Perceptions of Preservice Teachers
Communicating with Visual Imagery in E-portfolios

A Dissertation

Submitted to the Faculty
of

Drexel University

by

Kimberley Lyles-Folkman

in partial fulfillment of the

requirements for the degree

of

Doctor of Philosophy

June 2013

DEDICATIONS

This dissertation is dedicated to my parents, William and Barbara Lyles who have supported my goals throughout my life and have encouraged education. This is a living legacy to all that they have done, and for their inspiration and motivation to work hard and seek dreams.

ACKNOWLEDGEMENTS

I extend a “thank you” first to my committee chairperson, Dr. Joyce Pittman who encouraged me, critiqued my work, and supported me throughout this endeavor. Completion is a challenge, yet because of her organization, direction and push, I recognize that she was the most instrumental person in helping me to complete. Because of her guidance, it kept me on task and permitted me to stay “laser-focused” with her coordinated guidelines. I extend a warm thanks to my committee members, Dr. Elizabeth Haslam and Dr. Rebecca Clothey for their continued support in this process. This process has been long, and they have been part of this process in the early stages as well as the latter. Committee members, Dr. Linda Wood and Dr. Larry Stultz were instrumental in providing encouragement, time and feedback. It really takes a team to complete, and for that I thank my chair and committee members for all of their time.

A special thanks to friend and colleague Dr. Jerald Thompson for his direction in this process and for encouraging me to complete. Thanks to Dr. Tim Dempski, who responded to my questions and without hesitation offered assistance whenever I asked about the dissertation process.

I offer much thanks to my family, as it really is the best loving family unit that I know. My husband, Scott Folkman offered patience, support, love and many hugs to help me complete. He gave me balance to my life as he took on many duties over a period of years and sacrificed his own time to make this happen. Thanks to my 3 sisters, for your encouraging words and love; I have to extend a special thanks to my sister, Gwennie who assisted whenever I requested assistance; I appreciated her listening to my progress and my weekly action plan; her generosity of time and unconditional support is unmatched. To all of my many nieces and nephews, that unknowingly gave me energy to keep pushing; I hope that they acknowledge that anything is possible, and that exercising the mind is lifelong.

To my mother and father, William and Barbara Lyles, thanks for your love, words of encouragement, and all of the support that you have given me through all of my educational years. They exemplify parents that serve as a model for all those with children that have dreams small and big. They both have truly been my biggest cheerleaders and have given me the strength to keep pushing forward in all that I do. I am honored to be a product of the two of them.

For friends and others that I have not mentioned that did even the smallest deeds or acts of kindness to support me…I thank you.

TABLE OF CONTENTS

List of Tables

Table

List of Figures

Perceptions of Preservice Teachers' Communicating with Visual Imagery in E-portfolios

Kimberley Lyles-Folkman, Ph.D. in Educational Leadership and Learning Technologies

Drexel University, June 2013

Chairperson: Joyce Pittman

Abstract

The problem addressed in this study was to understand how preservice teachers documented and communicated learning via working eportfolios to demonstrate reflective practice in a teacher education class. The purpose of the study was to use mixed methods to understand how preservice teachers document and communicate their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. Because education now occurs in a technology-rich learning environment, visual imagery can chronicle learning and teaching experiences. This descriptive study was conducted in a teacher education classroom at a large state university in the southeast. The study focused on individual teachers who completed electronic portfolios as part of their clinical research, showing how they have used and implemented visual imagery and visual tools for assessment in their eportfolios. This study looked at preservice teachers' perceptions of using visual imagery in teaching and learning. Specifically, the questions asked were: 1) What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? 2) What are the differences in

teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? 3) How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program? 4) How do preservice teachers describe how visual imagery supports or constrains reflective practice? 5) What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their electronic portfolios to support reflective practice? This study also addressed new teacher evaluation and professional growth implementation scheduled to launch in Georgia during the school year 2014-2015 (Georgia Department of Education, 2012). In the 21st century, many teacher education faculties will become reliant upon eportfolios for evaluations. The current study aligns with the newly adopted effectiveness system for teacher evaluation and professional growth, a part of the (2012) Race to the Top Initiative (RT3), in Georgia, and includes the Teacher Keys Effectiveness System (TKES). This three-phase study employs mixed methodology including survey questionnaires, post-survey interviews and document analyses of eportfolio artifacts; data sources include electronic portfolio documents. Descriptive statistics, including frequencies, means, and standard deviations were used in the survey analysis. Open coding methods were employed for the interview analysis. Rich visual descriptions and examples are included of the preservice teachers' eportfolios that support evidence of visual representation. These outcomes identified the most important influences and differences using visual imagery and visual tools perceived by the preservice teachers. Factors relating to challenges and how visual imagery and visual tools supports and constrains reflective practice are also identified. These outcomes

indicated that visual imagery and visual tools can be used in the classroom to increase and support student engagement and communication during the learning and teaching process. The perceived influences regarding influence of visual image use include discussions of 21st century tools used as part of reflection in eportfolios. Findings may support 21st Century Teacher Education programs that use or anticipate using electronic portfolios for reflective practice. *(Keywords: E-portfolios, visual thinking, visual learning, 21st Century Literacy, emerging media, teacher education).*

Chapter 1: Introduction

Introduction to the Problem

Learning and teaching practices in the Digital Age are shifting as advances in media and technology now include tools that expand from text to audio, graphics and images. Presentation and communication options also are changing. Visual imagery as an education tool is becoming as common as text and strongly influences learning and teaching methods (Batson and Grush, 2011; Shrock, 2010; Yancey, 2011). Researchers share in the notion that literacy in the classroom must be defined and addressed in the light of growing application of new technologies. Best practice in achieving twenty-first century literacy is now a matter of developing in students a set of abilities and skills that allow aural, visual and digital proficiencies to converge (Yancey, 2012; Batson, T. 2011; Bass, R., and B. Eynon, 2009; Media Consortium, 2005).

Research in the field indicates visual thinking is now an agent of change in eportfolio development and in the classroom (Batson, 2012; Batson, 2011; Batson, 2010; Barrett, 2008; Campus Computing Project, 2011; EDUCAUSE, 2012; Eynon, 2009; Green, 2008; Yancey, 2009). Electronic portfolios (eportfolios) have replaced traditional or paperbound portfolios, providing a wide variety of usable technologies and formats, including audio, multimedia graphics, video, and text. These technologies expand presentation options for preservice teachers to communicate and demonstrate their competency (Costantino & De Lorenzo, 2002). E-portfolios are often used to measure teacher performance and because many teacher education programs are vested in eportfolios for assessing teacher competence, preservice teachers now

need an expanded platform, the eportfolio, to document and communicate their learning as part of their reflective reporting.

For the purposes of this study, the researcher regularly employs industry terms. *Visual thinking* is the use of visuals and learning to communicate or produce knowledge. In this study, visual thinking is the use of visuals and learning to communicate or produce knowledge and visual knowledge connects to the underlying role of visual literacy. Visual communication, like visual thinking and visual learning, are inter-related elements of visual literacy. Moore and Dwyer (1994) incorporated the three elements in an educational cube and expand upon the relationship and significance of these phenomena (Moore and Dwyer 1994, p104). An *e-portfolio*- (electronic portfolio) is a collection of artifacts, evidences and reflections documenting what the student or practitioner knows and is able to do; in teacher education programs, eportfolios can function as valuable tools for creating avenues for reflection and documentation. The collection of work can be representative of personal and professional growth and development for both preservice and inservice teachers, as well as for teacher evaluation (Barrett, 2010). Digital methods can include multimedia in a variety of formats such as graphics, audio, video, and text rather than paperbound artifacts. *Preservice teachers* are teachers in a preparatory state of learning before working in their discipline. For the purpose of this study, they are students enrolled in a teacher education course of study and presumably future educators. *Reflective practitioners* are adult learners who are engaged in professional development and learning who reflect on their strengths, weaknesses and areas for development. *Reflective practice* is the learning process which begins with the examination of an individual's own actions and comparing those actions to the ideal of

the practice; the process results in behavioral changes that improve professional performance (Fulmer, 1993).

Although the printed word has been the primary way to demonstrate competence in reflective practice, the digital landscape has now expanded offering new media technologies (Rhodes, 2011). Most notably, since imagery is now as important as text in communicating in a digital and web based classroom, it is important that preservice teachers have access to appropriate available visual tools and emerging media in which to demonstrate knowledge. Visuals can clarify written ideas and help learners develop knowledge constructs and understand relationships quickly. Furthermore, the National Council for Accreditation of Teacher Education (NCATE, 2008) has increased the mandate for accountability of student outcomes assessment and comparable measures of student learning in higher education. E-portfolios have been used for a more classroom-based and faculty-driven alternative to traditional assessments focused on standardized testing (Yancey, 2009).

This researcher believes that the use of eportfolios for reflective practice will increase in teacher education classrooms globally for three reasons: (1) visual imagery can support ideation; (2) visual imagery is a critical component to writing and communication of concepts; and (3) visual imagery supports demonstration of competencies in eportfolios. The researcher's professional experience and extensive study of this subject matter reinforced this belief. The topic of eportfolios has been investigated extensively by researcher Trent Batson (2011) who found "nearly half of all U.S. colleges and universities support portfolios to one degree or another: Portfolios are reaching critical mass and are at take-off stage. They are in many ways the new book – at the core of the learning enterprise as the most appropriate and productive learning space in this post-Web 2.0 era"

(http://campustechnology.com/articles/2011/02/02/the-student-portfolio-is-the-new-book.aspx). The annually administered Campus Computing Survey (2010) shows portfolio activity at nearly half of all institutions of higher education in the United States and growing (http://www.campuscomputing.net/sites/www.campuscomputing.net/files/Green-CampusComputing2010.pdf). Substantial growth in the use of eportfolios appears in a similar report released by The Educause Center for Applied Research (ECAR) annual Study of Undergraduate Students and Information Technology. The Center found similar evidence of increase for individual students (nearly sevenfold, from 7% to 52%) from 2010-2012. The report recommended that skill building and training opportunities need to occur with emerging technologies, such as eportfolios, to educate students attitudes about their importance (Dahlstrom, 2012). The discussion regarding eportfolio growth and use is continuing as more research evolves to support eportfolio use in academia and for individual students as a life-long learning tool. At Georgetown University's *Social Media E-portfolios* (2012) conference, coverage of the topic included eportfolio processes and the possibilities of mobile access and social media for eportfolios as well as research and development of eportfolios (http://www.educause.edu/events/educause-learning-initiative-2012-annual-meeting/social-media-eportfolios).

Growing numbers suggest that campus officials should take a more assertive look at the direction of eportfolio learning and teaching at their institutions. Researcher Trent Batson (2011), President and CEO of the Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL) and recognized electronic portfolio global expert and leader, has theorized that electronic portfolios have moved from an emphasis on institutional tracking of student progress to one on learning

outcomes in a traditional curricular structure. Batson (2011) suggests that the aesthetic and architecture of eportfolios is also undergoing changes:

> "E-portfolios "have moved from institution-centered to multi-centered…from assessment-centered to learning *and* assessment centered, from school-time limited to life-long and life-wide, from installed to SaaS, and from reinforcement of the status quo to supporting new learning and assessment designs. Electronic portfolios embody the potential to support education and learning practices that fit with the trend toward 'high-impact educational practices' and in life towards building a professional digital identity" (p. 1)

Batson identifies SaaS, or *Software as a Service*, to describe any cloud service where consumers are able to access software applications over the internet (http://campustechnology.com/Articles/2011/10/12). His research has led to a recent compilation, an *ePortfolio Technology Providers* list of support services and learner-oriented management tools that help users develop artifacts for their ePortfolios from interviews and research. A blog with global comments, responses and additions is also included (Appendix A). (http://campustechnology.com/articles/2011/10/12/a-survey-of-the-electronic-portfolio-market-sector.aspx).

To support educational eportfolios for evidence-based learning, foundational knowledge and best practices, the AAEEBL has four world conferences scheduled in 2013 to discuss emerging themes in eportfolio advancement. The AAEEBL, ePortfolio California, and EPAC are also producing a new webinar series, "Exploring ePortfolio Technologies: Reviewing Platforms and Approaches for Teaching, Learning, and Beyond" to examine eportfolio platforms. The new webinar series will launch in 2013 (http://www.aaeebl.org/eport-webinar). The discussions, global conferences, trends and emerging data are indicators of how the field of eportfolios is growing as well as the scale of change in implementation (Batson, 2012). When speaking to e-portfolio practitioners at an eportfolio conference held at LaGuardia Community College in

2008, Yancey suggested that eportfolios are remaking the landscape of higher education and constitute a "tectonic shift" in higher education (http://www.aacu.org/meetings/annualmeeting/AM13/). She argued that eportfolios radically alter how students learn, how faculty teaches and how institutions assess the value of education outcomes.

A recent Midwest Regional Conference presented by EDUCAUSE (2012), *Learning to think with our eyes: An examination of visual thinking,* taught attendees how to use images to communicate information, interact with course content, simplify complex data and archive class discussions. The content demonstrated how visuals enable learners to represent complex problems and summarize large amounts of data in an easy-to-understand format. They acknowledged that visualization of data is not a new concept and that many courses continue to concentrate on text-based resources, however in a digital environment, it is important to investigate ways digital tools capitalize on the brain's ability to comprehend visual information (http://www.educause.edu/midwest-regional-conference/2012/learning-think-our-eyes-examination-visual-thinking).

As debates continue to explore the direction of the eportfolio movement, Melissa Peet, a research scientist and leader in the eportfolio program at the University of Michigan, stated in a 2008 roundtable discussion about the future of the eportfolio movement (Eynon 2009), that asking questions about eportfolios is synonymous with asking questions about the future of learning. "And the future is here, now" (http://www.aacu.org/peerreview/pr-wi09/pr-wi09_eportfolios.cfm). Advances in emerging media and the use of imagery chronicles this shift in learning experiences.

Problem Statement

The problem addressed in this study was to understand how preservice teachers documented and communicated learning via working eportfolios to demonstrate reflective practice in a teacher education class. The study explored how preservice teachers' use of visual imagery supports reflective practice in the classroom. The aim was to look at preservice teacher eportfolios developed in teacher education courses at a large state university in the southeast to learn in what ways preservice teachers perceived the use of visual imagery and whether it supported or constrained their reflective practice.

As previously mentioned, for purposes of this study, visual thinking and learning include the use of visuals – digital images, photographs, illustrations, renderings, maps, diagrams, graphics, infographics, animations, sketchnotes, graphic recordings, videos, and social media – to communicate information.

Mixed methods research explored and examined preservice teachers as learners to discover how preservice teachers documented and communicated their progress using working eportfolios for reflective practice. The study used quantitative and qualitative methods to investigate perceptions concerning the employment of visual imagery in eportfolios. This study is important because portfolios offer an organized way for preservice teachers and practitioners to demonstrate their competence in reflective practice. Eportfolios are increasingly becoming integrated in teacher education as a way of documenting learning and professional growth (Batson, 2012; Batson, 2011; Batson, 2010; Barrett, 2008; Campus Computing Project, 2011; EDUCAUSE, 2012; Eynon, 2009; Green, 2008; Yancey, 2009).

Purpose and Significance of the Study

Purpose Statement

The purpose of the study was to use mixed methods to understand how preservice teachers documented and communicated their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supported them in demonstrating their competency in a teacher education course. The reality of the situation is that educators are overlooking visual thinking construction although it is a crucial component in supporting communication and learning in eportfolio development and practice (Yancey, 2009). According to Constantino and Lorenzo (2002) in the context of teacher education, portfolio development is a valuable process for documenting course competencies. Preservice teachers are responsible for communicating their professional growth with a collection of artifacts to demonstrate their understanding of course material; the portfolio is an indicator of the skills that the practitioner has mastered. E-portfolios reflect technology competencies. These competencies may be reviewed after each course or throughout students' educational programs. Practitioners may later use their portfolios in seeking employment opportunities or as tools for reflection and analysis in their own classrooms. Teacher education faculty may also use student portfolios to record outcomes in relation to state or national standards and as evidence of their own professional development.

Significance of the Problem

This study addressed preservice teacher practice, perception and performance in education courses, and is significant with regard to the planned statewide teacher evaluation and professional growth implementation scheduled to launch in Georgia during the school year 2014-2015. In the 21st century, many teacher education faculties will become reliant upon eportfolios for evaluations. This study

supports effective communication in these evaluations, and may have global implications; this study is however, based in Georgia.

The newly adopted effectiveness system for teacher evaluation and professional growth was developed in 2012 as part of the Race to the Top Initiative (RT3), in Georgia. The new Teacher Keys Effectiveness System (TKES) has multiple components, including the Teacher Assessment on Performance Standards (TAPS), Surveys of Instructional Practice and measures of Student Growth and Academic Achievement. The overall goal of TKES is to sustain continuing growth and development in each teacher (http://www.doe.k12.ga.us/School-Improvement/Teacher-and-Leader-Effectiveness/Pages/Teacher-Keys-Effectiveness-System.aspx. The results from this study could potentially help to improve teacher effectiveness throughout Georgia by communicating and documenting teacher competencies. Because of new teacher evaluation structures, findings from this study could provide recommendations for teaching and, learning and ways to support better performance, and learner outcomes for preservice teachers. The results could provide insights into how preservice teachers will be evaluated in the light of new teacher education performance measures.

Cambron and McCabe (2000) have determined that experienced teachers gain knowledge of their craft through systematic and informed reflection upon their work. As seasoned teachers, they will identify connections between theory and practice in their reflective work. Technology and pedagogy are part of reflective practice in many classrooms as teacher education has increasingly come to rely on eportfolio development as part of preservice and inservice teacher training. Some research indicates that technology and pedagogy are isolated from one another, as two different discussions, and therefore production often prevails over both quality of work and of

learning; thus, innovative intra-disciplinary practice and method is overlooked, although it has a significant impact on learning (Georgetown University, VKP, 2002).

Reflective practice is constantly transforming as new tools emerge; thus practitioners are faced with change in determining how and what tools will be used to present their learning. In the final product, the eportfolio will reflect teaching proficiency, experience with software, management of this visual knowledge and professional growth. Innovative approaches to reflective practice are worthy of examining as they relate to newer technologies; however, the potential of new tools has yet to be fully exploited. If preservice teachers are not prepared to apply innovative and fundamental concepts as teacher practitioners they will also not be prepared to compete and support K-12 state standards for applying technology to develop students' higher order skills and creativity (http://www.iste.org/standards).

International Society for Technology in Education (ISTE's) and National Educational Technology Standards (NETS) for Teachers are the standards currently used to evaluate the skills and knowledge educators need to teach, work, and learn in an increasingly connected global and digital society. NETS require preservice teachers to meet educational technology standards, demonstrate continual growth in knowledge and skills and to stay abreast of current and emerging technologies (http://www.iste.org/standards/nets-for-teachers). To which, teachers must:

a. demonstrate fluency in technology systems and in the transfer of current knowledge to new technologies and situations;
b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation;
c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital age media and formats; and
d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

(http://www.iste.org/standards/nets-for-teachers/nets-for-teachers-2008).

These requirements are specifically related to the current study in that it addresses change that is occurring in classrooms and in the curriculum. Some researchers believe eportfolios may transform higher education to a degree incomparable to other technology applications we have known thus far (Batson 2004). No studies currently identify how practitioners specifically communicate their visual knowledge or their perceptions of using visual imagery in reflective practice.

Research reveals that without instruction focused on the technologies and effective strategies, most students will not learn them or will learn them only minimally (Barrett 2002). Additionally, some of the research results also indicate that without curriculum-specific experience in using these processes and strategies, even fewer students will carry them forward into new and appropriate contexts (Barrett 2002). This particular research is important because it addresses the issue of the lack of knowledge and strategy that students may confront particularly when using the tools; this could be a potential issue as preservice teachers aim to communicate what they know with the technology and later as they move into inservice positions, with classrooms of their own, in which to demonstrate what they know. It will contribute to a better understanding of visual thinking in the context of reflective practice and the integration of innovative technology.

Potentially, this study could contribute to a better understanding of the relationship between visual knowledge and technology in teacher education. The research explored teachers' perceptions in communicating with visual imagery via eportfolios at a large state university in the southeast. The data measured outcomes and the impact of visual thinking as it relates to learning, technology use, and reflective reporting in preservice teachers' classrooms. The audiences who may find

this study of interest include practitioners, researchers, and policy makers. The researcher hopes to contribute to the knowledge base, make recommendations, and thereby improve teaching and learning.

Infusion of learning technologies in teaching has introduced new questions and quests in the classroom. If students' are exploring multiple types of media, which have then, at least in part, to constitute their knowledge, the research may then show what they need to know about these tools to communicate their ideas effectively. Girod and Cavanaugh (2001) argue that technology is an agent of change in teacher practice and can "significantly alter the way teachers, pupils and schools operate" (p.40).

Research Questions

The central research questions were:

> Q1. What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? (Descriptive)
>
> Q1a. What are the differences in teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? (Descriptive)
>
> Q1b. How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program? (Descriptive)
>
> Q2. How do preservice teachers describe how visual imagery supports or constrains reflective practice? (Comparative)
>
> Q2a. What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their electronic portfolios to support reflective practice? (Comparative)

The research utilized a mixed method approach. In order to address whether the use of visual imagery by teachers demonstrating reflective practice supported or constrained the eportfolio learning process, teachers' perceptions will be measured using three (3) instruments in this mixed methods study. 1) An online survey with open-ended questions was administered. The survey instrument used in this study is:

Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April). 2) Interviews were administered via invitation to discuss individual eportfolios in-depth. 3) Artifacts from participants were reviewed and the researcher wrote about the journey and experiences of the teachers. A rubric was used to support this qualitative process. The researcher collected this data from student participants enrolled in a large state university in the southeast. The survey questionnaires were administered to 50 student teachers who have completed their Clinical Practice course. The interviews were conducted with volunteer participants and were administered to ten (10) preservice teachers. Artifacts in the form of actual eportfolios will include a review of five (5) eportfolios that have been completed as part of Clinical Practice course work. Information from the data determined teachers' attitudes and perceptions concerning communication with visual imagery for reflective practice in eportfolio development. The quantitative and qualitative methods provided numeric and descriptive data for this study and supported answers to research questions. The online questionnaires were administered via *Survey Monkey* during the spring semester, 2013.

The primary data supported the foundation of the study by providing considerable information about visual tools used in eportfolios in a regional teacher education classroom. The three main sources of data are: (1) an online survey with open-ended questions and (2) interviews of volunteer respondents (3) and artifacts in the form of eportfolios.

Conceptual Framework

Researcher Stance and Experiential Base

As the researcher, my direct experience to eportfolios is from the perspective as a faculty member that has taught portfolio and eportfolio classes for a number of years

specifically to design students. My current course goals are to support my students in producing eportfolios that represent a culmination of their reflective work for purposes of assessment and employment. I recognize that although portfolios have been used in the design field since design courses have been part of college curricula, it is growing in popularity in other academic areas. Based on my experiences and research, I believe that visual thinking and aspects of visual image use is a critical component to communication in eportfolios. This is primarily because the digital terrain has shifted and therefore, visual thinking is now as important as reading, writing and arithmetic. Pictorial language should be valued as verbal language. Visual image use is now part of the conversation regarding teaching and learning and is also a key component of 21st century literacy. The researcher has had an interest in this topic over a period of time, and has posted digital resources on "Pinterest" boards and curated visual news pages in "Scoop.it" to inform this research. The collection of research regarding this topic is in the form of books, scholarly articles, videos, blogs, images and authors that influence this topic. The data has supported the research process as rich information has emerged from the collected content. The digital collections can be reviewed at http://pinterest.com/klylesfolkman/ and http://www.scoop.it/t/visual-thinking-visual-learning-visual-literacy.

