to find them:
 - right click to see tools UNDER tools
 - Tool’s menu shows up when tool is selected at top left
 - Show this with Brush
- Layers and how to (use foreground/background colors AND GRADIENT to show this):
 - Name
 - Add new
 - Move behind/pull to front
 - Make it visible/invisible
 - Delete layers
 - SELECT THE LAYER YOU ARE WORKING ON
- how to UNDO actions

- Enhancing layers using Filters in the Main Menu (clouds?)
 - Click on Filters in the main menu. (A drop down list of various filters will appear.)
 - Scroll over Render to see the Render menu, then select Clouds.
- Effects (fx) button, where it is and how to view the options
 - You guys will read the directions of what to do with it for the assignment, but I just wanted you to be aware of where it is and how to pull the menu open
- End – how to save
 - PSD when still working, JPEG when finished (this will flatten all layers and you will not be able to manipulate them individually)

APPENDIX K INSTRUCTOR DISCUSSION TOPICS PROMPT

The topics of this in-class discussion (~5 minutes) should include:

- learner questions from the lecture or Photoshop Tools Assignment
- possible challenges while using Photoshop,
- possible professional applications of using Photoshop, and
- a look ahead to Practice Assignment and Transfer Assignment.

APPENDIX L
INFORMED CONSENT FORM

IRB Study # IRB201702072

Title: Flipped Classroom and its Impact on Learner Achievement and Learner Satisfaction in an Undergraduate Technology Literacy Course

Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study: The purpose of the study is to examine the best practices for teaching an undergraduate computer literacy course that includes both face-to-face and online instruction. The study will take one specific blended learning strategy, the flipped classroom model, and evaluate its impact on learner achievement and learner satisfaction by comparing it to the typical instruction that takes place in the technology literacy course EME2040. The study can inform adjustments of the curriculum to improve the learning experience for future EME2040 and other technology literacy courses' students.

What you will be asked to do in the study: Take part in EME2040 instruction and course content, with the addition of short Pre- and Post-tests and short Demographic/Academic Surveys and a Learner Satisfaction Surveys. These tests and surveys will be distributed and collected during regular EME2040 meeting times.

Time required: The only time required for this study will take place during regular EME2040 meeting times. Aspects of the study will take place from Module 4 through Module 7.

Benefits: While there are no direct benefits for the participants, the data collected may have significance for improving the learning materials used in the EME2040 and other technology courses' curriculum.

Compensation: There is no compensation related to this study.

Confidentiality: Your identity will be kept confidential to the extent provided by law. The names of the participants will not be used in any research reports or presentations. Your name will not be connected to your responses once data collection is over. The final results will be presented in a paper and might be sent to research journals for possible publication or used in research conference presentations. No names or other identifying information will be used in reporting the data.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating. The assignments that contribute to course grades for EME2040 will not be reviewed with the participants' names until the data analysis is complete. In other words, identification codes only will be used for all data and assignments throughout the data analysis process. The Principal Investigator will create a Microsoft spreadsheet that links participants' names to their identification codes after the initial data collection in week 4 of the Fall 2017 semester. This spreadsheet will not be opened again until the data analysis process is complete following week 7 of the Fall 2017 semester. Only after the data analysis process is complete will the Principal Investigator use the spreadsheet to link the identification codes to the names of the students so the scores on these assignments can contribute to their EME2040 course grades.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence. You do not have to answer any questions you do not want to answer.

Whom to contact if you have questions about the study: Max Sommer, School of Teaching and Learning, College of Education, University of Florida, e-mail: msommer15@ufl.edu, phone: (661) 607-2945; or Albert Dieter Ritzhaupt, School of Teaching and Learning, College of Education, University of Florida, e-mail: aritzhaupt@coe.ufl.edu, phone: 352-273-4180.

If you have any questions about your rights as a participant in this study, please contact the UF IRB office: Telephone: (352) 392-0433, Fax number: (352) 392-9234, e-mail address: irb2@ufl.edu

I have read the procedure outlined above. I voluntarily agree to participate in this study and have received a copy of this description.

Participant

Date

Researcher

Date

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BIOGRAPHICAL SKETCH

Max Sommer received his Bachelor of Arts Degree in geography from the University of Florida in December of 2015. He also graduated with a UFTeach Minor. In January of 2016, Max was accepted as a graduate student in the Master of Arts in Education (MAE) in Curriculum and Instruction with an emphasis on Educational Technology Program at the University of Florida. In January of 2017, Max began working as a teaching assistant and instructor for the course EME2040: Introduction to Educational Technology. Throughout his academic career, Max has also worked as an Education Assistant for the Education Department at the Florida Museum of Natural History.