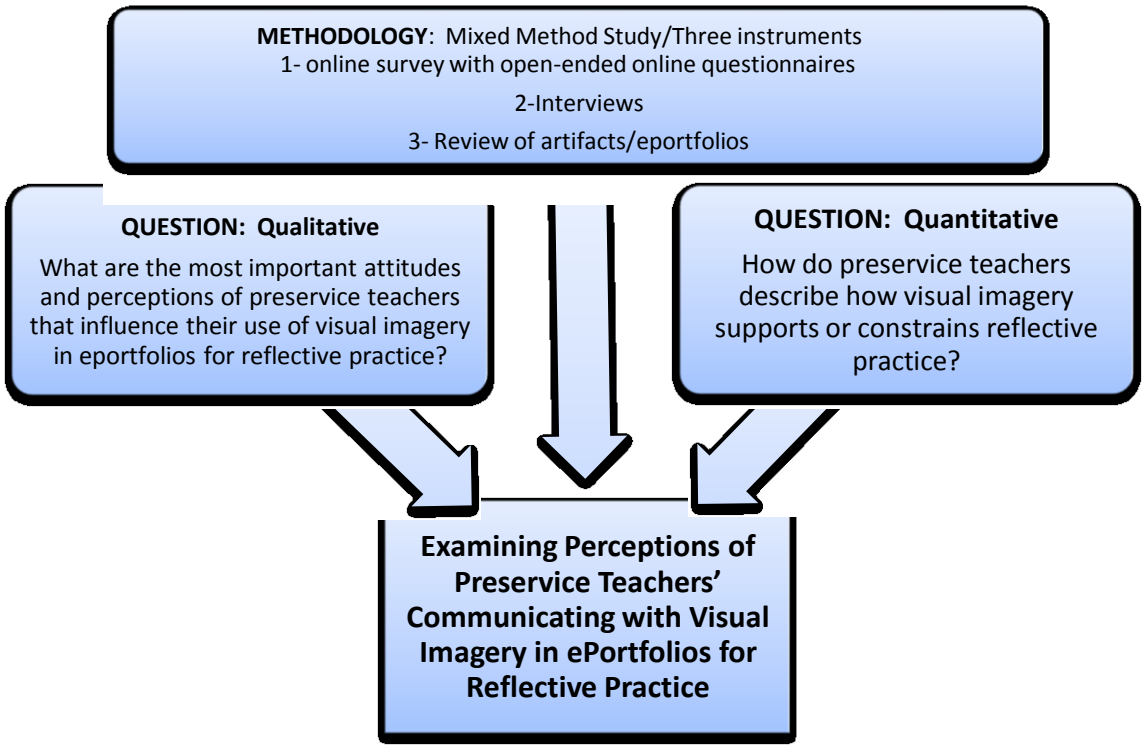
Conceptual Framework of Research Streams

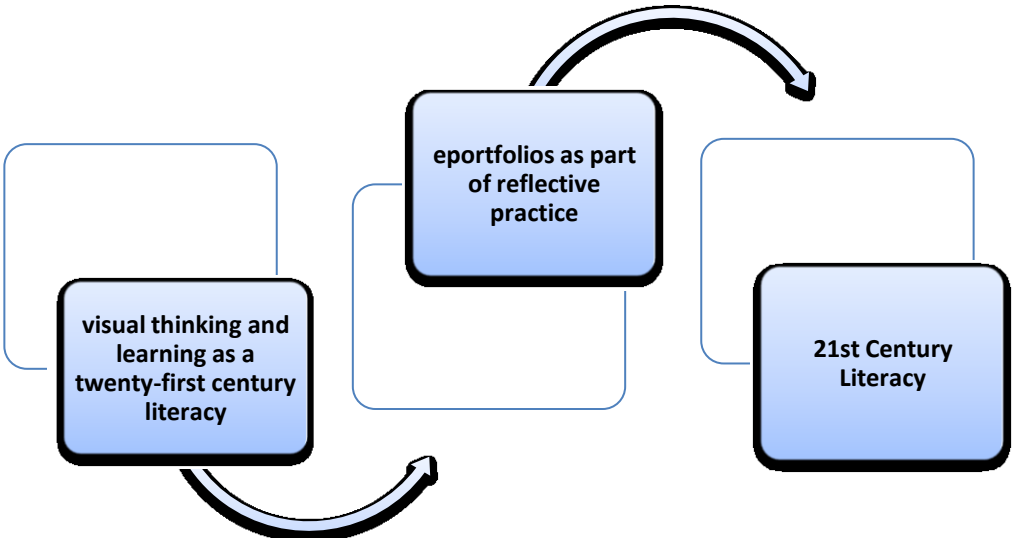
Conceptual frameworks are best conveyed graphically rather than via text; the theory may be presented as a visual representation to diagram relationships among design components (Creswell, 1994; Miles and Huberman, 1994; Maxwell, 1996). "A conceptual framework explains, either graphically or in narrative form, the main dimensions to be studied--the key factors, or variables—and the presumed relationships among them. Frameworks come in several shapes and size. They can be

rudimentary or elaborate, theory-driven commonsensical, descriptive or causal" (Miles and Huberman, 1994, p.18). Furthermore, research on conceptual frameworks suggests the conclusion that the concept map, a visual display of the current working theory or picture of the territory for a proposed study, and not of the study itself, is useful to readers who wish to absorb information quickly (Maxwell 1996). The theories relevant to this study and included in the theoretical map are expanded upon in Chapter Two, the literature review. The literature review will support links to the research questions.

Conceptual Framework

FIGURE 1.





The theoretical framework consists of theories that appear to be interrelated. The researcher hopes to gain a perspective upon and synthesize relationships between ideas and practice. This framework will include past and current thinking to establish the context of the problem.

As noted in the conceptual (Figure 1), and theoretical framework, the research is embedded within several overlapping factors. Of these factors, use of visual imagery for reflective reporting has perhaps received the least attention by researchers in the past, yet because of advances in media and technology, a growing number of researchers from various fields are starting to contribute to the conversation. Because the use of visual imagery in preservice teachers' eportfolios is the focus of the proposed research, the review of the empirical literature that follows will include published studies and research regarding (1) visual thinking and learning as elements of rich learning environments (2) eportfolios as part of pedagogical documentation and reflective practice in Teacher Education course work (3) 21st-century literacy and the use of visual imagery as a language to chronicle learning experiences.

First, Yancy, *et al*, assert that 21st-century literacy is now considered a set of abilities and skills where aural, visual and digital converge. They theorize that because the digital terrain is changing, so is teaching and learning (Yancey, 2012; Batson, T. 2011; Bass, R., and B. Eynon, 2009; Media Consortium, 2005). The connection that this researcher attempts to make is that text has been important to teaching and learning, yet new tools such as visual aids have created a shift in how educators absorb and synthesize information, and in how they convey achievement. In the discussion regarding text, the researcher associates use of text as a means to communicate ideas; use of visual images can also be a means to communicate ideas and concepts. Researchers (Batson and Grush, 2011; Shrock, 2010; Yancey, 2011) provide a body of work, which illustrates the fact that visual imagery is inundating education culture. Growing research activity indicates that visual thinking is now an agent of change in emerging practice. Although current research is important to understanding the perspective of this study, ideas from Moore and Dwyer (1994) remain relevant to the discussion of visual thinking. Their early and extensive studies indicate that visual thinking, visual learning and visual literacy are interconnected as part of an educational "cube;" they expand upon the relationship among and significance of these principles in education and in business.

If teaching advancement begins in a teacher education classroom, we have to look at theorists who continue to strive for answers for how practice is impacted by emerging technology (Batson, 2012; Batson, 2011; Batson, 2010; Barrett, 2008; Campus Computing Project, 2011; EDUCAUSE, 2012; Eynon, 2009; Green, 2008; Yancey, 2009). Much of the current research, and studies that focus on this topic, is investigated in the current exploration. Furthermore, Girod and Cavanaugh (2001) argue that technology is an agent of change in teacher practice and can "significantly

alter the way teachers, pupils and schools operate" (40). Perhaps the largest body of research contributing to this study rests on the theories of researcher Trent Batson (2011) who discovered that "nearly half of all U.S. colleges and universities support portfolios to one degree or another" (http://campustechnology.com/articles/2011/02/02/the-student-portfolio-is-the-new-book.aspx). As the president and CEO of the Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL), and an electronic portfolio global expert and leader, Batson has theorized that electronic portfolios have moved from their use as institutional tracking of student progress toward assessing learning outcomes in a traditional curricular structure. He has also developed blogs and compiled lists of support services and learner-oriented management tools that help users develop artifacts for their eportfolios; one of these tools is using visual technology to support teacher reflection via eportfolios. His contributions have added to a global discussion about the directions in the applications of eportfolios and the shift in teaching and learning.

Costantino & De Lorenzo (2002) examined earlier discussions about traditional or paperbound portfolios versus e-portfolios. They highlight the range of available technologies including multimedia and a variety of formats, such as graphics, audio, video, and text. Their research supports later research suggesting that the presentation options preservice teachers have to communicate and demonstrate their competency have expanded. Opposing research conducted during the same time concerning connections between technology and pedagogy indicated that production of work often prevails over quality and learning, and are isolated as two different discussions (Georgetown University, VKP, 2002). Researchers at Georgetown University continued to add to the conversation about technology and learning when

they presented their findings at a conference, *Social Media E-portfolios* (2012), about eportfolio processes and the possible uses of mobile access and social media for eportfolios, as well as research and development of eportfolios (http://www.educause.edu/events/educause-learning-initiative-2012-annual-meeting/social-media-eportfolios).

The framework presented here attempts to understand the use of visual tools to support preservice teachers in demonstrating their competency in a teacher education classroom. This researcher believes that previous research did not regard the use of visual imagery as important to learning as text to communicate ideas. In fact, early researchers of the medium categorized visual communication as "fluffing around" (http://jperk30.edublogs.org/2011/04/23/good-point-bad-point/). Even though visual imagery has been proven an integral part of human cognition, it tends to be marginalized and undervalued in contemporary higher education (McLoughlin & Krakowski, 2001). If verbal texts (audio), diagrams, drawings, photographs, and videos are all regarded as texts to be read, then these elements can be confidently applied to the development of new inclusive curricula (Roth, 2002). Because of these factors, it is therefore becoming increasingly necessary to include the use of visual imagery as part of the dialogue regarding the direction of eportfolios and tools needed in the classroom; as an instructional concept, it has the potential to support a diversity of learners. Now, the development of visual, media and digital fluencies is critical to learning and teaching (http://jperk30.edublogs.org/2011/04/23/good-point-bad-point/).

Definitions for purposes of this paper:

Visual Thinking- The use of visuals and learning to communicate or produce knowledge. For purposes of this paper visual thinking is the use of visuals or visual

imagery and learning to communicate or produce knowledge; and visual knowledge connects to the underlying role of visual literacy. Visual communication, as are visual thinking and visual learning, are all inter-related when discussing the role of visual literacy. Moore and Dwyer (1994) incorporated the three elements in an educational cube and expand upon the relationship and significance of these areas (Moore and Dwyer 1994, p104).

E-Portfolios- (electronic portfolios) a collection of artifacts, evidence, and reflections documenting what one knows and is able to do; in teacher education programs, a method for creating avenues for reflection and documentation of personal and professional growth and development for both preservice and in-service teachers as well as teacher evaluation. Digital methods can include multimedia in a variety of formats, such as graphics, audio, video, and text opposed to paper bound artifacts.

Preservice teachers- Teachers in a preparatory state of learning before working in their discipline. For the purpose of this study, they would be students enrolled in a Teacher Education Department and presumably future educators.

Reflective practitioners- Adult learners who are engaged in professional development and learning. Their knowledge can be used to reflect on their strengths, weaknesses and areas for development.

Reflective practice- the learning process in reflective practice begins with the examination of an individual's own actions and contrasting the actions to the ideal of the practice; the process results in behavioral changes that improve professional performance (Fulmer, 1993).

Perceptions- influences in the ways in which humans understand the world around them and how they make decisions (Berelson and Steiner, 1964). As a psychological construct, it is associated with other constructs such as attitude in this research.

Attitudes - refers to an individual's preference for or disinclination toward an idea, issue, item or object; it is subjective in nature, and can be positive or negative. Attitudes very often come in pairs, one conscious and the other unconscious. (Jung, 1921).

Limitations, Delimitations, Assumptions

Limitations

The margin for error in data obtained via survey cannot be fixed with accuracy because human beings do not necessarily answer questions with candor (Creswell, 2009). Results might not accurately reflect the opinions of all members of the included population. The population and the geographic region from which data could be collected are limited. The small sample available for the study indicates that results may not be generalized beyond the specific population from which the sample is drawn. The population involved in the current study focused only on members located within one (1) Teacher Education program and in one (1) state. Additionally, because this study is interested in eportfolios, only those students with eportfolios will participate.

Delimitations

There are a large number of potential participants for a similar study. Results are therefore not definitive, but can indicate the usefulness of further investigation and research.

Assumptions:

The researcher is aware that demographics, race, age, gender and socioeconomic class can affect a study. The researcher will not attempt to collect demographic information or analyze such factors. For the purpose of discussion, the

researcher assumes participant demographics will not significantly affect their perceptions.

Summary

In this descriptive study, the aim was to investigate and understand how teachers demonstrate their competency by using visual tools to support reflective practice in electronic portfolios. Because education now occurs in a technology-rich learning environment, visual imagery can chronicle learning and teaching experiences. The comprehensive literature review supports an understanding of the growing discussion of teacher reflection in eportfolios and how preservice teachers communicate learning.

This study was conducted in a teacher education classroom at a large state university in the southeast. The study focused on individual teachers who completed electronic portfolios as part of their clinical research, showing how they have used and implemented this assessment tool and how they perceived the use and value of visual imagery in learning. The study employs mixed methodology including survey questionnaires, individual interviews and document analyses; data sources include electronic portfolio documents. After review of the literature and upon the conclusion of the study, the findings and results from the collected data will be shared with the institution, to support teacher education programs and the growth of innovative practices in eportfolio.

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter reviews specific factors relevant to perceptions of preservice teachers' communication with visual imagery in eportfolios (electronic portfolios) for reflective practice. This section includes published studies and research with regard to (1) visual thinking and learning as elements of rich learning environments; (2) eportfolios as part of pedagogical documentation and reflective practice in Teacher Education course work; and (3) 21st-century literacy and the use of visual imagery as a language to chronicle learning experiences. This review is arranged to provide a vivid picture of the various fields of knowledge that contribute to this learning. Although multiple categories provide a snapshot of the progression of this topic, the literature presented is reduced to three large areas in the framework that reveal significant evidence to answer the broad questions: (1) What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? and (2) How do preservice teachers describe how visual imagery supports or constrains reflective practice?

The theoretical framework in this literature review consists of theories that appear to be interrelated. The researcher hopes to gain a perspective upon and synthesize relationships between ideas and practice. Included in this review are past and current thinking to establish the context of the problem. Because the use of visual imagery in preservice teachers' eportfolios is the focus of the proposed research, the review of the empirical literature that follows will include published studies and research to support in answering the guiding research questions of this study. These

researchers' theories and scholarly works are key to helping shape this review: Batson, Barrett, Day, Moore and Dwyer, Shrock, Villano, and Yancy.

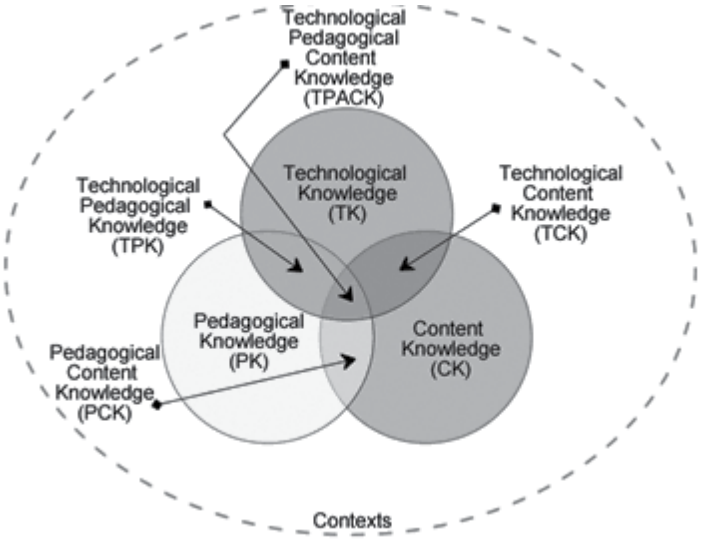
The paper begins with a review of the theoretical framework, evidence of eportfolio use, standards, historical functions, as well as traditional and current technology integration in educational portfolio development. Second, the researcher discusses strategies, initiatives, and 21st century literacy communication with new media. Third, this chapter addresses contributing areas of visual image use, visual literacy and visual thinking representation, and a review of global initiatives in portfolio development also chronicling this practice. Chapters conclude with teacher perceptions and attitudes. The literature provides a rich backdrop for research and studies to support the conceptual framework presented in chapter one (FIGURE 1).

Theoretical Framework for the Study

The application of the Technological Pedagogical Content Knowledge (TPACK) framework has been used to discuss other constructs believed to influence technology integration, but for preservice education, this framework can be used to better understand the impacts of various learning experiences and models for teacher preparation. The TPACK framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006) gives researchers the opportunity to observe the role technology plays in communicating teacher knowledge. It has enough flexibility to allow for a rapidly evolving technological landscape (FIGURE 3). The research efforts of Jason T. Abbitt (2011) provide insight into the recent emergence of the TPACK framework, and indicate that more must be learned about the knowledge base teachers require to support student learning by using technology in productive and meaningful ways. He reflects that there are efforts to establish valid and reliable measurement tools able to assess teacher knowledge relating to technology in teaching and learning which

include both self-reporting and performance-based measures. Although gaps exist in the available methods and instruments, the varied approaches in measuring TPACK effectiveness can be identified for evaluating courses, workshops, and programs that prepare preservice teachers. According to Abbitt (2011) TPACK has emerged as a way to represent the knowledge required to use technology in an educational setting in ways that are contextually authentic and pedagogically appropriate (p.281).

The TPACK framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006) FIGURE 2.



supports this study's attempt to understand the use of visual tools as part of preservice teachers' demonstration of competency in teacher education coursework.

The TPACK assessment instrument used in this study is: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April).

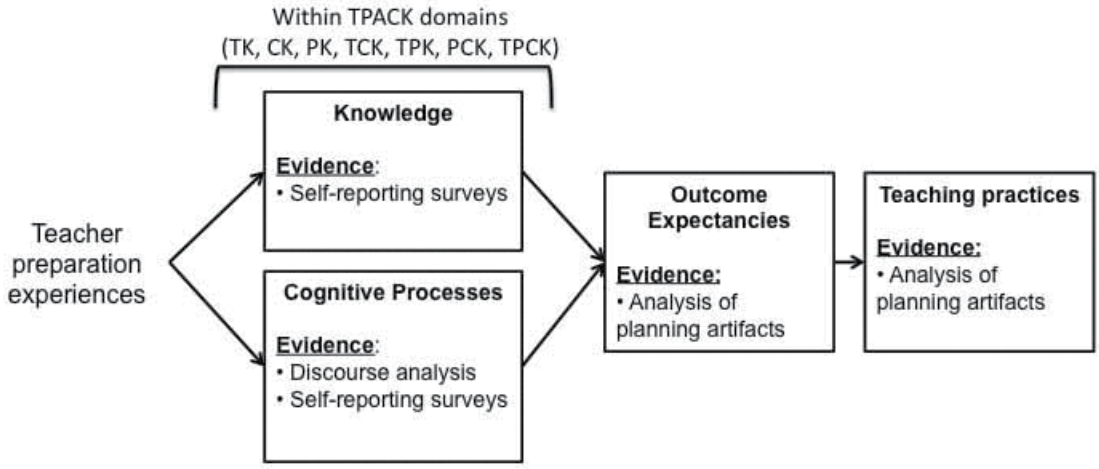
In a review of current methods and instruments for measuring TPACK, Jason T. Abbitt (2011) *Measuring Technological Pedagogical Content Knowledge in Preservice Teacher Education* states:

> Within the context of a preservice teacher preparation program, it is necessary to consider the promise of these methods and instruments for understanding the impact of teacher preparation experiences on preservice teachers' knowledge within these distinct domains. When considering the application of the various methods and procedures for measuring TPACK, it is important to consider that the TPACK framework can serve both as a model for the requisite knowledge of teachers for technology integration as well as a model of how innovative technology integration emerges. Using the instruments and methods currently available, it is possible to envision the ways in which the TPACK framework serves as a lens for observing the impact of teacher preparation experiences on knowledge and cognitive processes as well as for assessing the outcomes leading toward effective and innovative teaching practices.

Abbitt (2011) adds that the survey has benefitted from ongoing research and revision to create a measure of the perceived knowledge of preservice teachers in the TPACK domains. As an instrument intended to be used to reveal the changes in TPACK throughout a teacher preparation program, the survey has been demonstrated to be valid and reliable and provides an efficient tool for research and evaluation relating to TPACK" (p.291). The research study used in this paper, employs a mixed methodology which supports the findings of researcher Abbitt. However, as he points out, TPACK, while it serves as a model for communicating knowledge and technology integration, its use must take place in an environment that is sensitive to contexts not always readily apparent. Therefore, researchers should not rely on TPACK alone, but apply it as one of multiple instruments that measure competency. As he has illustrated (Figure 3), "both quantitative and qualitative measures provide unique insights into various facets of preparing preservice teachers to integrate technology" (p.296).

TPACK-based evaluation of teacher preparation experiences using existing methods and instruments

FIGURE 3.



There are seven knowledge concepts in the TPACK framework, as described by Mishra and Koehler (2006):

> • Pedagogical knowledge (PK): Knowledge of nature of teaching and learning, including teaching methods, classroom management, instructional planning, assessment of student learning, etc.
> • Content knowledge (CK): Knowledge of the subject matter to be taught (e.g., earth science, mathematics, language arts, etc.)
> • Technology knowledge (TK): Continually changing and evolving knowledge base that includes knowledge of technology for information processing, communications, and problem solving, and focuses on the productive applications of technology in both work and daily life
> • Pedagogical content knowledge (PCK): Knowledge of the pedagogies, teaching practices, and planning processes that are applicable and appropriate to teaching a given subject matter
> • Technological content knowledge (TCK): Knowledge of the relationship between subject matter and technology, including knowledge of technology that has influenced and is used in exploring a given content discipline.
> • Technological pedagogical knowledge (TPK): Knowledge of the influence of technology on teaching and learning as well as the affordances and constraints of technology with regard to pedagogical designs and strategies
> • Technological pedagogical content knowledge (TPCK): Knowledge of the complex interaction among the principle knowledge domains (content, pedagogy, technology) (p. 1025).

The researcher for this study will use TPACK in the context of a preservice teacher preparation program to examine teachers' perceptions and experiences of using visual imagery as part of reflection in their eportfolios.

E-portfolios as Part of Reflective Practice

E-portfolios are part of the discussion regarding reflective reporting. This section of the literature review addresses the role of eportfolios in supporting a series of standards and practices in Teacher education classrooms. These performance measures are also included because this study looks at one university based in Georgia. New teacher evaluation and professional growth implementation are scheduled to launch in Georgia during the school year 2014-2015 (Georgia Department of Education, 2012). In the 21st century, many teacher education faculties will become reliant upon eportfolios for evaluations. The current study aligns with the newly adopted effectiveness system for teacher evaluation and professional growth, a part of the (2012) Race to the Top Initiative (RT3), in Georgia, and includes the Teacher Keys Effectiveness System (TKES). Its multiple components comprise the Teacher Assessment on Performance Standards (TAPS), Surveys of Instructional Practice and Measures of Student Growth and Academic Achievement. The overall goal of TKES is to sustain continuing growth and development for each teacher (http://www.doe.k12.ga.us/School-Improvement/Teacher-and-Leader-Effectiveness/Pages/Teacher-Keys-Effectiveness-System.aspx).

The position of the National Council for Accreditation of Teacher Education (NCATE, 2008) which has increased the mandate for accountability of student outcomes assessment and comparable measures of student learning in higher education, had further contributed to the use of E-portfolios for a more classroom-based and faculty-driven alternative to traditional assessment methods, which focus on standardized testing (Yancey, 2009). The International Society for Technology in Education (ISTE's) and National Educational Technology Standards (NETS) for Teachers (2008) which currently supply the standards used to evaluate the skills and

knowledge educators need to teach, work, and learn in an increasingly connected global and digital society require preservice teachers to meet educational technology standards, demonstrate continual growth in knowledge and skills and to stay abreast of current and emerging teaching tools (http://www.iste.org/standards/nets-for-teachers).

An overview of TPACK was described in the first section in this review with regard to standards. Cox (2008) defines TPACK as "the knowledge of the dynamic, transactional negotiation among technology, pedagogy, and content and how that negotiation impacts student learning in a classroom context." He determines that, the essential features of TPACK are (a) the use of appropriate technology (b) in a particular content area (c) as part of a pedagogical strategy (d) within a given educational context (e) to develop students' knowledge of a particular topic or meet an educational objective or student need. (p. 40). Although the effective integration of a teacher's TPCK students can be purposefully guided through the "regimen of techniques for evidentiary inquiry and assisted in the development of new methodological schema for inter-textual and recursive historical study" (Swan & Hicks, 2007, p. 144). Adcock, L., & Bolick, C. (2011) provide insight as to how this technology can provide a basis for building preservice teachers' TPACK. The researchers believe that the process of using technology in meaningful ways is through the design of a digital flexbook using wiki. They note that because Web 2.0 tools have provided an opportunity for a variety of students in various contexts to create knowledge in visual, aural, spatial, and textual forms, the creation of a digital flexbook could be an important step in actively engaging preservice teachers in the process of learning subject specific content while building the necessary skills for the development of TPACK.

Early research has helped to shape an understanding of key principles in teaching and learning. Many forerunners in the field of educational research have emphasized the role of reflection in successful communication of ideas. To understand the foundation for reflection in learning and knowledge, it is imperative to look at researcher Dewey who proposes that l learning begins only when one realizes that established ideas are inadequate for solving a problem at hand. It is then that one must use the process of reflection to find a way to seek improvement. In *Democracy and Education*, Dewey (1916) states:

> Thought or reflection, as we have already seen virtually if not explicitly, is the discernment of the relation between what we try to do and what happens in consequence. No experience having a meaning is possible without some element of thought (p.158).

Researcher Rogers (2007) supports the value of Dewey's theories and asserts that thinking, particularly reflective thinking or inquiry, is essential to both teacher and student learning. Eisner (1998) further contributes to this discussion in stating that in order for understanding to take place, one must first experience. Reflection, therefore, becomes an essential part of understanding and teaching, and in fact, reflection must be a fundamental part of teaching success.

Greenberg J., Pomerance, L. and Walsh K. (2011) theorize that as teachers gain experience by trial and error, reflection allows for growth; experienced teachers gain knowledge of their craft through systematic and informed reflection on their work; seasoned teachers are likely to identify connections between theory and practice. Dewey (1933) provides insight into the perspectives on cognition in adding that reflective thinking moves perception of a limit or impediment to "an act of searching, hunting, inquiring, to find material that will resolve the doubt, settle and dispose of the perplexity" (p.12).

As the literature suggests, reflective practice is a contributing part of preservice education and supports preservice teacher success. Greenberg et al. (2011) found that those enrolled in formal preservice programs that included reflective practice as part of document learning were more likely to be effective in the classroom than those with no such training. The idea of incorporating reflection in their development may be an indicator of how the preservice teachers will perform when inservice.

Michael Day (2009) asserts that electronic portfolios or webfolios, like traditional portfolios, support reflective practice, self-evaluation and authentic assessment, but can include any type of media, thus presenting a wider network of communication and information and having the potential to change the landscape of pedagogy, curriculum, and assessment for students, faculty, and administrators http://www.ncte.org/college/briefs/eportfolios. The impact of the use of eportfolios is shared by Trent Batson (2009) as he has noted in much of his research electronic portfolios have greater potential for altering higher education than any other technology application we've known thus far. Fischman (2009) also asserts that "If we truly want to advance from a focus on teaching to a focus on student learning, then a strategy involving something like electronic student portfolios, or ePortfolios, is essential" (http://chronicle.com/blogPost/Electronic-Portfolios-a-Pa/4582/).

Electronic portfolios in a teacher education program provide an efficient method for displaying preservice teachers' work, which represents their knowledge and documents their growth throughout the program (Batson, 2009). Electronic portfolios may exhibit benchmark performance measures for preservice teachers by allowing for the evaluation of the effectiveness of teaching strategies. Preservice teachers may also present artifacts of their reflections to show their progress towards meeting the standards of their programs. Author Helen Barrett, a thought leader regarding the use

of eportfolios and a 2007winner of the *EIFEL's Lifetime Achievement Award* for contribution to eportfolio research and development, highlights and focuses on the two major purposes for developing ePortfolios, and how to balance both approaches to enhance learner engagement with the eportfolio process (*Balancing the Two Faces of ePortfolios*, 2010) She believes that portfolios should include varied content and offer information in a variety of formats:

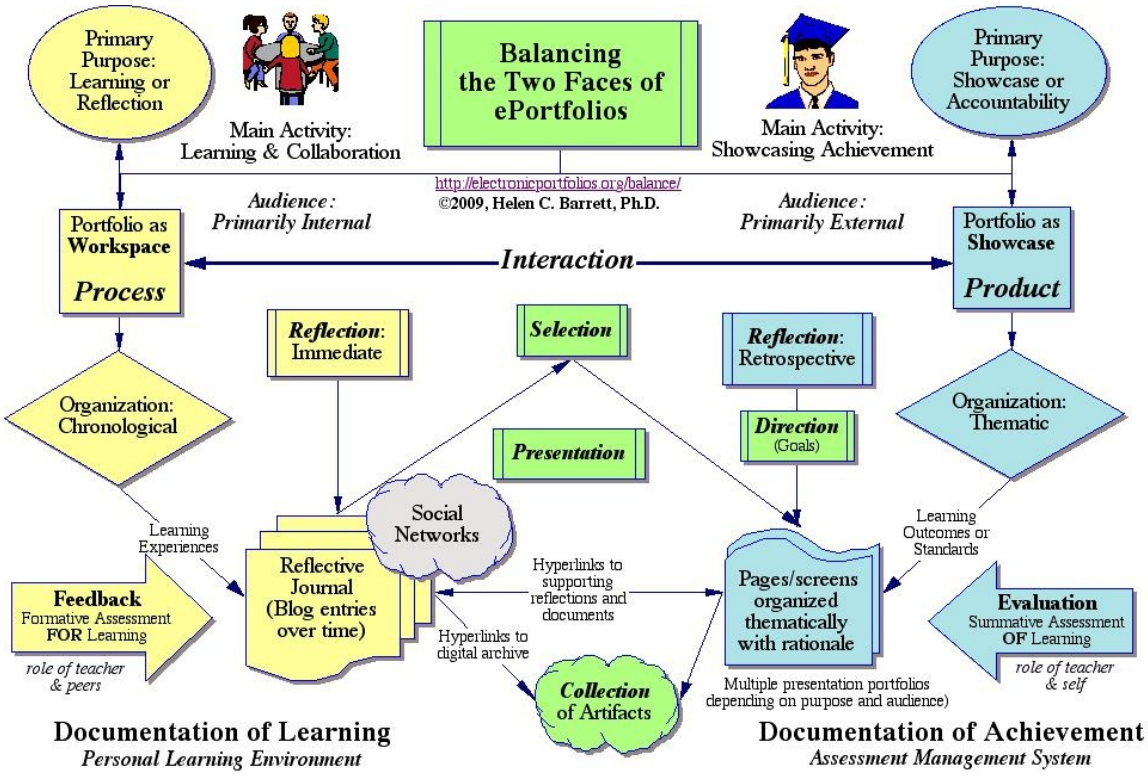
- Collecting
- Selecting
- Reflecting
- Projecting
- Celebrating

She adds that new technologies allow portfolio enhancement through:
- Archiving
- Linking/Thinking
- Storytelling
- Collaborating
- Publishing

Barrett (2010) developed a concept map, (FIGURE 4) to show how learning experiences are embedded in the curriculum. This map demonstrates that the primary purpose of a portfolio is one of learning or reflection as well as a showcase of accountability. Her research suggests that there are two ways that artifacts can be used as evidence of learning. One is in the educational institution's assessment system and the second is in the learner's archives in the form of a portfolio. She claims that this process is "interactive and reflective", connecting the artifacts with the learner's reflection, which is the rationale or justification for using the artifact as evidence of learning.

Balancing the Two Faces of E-portfolios (Barrett, 2010)

Figure 4.



She concludes that the final element in this development takes place when an assessor looks at the artifact and the learner's reflection, and then decides if this work has met the guidelines outlined in the associated rubric to determine level of success.

There are additional areas related to eportfolios that follow in this paper to help frame the research on the topic. They include: standards, historical function, reflective practice methods, best practice, the future of eportfolios, and the role of assessment in portfolios. This section provides a connection to the research by providing an understanding of the purpose and function of eportfolios in teacher education. It also presents information about eportfolios as artifacts and evidence of learning in the classroom.

E-Portfolios Standards and Historical Function

Researchers and theorists continue to strive for answers in the use of portfolios and teacher practice. E-portfolios were the topic of a recent review of the credit system that is part of current academic practice at many institutions. At the Association of American Colleges and Universities (AACU) forum *E-Portfolio Forum Look What I Can Do: Reclaiming a Focus on Learning* (2012), researchers discussed the promise of ePortfolios as an academic model for tracking student learning outcomes. Technology as an agent of change or a catalyst for change and pedagogical strategies were strong components of the conversation concerning eportfolio development for reflective practice. A continuation on the topic of eportfolios will be addressed in a symposium: *E-portfolios Foundational Knowledge, Student Voices and Best Practices* (2013) in partnership with the International Journal of ePortfolios and the Association for Authentic, Experiential and Evidence-Based learning (AAEEBL). The conference will continue the discussion in seeking best practices for knowledge and use of ePortfolios.

To understand the foundation for eportfolio development and visual knowledge development, Jim Nichols (2006) writes in "Visuals, Videos, and Multimedia - Why Use Them in Teaching?":

> Based on 25 plus years of teacher training, I can verify that few educators effectively use visuals, videos, and multimedia as methods of presenting material to students. My position is that proper teaching methodology works regardless of presentation mode. The recent recognition by literacy organizations (NCTE and IRA) of "Viewing" and "Visually Representing," as literacy skills, along with reading, writing, speaking, and listening, indicates both the importance of teacher use as tools of instruction and the need for learners to develop skills in interpreting and applying them (http://www.teach-nology.com/tutorials/visuals/)

Barrett (2008) describes the concept of portfolio documentation as a platform for students in teachers' preparation program to provide indicators of knowledge and progress that can be measured. Thus, national, state or district standards can be used

as a guide to determine the areas of assessment. Portfolios may also serve as an instrument for gaining a better understanding of preservice teachers' abilities; examining artifacts can provide tangible evidence of knowledge gained and skills mastered in their teaching processes.

Another school of thought is that many portfolios in this century are highly individualized and personal while satisfying multiple standards, such as district and school policies, court decisions, and professional association standards. Thus it is argued that portfolios may not present enough pertinent information for administrative uses. Shavelson and Klein (2010) summarized that portfolio assessment cannot be used as an appropriate and safe vehicle to make summative decisions in a certification context. Furthermore, they do not feel that eportfolios are a good form of measurement unless the contents are rigorously controlled and systematically evaluated. Otherwise students could be legally challenge schools. Thus, they perceive portfolios as collections of candidate artifacts that present examples of candidate knowledge, skills, dispositions, and growth, yet they do not support portfolios as a form of assessment. The theorists also argue that portfolios need to be evaluated individually as part of the candidate's overall performance record or summative assessment using a database format. Their argument points out that:

> Portfolios do not and cannot meet the requirements for standardization because by their very nature, they are tailored to each student…Portfolios are simply not up to the task of providing the necessary data for making a sound assessment of student learning. They do not and cannot yield the trustworthy information that is needed for this purpose. There are three major reasons portfolios are not appropriate for higher education assessment programs: They are (a) not standardized, (b) not feasible for large-

> scale assessment due to administration and scoring problems, and (c) potentially biased. Indeed, course grades, aggregated across an academic major or program, provide more reliable and better evidence of student learning than do portfolios" (http://www.insidehighered.com/views/2009/10/16/shavelson#ixzz2JdtKQV00).

Other challenges in portfolio implementation were found in a study reporting the experiences of teacher participants using e-portfolios for developing independent learning. Chau J. and Cheng G. (2010) presented findings that indicate some teachers, in order to meet assessment requirements see conformity to evaluation criteria in eportfolios as a more pressing imperative than individuality. They feel individuality is a quality that makes learning meaningful, and they would rather not produce 'clone' eportfolios, which resemble their peers' eportfolios, void of personal preferences or abilities. What also appears to be in question is a fear that deviation from the standard profile might jeopardize their success. Batson (2010) adds to this discussion and suggests, alternatively, that eportfolios provide a more authentic form of assessment in comparison to using legacy testing practices of memorization. He asserts, "Portfolios dictate a different approach to evaluation: accumulation of work evidence and reflection on that work. Using reflection as the most basic way that we academics evaluate students is far more appropriate to the way we work in this century than the testing methods of last century. We no longer need to test as we did, but we *do* need to evaluate using portfolios" (http://campustechnology.com). According to Carnegie Mellon University, summative assessments are often *high stakes*, meaning that they have a high point value. The goal of summative assessment is to *evaluate student learning* at the end of an instructional unit by comparing it

against some standard or benchmark (www.cmu.edu/teaching/assessment/basics/formative-summative.html). Barrett (2006) reflects on the theory of summative assessments. This author concludes that the problem is that the main issue amongst educators is with the more summative or perhaps behavioral approaches, rather than the constructivist paradigm. Furthermore, she has observed that very few educators have experience using portfolios in their teacher preparation, as well as there a lot of incompatible uses of portfolios implemented in teacher education programs. Moreover, Barrett believes that the model of portfolios implemented with student teachers is not compatible with how their students would use them in schools. She asserts that we aren't modeling appropriate practices and we need to ask the right questions to determine how to break this cycle. Her research recommendations include having administrators and teachers develop and maintain their own reflective portfolios, and create a collaborative environment where portfolios are used for collaboration and professional development, not only for high-stakes evaluation purposes. (http://electronicportfolios.org/wordpress/index.php?cat=16)

This researcher supports the current responsibility of educational technology standards; conclusions indicate an opportunity for teacher candidate to meet recent standards of technology experience and competence. This notion is reflected in the standards for NETS•T (2008). As a result of its focus on preservice teacher education, NETS defines the fundamental concepts, knowledge, skills, and attitudes for applying technology in university educational settings. All teacher candidates who are seeking certification or endorsements in teacher preparation must meet these educational technology standards. It is also the responsibility of university faculty and cooperating schools to provide opportunities for teacher candidates to meet these fundamental

standards in their learning environments. Developing creative and innovative ways for implementing NETS•S Standards must be introduced to classrooms and thus use of technology to reflect learning in a creative way. Standards and performance indicators listed provide guidelines for teachers currently in the classroom to include:

1. Facilitate and Inspire Student Learning and Creativity

   Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. Teachers:

   a. promote, support, and model creative and innovative thinking and inventiveness.

   b. engage students in exploring real-world issues and solving authentic problems using digital tools and resources.

   c. promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes.

   d. model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.

2. Design and Develop Digital-Age Learning Experiences and Assessments

   Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S. Teachers:

   a. design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity.

   b. develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress.

   c. provide students with multiple and varied formative and summative assessments

   d. aligned with content and technology standards and use resulting data to inform learning and teaching.

3. Model Digital-Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers:

a. demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.

b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation.

c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital age media and formats.

d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning. http://www.iste.org/standards/nets-for-teachers/nets-for-teachers-2008.

Portfolios in education classes are largely used to support preservice teachers' reflections and guide them in understanding their own learning. They illustrate a rich picture of student work that documents growth over time. A central feature of creating eportfolios demonstration of professional growth (or increase in authentic competency) within past, present, and future practice and connected relationships (Yancy, 2009). Many educators and theorists advocate the use of portfolios in education for students as well as teachers (Yancy, 2009; Batson, 2009; Barrett; 2010). Cambridge (2001) research shows that reflection is central to learning, and the reflective core of balanced learning portfolios is what transforms a collection of information to meaningful knowledge. Yancey (2007) adds that electronic portfolios are created through the same basic processes used for print portfolios: collection, selection, and reflection.

Teacher education programs sometimes implement structured templates for eportfolios attached to a conceptual framework. Students then have to follow the templates to configure and submit their eportfolio entries (Gibson & Barrett, 2003). Standard eportfolio templates require teachers to upload content material as evidence to support a rubric category. At the end of each entry, students write a reflection

about their experiences and the course material presented (Parkes & Kajder, 2010; Plaisir, Hachey & Theilheimer, 2011).

The concept of portfolios is not new to all disciplines of study, particularly, not in the arts, wherein there has been a long tradition of portfolio development. The artist's portfolio serves as a foundation for a continuum of learning experiences, including reflection, feedback and exchange. Later, in the formal context of an artist's education, the portfolio becomes a critical vehicle with which to market his or her work, which goes beyond education and creative development and into career (Barrett, 2006). Some education departments have introduced eportfolios as a benefit of technology and electronic media. The arts however, have maintained the use of portfolios for years, particularly as a visual display and supplement for artists seeking work, or as a representation of their knowledge of certain areas. Comparatively, an educational portfolio contains work that a learner has selected to indicate growth and change over a period of time. An educational portfolio is the learner's reflection on the individual pieces of work, or artifacts, to relay a story (Barrett 2008). In summarizing the term "portfolio" Barrett (2006) states that there should always have a modifier or adjective that describes its purpose. There are various purposes for portfolios in education and those can include learning as well as assessment, employment, marketing to potential employers and showcasing best works. In addition to these multiple purposes, portfolios can be found in K-12 schools, higher education and the professions. Some early research (Barton, 1997; Burke, 1997; Hartnell-Young and Morris, 1999) agrees with the perspective that the portfolio can serve multiple purposes beyond teacher preparation programs. Barrett (2006) has also used the term "course portfolio" and described the structure to be both formative, as a way of improving their teaching, and summative, as a way of presenting their teaching for

external review, evaluation, and reward. Tenure, promotion files and teaching awards have been included in course portfolios. Teachers have even presented their portfolios at conferences or have published articles with selected pieces from their portfolios. Portfolios have been used to improve coordination in the teaching of sequential courses and used to establish uniform learning goals (Barrett 2006).

The most current term that contrasts the previous terms of portfolios and e-portfolios, is “electronic learning portfolios” (or e-folios). This term has created some discussion with regard to new technologies and portfolio development. The argument at the forefront is the question of whether we can swap one technology for another. Is technology becoming a crutch for learning? Carney (2001) theorizes that some early researchers suggest that one technology and new tools cannot be so easily swapped for another. However, some theorists believe that the issue is more about thinking and cognitive measures when dealing with technology and less about adaptation. Clark (2003) claims that technologies are interwoven with thinking. It makes no sense to “factor out” what the human brain is doing as the “real” part of thinking, and to view what the technology is doing as a “cheat” or “crutch.” Rather, we can understand cognitive activity as shared among a number of people and artifacts, and cognitive acts as learning to think with other people and artifacts. Following this theory, students need to know how to think with and through their tools as much as they need to record information in their heads. Thus, thinking is at the forefront of learning, regardless of the available technologies. Dublin adds to this theory- “We should … remember that the entire process is 'about people….not technology” (2004, p.294).

Traditional Reflective Practice Methods in Portfolios and Best Practice Today

The National Board for Professional Teaching Standards (NBPTS) and other organizations have often relied on the method of videotaped reflection to have

practitioners review their own teaching methods' strengths and weaknesses in order to improve their classroom practice. Videotaped reflection has been a part of teacher reflective practice since the 1960s (Sherin & van ES, 2005). Early traditional methods of reflection were identified as journaling, conferencing, and videotaping. Videotaped documents became a central artifact in teaching portfolios. Early and traditional studies by Jensen, Shepston, Connor, and Killmer (1994) concluded that videotaped reflection served as a catalyst for effective assessment of teaching, particularly student teaching. Using video as a means of self-study allows teachers to reflect on one situation numerous times. Sherin and van Es (2005) cite theoretical support for video-taped reflections: "…Video can help teachers learn to notice, that is, to develop new ways of 'seeing' what is happening in their classrooms" (p. 476). This process helps teachers at all levels from novice to veteran. Sherin and Van Es also note the importance of video reflection because it acts as a "permanent" record of teaching and allows the teacher to develop new ways of seeing what has happened in their classroom (2005).

Early forms of reflective practice lean towards video as a way of presenting teacher perceptions and competency. However, the research later suggests eportfolios are a superior method in keeping with changes in society, education and technology. Methods and formats for reflective practice are constantly changing (Burnett, 2009; Batson, 2010). Certainly it represents an ongoing evaluation of the effects of instruction on students and the school environment (Krol 1997). Eventually, beyond videotapes, reflective practice in teacher education programs often took the form of written journals, according to authors, Dale, Wright and Gerber (2006), because it is a form accessible to all students and unaffected by school placement sites. Furthermore, written journals have proved to serve as an easy option when sharing data between

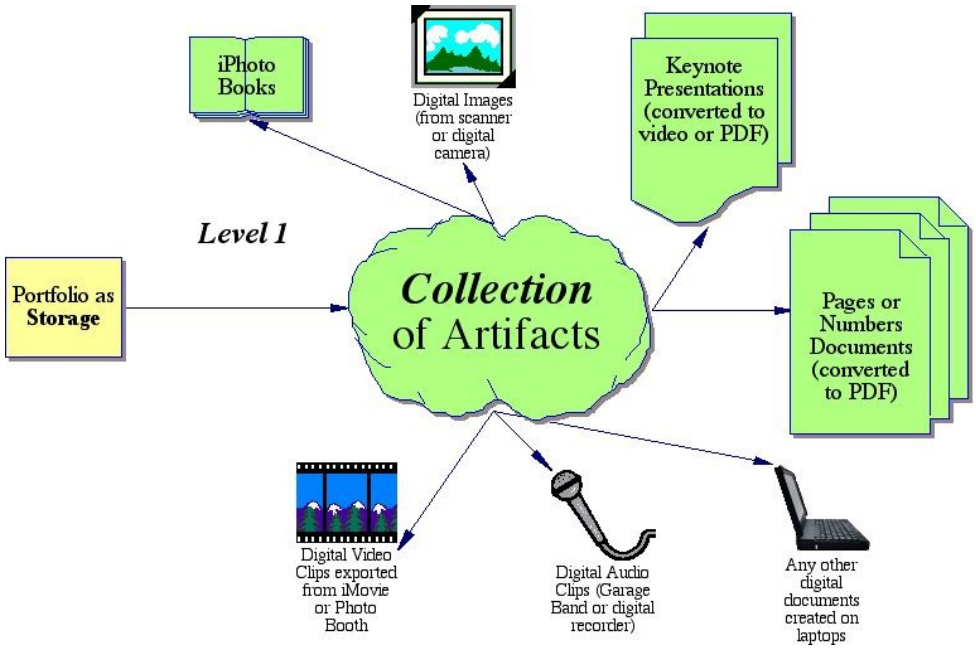
instructors and supervisors for critical dialogue. However, further investigation and feedback from their methods courses allowed these authors to theorize that preservice teachers find the process of reflective journal writing "tedious," even as they see the value of documenting their thoughts and experiences.

Portfolios in education for reflection, assessment, marketing, etc. are a fairly new concept in comparison to those used in visual arts. Eisner (1989) has long advocated for the portfolio review of art students, so a student's individual progress can be charted in comparison with the same student's past performance. One of the foremost leaders in multiple ways of learning, Gardner (1989) also advocates for a portfolio or "processfolio" for evaluating student success. As the concept of portfolio assessment is becoming more commonly accepted for general use in education, some theorists are starting to look at all areas of portfolio development. Portfolios rely heavily on visual information, so an awareness of visual image use could further support this reform (Batson, 2009).

The result of collective research done by Barrett (2011) identifies the most basic level of creating an electronic portfolio. She points out that artifacts represent integration of technology in one curriculum area (i.e., Language Arts). The concept map that she created indicates a Level 1: eportfolio as storage, with work collected regularly – weekly or monthly.

The visual map (FIGURE 5) is illustrated as a collection of work in a digital archive as part of best practice; it may include the following categories of contents in a digital presentation:

A Focus on Contents & Digital Conversion of Portfolios (Barrett, 2011) FIGURE 5.



As various formats for communicating knowledge in the form of education-based portfolios emerge, some researchers have labeled this practice “digital storytelling” (Dale, Wright and Gerber, 2006). In an evolving technological age, the trend of storytelling is now becoming more digital, thus offering new software, tools, and visual imagery to explore narrative. The Institute for New Media Studies (2010) notes, that the digital frontier is a dynamic new space for storytelling, but its potential has yet to be realized. Today, although it may not serve as empirical research, many blogs are displaying content learning that sometimes presages what happens in student coursework.

Why an electronic portfolio opposed to the traditional structure? Research at the Center for Disease Control (CSC) (Davis, M. & Waggett, D. 2006), utilized emerging technologies to arrive at different approaches to developing skills and competencies in technology, reflective practice and eportfolio development with preservice teachers. Their research showed that the students had a richer experience when they used

technology integration. (Yancy, 2007) adds insight to this notion that the students' level of involvement is instrumental in the experience of using eportfolios. Therefore, portfolios today are more student-driven and tool-driven, while traditional portfolios were usually teacher-driven and institution-driven. She has also found that reflection is powerful in this tool, particularly if students take ownership of their eportfolios. Farmer (1997) responded to this question in earlier research, at the onset of the use of visual technology, reporting, "the electronic portfolio can be made accessible to a large number of audiences; work can be duplicated to facilitate multiple assessments, it offers flexibility of arrangement and selection; and it fosters student ownership of personal effort" (p.30).

Research shows that electronic portfolios have several other advantages to traditional portfolios. Unlike paper-based portfolios, electronic portfolios allow a multimedia approach for preservice teachers to present teaching, learning, and reflective artifacts in a variety of formats utilizing technology and tools such as graphics, audio, video and text; it also permits cross-referencing of artifacts (Barrett, 2009). Artifacts may be easily inserted as files, scanned, or uploaded to the portfolio. Furthermore, electronic portfolios are easily accessible, store multiple media and are easy to update and present. Discussion evolving eportfolios versus written portfolios presents another issue as to the context of learning discussed in another chapter of the current study, "visual and verbal language" an e-portfolio that includes visual thinking can potentially support all learners including visual learners (21st Century Literacy Summit, 2005; Gardner, 1999; Eisner, 1998; Batson, 2008). Written portfolios are often the products of students who may be more skilled as writers (Jenson, 2011). An argument for using a variety of formats including visual imagery for reflective purposes is that people learn differently (Gardner, 1999).

Haslam (2002) introduced video case studies in a field seminar at Drexel University as part of best reflective practices in her Teacher Education classroom. This supports the argument for using another format for reflective practice, as well as Gardner's theories of "learning differently" as indicated previously. Her preservice teachers developed video case studies which could then be incorporated into the preservice teachers' portfolios. Their goals for the project was to (1) inquire into specific teaching practices preservice teachers experience through individual ways of knowing; (2) use multimedia tools for inquiry and meaning making; (3) connect teaching performance, best practice standards and reflective assessment; and (4) use mediated learning in a more conscious and empowering context for continuous learning, research, and reflection. Preservice teachers previously created videos as part of their placements, yet the connection to their overall performance goals was loosely connected. The change in the video format for reflective purposes was that the preservice teachers were asked to do their own video case studies with a meaningful concentration and focus. This new format with inquiry into their own practice brought to question, if learning to see would help them learn to teach? The video case outcomes presented in the class seminar, were positive and permitted the preservice teachers an opportunity to not just teach, but to investigate their own practice. This type of authentic assessment utilized visual thinking as part of best practices.

Posner (2005) states, "if preservice teachers do field experience without thinking deeply about it, if [they] merely allow [their] experiences to wash over [them] without savoring and examining them for their significance, then [their] growth will be greatly limited" (p. 3). Preservice teachers' accounts of well-remembered events / critical incidents can serve as important ways to provide good reasons for their actions and

understandings within the context of their program and thus serve as a way for them to begin to articulate their knowledge.

Another finding that makes a connection as to "why" classroom teachers should use eportfolios and also demonstrates a "need" in this technological era is presented by several researchers. Early findings in the research of McKinney (1998) show that teachers who demonstrate their competence by using technology through the development of an electronic portfolio are more likely to incorporate technology into their own classrooms. Related research by Barrett (2007) shows that preservice teachers must learn how to use technology effectively in their preparation programs. Teachers with little or no experience with technology are less likely to incorporate its use in their classrooms. Batson (2008) believes that if educational advancement depends upon an exchange of ideas as a springboard for learning and for teacher preparation, then technology is a central part of this discussion.

In an AAUP (2009) publication, *E-portfolios at 2.0: Surveying the Field* (FIGURE 6), two professors of English shared examples of their student eportfolios which they believe to be distinctive, in part because of their attention to visual rhetoric. They also shared, *The Cyber E-portfolio Gallery Tour* (FIGURE 7) to show a range of disciplines and various eportfolio projects on the Web:

(FIGURE 6)

E-portfolios at 2.0: Surveying the Field (AAUP, 2009)

When They Have Pictures & Assignments, They Can Get an Idea
LaGuardia Community College, CUNY
www.eportfolio.lagcc.cuny.edu/ ,www.eportfolio.lagcc.cuny.edu/scholars/sp07.html

Nestled against the East River in Queens, New York LaGuardia Community College is home to a six-year-old e-portfolio program that reaches more than eight thousand students each year. Serving one of the most diverse, immigrant-rich student bodies in the country, the LaGuardia e-portfolio program combines a student-centered approach to e-portfolio creation with institutional assessment.

"I think it's good because my parents are in Sri Lanka so they need to see my progress in the USA," one student told interviewers in a focus group study. "When I tell them my major is business management, they can't really think about that course because they don't have background. But when I have pictures, assignments, and course descriptions, they can get an idea about those concepts. And I think it's a good opportunity for us to reflect to ourselves about our work and everything."

LaGuardia's e-portfolios are distinctive, in part because of their attention to visual rhetoric. Students have a high degree of control over their portfolio's appearance. Some students use customizable templates, while others create their e-portfolios from scratch, using Flash and Dreamweaver. Either way, students spend significant time on the imagistic look and feel of the e-portfolio, yoking their visual presentation to written content. The result is a striking collection of visually provocative e-portfolios that harness the power of multimodal composition.

Data gathered using the Community College Survey of Student Engagement show that students in e-portfolio-intensive courses at LaGuardia are more likely to show high degrees of engagement with critical thinking, collaboration, and writing. Analysis of course pass rates and semester-to-semester retention also show higher rates of success for students in e-portfolio-intensive courses, compared to students in similar courses that do not use e-portfolios.

Funded in part by grants from the Title V program of the U.S. Department of Education, LaGuardia's e-portfolio system also supports the examination of student work from first-year courses to urban study and capstone courses, as a part of the institutional assessment process. Read against faculty-developed rubrics in seven core competencies, this collection of longitudinal data has been used in program reviews from accounting to nursing to basic skills in writing, and provides a new way to think about student development at the college.

E-portfolios at LaGuardia are supported in two key ways. Faculty members take part in extensive, multiyear professional development, thinking about how e-portfolios relate to their pedagogy. Experienced students work with the e-portfolio program in a professional capacity as e-portfolio consultants, leading e-portfolio tutorials, working with faculty in the classroom, and designing e-portfolio templates for beginning students. As such, LaGuardia's e-portfolio initiative is a collaboration between a risk-taking faculty, a supportive administration, and talented students willing to share their expertise.

(FIGURE 7)

The Cyber E-portfolio Gallery Tour (AAUP, 2009).

Learning More About E-portfolios: The Cyber E-portfolio Gallery Tour

An excellent way to learn about e-portfolios is to explore the rich diversity of projects available on the Web.

These galleries of student generated portfolios suggest the range of disciplines using e-portfolios, as well as the assignments and reflections students typically construct:

- Pennsylvania State University: portfolio.psu.edu/gallery
- San Francisco State University: eportfolio.sfsu.edu/gallery.php
- LaGuardia Community College:www.eportfolio.lagcc.cuny.edu/scholars/sp07.html

These sites suggest the growth of e-portfolio use in institutions of higher education, how campuses are using e-portfolios for assessment, and the connections between Web 2.0 and e-portfolios:

- Inter/National Coalition for Electronic Portfolio Research ncepr.org
- Dr. Helen Barrett's Electronic Portfolio resource site electronicportfolios.org/
- The International ePortfolio movement www.eife-l.org/about
- IUPUI Assessment Conference:planning.iupui.edu/conferences/national/nationalconf.html
- Minnesota ePortfolio project, see www.efoliominnesota.com/
- California State Universities ePortfolio projectteachingcommons.cdl.edu/eportfolio/index.html

New Media Tools for Learning in E-portfolios and the Future

Sonvilla- Weiss (2009) theorizes that the interactive representation of contextual knowledge and visual knowledge building is increasingly demanded today in our society; the use of Web based learning environments emphasize the audio-visual dimension of (e)pedagogy and a move towards practical, project-oriented curricula. What is more significant is his research supports the notion that more understanding and control of visual elements and their interpretations is increasing in need

regardless of the educational field, and that pedagogical expertise is required more because there is a growing need for visually oriented pedagogical experts such as teachers, tutors, designers and developers.

As technology evolves and classrooms change, Jenkins (2006) theorizes that students will need to learn to create using a range of different media tools. Web-based or electronic portfolios (eportfolios, ePortfolios, efolios, digital portfolios, webfolios, etc.) are still expanding, yet are a component of many teacher education programs (Strudler & Wetzel, 2005). Because there are multiple sources and a range of choices and opportunities for learning, students are challenged by classroom and industry demands to know how to use these tools to present, demonstrate and communicate their thinking. Thus, it becomes more imperative that the educational arena prepares and provides multiple forms of access to students as well as teachers to help students master these skills and function in hyper-mediated environments (Jenkins, 2006).

A study using multiple types of media and knowledge production developed by MIT's New Media Literacies (Jenkins, 2006b) asked students to tell and re-tell the same story employing a range of different media. Students first created script dialogues using instant messenger; they used PowerPoint to produce storyboards and incorporate internet images; they performed their stories and record them using cameras or video cameras; they also illustrate their stories by drawing pictures. In using the various media, they were asked to give thought to how each new tool contributed to their overall experience of the story. They also identified essential narrative elements for viewers to recognize characters and situations across the collection of media. Findings illuminated the idea that new techniques change the circumstances for teaching, learning and collaboration. This particular study theoretically engages opportunities for thought regarding learning when ways of

communicating knowledge and skills are changed. I found this research to be significant in contributing in the development of my broad question however, it also brings thought to other questions. If students' are exploring multiple types of media which have to both demonstrate and constitute their knowledge, what do they need to know about these tools or how to use them ? At what point in achieving education do they need to know? Finally, how flexible can the levels of mastery be for success? If students enter teacher education with strong backgrounds in communicating knowledge visually, they may be able to represent their thinking and the process better than students without this previous experience; and they may be more successful when using multiple tools. Because some of the pedagogical challenges in eportfolio development are concerned with the possibility that process may supersede thinking (as discussed later), the argument might be countered by the building of visual communication courses into education curricula. In other words, if students know how to use visual communication software before they begin work on their portfolios, the chance of mechanics replacing thinking is reduced. Some notions with regard to visual literacy will be addressed later in this study.

A similar set of questions might also apply to rubrics and evaluations for student portfolios. What are the requirements for teachers of portfolio development? Are current rubrics for assessment and review sufficient to analyze multiple forms of data in an e-portfolio? Would a collaborative approach, cross listing said coursework with class offerings in a School of Media, School of Design, or School of Art Education benefit Teacher Education? These questions are outside of the scope of the current study, but are pertinent to the emerging discussion on eportfolios and visual thinking.

Some universities and schools are committed to the future of eportfolios and make sure teachers gain practice and experience with them. The literature provides

the history and speculations for the future in the use of eportfolios, particularly in classroom environments. As this study is concerned with examining the perceptions of teachers' using visual imagery in eportfolios for reflective practice, it is important to review perspectives regarding eportfolios past and future. Teacher perception and attitudes is explored and reviewed in a chapter later.

Fischman's (2009) "Electronic Portfolios: a Path to the Future of Learning," provides insight to this discussion, "At the moment, eportfolios represent perhaps the most promising strategy for responding to calls for accountability and at the same time nurturing a culture of experimentation with new forms of learning" http://chronicle.com/blogs/wiredcampus/electronic-portfolios-a-path-to-the-future-of-learning/4582.

Social competition is also being recognized in the growing trend toward eportfolio development. "Alternative Certification of Learning" concepts are gaining in popularity (Batson, 2012). The badge movement, presenting a badge to reflect a level of achievement in performing a particular task and as a form of learner peer review is growing in popularity. The McArthur Foundation (2011) has provided 2 million dollars in funds for a competition to develop the national technical infrastructure to manage badges as certificates. As part of lifelong learning, their stance is that GEDs and college degrees cannot convey the full range of knowledge and skills that students and workers master. Batson's (2012) *12 Important Trends in the ePortfolio Industry for Education and for Learning* endorses badges as incorporated into eportfolios as evidence of achievement. He points out that badges could in theory be coupled with rubrics as evidence of achieving a particular level of expertise. Furthermore, he adds that badges supported by peer review aligns with the "DIY" or "Do It Yourself" learner emerging pattern; now learners "own" their learning and perhaps "own" the process of

peer review, as well. With implications for eportfolios perhaps becoming more visible and more used in student peer groups, visual imagery may support better communication in reflective practice. Batson interviewed extensively with 14 eportfolio vendors and compounded a summary of key directions and developments with regard to uses of eportfolios:

1. *New companies.* New companies are entering the market. In this list are three companies I have not talked with before: School Chapters, Bedford/St. Martin's and Pathbrite. Each is entering this market sector with good preparation and realistic expectations about their entry into the market sector. Since the total number of significant ePortfolio providers in the world is less than 20, three new entries into the market marks a significant increase.
2. *Larger scale implementations.* Typical campus implementations have moved beyond scattered individual and program pilots to large program rollouts.
3. *Greater sophistication on campus.* Campus representatives are becoming more selective and knowledgeable: It's not enough that an ePortfolio application has a certain feature. Now, these reps want to see how the feature works. "Campuses are so much more sophisticated about ePortfolios now!" said one interviewee.
4. *Selling to individuals.* I found an incipient move to individual accounts. Up until this year, almost all ePortfolio accounts for students were created through an institution acting as "middleman." But, I found that now a couple of companies are primarily or only selling to adult individuals. This emergent trend is a significant marker in the development of the industry.
5. *More mobility.* Mobility is a necessity for ePortfolio users. They want and need to be able to access their ePortfolio account from anywhere using any device. Therefore, I found that many of the companies offer a mobile app for smart phones or at least ability to use a browser on a smart phone to access the ePortfolio.
6. *Tenuous international markets.* Most companies are U.S.-based or Canadian, and, with a couple of exceptions, have not penetrated the international market extensively; the few companies or open source communities headquartered outside the U.S. have done well in the U.K. and Australasia. One exception to this general picture is the Middle East, notably the United Arab Emirates, where institutions there want accreditation in the U.S. and are adopting U.S.-based ePortfolio applications. The reason for this picture of global imbalance in the market bears exploration.
7. *A maturing K-12 sector.* The K-12 market has begun to grow. There are very different needs and restrictions for ePortfolios at this level, so the applications have to be customized differently. Use of ePortfolios during the K-12 years, therefore, may not translate into student ePortfolio expertise in college.
8. *Corporate market interest.* The corporate market shows signs of some interest in ePortfolios, perhaps driven by the advent of self-paced online learning in corporate settings. Self-paced learning in this setting may be

designed for employees to keep up with the more rapid changes in the market, in the knowledgebase, and in the products than before information technology. Online self-paced learning may be replacing training and may not be occasional but constant. Staying ahead in many fields and markets is harder than ever. To show that an employee is up-to-date, an ePortfolio may be the best tool (as long as the ePortfolio does not contain trade secrets and is not legally owned by the company).

9. *Alternate certification of learning.* All companies are aware of badges, MOOCs, and open education resources (OERs). Some have begun to incorporate the ability to include badges in their applications. This is a form of micro-credentialing certified by peers who work with a person on a joint project with separate but critical deliverables. Badges have seen a recent bump in activity and the implications of pairing badges with ePortfolios are significant.
10. *The merging of LMS and ePortfolio technologies.* We may be seeing the end of the LMS as we have known it. The market won't go away, but the LMS may begin to morph into an ePortfolio architecture, supporting longitudinal learning and decoupling from the course-based design they've had since the early CMS. LMSes, however, will not belong legally to the learner as ePortfolios do, so they will remain institutionally owned and therefore cannot serve to support the same level of transformation as do ePortfolios.
11. *Market segmentation.* A sign of ePortfolio industry maturity is that ePortfolio providers are specializing and finding particular market niches. Some providers specialize in linking ePortfolio content to global standards, others provide libraries of rubrics, while still others focus on intuitive learner-focused interfaces and functionality. A few providers include the "big three": an LMS, an assessment management system, and a student learning ePortfolio, all the while sharing functionality among the three apps.
12. *The move to Web 2.0 native architectures.* ePortfolios, at least the learner-focused modules or applications, do not in theory need to be tethered to an educational institution. E-portfolios as learning-enablers may come into their own when they become consumer applications marketed to the larger general market. They can make this move, and in some cases are making this move, when their architecture follows the lines of open architecture native to the Web, such as the latest version of Sakai.

These findings are significant because the response of developers to a tool that is entirely mobile in that it can be accessed by any browser, anywhere, and the frequency of eportfolio adoption in corporations as a tool for reporting indicates the need for change and growth of eportfolio use in classrooms. Connections to eportfolios and the workplace are also growing. Batson's research reveals global implications of eportfolio usage. "An electronic portfolio belongs to the learner: a Web-based application that can upload and store any file type to serve as evidence; it is an active

repository with many management tools that can generate Web presentations for particular purposes; it is a resume-maker with linked evidence" (http://campustechnology.com/Articles/2012/09/19/12-Important-Trends-in-the-ePortfolio-Industry.aspx?sc_lang=en&p=1)

E-portfolios have been listed as a recommendation at the Conference on College Composition and Communication (CCCC) (2007). This listing is a critical addition to the current study because it presents the most up-to-date conference research about expectations, and thus speaks to the future of eportfolios. CCCC presented eportfolio guidelines that were adopted at the conference. Other key principles included delivering clear expectations and explanations to faculty members, program directors, administrators, students and technology staff. Students need to know how their portfolios will be used; faculty need to know what institutional expectations are, and technology divisions need to know what will be required of them in creating and maintaining systems as portfolio practice evolves.

Additional Conference recommendations included:

1) Administrative encouragement of "authentic" and "locally designed" assessment programs with the e-portfolios, rather than using the online nature of the portfolios to review work at many campuses in ways not designed by the faculty.
2) That various campus groups work together to define the appropriate privacy protections for work maintained in e-portfolios; students be given a clear understanding of what portions of their e-portfolios may be generally available publicly.
3) That faculty members help students with a range of issues that go beyond strictly curricular needs, to include how to reflect their multicultural identities in portfolios; how to use their portfolios to establish a "professional ethos," and how to adapt their portfolios for the workforce.

The site (www.courseportfolio.org) makes available for public review and comment over 200 course portfolios written by faculty from multiple institutions. The website is intended as an international repository for course portfolios, and all faculty teaching

at postsecondary institutions are invited to post their portfolios on it. Barrett (2013) has also identified portfolios for public review on her website www.electronicportfolios.org.

Findings in a whitepaper "Adobe ePortfolio" (Foley 2011) showed that according to one European study, the French have a growing awareness of ePortfolios, but there is no official policy currently in educational reform. The European Portfolio Initiative Coordinating Committee (EPICC) sponsored by the European Institute for E-Learning (EIfEL) is chartered to provide access to ePortfolios to all European citizens by 2010. The initiative encompasses educational and learning environments from childhood through ongoing adult learning. There is a shift towards an electronic form of a portfolio and away from the paper-based portfolios for assessment and accreditation. There is strong support and a push to put Europe at the forefront of using ePortfolios for continuing professional development purposes beyond the educational environment. EIfEL has also initiated a study on ePortfolio readiness.

New directions have been identified regarding assessment of knowledge and the use of visual images in the form of infographics. Shrock (2010) recently identified infographics as part of best practice. She describes infographics as a creative way to show knowledge using graphic visuals to communicate certain principles. Shrock developed a video, presented workshops, and wrote a blog to encourage the use of visual media tools to support infographics being included as part of the assessment process to show complex thinking. She presented concepts showing infographics as visual representations of information that is currently being used to teach, yet believes the best way to use infographics is for learning, and even more importantly, as part of assessment. She adds that the graphic visual structure supports all forms of information literacy skills. This is a significant issue because the notion of relying on

visuals as the predominant way of communicating knowledge in the classroom could potentially alter how teachers assess their classrooms. It could therefore, be important for teachers to be able to demonstrate the use of visual imagery as part of their reflective process if they are to engage in this new form of communication with their own students.

The literature on eportfolio practice validates eportfolios as a platform which allows learners to collect, organize and present digital evidence in a variety of media. This section on eportfolios as part of reflective practice and the sub-categories, aimed to examine and explain the potential and identify the challenges of supporting eportfolios. Barrett (2009) demonstrates that portfolios tell a story of learning, and thus if teachers are using visual tools to communicate their reflections, this use too would convey learning.

Visual Thinking and Learning as 21st Century Literacy

Empirical literature describes new directions in practice which are gaining momentum as they start to rely on visual knowledge in addition to written knowledge. A definition of twenty-first century literacy offered by the New Media Consortium (2005) is "the set of abilities and skills where aural, visual, and digital literacy overlap. These skills include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms" [*sic*] (p. 8). The presence of technology has caused the educator to rethink class structure to include more collaborative learning. One such project is the *21st Century Fluency Project,* an innovative resource designed to cultivate 21st century fluencies, while fostering engagement and adventure in the learning experience. The position of project members is that we need to shift our thinking to include a new set of literacies:

> This resource is the collaborative effort of a group of experienced educators and entrepreneurs who have united to share their experience and ideas, and create a project geared toward making learning relevant to life in our new digital age. Our purpose is to develop exceptional resources to assist in transforming learning to be relevant to life in the 21st Century. At the core of this project is our cloud-app Fluency21 Unit Planner, a global collaborative resource for 21st century learning. A place where like-minded educators can create, share, and collaborate to develop problem based learning modules that are engaging, challenging, relevant, and designed to cultivate the essential 21st Century Fluencies within the context of the required curriculum. **(**http://fluency21.com/)

The *21st Century Fluency Project* collaboration further explains, "Today, it's essential that all of our students have a wide range of skills beyond those that were needed in the 20th century, a range that includes the skills needed to function within a rapidly changing society." These fluencies may be visualized as an organized group (FIGURE 8) of 21st Century Fluencies, they are (1) solution fluency (2) creative fluency (3) collaboration fluency (4) media fluency (5) information fluency. Together, the group of fluencies provides the structure of a "global digital citizen" in the 21st century.

FIGURE 8. 21st Century Fluencies

21st Century Fluency Project

In this illustration, *creative fluency* provides a context for the current research as it is about using innovative design to add value to communicate; it is the process by which artistic proficiency adds meaning through design, art and storytelling. *Media fluency* also relates as it employs the notion of being able to look at any communication analytically to interpret messages and evaluate the efficacy of the chosen medium.

The Center for Media Literacy (CML) believes there are slight but important differences in the discussion pertaining to digital literacy, information literacy and media literacy. *Digital literacy* promotes competency with computers and software. *Information literacy*, is used primarily by the library community, and emphasizes the ability to access information, whether in print or electronically; *media literacy* is a more encompassing term in that media literacy embraces the *entire* process of *accessing, analyzing, evaluating, creating and participating with* media. Furthermore, they add that these skills for lifelong learning are reflected throughout education standards, regardless of whether the subject is health, technology, social studies, science, as well as other categories (http://www.medialit.org/best-practices-faq).

The Literacy Summit (2005) recognizes current standards of literacy not only include but also rely upon a variety of communications media. "In the classroom, as students find themselves engaged on multiple levels, it is easier for teachers to focus on critical thinking and problem-based learning. Communication skills are highly valued by students and teachers alike — both in traditional forms like print and public speaking, and also in forms like multimedia, the visual arts, music, and cinema. Assessment methods focus on performance and use blended modes that take into account the various facets of the skills imbedded in 21st century literacy" (The Report of the 21st Century Literacy Summit, 2005, p.8). This conference has created

new expectations and challenges in education. Students are challenging faculty and educational standards to reform the ways information is presented to include what they already know with regard to the tools they use (Prensky, 2005). Since a large component of what students use requires visual thought, visual thinking should be part of this media movement. According to the report, which is defined the similarly as the New Media Consortium (2005), "21st century literacy is the set of abilities and skills where aural, visual and digital literacy overlap. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms" (p.6). The purpose of the conference was to explore, discuss and analyze new media and areas associated with this media in hopes of engaging answers to pedagogical theories and plans to develop connections surrounding visual, aural and digital literacy. One of the questions presented was, "What does a world that values 21st century literacy look like? "The essential characteristic of this world is that it embraces 21st century literacy broadly. Communication is multi-dimensional, engaging, and increasingly unbound to text. Creativity is valued broadly, and success is associated with the ability to articulate ideas using not only words, but also images and sounds. Education is optimized for multi-tasking and tailored to each learner. Schools incorporate the new literacies across the curricula, and use them to more fully engage students, articulate ideas and demonstrate concepts" (p.7). The component of "visuals" is at the forefront of this conference as part of what makes people who use such media literate.

"A profound shift is taking place in the way people communicate and express themselves. Fueled by media that increasingly are crafted for a global audience, pervasive access to goods and services from ever more distant locales, access to

networks and communication services that span the planet, and generational ties between youth that transcend borders, a new concept of language — and what it means to be literate — is evolving" (New Media Consortium, 2005, p.1).

Findings in an online survey organized by EDUCAUSE (The Top Learning and Teaching Challenges, 2009) revealed the top five opportunities for growth in teaching and learning for the 21st century are:

(1) Creating learning environments that promote active learning, critical thinking, collaborative learning, and knowledge creation

(2) Developing 21st century literacies (information, digital, and visual) among students and faculty

(3) Reaching and engaging today's learners

(4) Encouraging faculty adoption and innovation in teaching and learning with IT

(5) Advancing innovation in teaching and learning with technology in an era of budget cuts

This study provides insight to what researchers describe as a shift from the Web 1.0 culture of researching information to a Web 2.0 culture which focuses on using rich tools to contribute to communication of ideas. According to Ittelson (2008) when considering the implications of Web 2.0, it is the basis of the next generation of eportfolios. He adds that it is a foundation whereby, the latest in digital technologies work interactively with tools, such as blogs and wikis applications; this foundation will help to advance knowledge and individual creativity in interesting and engaging ways. Metros and Woolsey (2006) add to the discussion on visual and verbal language in *EDUCAUSE* asserting that,

> "Academics have a long history of claiming and defending the superiority of verbal over visual for representing knowledge. By dismissing imagery as mere

> decoration, they have upheld the sanctity of print for academic discourse. However, in the last decade, digital technologies have broken down the barriers between words and pictures, and many of these same academics are now willing to acknowledge that melding text with image constructs new meaning, and some may even go so far as to admit that images, as communication devices, can stand on their own" (http://www.educause.edu/ero/article/visual-literacy-institutional-imperative).

In light of the shift in teaching and learning in the 21st century, the pressure to explore thinking skills and visual development skills is bringing attention to the arts (Batson, 2009). A recent article in the *Huffington Post* (2012) discussed the shift in learning and the importance of the inclusion of the arts in order to produce creative and innovative workers who can join the 21st century workplace. Currently, there is much emphasis on Science, Technology, Engineering and Math (STEM), yet because of the learning shift, Batson suggests that the current acronym *STEM*, should be changed to *STEAM*, that is, include art in the list of desirable educational ideologies to insure that the whole brain is nurtured through the arts and new thinking skills leading to creativity be included. This vision of reform could be a catalyst in improving American schools. Sir Ken Robinson (2012), international expert on creativity and education supports the theory of creativity as an important component of education in commenting "we are all born creative, but creativity gets squeezed out of us" by about the 4th grade (http://www.huffingtonpost.com/john-m-eger/nsf-arts-grant_b_2208522.html).

In support of this paradigm of creativity and arts in education are the U.S. Secretary of Education Arne Duncan, the National Science Foundation (NSF) and the National Endowment for the Arts (NEA). In a forum on the "Well Rounded Curriculum (2010) Duncan has stated that, "The arts can no longer be treated as a frill ... Arts are essential to stimulating the creativity and innovation that will prove critical for young Americans competing in a global economy." His position is that an arts education is

necessary in the information age and that “visual arts instruction improves reading readiness…” (http://www2.ed.gov/news/speeches/2010/04/04092010.html)

One National Science Foundation (NSF) grant of $2,654,895 called "Integrating Informal STEM and Arts-Based Learning to Foster Innovation" (2012) sets project goals to develop and experiment with a variety of innovative and creative incubator models in cities around the country in hopes of securing a new paradigm for education. This recent grant is significant because it recognizes the importance of the arts and visual education to support the challenges of 21st century educational initiatives (http://bpcp.org/nsf-awards-26m-grant-bpcp-national-incubator-project)

A recent 2011 report titled "Future Work Skills 2020,” states that visual literacy skills will be required by workers in the coming decade. The workforce will be creating, producing, and consuming graphically rich interactive media in every area of their lives; thus the workforce will need be skilled in graphic design, filmmaking and animation to produce content for business communications and workplace learning. The expectation will be for knowledge to be communicated via very sophisticated media that expands beyond simple text and an understanding of how to use visual representation and skill development will be necessary (http://bit.ly/2020skills). This particular research establishes the relationship between visual skills and 21st century skills needed; it also supports the framework of this research study.

As tools, technologies and software become more the norm in the classroom, rather than making distinctions between the different media, the greater the challenge will be to synchronize and manage this flow of information. Educators will learn from the experiences and technology used by students. Thompson (2010) attests in *Power of Visual Thinking, Wired Magazine,* that the new language of pictures may be what we need to tackle the world’s biggest challenges. He believes that in the past visual

thinking has taken a backseat to verbal agility because visual thinking in the form of picture-drawing has a stigma of being childish. However, because the Internet has boosted the utility of imagery and evolution of digital tools, the need for large iPad-like surfaces opposed to the keyboard has become paramount in expanding, sharing and sketching out concepts. He also indicated that as our digital tools evolve, so shall visual thinking which will support our communications better. (http://www.wired.com/magazine/2010/09/st_thompson_visual/).

Researcher Kenney (2008) adds to the discussion in recognizing that consumers and professionals are communicating visually more than ever before because of common use of internet technology. Written text, photographs, audio slideshows, video and animations are used by consumers for purposes of social media, such as Facebook, information websites and other commercial outlets. Professionals in the media industries are also using and interpreting visuals as part of the job of the media industry. The list of professions communicating with visuals is expanding. Therefore, researchers should be studying visual communication and universities should offer more courses in visual communication ideas and practices. Furthermore, advanced degree programs should also offer coursework related to visual communication and encourage professors to examine this area. At this writing, no universities have doctoral programs or scholars emphasizing visual communications, despite the increase of research and courses related to visual communication. He adds that because of the rising importance of visual technologies, professors should recognize the transferrable connections between visual communication and their fields. Arnheim (2004) supports the notion of visual communications having an important position in the curriculum and adds, “[W]hat is most needed is not more aesthetics or more

esoteric manuals of art education, but a convincing case made for visual thinking quite in general (p.3).

There is much research on various types of literacy currently evolving and the acknowledgement of visual thinking and image use is often embedded in the discussions. “In the evolving multimedia environment, media literacy is arguably more important than ever…there is expanding recognition that media representations help construct our images and understanding of the world and that education must meet the dual challenges of teaching media literacy,” Kellner, D., & Share, J. (2005) state, not only to teach students “to learn from media, to resist media manipulation, and to use media materials in constructive ways,” but also to acquire “skills that will help create good citizens and that will make individuals more motivated and competent participants in social life” (p.16). (Kellner, D., & Share, J. 2005, p.16). In other words, acquiring visual literacy has a profound social value beyond educational and commercial applications.

Early research by Feldman (1976) supports the notion of visual literacy and the benefits of its study early in the curriculum:

> [T]here is a language of images and that it can be learned … much of what many persons know about the world has been learned through visual images without the benefit of formal instruction in how to read them. The fact that many semi-literate or illiterate persons can cope successfully with their environments reinforces our second point; namely, that they have learned to read nonverbal, essentially visual, languages. Third, the several disciplines that study art--- history of art, iconology, art criticism, and aesthetics—constitute well-established ways of reading visual language. Still, it is a matter of regret that these disciplines had little or no application in school curricula. As for higher education, the role of these art languages has been peripheral… (p.199)

It is argued that pictorial language or visual messages should be as valued as verbal language for communication. In the discussion regarding the synchronization of visual and verbal language, Cal Swan (1991), the author

of an early publication of *Language and Typography* has been cited often. He explores this concept when he says, “These two distinct areas often come together in practice as there is clearly a very strong relationship between the conception of the words as a message and their transmission in visible form” http://typographichub.org/images/uploads/downloads/synchronisation_of_verbal_and_visual.pdf

As with most concepts in technological and educational reform, the impact of visual image use will depend upon how educators integrate it into the classroom. The contributions of the literature reflect what direction education and industry are taking in this era and more importantly, clearly state how pertinent knowledge of visual literacy is potentially a powerful benefit to student learning. Thus, developing the practice in academics for preservice teachers could serve as an educational model and ultimately improve education in general. Felten’s (2008) supports the notion of the need to provide visual literacy instruction as critical, because “living in an image rich world…does not mean students naturally possess sophisticated visual literacy skills, just as continually listening to an iPod does not teach a person to critically analyze or create music” (p. 60).

David Sibbet (2010) is another visualization expert who often works as a “keynote listener,” whereby he sits in on meetings and creates drawings in the form of infographics to depict the issues raised in corporate environments. “If you want everyone to have the same mental model of a problem, the fastest way to do it is with a picture.” He believes that visual language can be a powerful tool for communication; he describes the images to be effective far more often than typed or verbal summaries to project ideas. In his third trilogy on visualization, his book, *Visual Leaders: New Tools for Visioning, Management and Organizational Change* (2013), further supports

the need to make visual thinking a part of best practice.

http://www.pegasuscom.com/stia12/slides/d03-sibbet.pdf 2012

Dan Roam (2009) a visual-thinking "thought-leader" and author of *The Back of the Napkin*, argues that culture relies too heavily on words: school systems—and political systems—are designed to promote people who are verbal and eloquent. And text tends to encourage us to describe problems as narratives or linear lists of facts. But dynamic, complicated problems—like global warming and economic reform—often can't be conveyed as narratives. They're systems; they have many little parts affecting one another. In those situations, drawing a picture can clarify what's going on. "Words," Roam says, "won't save us." Roam was recently recognized for using drawings to illustrate how communication reform would improve relationships between various health care players—doctors, insurers, patients – during the recent national health care debate. Within a few weeks, nearly 300,000 people had viewed the images online. Members of the President of the United States staff called, requesting help with future communications in the form of visual imagery.

Challenges and Strategies in Communicating Visual Knowledge in E-portfolios

Educational reform can make contributions that can possibly benefit faculty, students, and administrators; however the process to get there may require great challenge, sacrifice and endurance. Villano (2006) states in "Electronic Student Assessment: The Power of the Portfolio" demonstrates that there are challenges for large schools as well as smaller institutions. Larger colleges will likely find that the more faculty in colleges, the bigger the task of getting them to surrender what they are comfortable with and are reluctant to exchange with "age-old assessment techniques" for a new concept; meanwhile, smaller schools are challenged with lack of time and resources. The author concludes that in order for new implementations to work, each

institution needs to continue to conduct self-assessments. “Teachers entering the workforce have grown up with easy access to computers, powerful creative tools, and the Internet. …and are comfortable both with the new forms of expressions that are emerging and with the tools that make them accessible.

Much of the research of (Asensio et. al., 2004) in their paper on “The Click and Go Decision Tool: Towards Inclusive and Accessible Visual Literacies” specifically discusses becoming visually literate. They determine that “practitioners often have very sophisticated ideas for educational use of rich media technologies, yet they often lack the language (ie. the literacy) to express these ideas in a way that helps to create meaningful learning events for their students and develop their own understanding and expertise” (abstract). They add that there is actually a lack of a shared language which prevents the sharing of practice in learning and teaching.

The areas of visual literacy and visual learning will be addressed later in this paper; as this research indicates, the lack of this type of knowledge is part of the current challenge of effective eportfolio development. With the abundance of information available to enhance portfolios, no studies seem to look at visual thinking as it relates to the perception of preservice teachers in using visual imagery to support their reflective process, or specifically addressing knowledge and skills needed to effectively communicate how to use eportfolios. The current research directly supports this need.

Barrett (2008) found that students benefit from an awareness of the processes and strategies involved in writing, problem-solving, research, analyzing information, or describing their own observations. She adds that there are, however, her extended studies regarding student knowledge and effective portfolio development reveal that without instruction focused on the processes, technologies and strategies that

underlie effective performance in multimedia communication, students will not learn them or will learn them only minimally. Some of these research results also indicate that without curriculum-specific experience in using these processes and strategies, even fewer students will carry them forward into new and appropriate contexts. This particular research is important because it addresses the issue of the lack of knowledge and strategy that students' may confront particularly when using technology tools; this ignorance is potentially be problematic in eportfolio development. Barrett (2008) adds that eportfolios can serve as a vehicle for enhancing student awareness of these strategies for thinking about and producing work, both inside and beyond the classroom.

Research that concentrated on visuals and learning in the context of new technologies was significant in a review that was developed at Georgetown University, "The Visible Knowledge Project" (2005) (http://crossroads.georgetown.edu/vkp/resources/glossary/learnercentered.htm), a study produced over a five-year period. Researchers examined reading, writing, and multimedia communication to determine best practices in new media environments. One contribution to the literature this project provides is the term *visible knowledge*. An extensive search for a current term that is associated with learning in the new technologies revealed no other vocabulary as a gloss for "the use of visuals and learning" to communicate or produce knowledge. The Visible Knowledge Project concentrated on how knowledge was obtained in images and text and how new technologies have transformed practice in the context of history courses. The questions researchers aimed to answer are:

1) How do students construct knowledge, express themselves, and build arguments through the use of new media?

2) How do students share and build knowledge through both online and face-to-face communication?

The Visible Knowledge Project operated with a full staff at the Center for New Designs in Learning and Scholarship (CNDLS) at Georgetown University and was coordinated with the History and Center for Teaching Excellence at LaGuardia Community College, CUNY. The project was designed to explore the impact of technology on learning, particularly in the areas of American culture and history. It was a large undertaking as it engaged 70 faculty from 21 institutions, from community colleges to research universities. A website was structured to obtain valuable input from the project members whereby questions were presented and their findings were developed in an online gallery for public access. The research and findings were detailed in the *Journal of American History*, and documented reflective practice as a method historians can teach to students so they may read images as historical texts and use multimedia to create historical knowledge. The findings have helped foster research in other institutions in developing contexts of reflective practice for the integration of technology.

The Visual Literacy Movement

The purpose of the historical overview of the visual literacy movement is to provide a context for the research problem presented in chapter one; an understanding of the term *visual literacy* will provide a better connection to the term *visual imagery* used throughout this paper. As stated in chapter one, for purposes of this paper *visual thinking* is the use of visuals or visual imagery and learning to communicate or produce knowledge; and *visual knowledge* connects visual thinking to the concept of visual literacy. Visual communication, as are visual thinking and visual learning, are inter-related phenomena. The term *visual literacy* now yields almost 4 million results

in a Google search, although five years ago the term yielded only several thousand results (google.com). Current studies rely on historically early research to help guide and shape new learning. This section specifically looks at early research to provide a background for the current research problem. Because the foundation of visual thinking today is embedded in much of the research from early studies, it is included in the current study to provide context. Thus, this literature review encompasses much of the progressive history of visual literacy as a concept leading to current research, and merging with new directions in studies of visual thinking, visual learning and visual literacy.

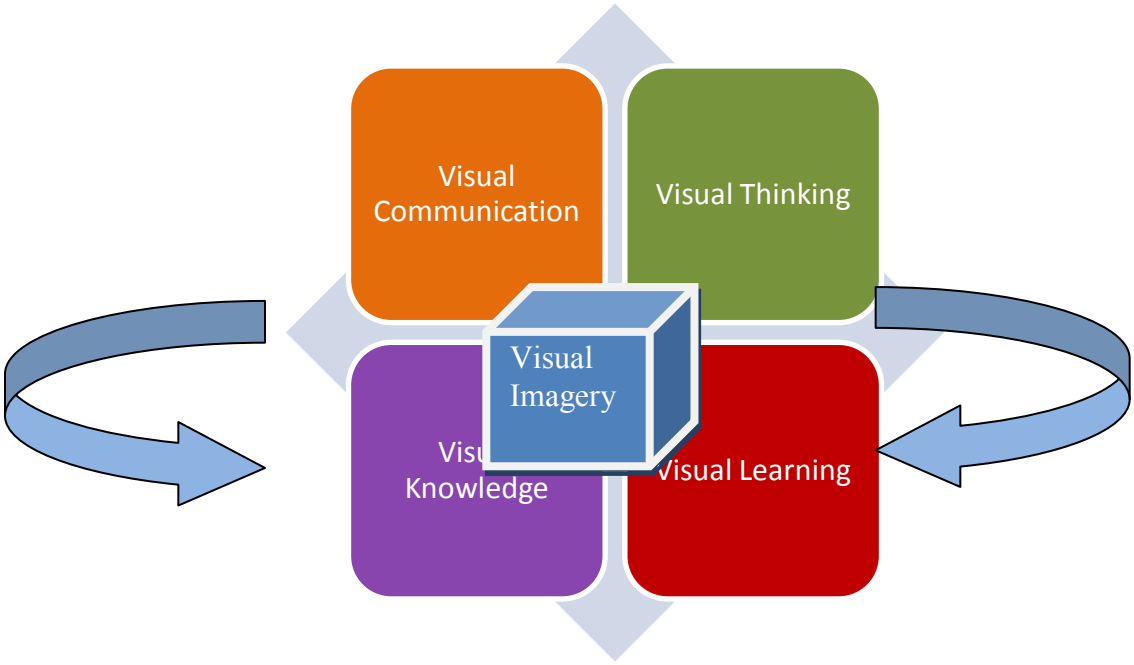
According to Fransecky & Debes (1972), scholars who were working with visual means of instruction in 1965 supported the emergence of the concept. It was in 1967 that visuals were first perceived as a language, and it was then that the first issue of the journal *Visuals are a Language* appeared. After a national conference on Visual Literacy was held at the University of Rochester, the International Visual Literacy Association (IVLA) became active. According to Moore & Dwyer (1994), IVLA goals are "to provide a multidisciplinary forum for exploration, presentation, and discussion of visual communication; to serve as an organizational base and communications bond for professionals interested in VL; and to promote and evaluate projects intended to increase the use of visuals in education and communication" (p. ix). The visual literacy movement is still young in relation to its potential future. Moore and Dwyer (1994) incorporated the three elements in an educational cube and expanded upon the relationship and significance of these areas (p.104).

This cube (FIGURE 9) was derived from the Visual Literacy Cube developed by Moore and Dwyer (1994). Their cube consisted of 3 components: Visual thinking, visual learning, and visual communication. The researcher felt that the components of

the Visual Literacy Cube have since expanded to include multiple components in the 21st century. The author believes that there are 5 components in the discussion regarding visual literacy; and that the use of visual imagery promotes a connection to the other terms and concepts. The component in the newer diagram, *The 21st Century Visual Literacy Cube* (Lyles-Folkman, 2013) was created by the author and include: Visual imagery, visual thinking, visual knowledge, visual learning, and visual communication. The diagram shows the visual relationship of the individual components to the whole.

FIGURE 9

The 21st Century Visual Literacy Cube (K. Lyles-Folkman©)



Tufte (1990) encourages the mingling of data-rich illustrations with scientific data and has demonstrated in books and lectures examples of information graphics which expand beyond verbal literacy. These concepts are explored again later in a chapter on visual and verbal languages. Authors and professors, Wilde and Wilde (2000) have also contributed to the topic of visual literacy and have explored the interdependence and interrelatedness of visual literacy principles. They presented in their book visual assignments and solutions by their design students and included detailed analysis of the intent of the problem. They examined the stepping stones of conceptual thinking and ways to problem-solve by creating challenges that invite questions, and typically not answers, of ways to communicate visually. They introduced spontaneous and instinctive approaches to using visual imagery to promote visually literate designers and novice communicators using visual imagery; they too have contributed to visual literacy and the problem-solving process when using visuals.

Early research as well as recent research both suggests that students need to develop the skills necessary to use and learn from visual images (Fransecky & Debes,

1972; Moore and Dwyer, 1994; Arnheim, 1969). There appears to be much overlap in the labeling of this new type of learning. Bikkar Randhawa (1978) suggested that when we think of visual learning, we should embrace operational terms or constructs such as visual thinking, visual learning, and visual communication to organize the concept. These "sub-concepts" are actually operational constructs that can reinforce understanding of visual learning. Moore and Dwyer (1994) distinguish visual learning as a methodological rather than a substantive field, i.e., its function is to communicate in the professions. It is not, in and of itself, a profession. They also remark that theoretical contributions are still being synthesized and even as a concept, characteristics of visual learning are still evolving. In searching for a way to organize the term, this background of overlap is substantial to the current discussion because it guided this researcher towards a term that is both current and indicative of the movement of a learner-centered era of education theory. As an educator and formally trained artist, the term "visual thinking" encompasses the current direction regarding learning with visual imagery, observable in learning environments today. Some of the earliest research surrounding this term was accomplished by Arnheim (1969), who expressed in early writings his view that visual perception is a form of visual thinking.

Of particular interest to this research is the idea that as a result of changing technologies, the expectation for the novice, student, or professional to know how to successfully use visual images is becoming more universal. Rhyne (1998) reinforces this perception, stating, "during the last twenty-five years, there has been a revival of interest in comprehending where meaning comes from in visualizations. Since we live in a visual culture we need to become visually literate" (p.118). If teachers are facilitating or encouraging students to develop websites, PowerPoint presentations, or other visual media, it should be the responsibility of the educator to direct the student

to use the presentation material effectively. Rakes (1999) notes, " the ability to read, interpret, and construct graphic displays is of growing importance in an increasingly visual world, as students are exposed to more computer-based electronic texts, which rely heavily on graphical interfaces and graphic aids" (p. 14).

Visual and Verbal Language

Much of the research for this review is web-based. However, print research that speaks to the topic specifically is minimal in areas of education, art education, information technology, media arts and psychology. It is such an emerging area, that when this researcher began the current study, there was little existing information to support ideas about the topic. Now, because the digital landscape integrates visual imagery and educational eportfolios, research is more accessible. The online paper, "An Investigation into Visual Design in the Development of Educational Web-based Projects" (Knapp, 2006) explicates this issue: "Access to the technology however, doesn't mean access to design skills. Historically, graphic designers are responsible for making information presentable, legible, and accessible. There is substantial evidence to support the theory that well-presented information not only improves the learning experience but also facilitates deeper learning" (p.7).

As previously indicated in this paper, visual thinking is related to the term *visual literacy*, as are visual learning and visual language. "Visual literacy is a means to visual thinking, which is as much a processing of information as it is knowledge of information as it is knowledge of visual elements." (Dwyer and Moore, 1994, p.22). Cultivation of visual thinking in the classroom is growing and hopefully, educators in many disciplines will one day justify the value and importance of integrating visual literacy with education curricula. Arnheim (1969) views the lack of visual training in the sciences and technology to be a "serious ailment in our civilization." Additionally,

he asserts that “the discipline of intelligent vision cannot be confined to the art studio; it can succeed only if the visual sense is not blunted and confused in other areas of the curriculum. To try to establish an island of visual literacy in an ocean of blindness is ultimately self-defeating. Visual thinking is indivisible” (p. 307). In further explaining the benefits of visuals, Rakes (1999) notes, “instructional texts of all kinds include a variety of visual images intended to help the learner understand and remember text. Visuals are certainly capable of serving this function. They can make abstract concepts more concrete or simplify complex information in a variety of ways” (p.14). Hence, visuals help students to organize ideas, make transferable connections, support knowledge building and clarify thinking. Rakes continues to reinforce how the role of visual literacy in teaching and learning as a tool can support performance in the classroom (1999). “Visual literacy skills can expand students’ abilities to learn and communicate. Visual strategies can be motivational and can reinforce other basic literacy skills. They can encourage organizational skills along with creative and analytical thinking” (p. 18).

In discussing integration of visuals in learning, we cannot overlook the sciences, which have engaged visual imagery richly. In relationship to the broader academic landscape, “scientific visualization, an anomaly only twenty years ago, has jumped from mainframe to mainstream. Image archives, rare and crudely catalogued ten years ago, are emerging as searchable collections providing rare access and insight into art and culture. New, visually rich journalistic forms such as digital photography, audio and video podcasts, and e-documentaries allow novices along with professionals to be content creators” (Metros and Woolsey, 2006, http://www.educause.edu/EDUCAUSE+Review/).

The three individuals who had perhaps the greatest impact on twentieth-century thought---Albert Einstein, Charles Darwin, and Sigmund Freud---all used visual images in developing their revolutionary theories. Darwin's notebooks reflect an ongoing fascination with the image of a tree (Voss, 2010). This symbol appeared to be important in helping him conceptualize the theory of evolution. In one of his notebooks (alongside a sketch of a tree), Darwin wrote: 'Organized beings represent a tree, irregularly branched… as many terminal buds dying as new ones generated.' Similarly, Albert Einstein received one of the original inspirations for his theory of relativity at the age of sixteen, when he visualized what it might be like to ride on a beam of light. Sigmund Freud supported his theories of personality in part by relying on the image of an island rising out of the sea—a metaphor for the relationship of the ego to the unconscious (Armstrong, 1993, p. 56). Moore and Dwyer (1994) state, "[W]hen artists and scientists are creative, visual literacy is essential. Visual knowledge and thinking are extensively reported as essential to creativity and problem-solving" (p. 99). Science and the arts are often viewed as polar opposites. However, evidence demonstrates that scientists and engineers employ skills in the visual arts to summarily communicate complex ideas. Some biologists, such as Harvard University's Bert Holdobbler, a Pulitzer Prize-winner, illustrate their own books and papers. Thomas Eisner, of Cornell University, takes photographs of insects that are not only of interest to entomology but also award-winning art. Roger Kingdon, a painter and researcher who has focused on how monkeys communicate in the wild consciously applies his 'artist's eye' to his scientific research. Tufte (1997) known to be an observer and analyst of visual displays, presented images of statistical graphics, charts, diagrams and animations along with narratives to demonstrate abstract and scientific data. The facts contain implications for writing instructors to use visuals

with words as a way teach and learn, according to Soho (2010), who concluded that writing instructors will need to consider expanding the curriculum to include meta-concepts related to aesthetic composition in visual and printed texts. By doing so, students have the opportunity to consider how to create and utilize visual design techniques and organize their writing. Ultimately, students compose visuals to support text information and thereby expand upon their communication skills.

Bourzac (2007) reported on a MIT colloquium sponsored by the Office of Educational Innovation and Technology. The Office planned to offer online resources for MIT teachers who want to incorporate visual learning into their curricula. MIT educators discussed visualization tools and shared advice about using aids such as animation, line drawings, and models to help students better understand abstract scientific concepts. Researcher and speaker at the colloquium, Frédo Durand, generally centers work on 3-D imaging. However, he strongly suggested that teachers have students come up with their own visualizations including doodles and line drawings. His presentation is relevant to this dissertation because he illustrated the connection between imagery and learning. "Visualization provides a different perspective on what you're teaching," stated Durand. Teachers often use metaphors to get a point across, and visualization is another version of the same thing: "Some students get one metaphor, some another."
http://www.technologyreview.com/article/408073/getting-the-picture

Much of the literature gives credit to early research from Debes (1969) who attested that visual learning could only be possible after the development of special knowledge and technologies. The time has come when we are confronted with these digital technologies and hence visual thinking, which supports the importance and promotion of visual learning.

A study by Levin, Guttman & McCabe (1977) investigated giving students' instructions to visualize compared rather than verbalize strategies. The guiding question was "[I]n what ways can such visual strategies be helpful in classroom learning?" (p.30). This experimental study using child subjects was said to be "striking" in terms of results. "Levin cited significant experimental findings that he listed as: (1) with limitations, pictures can be a big help in children's learning, (2) self-produced images together with active student involvement greatly facilitate learning and (3) prose learning can be facilitated by strategies that utilize imagination" (p.30). This study reinforces what Arnheim (1969) and others have suggested, that cultivation of visual thinking and strategies could potentially support curricular goals.

Paivio and Desrochers (1979) found in a study with university students learning French words that visual imagery facilitated recall, and that comprehension was much higher when teachers employed visual rather than written or by-rote learning. Mayer (2001) also found that learners retained more information when: 1) they receive words and corresponding pictures rather than words alone; 2) corresponding words and pictures are near rather than far from each other; 3) extraneous words, sounds, and pictures are excluded; 4) words are presented as narration rather than as text on the screen (p.185).

Ausburn and Ausburn (1978) point out that, "if we accept clear similarities between VL and verbal literacy, then we ought to accept two important principles: a) visuals have their own vocabulary, grammar and syntax, and b) a visually literate person should be able to read and write visual language, i.e., s/he should be able to decode (interpret) visual messages successfully and to encode (compose) meaningful visual messages" (1978, pp. 291-297). Dondis (1974) examines visual language by comparing written language in a book to visual literacy and deduced the need for

people to acquire the essential skills of understanding visual communication because so much information is being studied and transmitted in non-verbal modes. His research supports the notion that learners be verbally literate whether they are writers or not, and that they should find it equally necessary to be visually literate, "artists" whether artists or not. He believes written and visual concepts are interconnected elements, both needed for communication. Although Dondis (1974) believes that visual and verbal languages are interconnected, he also believes that they have their own linear structures. Unlike many researchers who demonstrate Fries's (1952) theory on verbal language can be applied to visual language, Donis suggests such constructs cannot be fully applied to visual language. He argues that verbal literacy has a symbol system that represents designated sounds which is accompanied by a common syntax. Thus, when they are mastered, it is possible to read and write. "But, it is apparent that even in its most simplified state, verbal literacy represents a structure with technical plans and agreed-on definitions, which, by comparison, characterize visual communication as almost totally lacking in organization. So it would appear."

The topic of visual learning has been given more attention as our forms of media have been growing more technology-rich (Batson, 2010). Many visual learning proponents have emphasized the essential need for this skill in addition to verbal skills for more than twenty- five years. Feldman (1976) reflects on the role of visual learning parallels in our culture and between the visual and verbal:

> Today, written language steadily recedes; the ratio of printed words to printed images grows smaller; only spoken language holds its own, and even here the image of the speaker (as in television and films) is more vivid and often cognitively and effectively more significant than what he says. Words multiply as they lose their semantic value in a desperate effort to catch up with the electronic and printed images that carry them along like so much baggage. We have in effect a reversal of the time-honored relation between a text and its illustrations… (p. 200).

Early theories by Pavio (1978) suggest that it is impossible to do higher order thinking without using imagery. If educators acknowledged this insight, it could make a difference in student development and success. They will be able to design, build, invent and expand upon their visions independently of others. “As members of a society which increasingly relies on visual messages, we must learn how to interpret these messages in a meaningful way” (Fransecky & Debes, 1972, p.278).

It is proposed that visual language exists, just as verbal language exists, which some would like to debate. However, Fransecky and Debes (1974) answer the question concerning the legitimacy of visual language: “Certainly both visual and verbal languages involve thought processes, which precede speech and writing (visual and verbal). Language, then, has a deep structure (a process of growth), and a surface structure (sounds, visual symbols) which communicate. A good visual statement – a picture, painting, or film—begins with an underlying idea—a kind of deep structure—from which the communicator develops a surface structure visual presentation” (p. 9).

Visual Thinking, Tablets and Visual Note-Taking

Rohde (2012) theorizes that there has been an increase in “visual note-taking” often referred to as “sketch-notes” or “graphic recording” that has expanded to use in conferences, events and workshops across the world. It is like note-taking, but includes visual notes as well as words. It is a form of visual mind-mapping a way of conceptualizing and visualizing ideas, information, and other data on paper, on a whiteboard, or a digital tablet beyond the traditional text medium of outlining. Rohde’s indicates that sketch-noting, or visual note-taking, is for clustering information and capturing big ideas. The concept of using visuals to support memory during and after learning has been verified previously by Buzan (2006) and other researchers who examined recording and organizing thoughts in various note-taking and mind-

mapping activities. They found that by using visual mind-mapping, one could maximize the brain's untapped potential and develop extended ways of communicating. Buzan's book (1996) The Mind Map Book, with reprints in (2006) has showed a growing increase of citations of 150% as of 2013 (google.com). This may be an indicator of the increase of discussions regarding visual thinking.

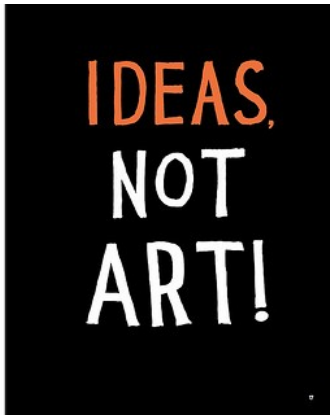
In a recent book Rohde (2012) supports the notion of "sketch-notes" and why and how images can be used to capture thinking visually, remember key information more clearly, help better process the information conveyed orally and aurally and how to share results with others (FIGURE 10) and (FIGURE 11). This type of image use is important to this research when we look at how visual images are currently being included in content to support textual communication of ideas; this type of communication with images is also widely used in iPad applications to communicate ideas as previously presented in this paper. Akah and McBride (2012) offer in their Kindle book edition, *Sketchnotes: Field Guide for the Busy Yet Inspired Professional*, ideas to help learners develop their "own language" by fusing images and text to record and communicate ideas.

There has been an increase in the number of blogs and podcasts dedicated to showcasing visual notes as well as recently- released several books supporting the idea of combining writing and visual effectively. The blog *Sketchnote Army* (http://sketchnotearmy.com) showcases a worldwide community of sketch-noters (FIGURE 12) which features conference materials in this format created with an iPad or other digital devices. The movement has sketch-noters sharing work on Flickr, Instagram and Storify. Sketch-noter Rohde (2012) believes this method of taking notes is useful for schools and educators who want to explore different learning styles and adults who attend work-related meetings and conferences. Visual note-taking can be

done in real-time. Therefore, the images, texts and diagrams can be shared as they are being produced. Many lectures and conferences have gained a heightened increase in attention in recent years because of notes produced for keynote speakers and shared at conferences such as: Ted Talk, Tedx, SXSW, the Virginia Women's Business Conference, and many others. An influx of new applications and iPad applications (apps) have also been created to support the growth of sketch-notes movement (FIGURE 13). Adobe Ideas, Sketchnotes, Graphic Recorder, Sketchrolls, Bamboo Paper, Jot, Penultimate, Paper (by 53), Clibe and Google Fusion tablets all contribute to this emerging media of communicating ideas visually.

Sketchnotes Rohde (2012)

FIGURE 10

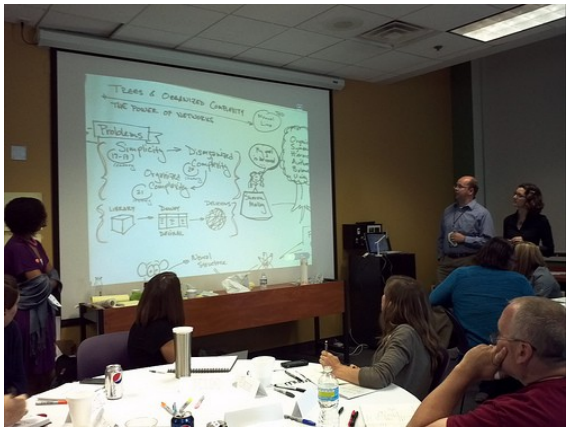


Sketchnotes of a University webinar and Principles

FIGURE 11

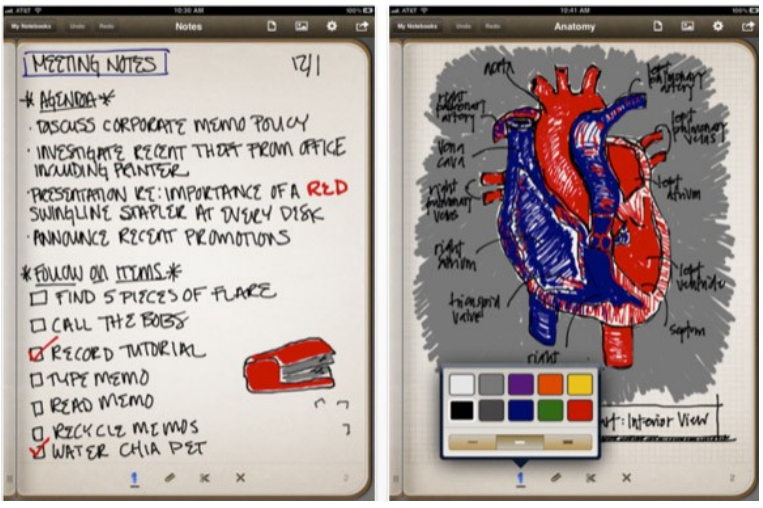
Sketch-note Army

FIGURE 12



Sketch-note iPad application

FIGURE 13



Global Initiatives

E-portfolio initiatives are world-wide. The first International ePortfolio Conference took place in 2003 in Poitiers, France, and attracted delegates from twenty different countries. It was during that first conference that EIfEL, the organizer and co-organizer of ePortfolio events and conferences in Europe and worldwide, first revealed its vision. By 2010, presenters predicted, every citizen will have an e-portfolio. This view is quite different from the position taken in the United States. Most of the literature focuses primarily on education goals in the U.S., not for all people. This 2006 conference merged 300 delegates from 27 countries with the largest groups being from the UK and the Netherlands. Many of these delegates had an education and training background, but there were also a large number of attendees from public authorities, associations, foundations, and eLearning supply corporations. Clearly, eportfolios are an emerging field in the United States as well as abroad. Also, although the ePortfolio initiative is embedded in education theory, it also expands into the workplace; the perspective is global and is expected to increase, not to diminish in the future. According to a (2006) dissertation from authors Murray and Smith in the UK, the British government through a series of white papers, placed e-learning at the center of developing learning. The white paper, 'Harnessing Technology' (DfES 2005) promotes" a call for education institutions to supply personal web space to learners to enable them to build electronic portfolios of their achievements to facilitate the process of lifelong learning" (p.211).

Elsewhere, ePortfolio advocates are following suit in unique ways. Despite the caution in the U.S., Villano (2005) explains that in the UK, ePortfolios are becoming as commonplace as cellular phones; and they are gaining strength in New Zealand and in

Canada. The national organization Learning Innovations FORUM launched an initiative in April 2005 to provide ePortfolios to all of its members. This fact provides evidence that although it is perhaps a lofty goal, eportfolios are starting to have a major impact in other parts of the world with profound organizational changes outside of schools. Although this paper does not go in depth as to the changes happening in the world economically, nor does much of the educational research expand into the economics, it is important to understand why these changes are occurring globally. Author Villano (2006) lists twenty things that can be done to support in the research and promotion of eportfolio development (APPENDIX C) (http://campustechnology.com/articles/41130_5/). Some goals listed in this article are identified in this researcher's goals in researching visual learning in an institutional environment. Meanwhile, other organizations and groups are inquiring about visual learning in hopes of advancing future educational needs. Furthermore, the researcher Batson adds (2013) in an article, *The Taming of the MOOC--With ePortfolio Evidence*, that more research and support is critical as MOOC's, a relatively new buzzword meaning Massive Open Online Course, grows. He asserts that a major benefit of eportfolios is that they allow learners to collect evidence of their learning in the classroom, of their work in team projects, and of their work outside of the classroom; and that learners enrolled in MOOCs would increase the value of their experience by using an eportfolio. The MacArthur Foundation (2006) launched a five-year, $50 million digital media and learning initiative to help determine how digital technologies are changing the way young people learn, play, socialize, and participate in civic life. Because this is the first generation to actually grow up with digital tools, they question the implications for education and for society, and search for answers critical to developing educational needs: 1) How is digital technology changing young

people and how they learn? 2) What skills will they need to thrive? 3) How should schools and social institutions adapt to meet these changing needs? 4) What do youth themselves think about the new world before them? Jenkins (2006) makes a meaningful contribution to this line of inquiry by indicating that a merger of preservice teachers' critical skills and research associated with a digital environment of learning could bring more awareness to this evolving topic. Social media as a component of global change has also been impacted by the increase in visual image usage. According to Shields, M. (2013) stated in *Adweek*, that half of Facebook posts are now images, and brands place photos in tweets to increase engagement. In *Adweek's* interview with CEO Vineberg of a two-year-old startup *ThingLink*, he adds that engagement increases when you communicate with images and that it's clear the Internet has become a more visual place. "If you communicate through an image, people engage with it—we know that because of Facebook. And if you put content inside an image, the engagements go crazy." Vineberg observed that images embedded with videos, annotations or links see clickthrough rates of as much as 50 percent (http://www.adweek.com/news/technology/publishers-are-love-new-photo-platform-148129).

Perceptions and Attitudes

It is important to establish and elaborate on the nature and implications of perceptions on decisions because this dissertation includes perceptions and reactions to change. This section of the literature review examines faculty perceptions and attitudes, which could potentially affect preservice teachers' decision-making. Research on perceptions is rich and comprehensive, and therefore, the intent of this literature review is not to present an exhaustive list of definitions of perception. Instead, the intent of the researcher is to establish two main points regarding this

dissertation. First, perception, as a psychological construct, is associated with other constructs such as attitude or emotion. Despite the differences among these constructs, some of them seem to share common properties and therefore, attitudes will also be included as part of this literature. Second, perceptions influence the ways in which humans understand the world around them and how they make decisions (Berelson and Steiner, 1964). Perception has been previously defined in the definitions section of this dissertation. The early research on perceptions were defined by Bartlett's (1932) influential works on the constructive nature of cognition, which argues that schematic thinking dominates human perception in ways that human generic beliefs about the world influence and shape information processes. One of several researchers (Allport, 1954) extended Bartlett's (1932) work and has since advanced our understanding of several concepts such as perception, attitude, and judgment. It has also been defined as a "complex process by which people select, organize, and interpret sensory stimulation into a meaningful and coherent picture of the world" (Berelson and Steiner, 1964, p.88). Some theorists state that perception is "about receiving, selecting, acquiring, transforming and organizing the information supplied by our senses" (Barber and Legge, 1976, p. 7). The preceding discussion on perception has suggested that from a psychological perspective, individuals' perceptions have a directive influence upon their decision-making and the outcome of their decisions. The discussion on perceptions would be incomplete without also mentioning "attitudes" as a related concept.

This section discusses how research on perceptions has advanced our understanding of attitude(s). Just as the preceding discussion of human perceptions has given an overview of how humans perceive and make sense of the world, attitude, in psychology, has also been examined extensively. Attitudes are also defined in the

definitions section of this dissertation. The main component of research on attitudes as a definition refers to an individual's preference for or disinclination toward an idea, issue, item or object; it is subjective in nature, and can be positive or negative. Attitudes very often come in pairs, one conscious and the other unconscious. (Jung, 1921). Another early definition that has influenced subsequent studies on attitude is "the affect for or against a psychological object" (Thurstone, 1931, p. 261). One definition that seems to be more comprehensive is that attitude is "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related" (Allport, 1935, p. 8). A final definition that is slightly different from Thurstone's (1931) is that attitude is "a disposition to react favorably or unfavorably to a class of objects" (Sarnoff, 1960, p.261). This dissertation supports the theory that there are two important aspects of attitude: one of them is a belief aspect that uses cognitive processes to describe an object and its relation to other objects, the other is an affective aspect that leads to liking or disliking an object (Katz, 1960). Other discussions regarding the research on attitudes are about how individuals acquire attitude. In psychology, attitudes arise from concepts, which are constructed through experience; and concepts become attitudes though a process in which an evaluative aspect is added on to them (Rhein, 1958). According to Salancik and Pfeffer (1977, 1978) they assert the role of social information is supported by behavioral reactions of individuals to situations. Attitudes may be stable dispositions, but may be influenced by social situations. By acknowledging the varied discussions on the operations of attitudes, we can affirm that humans' attitudes can: (1) influence thinking (2) decision-making and (3) behaviors. Furthermore, we can acknowledge that these elements may apply even in situations whereby, humans recognize the existence of

their attitudes, as well as in situations in which they do not recognize the existence of their attitudes.

Although this paper is not about technology adoption and specifically more about how preservice teachers are communicating with visual imagery, future research can look extensively at key pedagogical elements related to this topic. Christensen (2002) theorizes that proper development in the use of technology in a classroom is an important component to successful integration of the technology: "the instructor who has learned to integrate technology into existing curricula may teach differently than the instructor who has received no such training" (p. 413).

Summary

In reviewing relevant literature related to this study, it appears that the foundational shift now occurring in education is prompting learners to access other avenues by which to communicate. Students now are exposed to changing technological materials and tools beyond text and are encouraged to think in new ways about how they learn and communicate (Barrett; 2012; Batson, 2012; Buzan, 2006; Felten, 2008; Kellner, D., & Share, J. 2005; Moore & Dwyer, 1994; Sibbet, 2010; Thompson, 2010). Research shows that these media-enriched environments are challenging the teacher and the learner to construct and produce various levels of reflection to represent their professional growth. Since reflection is often embedded in eportfolios and is important to the success of teacher education programs, it is imperative that visual thinking is looked at more critically to support educational reform. The current research is instrumental in providing perceptions and attitudes of the use of visual imagery for communication with goals of answering the research questions. This review connects multiple fields of study: eportfolios as part of reflective practice, 21st century literacy or fluency, and visual thinking and learning as a 21st

century skill. The level of available technologies now makes possible international study concerning perceptions and roles of electronic portfolios to support student learning, engagement and collaboration. Barrett (2009) concludes that we have the technology and we have the vision; we need to now produce a better understanding of what works. The current study hopes to contribute to thought about "what works" by examining perceptions of preservice teachers' communicating with visual imagery in eportfolios for reflective practice.

CHAPTER 3: RESEARCH METHODOLOGY

Introduction

This chapter introduces the methodology and context of the study, the site and population descriptions, methods used, instrumentation, data analysis, data collection, analysis procedures, stages of data collection, limitations and ethical considerations of this study.

Research Design and Rationale

The study employed a concurrent mixed methodology including survey questionnaires, individual interviews and document analyses. Both quantitative and qualitative data were used to categorize, interpret, and explain the research questions. Creswell (2009) examined qualitative and quantitative research methods and determined that it is advantageous for a researcher to combine methods to better understand the phenomena and fully interpret a situation. He also theorized that a concurrent strategy of inquiry employs one data collection phase during which both quantitative and qualitative data are collected (FIGURE 14).

Creswell (2009) qualitative and quantitative research methods

FIGURE 14.

Calfee & Sperling (2010) theorize that amplification of observation and interpretation can lead the researcher to a more robust understanding of varied traditions. Using the research questions, the literature review, and the theoretical and conceptual framework to focus this study, the researcher began by asking questions

regarding eportfolios and the perceptions of preservice teachers' communicating with visual imagery in eportfolios for reflective practice.

The inherently flexible design in mixed-methods qualitative research allows the exploration of a process that has not yet been identified and therefore, may bring forth new findings. It is a particularly effective means of exploring social relationships. "Qualitative research is done for the purpose of understanding social phenomena, social being used in a broad sense. Quantitative research is done to determine relationships, effects, and causes" (Wiersma, 2000, p.13). Data gathered can yield useful, vivid analyses to contribute to the ongoing discourse about the topic at the large state university in the southeast and in the educational field. Wiersma (2000) summarizes qualitative research, stating that the paradigm relies heavily on narrative description and has characteristics that include grounded theory, inductive and holistic inquiry, an understanding of social phenomena, context-specific material, an observer-participant, and a narrative-descriptive foundation. Quantitative research, however, is based on deductive inquiry, relationships, effects, causes, is theory-based, focuses on individual variables is context-free, relying on generalizations, is based on the detachment of the researcher, and requires statistical analysis is a component. Schloss & Smith (1999) indicate that while quantitative research is more commonplace than studies involving qualitative research, this seeming preference is not a reflection of quality or the viability of qualitative research in contributing to our knowledge base. To answer the research questions, this study will use three instruments: a selected survey instrument, interviews with participants and artifacts related to the purposive sampling design of the study (Table 1).

Table 1

Research Question Matrix: Mixed Methodology / Lyles-Folkman, K. (2013).

Research Questions	Mixed methods	Data Collection Methods	Data Analysis
Research Question Q1 What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? Variables: attitudes and perceptions that influence use of visual imagery	Qualitative (descriptive) Open-ended questions can provide detailed information in respondents' own words. Perceived influences determined by open-ended interviews	Semi-structured Interviews (Telephone) Open-ended questions Artifacts: Documents will be interview transcripts • Text data	Qualitative Software (Survey Monkey) Coding and thematic analysis • Codes & themes for interpretation • Similar and different themes • Visual data display
Research Question Q1A What are the differences in preservice teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? Variables: differences in attitudes and perceptions towards use of visual imagery	Qualitative (descriptive) Open-ended questions can provide detailed information in respondents' own words. Perceived differences determined by open-ended interviews	Semi-structured Interviews (Telephone) Open-ended questions Artifacts: Documents will be interview transcripts • Text data	Qualitative Software (Survey Monkey) Coding and thematic analysis • Codes & themes for interpretation • Similar and different themes • Visual data display
Research Question Q1B How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program?	Qualitative(descriptive) Provides firsthand visual experiences from preservice teachers' perspective	Artifacts: E-portfolios; • image data	Researcher conducts content analysis of preservice teachers' portfolios • Artifact description
Research Question Q2 How do preservice teachers describe how visual imagery supports or constrains reflective practice? Variable: Support and constrain Dep. Variable: Descriptions of visual imagery	Quantitative (comparative) Provides numeric information. Support and constrain measured using survey questionnaires	Online survey questionnaires Surveys: • Numeric data	Quantitative Software (Survey Monkey) • Descriptive statistics • Frequencies • Means • Standard deviations
Research Question Q2A What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their eportfolios to support reflective practice? Variable: attitudes and perceptions Dep. Variable: challenges of using visual images	Quantitative (comparative) Provides numeric information. Attitudes and perceptions of technology challenges measured using survey questionnaires	Online survey questionnaires Surveys: • Numeric data	Quantitative Software (Survey Monkey) • Descriptive statistics • Frequencies • Means • Standard deviations

- **Interpretation of Entire Analysis-** (1) Explanation of the meaning (2) discussion of quantitative results (3) Interpretation of the meaning of the interviews and artifacts (4) recommendations for future studies.

Site Description and Population

Site Description

The large state university in the southeast is an accredited teacher education institution; the university requires that teacher candidates are continuously assessed to be sure that they are meeting national, state and program requirements. The Early Childhood Education Bachelor of Science in Education program consists of 129 hours of coursework and field experience. The program goals are to develop teachers as facilitators of learning. The program reflects research and best practice in the field of early childhood education and teacher education. Teacher candidates are exposed to content and pedagogy in all academic disciplines taught in the early childhood classroom.
(http://education.gsu.edu/ece/docs/ECE_BSED_Program_Manual_Fall_2012.pdf). The site for the study has been requested and secured; permission has been granted from the college administration to do a study at their institution (APPENDIX F).

The portfolio is a critical component for assessing preservice teachers' reflective work and knowledge. Teacher candidates at this university where the study takes place are evaluated according to Assessment Transition Point Criteria, which include the successful completion of all: 1) Program course work, 2) Benchmark Conferences including Professional Portfolio Reviews, and 3) Key Assessments. Previous to Clinical Practice, which occurs at the end of each semester, a Benchmark Conference, including a Professional Portfolio Review is held with faculty, field supervisors and candidates. Candidates must present evidence of their growth and development by presenting documentation related to the framework standards which guide the

program. All assignments, including the Professional Portfolio Review score and coursework, make up the students' course grades. Teacher candidates are required to meet the program level target upon review per a Portfolio Rubric. If they do not, they have one opportunity to revise and resubmit the Professional Portfolio for further evaluation. If the revision does not meet the program level target, candidates must repeat the course, and may not enroll in the next block of coursework.

The researcher is aware that this study could reflect perceptions of the faculty as well as student teachers; however, her primary concern is with the perceptions of student teachers. The Teacher Education department is supportive of this study as it pertains to the preservice teachers' curriculum and reflective reporting. Findings from this study could also contribute directly to the department's understanding of how students perceive the use of visual imagery to document their learning for the Professional Portfolio Review. Furthermore, with regard to the planned statewide teacher evaluation and professional growth implementation scheduled to launch in Georgia during the school year 2014-2015, this study is significant as it addresses preservice teacher practice and performance in education courses. The new Teacher Keys Effectiveness System (TKES) has multiple components, including the Teacher Assessment on Performance Standards (TAPS), Surveys of Instructional Practice and measures of Student Growth and Academic Achievement. The overall goal of TKES is to sustain continuing growth and development in each teacher (http://www.doe.k12.ga.us/School-Improvement/Teacher-and-Leader-Effectiveness/Pages/Teacher-Keys-Effectiveness-System.aspx. Results for this mixed-methods descriptive study could affect how preservice teachers will be evaluated according to new teacher education performance measures. This study also supports application of NCATE and ISTE (2008) standards. International Society for Technology

in Education (ISTE's) and National Educational Technology Standards (NETS) for Teachers are the standards currently used to evaluate the skills and knowledge educators need to teach, work, and learn in an increasingly connected global and digital society. NETS require preservice teachers to meet educational technology standards, demonstrate continual growth in knowledge and skills and to stay abreast of current and emerging technologies (http://www.iste.org/standards/nets-for-teachers).

The background of this assessment framework is significant because the portfolio is used as a measurement of teachers' knowledge and is a key factor in determining whether or not teachers move forward in their program coursework. Inclusion and use of visual imagery could be contributing factors for the success of the reflective process in the completion of portfolios. Also, because assessment includes the portfolio, results of this study may be applicable as educators at the university where this study takes place continue to explore various ways to meet educational technology standards as described in this paper.

Population Description

The participants for this study are a small population of 50 preservice teachers enrolled in teacher education courses at a large state university in the southeast. The university is supportive of scholarship, has a Teacher Education program which utilizes eportfolios as part of teacher assessment, and includes a mandatory Professional Portfolio Review teachers must pass in order to continue coursework in the program. Furthermore, the student population is ethnically diverse and educates both genders; therefore the sample is representative of the population this research is studying. Non-probability sampling was chosen for its specific theoretical criteria. According to Oliver (2006) purposive sampling requires researchers to choose

individual participants who would be most likely to contribute appropriate data, both in terms of relevance and depth. The findings for the research questions are applicable to this particular sample.

Research Methods

Description of Methods Used

The methodology included a three-step procedure. The researcher answered the study questions by including three instruments: an online survey questionnaire, open-ended interview questions, and a review of artifacts (APPENDIX D). According to Calfee and Sperling (2010) "Mixed methods give complementary and mutually enhancing ways of reaching richer interpretations of observed phenomena than may be possible from a quantitative or qualitative approach alone" (p.7). This research study relied upon quantitative data derived from a Likert-type survey (Schmidt, et al., 2009), qualitative data from telephone interviews and a review of the artifacts. In order to address the question of whether the use of visual imagery by teachers in reflective practice supported or constrained the eportfolio learning process, teachers' perceptions was measured using the survey questionnaires; this survey also yielded numeric data. In this research, the surveys provided the participants with two opportunities to communicate their perceptions of what is occurring in their reflective practice regarding eportfolios and use of visual imagery. The qualitative data, which included 10 interviews with preservice teachers from a large state university provided data to address the most important perceptions of teachers influencing their use of visual imagery in eportfolios for reflective practice; and support findings from assessment of qualitative data. Artifacts include electronic portfolio documents and yielded rich visual data and stories that show how teachers demonstrated their competency by using visual tools. The researcher triangulated the data by examining

evidence from the 3 data sources and then used it to build a coherent justification for themes in the study; this process supported validation and reliability of data.

Creswell (2009) suggests that there is an advantage for researchers to combine qualitative and quantitative methods; they can better understand the concept being tested or explored. The descriptive method of research was used for this study. Creswell (1994) states that the descriptive method of research is to gather information about the present existing condition; the emphasis is on describing rather than on judging or interpreting. The aim of descriptive research is to verify formulated hypotheses that refer to the present situation in order to elucidate it. The researcher opted to use this research method considering the objective to obtain first hand data from the respondents.

First, an online survey with a Likert-type scale was necessary, to provide a numeric description. Participants specifically rated their level of agreement to disagreement for each question along a 6-point Likert scale with the range of designations being between, *1 = Strongly Disagree* and *6 = Agree*. Online survey questionnaires were conducted with 50 teachers enrolled in the Teacher Education program at the university of study. It was administered to fifty preservice teachers upon completion of their Clinical Practice curricula, at the end of each semester. At this stage, most preservice teachers have completed their portfolios or are in preparation of completion for the Assessment Transition Point Criteria; this assessment was the framework standard which guided the teacher education program. Information from the Likert-type survey was used to determine how visual imagery supported or constrained reflective practice in teachers' eportfolios. The quantitative method provided a numeric description for this study and supported answers to the research questions. Survey Monkey was used to distribute the survey

questionnaires as well as for data analysis. Survey Monkey is an online survey tool that can support researchers in designing, sending and collecting surveys, polls, questionnaires, customer feedback and market investigations (www.surveymonkey.com). Teacher education students volunteered their participation. As previously discussed, the location for the study was requested, secured, and will be used as per the permission from the university administration. The participants were contacted via email with electronic letters to students enrolled in the Teacher Education program. The initial contact occurred via the university administration communication to students already enrolled in the Teacher Education program at the university; they shared that research is taking place and that the researcher is looking for volunteers.

Second, for the qualitative contribution to this study, open-ended interviews were administered via invitation to discuss individual eportfolios in depth. Telephone interviews were administered to ten students to determine the most important perceptions of teachers influencing their use of visual imagery in eportfolios for reflective practice. Purposeful sampling was used to select 10 participants. According to Creswell (2007) the concept of purposeful sampling is used in qualitative research**.** This type of sampling means that the inquirer selects individuals and sites for study because they can purposefully inform an understanding of the research problem and central phenomenon of the study (p.127). The total number of participants were categorized as per various majors and selected randomly to delineate the 10 participants if more than 10 volunteered. This process provided an opportunity to include various majors within the teacher education program to be represented. The information regarding the participants' major was listed in the demographics section of the survey questionnaire. The approach of maximum variation was used which is a

popular approach in qualitative studies, according to Creswell (2007). Furthermore, he states that this process also consists of determining in
advance some criteria that differentiates the sites or participants, and then selecting sites or participants that are quite different on the criteria. This approach is often selected because when a researcher maximizes differences at the beginning of the study, it increases the likelihood that the findings will reflect differences or different perspectives, which is an ideal in qualitative research**.** Pinnegar & Daynes (2006) theorize that the intent in qualitative research is not to generalize the information**,** but to elucidate the particular, the specific.

The telephone interviews were conducted with participant consent and were audio taped. According to Wiersma (2000) the interview provides opportunity for in-depth probing, as well as elaboration and clarification of terms. He adds that a recording of the interview will support retention via oral communication. Data collection provided information from the viewpoint of the interviewees. Preservice teachers voluntarily agree to participate in the second part of this study by confirming in the online survey that they would proceed to the telephone interviews.

Third, artifacts in the form of eportfolios were collected from volunteer participants. These artifacts were reviewed and the researcher wrote about the journey and experiences of the teachers. The results of the data collected provided rich visual evidence and detail of teachers' use of visual imagery in reflective studies, and provided stories from the perspective of participant student teachers. An artifact, as physical trace evidence provides evidence in the form of stories, rituals, and myths; and/or uncovers themes (Cresswell 2009). Purposeful sampling was used to select artifacts from five participants as was indicated in the collection process for the interview participants.

The quantitative data collected from online surveys and qualitative data from the open-ended questionnaires and artifacts was analyzed to answer the research questions for this study. The researcher categorized, interpreted, and explained the perceptions of teachers communicating with visual imagery in eportfolios as part of reflective practice in Chapter 4. For purposes of confidentiality, the preservice students' names were not identified or communicated in the results. Identifiers were removed from all materials to protect the participants of this study. There were no risks involved for the university or students. No students were compensated, nor did outside preparation or commitment take place for the student. The researcher completed IRB Certification (APPENDIX G) and followed all IRB guidelines and rules to protect human subjects; this is a low-risk study.

Instrumentation

Thomas & Brubaker (2000) attempt to qualify the debate of traditional experimental concepts of validity by adopting various terms, including *authenticity* and *trustworthiness*. This study aims to validate claims by examining multiple levels of data and triangulating data sources to establish authenticity and trustworthiness of results. Data are collected concurrently in one phase, and interpretation involves comparing the results of each to best understand the research question (Creswell and Plano Clark, 2007).

> Another author revealed, "Research is valid to the extent that its outcomes convincingly answer the questions on which the study has focused. Decisions about whether an account of events is "true" (accurately reflects the real world) are guided by criteria of objectivity (the methods of research are free from the researcher's personal biases), of representativeness… the study's sample of people, places, or events accurately represents the characteristics of the of the broad population of people, places, or events to whom the generalizations are applied" (Thomas & Brubaker, 2000, p. 14).

The survey: initial quantitative instrumentation included online questionnaire surveys in the form of Likert-like questions, which were sent via the Internet to

students enrolled in the teacher education course at the location for the study; questionnaires were presented at the end of a teacher education informational meeting. Online survey questionnaires were given to student participants who have completed work on their eportfolios during the previous semester. Permission to employ the survey identified below as the instrument used in this study was requested via email (APPENDIX B). The survey instrument is: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April). The reliability, validity, and internal consistency of this scale is statistically adequate, with an internal consistency reported as high and statistically significant (alpha=0.82) for Technology Knowledge (TK); (alpha=0.84 for Pedagogy Knowledge (PK); and (alpha=0.92) for Technological Pedagogical Content Knowledge (TPACK), (Schmidt, et al., 2009). The instrument was developed to be used in the context of teacher education.

The interviews: the second form of qualitative instrumentation were telephone interviews in the form of open ended questions which were administered to students enrolled in the teacher education course at the study location. The preservice teacher participants volunteered to engage in the second part of this study by confirming via the online surveys by checking a question box at the bottom asking them if they are willing to proceed to the interview phase. The questions were open-ended, allowing the researcher to access understanding of the most important perceptions of teachers influencing their use of visual imagery for reflection in eportfolios. The author Kerlinger (1993) states the advantages of open-ended questions in research:

> Open ended questions are flexible; they have possibilities of depth; they enable the interviewer to clear up misunderstandings (through probing); they enable the interviewer to…detect ambiguity, to encourage cooperation and achieve rapport, and to make better estimates of respondents' true intentions, beliefs, and attitudes (p.484).

The artifacts: Qualitative data sources included preservice teachers' documentary evidence (artifacts) of students' reflective entries in their eportfolios. Five (5) eportfolios were reviewed from student teacher volunteers who have indicated in the initial survey that they were willing to share their reflective process presented in their personal eportfolios. The artifacts showed how teachers demonstrated their competency by using visual tools to support reflective practice in electronic portfolios. These source materials provided a first-hand account of the teachers' reflective experiences when using visual tools. Borko and Stecher (2012) describe the importance of a review of artifacts as reliable and valid information in research studies. Their research also included a review of teacher reflections and a notebook portfolio as part of self-report. They determined that artifact-based instruments may illuminate features of instruction generally not apparent, even through direct classroom observation; furthermore, the process of structured collection and reflection on artifacts may also have value for professional development.

Data Analysis Procedures

By the third week of May 2013, all questionnaires, interviews and artifacts were collected. The analysis process overlapped starting in the third week of May until the fourth week of May 2013. Analysis included the coding and summarizing of findings. The data collected from surveys and questionnaires was analyzed and coded to bring meaning to the discussions. Coding, the "process of organizing the material into chunks before bringing meaning to those chunks" (Creswell, 2003, p. 192) allows the researcher to look for emerging themes in the data. Coding will require categories for the researcher to create and organize data based on these patterns. The data will then be interpreted to include specific implications that correlate with research questions presented in this study. McCracken (1988) states, "The object of analysis is to

determine the categories, relationships, and assumptions that inform the respondent's view of the world in general and the topic in particular" (p. 42).

This information may be helpful to this university and colleges with Teacher Education programs in future decisions regarding tools that could be used to support development of eportfolio reflection in the teaching and learning process. The results of this study, could point to recommendations that courses in visual thinking be included as a part of best practices for eportfolio development in preservice teachers' reflections. If the use of visual imagery supports reflective practice in eportfolios, using it will help teachers address potential challenges incorporating various visual software and tools into their reflective processes. It could also support innovative visual thinking principles and visual knowledge building in teacher education. Other factors surrounding visual thinking that still need to be examined are whether teachers feel adequately trained in the technology to integrate it successfully in their work. Another issue that needs to be addressed is whether current teacher education curricula support eportfolios as part of the reflective process for teachers or for assessment.

Triangulation of multiple data sources could aid in confirming the research conclusions. Schloss & Smith (1999) theorize that such triangulations are a way of increasing validity… "another essential method for ensuring the accuracy of perceptions in qualitative research is triangulation" (p. 93). Wiesma (2000) contributes to this research on triangulation adding that "…it can be conducted among data sources or different data-collection methods … to determine whether or not there is corroboration" (p.251).

The online survey questionnaires were administered the first through the third week of May 2013, which constituted the quantitative aspect of this study. Surveys determined the quantitative answer to research question(s) Q2: How do preservice

teachers describe how visual imagery supports or constrains reflective practice? It should also yield answers to Q2A: What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their eportfolios to support reflective practice?

During the second and third week of May 2013 the post-survey telephone interviews were conducted to constitute the qualitative aspect of this study. Interviews determined the qualitative answer to research question(s) Q1: What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? It should also yield answers to Q1A: What are the differences in preservice teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? As discussed previously, the teacher participants were volunteers that agreed to the second part of this study by confirming on the online surveys to a question box at the bottom asking them to proceed to the interview process as well as to the artifacts process if they chose to volunteer.

The interviews will be audio-recorded and subsequently transcribed verbatim. The first level of data analysis will involve data reduction through summarizing, and coding. The findings will be coded and summarized over a two week period during the second week of May and be completed by the end of May 2013. The data analysis process will include data reduction, data display, conclusion-drawing and verification; the survey instrument to analyze data as previously mentioned, will be Survey Monkey. This process ran parallel to collection of the data as key themes or topics are identified.

By the third week of May 2013, five (5) artifacts in the form of eportfolios were collected for data analysis. The researcher was interested in searching for

relationships. A rubric will be used to support this process. The Department of Education and North Carolina Wesleyan College (2013) utilize a reflection rubric to assess level of reflection on the Admission Essay as well as on their Student Teaching Portfolios. This rubric (Table 2) was used as a guide for the eportfolio analysis for reflective practice to better understand how preservice teachers' communicate with visual images for reflective practice; and to answer the research question Q1B: How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program? The Reflection Rubric list below includes three categories that are specified and mandated by the North Carolina Department of Public Instruction and North Carolina State Board of Education, as a way to assess reflective practice in their state's preservice teachers' eportfolios:

> *Macro-Reflective:* Distinguished by a search for relationships, connections, justifications, consequences, evaluation, and critical processes. The reflection is driven by a vision in the form of personal, pedagogical, or social conceptual and decision-making framework. Assertions are specific, supported with evidence from experience and conceptually connected. The writer's perspective is multidimensional explaining how the event can be connected to a larger conceptual framework.
>
> *Micro-Reflective:* Includes a self-awareness of the writers' own meaning-making process but limited to the immediate situation or event, lacking connections to a broader educational theory or framework. Assertions are specific and supported with evidence from experience. The writer's perspective may be multidimensional, representing more than one learner or groups of learners.
>
> *Pseudo-Reflective:* A list, log, story, description or a narrative of an educational event. A reaction or retelling without thoughtful connection to other events. Assertions are general and not supported with evidence from experience, theory or research. The writer's perspectives are undifferentiated and general regarding the needs of learners (p.9).

Table 2

NORTH CAROLINA WESLEYAN COLLEGE
Department of Education Reflection Rubric

Reflection Rubric			
Score	***Pseudo-Reflective*** **(1)**	**Micro-Reflective (3)**	**Macro-Reflective (5)**
	A reaction or retelling without thoughtful connection to other events.	Self-awareness of the writers' own meaning-making process but limited to the immediate situation or event.	Search for relationships, connections, justifications, consequences, evaluation, and critical processes
	Assertions are general and not supported with evidence from experience, theory or research	Assertions are specific and supported with evidence from experience	Assertions are specific, supported with evidence from experience and conceptually connected.
	The perspective is undifferentiated and general regarding the needs of learners	The perspective is multidimensional, representing more than one learner or groups of learners	The perspective is multidimensional in explaining how the event can e connected to a larger conceptual framework

*This rubric is used to assess level of reflection on the Program Admission Essay and Student Teaching Portfolio.

Further evaluation will determine methods for implementing visual tools to communicate strategies and technologies into the teaching curricula at the university where the study takes place. NETS•T (2008) standards require teacher educators to meet educational goals, including demonstration of continual growth in technology skills to stay abreast of current and emerging practice. The findings from this study could support institutional goals. The standards require teachers to implement curriculum plans that embrace methods and strategies for applying technology to maximize student learning and to apply technology to develop students' higher order skills and creativity.

Stages of Data Collection

The study was administered during the first through the third week of May 2013; this was the beginning of the spring semester for this participating university. There were three phases in the data collection procedure (Table 3). The order of the phases of each step occurred as follows:

Phase I of this study included an online survey. Participation in the online survey took approximately 10 minutes. At the end of the online survey the participants were given the choice to end their participation with the study or continue on to Phase II of the study. If the participants decided to continue in Phase II of the study, they then participated in a semi-structured interview that occurred during the spring semester; the interview took place post-survey and was administered via telephone. The telephone interviews were audio taped and then transcribed by the researcher. Participation in the telephone interview was approximately 20 minutes. Phase III of this study was to review artifacts in the form of the student teachers' eportfolios. Participants were invited to make their eportfolios available for review as a part of this study by forwarding a link to their eportfolios to the researcher.

The questionnaires were distributed electronically via email to approximately fifty (50) preservice teacher participants and included forty six (46) questions. The questionnaire was sent by the researcher to the study location. The university approved the study to take place in their School of Education and the administration then distributed the instruments to the preservice teachers' that have taken Clinical Practice courses that support eportfolios as part of their preservice teachers' reflective reporting. The completed surveys were then forwarded by the participants to the researchers' email account via *Survey Monkey*. An introductory letter and consent form accompanied the electronic questionnaire which also identified the study as well

as contact information of the researcher and principal investigator. The expected number of preservice teachers did not respond the first week that the administration released the three phases of the study, thus a second request was submitted by the administration. This occurred via preservice teachers' email accounts with a cordial invitation again to respond within the timeframe of one week. The responses to this survey are confidential; no individual was identified with his or her responses; each participant was given pseudonyms to identify participants.

Table 3
Three Stages of Data Collection

Data Collection Phase and number of instruments administered	Phase I (50 surveys) May week 1-3, 2013	Phase II (10 interviews) (post-survey) May week 2-3, 2013	Phase III (5 artifacts) (post-interview) May week 2-3, 2013
Instrument	online survey	semi-structured interview (administered via phone) (audio-taped)	review of artifacts (student teachers' eportfolios)
Approximate Time	approximately 10 minutes	approximately 20-30 minutes	Participants will forward a link to their eportfolios to the researcher to review
Participation level	At the end of the online survey, the participants are given the choice to end their participation with the study or continue on to Phase II of the study	At the end of the semi-structured telephone interviews, the participants are given the choice to end their participation in the study or to continue on to Phase III of the study	The participants will end participation after forwarding artifacts
Data Analysis: End of May, beginning of June 2013			
*All participants from the Teacher Education program who have completed eportfolio entries for reflective practice are invited to volunteer to be a part of the study. The study will take place during the beginning of the spring semester.			

Limitations

The researcher acknowledges limitations in this research study that may affect the internal or external validity of the dissertation's outcome. First, the margin for error in data obtained via a survey instrument cannot be fixed with accuracy because human beings do not necessarily answer questions with candor (Creswell, 2007). Second, the results may not accurately reflect the opinions of all members of the included population because the sample for this study is a small population at one university. Third, the population and the geographic region from which data was collected was limited. The small purposeful sample available for the study indicates that results may not be generalized beyond the specific population from which the sample is drawn. Fourth, the population involved in the current study focused only on members located within one (1) Teacher Education program and in one (1) state. Fifth, because this study is interested in eportfolios, only those students with eportfolios participated. Also, because there are a large number of potential participants for a similar study, the results are therefore not definitive. This study could, however, indicate the usefulness of further investigation and research. The researcher is also aware that demographics, race, age, gender and socioeconomic class can affect a study. The researcher did not attempt to collect race or socioeconomic information or analyze such factors; this is delimitation in this study. In an attempt to minimize researcher bias or personal beliefs and values, the data collected will be via purposeful sampling methods, as indicated in this paper previously. For the purpose of discussion, the researcher assumes participant demographics did not significantly affect their perceptions.

Ethical Considerations

Ethical considerations and human subject issues such as maintaining confidentiality of data, preserving the anonymity of informants, and using research for intended purposes is important to this researcher (Creswell, 2009; Glatthorn, 1998; Merriam, 1988; Wiersma, 2000). Previous to answering online survey questions, a consent statement for the participants was included as part of the introduction to the survey. It stated that submission of the online survey indicates consent to use the data in research. It also stated that the responses will be kept completely confidential and will not influence participant course grades (Appendix B). An IRB was filed with Drexel University and approved before research was performed.

This study employed a small sample population and has three phases of data collection. This study used an online survey in which teacher education students volunteered their participation. The only identifier in the online survey is a sequential tracking number assigned to the respondent-data. This study also used semi-structured interviews with teacher education students, whereby closed doors were used during the interview process for the telephone interviews. This study collected artifacts in the form of eportfolios which was sent by the participant electronically. The participants were given an electronic informed consent form and asked to send information for any phase that they will be participating only if consenting (see Appendix D), which assures confidentiality. The researcher interviewed participants and stored the tape recordings, and notes, in a locked file cabinet at Drexel University; no other person other than the researcher will have access to the locked file cabinet. After the interview data has been analyzed, the tape recordings and the notes will be destroyed. The electronic data was also deleted and destroyed after it had been analyzed. Because the electronic data may or may not have connecting names of the

participants, the names were changed for safeguard and to protect the subject's confidentiality while handling the data and reporting the findings.

Summary

This study used both qualitative and quantitative methodology. The researcher examined quantitative data via questionnaire surveys and the qualitative data in the interviews and artifacts to answer research questions. The research presented and discussed the data collection methods and analysis, the research study design, the instruments used, and the population involved in the study.

This study is significant because visual thinking is an important factor in the foundational shift now occurring in learning in media-rich environments (Shrock, 2010; Smolin and Lawless, 2003; Johnassen, 2000; Rakes, 2000). Although a text-centric world has guided education, the importance for integrating visuals in the educational arena is surfacing as students are now required to think visually hence, learn visually (Yancy, 2007; Burnett, 2006; Davis, M. & Waggett, D., 2006; Greenberg, 2004; Costantino & De Lorenzo, 2002; Barrett, 2002). The results of this study provide empirical evidence for the need for use of visual imagery for reflective practice in eportfolios at the university in which the study takes place. These findings may also have implications for curriculum development in support of reflective reporting and new teacher education performance measures. Practitioners, researchers, and policy makers in the broader education community are audiences who could also find this study outcome to be of interest.

Chapter 4: Findings, Results, and Interpretations

Introduction

The findings, results, and interpretations in this chapter showcase and synthesize all research presented and discussed what the study revealed. Thick, rich descriptive data provides an overview of the feedback from the research conducted. The type of research methods as discussed in Chapter 3 supports the development of the findings; and the evidentiary base and academic argument of the results are presented in the results section of this chapter. Findings in this study are presented in a manner that addresses the research questions. Salient data is accounted for in the findings as it relates to the conceptual/theoretical framework. This chapter will close with a discussion of interpretations of what the results mean. Chapter 5 concludes the research discussion and specifically discusses directions for future research and recommendations.

There are three research streams in this study: (1) visual thinking and learning as elements of rich learning environments (2) eportfolios as part of pedagogical documentation and reflective practice in Teacher Education course work (3) 21st-century literacy and the use of visual imagery as a language to chronicle learning experiences. Published studies and research regarding the use of visual imagery in preservice teachers' eportfolios is the focus of the research, and these research streams are also presented in the literature review. Each research stream is important as it relates to the research questions presented in this study.

Findings

The purpose of this study was to use mixed methods to understand how preservice teachers document and communicate their learning in working eportfolios

and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. The findings and results from the collected data will be shared with the institution, to support teacher education programs and the growth of innovative practices in eportfolio development. The research explored teachers' perceptions in communicating with visual imagery via eportfolios at a large state university in the southeast. The data measured outcomes and the impact of visual thinking as it relates to learning, technology use, and reflective reporting in preservice teachers' classrooms.

A guiding question to this study was: RQ1-What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? This qualitative question was used to collect textual data to determine the perceptions and attitudes of the participants that influence the use of visual imagery for reflective practice in their eportfolios. Telephone interviews were part of this methodology. A subquestion was: RQ1a- What are the differences in teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? A second qualitative subquestion answered by eportfolio artifacts was: Q1b. How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program? The second guiding question was: RQ2- How do preservice teachers describe how visual imagery supports or constrains reflective practice? A subquestion was: RQ2a- What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their electronic portfolios to support reflective practice? This quantitative question and the perceptions and attitudes of the participants will serve to identify numeric data from online survey questionnaires to determine in what ways does the use of visual imagery

support or constrain reflective practice? The researcher used online survey questionnaires, open-ended interviews, and artifacts in the form of eportfolios to answer these research questions and sub-questions; the questions influenced the development of the findings. In this research, the survey and the interviews provided the participants with two opportunities to communicate what is occurring in their reflective practice regarding eportfolios and the use of visual imagery and visual tools. This descriptive research method permitted the researcher to obtain first hand data from the respondents; the emphasis was on describing rather than on judging or interpreting the current situation. The H_0 (the null hypothesis) for this study states that there is a significant difference between the selected survey Questions 30-33 and the responses to Questions 43 – 46; or there is a significant difference between Content Knowledge and Technological Pedagogical Content Knowledge.

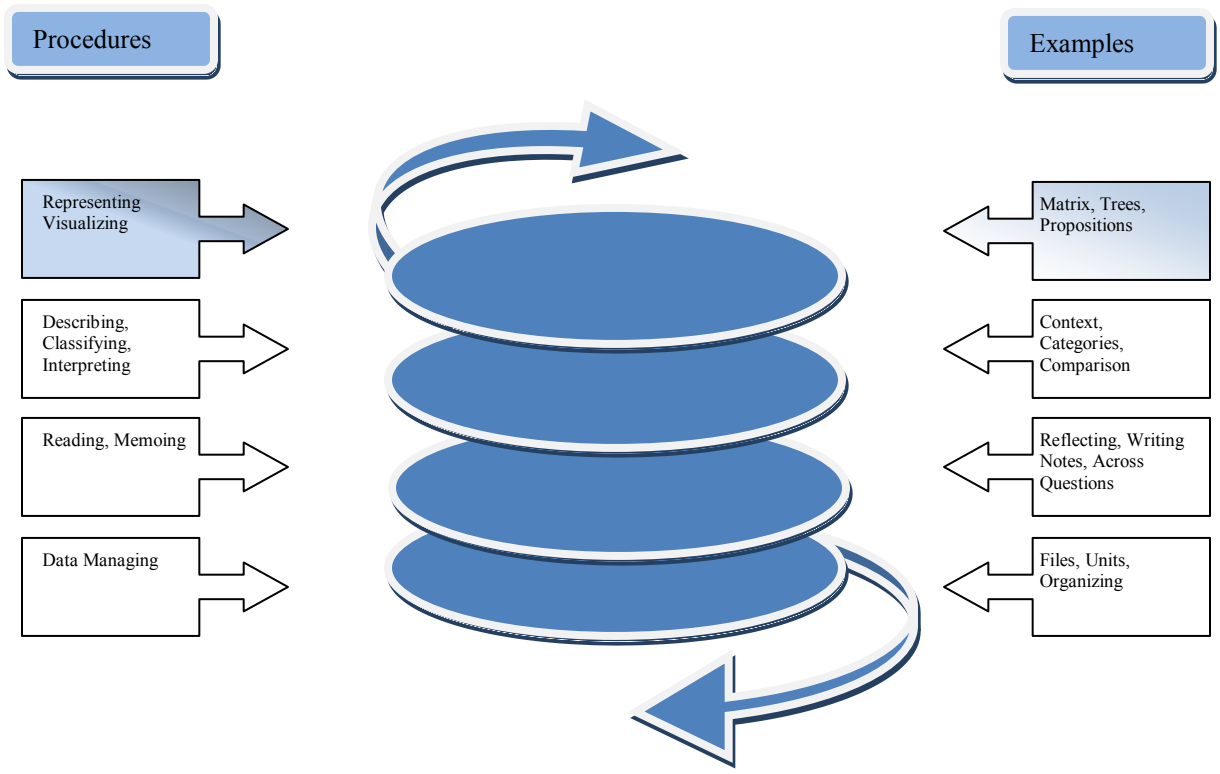
Johnson and Onwuegbuzie (2004) describe mixed methods research as the third research paradigm and asserted that the research world is becoming increasingly interdisciplinary and complex. Furthermore, they suggest that researchers need to complement one method with another to provide superior research; and that many research questions and combinations of questions are best and most fully answered through mixed research solutions. The results were triangulated to enhance the research and to minimize any researcher bias.

There is no one-size-fits-all approach to data analysis in qualitative research. Commonalities across methodological approaches do exist and can be represented by an illustrative schemata (Figure 15) developed by Creswell (2007). According to Creswell, analysis starts at the bottom of the figure (i.e., during data collection) and proceeds upward through various stages until a written account is developed that presents the findings. The spiral image highlights a non-linear perspective and offers

both procedures and examples throughout each stage of the process, from initial data management to representation of findings. Methodological rigor during data collection can help make analysis easier and findings more credible. Creswell's data analysis spiral highlights an iterative and systematic approach to data analysis that can help to ensure credible findings.

(Figure 15)

Data Analysis Spiral originally developed by Creswell (2007).



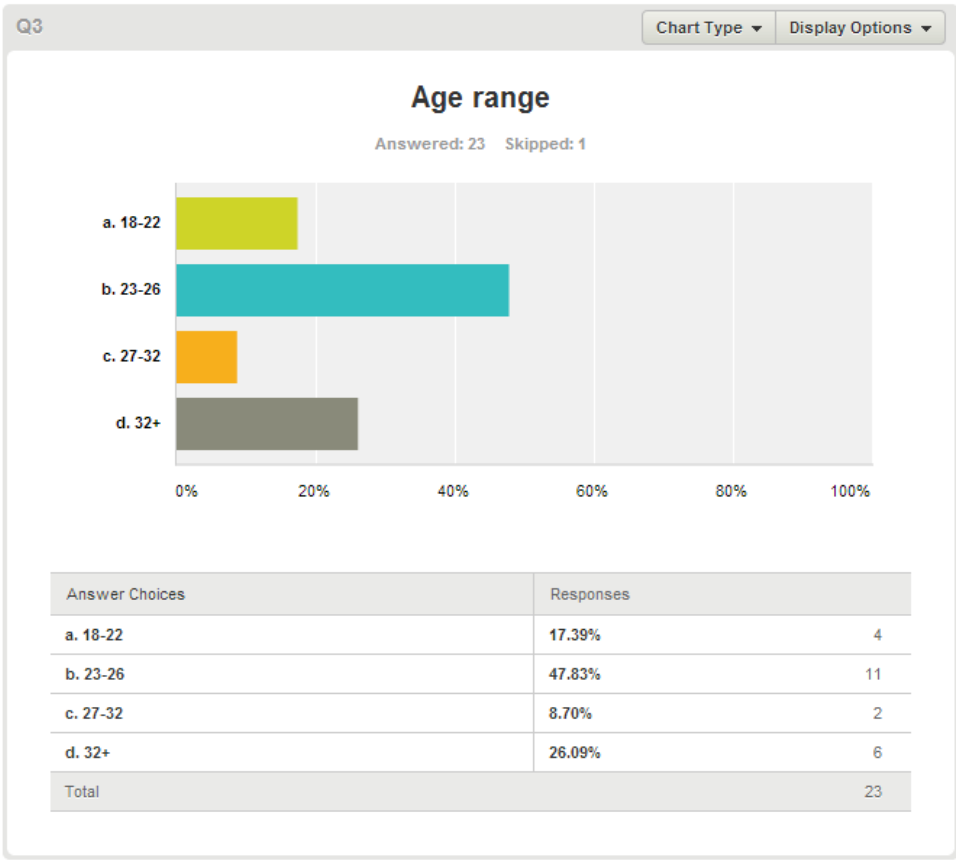
Survey Data Analysis

There were three phases in this study. The first phase started with survey questionnaires; 22 preservice teachers took part in this initial phase. The small sample and demographics for this study population included teacher candidates from The Early Childhood Education Bachelor of Science in Education program at a large

state university in the southeast. The study also took place at this university. Regarding the response rate for this survey, 193 instruments were distributed and 24 respondents took the survey which yielded a survey return of 12.43%. The final response rate was 11.39 %, as a result of 2 respondents not completing the survey. A limitation of this study is that the response rate could have been higher; however the targeted group graduated or was starting a summer break when the surveys were distributed. As a result, some of the students may not have received the surveys if they did not open their university emails after their departure. It was however, close to half of the anticipated total survey sample of fifty preservice teacher participants.

Table 4

Survey Demographics (Age range)

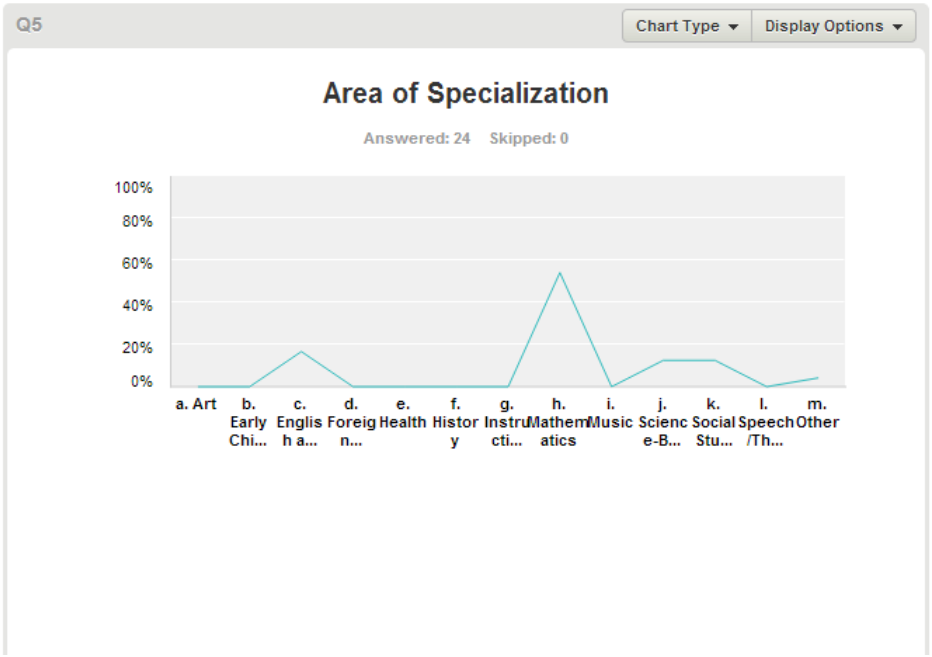


Answer Choices	Responses	
a. 18-22	17.39%	4
b. 23-26	47.83%	11
c. 27-32	8.70%	2
d. 32+	26.09%	6
Total		23

The demographics in age ranged from 18-22 to 32+ and over 47% were in the age range of 23-26 (Table 4). In regards to the areas of specialization in the Teacher Education respondents, 5 areas of teaching specialization took part in the survey. The majority of the participants were female at 86.96%; 13.04% were men and one participant did not reveal their gender. Most preservice teachers' areas of concentration were in Mathematics (Table 5). Over 50% of the participants fell into the category of Math at 54%; English and Language Arts accounted for 16.67%; Science-Basic and Social Studies were equally split at 12.50%; and 4.17% were other. All participants were seniors, or recent graduates.

Table 5

Survey Demographics (Areas of Specialization)



The findings of the qualitative and quantitative data are discussed below. Survey Monkey was the SPSS or Statistical Package for Social Sciences software (used

by researchers to perform statistical analysis) for the online survey questionnaires. The quantitative results were categorized using means and standard deviation for analyzing the Likert-type scale on the questionnaire. Participants rated their level of agreement to disagreement for each question along a 6-point Likert scale with the range of designations being between, *1 = Strongly Disagree, Disagree, Neither Agree or Disagree, Agree Strongly* and *6* = Agree. (Table 6) highlights the quantitative results from twenty two (N=22) preservice teacher participants. The preservice teachers that took this survey were notified by an email forwarded from the state university administration with an access link to invite the preservice teachers to volunteer for the survey. The survey results from the participants were then collected and analyzed. All results were kept on the SPSS server and are password protected; pseudonyms were used so that the participants are not identifiable. Dependent variables in this study are the use of visual imagery and visual tools in the reflective process when developing an eportfolio. Visual imagery/visual tools use was measured as 22 preservice teachers responded to each of 46 survey questions.

Table 6

Means and Standard Deviation Table of Likert Scale Questions for visual imagery/visual tools (N=22)

		M	SD
Q 1.	I know how to solve my own visual imagery/visual tools problems.	4.4	4.615
Q 2.	I can learn visual imagery/visual tools easily.	4.2	3.898
Q 3.	I keep up with important visual imagery/visual tools.	4.4	4.722
Q 4.	I frequently play around the visual imagery/visual tools.	4.4	4.335
Q 5.	I know about a lot of different visual imagery/visual tools.	4.4	6.188

		M	SD
Q 6.	I have the technical skills I need to use visual imagery/visual tools.	4.4	4.827
Q 16.	I have sufficient knowledge about visual imagery/visual tools.	4.4	4.979
Q 18.	I have various ways and strategies of developing my understanding of visual imagery/visual tools.	4.2	6.099
Q 19.	I know how to assess visual imagery/visual tools in a classroom.	4.4	6.024
Q 20.	I can adapt personal use of visual imagery/visual tools based-upon what students currently understand or do not understand.	4.4	5.594
Q 22.	I can assess visual imagery/visual tools in multiple ways.	4.4	5.319
Q 24.	I am familiar with common student understandings and misconceptions regarding visual imagery/visual tools.	4.4	3.435
Q 25.	I know how to organize and maintain visual imagery/visual tools.	4.4	5.319
Q 30.	I know about visual imagery/visual tools that I can use for understanding and doing	4.2	6.648
Q 34.	I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson.	4.2	7.758
Q 35.	I can choose visual imagery/visual tools to enhance students' learning for a lesson.	4.2	7.259
Q 36.	My teacher education program has caused me to think more deeply about how visual imagery/visual tools could influence the teaching approaches I use in my classroom.	4.2	3.492
Q 37.	I am thinking critically about how to visual imagery/visual tools in my classroom.	4.4	4.615
Q 38.	I can adapt the use of visual imagery/visual tools that I am learning about to different teaching activities.	4.4	7.092
Q 39.	I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.	4.4	7.162
Q 40.	I can use strategies that combine content, visual imagery/visual tools and teaching approaches that I learned about in my coursework in my classroom.	4.4	8.173
Q 41.	I can provide leadership in helping others to coordinate the use of content, visual imagery/visual tools and teaching approaches at my school and/or district.	4.4	4.560
Q 42.	I can choose visual imagery/visual tools that enhance the content for a lesson.	4.2	7.758

The questions presented above (Table 7) that specifically related to visual image use and visual tools use were Questions 1-6, 16-25, 30, 34-42. The most important

questions that refer to visual image use and visual tools use are Questions 1, 3-6, 16, 19-25, 37-41, *M*= 4.4; Questions 2, 18, 30-36, 42, *M* = 4.2 score.

TK (Technology Knowledge) in Questions 1-6, was also asked as it relates to visual image use and visual tools use (Table 7).

Table 7

Means and Standard Deviation Table of Likert Scale Questions for TK (Technology Knowledge) (N=22)

		M	SD
Q 1.	I know how to solve my own visual imagery/visual tools problems.	4.4	4.615
Q 2.	I can learn visual imagery/visual tools easily.	4.2	3.898
Q 3.	I keep up with important visual imagery/visual tools.	4.4	4.722
Q 4.	I frequently play around the visual imagery/visual tools.	4.4	4.335
Q 5.	I know about a lot of different visual imagery/visual tools.	4.4	6.188
Q 6.	I have the technical skills I need to use visual imagery/visual tools.	4.4	4.827

The most important questions that refer to TK (Technology Knowledge) are Questions 1, 3-6, *M* = 4.4. Question 2, *M* = 4.2.

Additional questions included in the survey were related to areas of specialization in the areas of math, social studies, science, and literacy. This adapted survey instrument: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April) referenced preservice teachers and it included teaching areas of specialization of math, social studies, science, and literacy.

The following Table 8 illustrates questions 7-25 related to CK (Content Knowledge) and was included to identify knowledge base, and strategies used to develop that knowledge.

Table 8

Means and Standard Deviation Table of Likert Scale Questions for CK (Content Knowledge) (N=22)

		M	SD
Q 7.	I have sufficient knowledge about mathematics.	4.2	4.658
Q 8.	I can use a mathematical way of thinking	4.2	4.764
Q 9.	I have various ways and strategies of developing my understanding of mathematics	4.2	5.674
Q 10.	I have sufficient knowledge about social studies	4.2	4.207
Q 11.	I can use a historical way of thinking	4.2	5.167
Q 12.	I have various ways and strategies of developing my understanding of social studies	4.2	6.140
Q 13.	I have sufficient knowledge about science	4.2	3.420
Q 14.	I can use a scientific way of thinking	4.2	5.449
Q 15.	I have various ways and strategies of developing my understanding of science	4.2	5.674
Q 16.	I have sufficient knowledge about visual imagery/visual tools.	4.4	4.979
Q 17.	I can use a visual way of thinking.	4.4	6.024
Q 18.	I have various ways and strategies of developing my understanding of visual imagery/visual tools.	4.2	6.099
Q 19.	I know how to assess visual imagery/visual tools in a classroom.	4.4	6.024
Q 20.	I can adapt personal use of visual imagery/visual tools based-upon what students currently understand or do not understand.	4.4	5.594
Q 22.	I can assess visual imagery/visual tools in multiple ways.	4.4	5.319
Q 24.	I am familiar with common student understandings and misconceptions regarding visual imagery/visual tools.	4.4	3.435
Q 25.	I know how to organize and maintain visual imagery/visual tools.	4.4	5.319

The most important questions that refer to CK (Content Knowledge) are Questions 16, 17, 19-25, *M*= 4.4 score; remaining questions have a *M* = 4.2 score.

The following questions 26-29 (Table 9) related to PCK (Pedagogical Content Knowledge) indicated teaching approaches in the areas of specialization.

Table 9

Means and Standard Deviation Table of Likert Scale Questions for PCK (Pedagogical Content Knowledge) (N=22)

		M	SD
Q 26.	I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in mathematics	4.0	6.928
Q 27.	I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in literacy	4.4	5.899
Q 28.	I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in science	4.2	7.259
Q 29.	I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in social studies	4.2	5.585

The most important questions that refer to PCK or pedagogical content knowledge is illustrated in Question 27, *M*= 4.4.

Table 10 below illustrates TCK (Technological Content Knowledge) in Questions 34-33 related to technology use as it relates visual image use and visual tools use in specialized areas.

Table 10

Means and Standard Deviation Table of Likert Scale Questions for TCK (Technological Content Knowledge) (N=22)

		M	SD
Q 30.	I know about visual imagery/visual tools that I can use for understanding and doing	4.2	6.648

Q 31.	I know about visual imagery/visual tools that I can use for understanding and doing literacy	4.4	5.683
Q 32.	I know about visual imagery/visual tools that I can use for understanding and doing science	4.2	6.797
Q 33.	I know about visual imagery/visual tools that I can use for understanding and doing social studies	4.2	5.118

The most important questions that refer to TCK (Technological Content Knowledge is Question 31, *M* 4.4.

TPK (Technological Pedagogical Knowledge) in the following Questions 34-42 (Table 11) referenced teaching lessons in the classroom combined with visual image use and visual tools use.

Table 11

Means and Standard Deviation Table of Likert Scale Questions
For TPK (Technological Pedagogical Knowledge) (N=22)

		M	SD
Q 34.	I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson.	4.2	7.758
Q 35.	I can choose visual imagery/visual tools to enhance students' learning for a lesson.	4.2	7.259
Q 36.	My teacher education program has caused me to think more deeply about how visual imagery/visual tools could influence the teaching approaches I use in my classroom.	4.2	3.492
Q 37.	I am thinking critically about how to visual imagery/visual tools s in my classroom.	4.4	4.615
Q 38.	I can adapt the use of visual imagery/visual tools that I am learning about to different teaching activities.	4.4	7.092
Q 39.	I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.	4.4	7.162
Q 40.	I can use strategies that combine content, visual imagery/visual tools and teaching approaches that I learned about in my coursework in my classroom.	4.4	8.173
Q 41.	I can provide leadership in helping others to coordinate the use of content, visual imagery/visual tools and teaching approaches at my school and/or district.	4.4	4.560
Q 42.	I can choose visual imagery/visual tools that enhance the content for a lesson.	4.2	7.758

The most important questions that refer to TPK (Technological Pedagogical Knowledge) are Questions 37-41, *M*= 4.4. Question 34-36 and 42, *M* = 4.2.

TPACK (Technology Pedagogy and Content Knowledge) in Questions 43-46 referenced teaching lessons in areas of specialization and how or if those lessons could be combined with visual image use and visual tools use (Table 12).

Table 12

Means and Standard Deviation Table of Likert Scale Questions For TPACK (Technology Pedagogy and Content Knowledge) (N=22)

		M	SD
Q 43.	I can teach lessons that appropriately combine mathematics, visual imagery/visual tools and teaching approaches	3.8	6.870
Q 44.	I can teach lessons that appropriately combine literacy, visual imagery/visual tools and teaching approaches	4.4	6.693
Q 45.	I can teach lessons that appropriately combine science, visual imagery/visual tools and teaching approaches	4.2	6.648
Q 46.	I can teach lessons that appropriately combine social studies, visual imagery/visual tools and teaching approaches	4.2	5.167

The most important questions that refer to TPACK (Technology Pedagogy and Content Knowledge) is Question 44. This response has a 4.4 means average. Questions 45-46, *M* =4.2 and Question 43 is *M* = 3.8.

As part of this descriptive study, the following (Table 13) shows the correlations between the mean scores for (Table 10) Content Knowledge (CK) and (Table 12) Technology Pedagogy and Content Knowledge (TPCK). The result indicated a positive correlation between Content Knowledge and Technology Pedagogy and Content Knowledge. These correlations suggest that the content could be driving the utilization of the visual imagery imagery/tools by the preservice teachers. The calculations of the data are also presented (Table 14) in a scatterplot. Data to support the positive correlations is presented in this study and later described in the final chapter.

Table 13

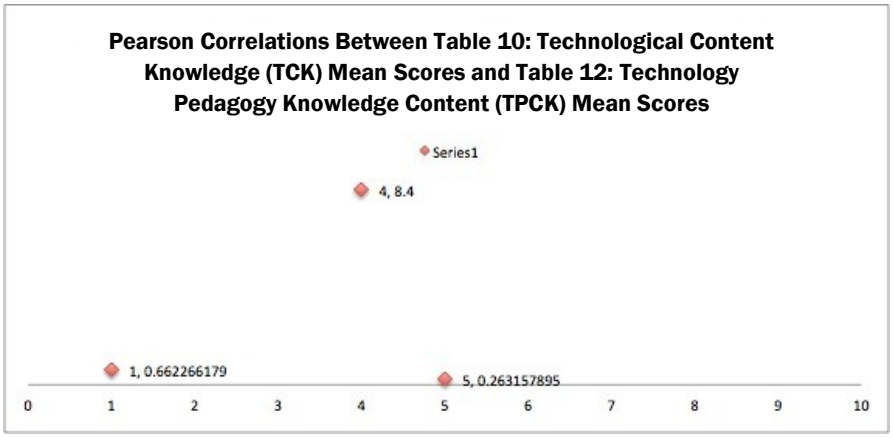
Correlations Among and Descriptive Statistics for: Content Knowledge (CK) and Technology Pedagogical/Content Knowledge (TPCK)

Survey Questions 30-33 Content Knowledge	*M*	Survey Questions 43-46 Technology Pedagogy Content Knowledge	*M*
I know about visual imagery/visual tools that I can use for understanding and doing	4.2	I can teach lessons that appropriately combine mathematics, visual imagery/visual tools and teaching approaches	3.8
I know about visual imagery/visual tools that I can use for understanding and doing literacy	4.4	I can teach lessons that appropriately combine literacy, visual imagery/ visual tools and teaching approaches	4.4
I know about visual imagery/visual tools that I can use for understanding and doing science	4.2	I can teach lessons that appropriately combine science, visual imagery/ visual tools and teaching approaches	4.2
I know about visual imagery/visual tools that I can use for understanding and doing social studies	4.2	I can teach lessons that appropriately combine social studies, visual imagery/ visual tools and teaching approaches	4.2

The correlation coefficient of r = 0.66226179 *indicates a positive correlation between CK and TPCK.*

Table 14

Pearson Correlations Between Table 10: Technological Content Knowledge *(Y)* Mean Scores and Table 12: Technology Pedagogy Knowledge Content *(X)* Mean Scores



A Pearson's Correlation Coefficient measure of association was used in this study to measure the strength of the linear relationship between numerical variables. The scatterplot shows the correlation coefficient of $r = 0.66226179$. Therefore, there is a positive significant correlation between content knowledge measured in Table 10 and Table 12. In order to determine if there is an association between the responses for Questions 43 – 46 and Questions 30-33, the researcher used Pearson's Correlation Coefficient analysis which uses values between -1.00 and +1.00 (Peck, et al, 2012). According to Peck, et al. (2012), a value near the upper limit, +1, indicates a strong positive relationship, whereas an *r i*s close to the limit, -1, suggests a strong negative relationship (p. 228). Furthermore, Peck, et al. determined that even a weak correlation can indicate a meaningful relationship. The analysis indicated (Table 13, 14) showed that the H_0 (the null hypothesis) stated that there was a significant difference between the selected Questions 30-33 and the responses to Questions 43 - 46. Thus, these results reject the H_A (the alternative hypothesis) for this study stating that there was no significant difference between Content Knowledge and Technological Pedagogical Content Knowledge.

Means scores were used as part of this descriptive study to obtain the correlations. Means and standard deviation scores were presented in the existing tables representing questions presented in the surveys to the participants. When the

values in a dataset are closely bunched together the standard deviation is small. When the values are spread apart the standard deviation will be relatively large. The standard deviation is usually presented in conjunction with the mean and is measured in the same units. A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation scores indicate that the data is spread out over a large range of values. http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Standard_deviation.html. The values for this Likert scale were 1-6 and not higher than a 6, thus the likelihood of the standard deviation will be larger in this study. This study reflects a standard deviation range of 3.43 through 8.17.

Research Question 2, asks: How visual imagery supports or constrains reflective practice. The respondents' questions that specifically related to how visual imagery supports practice were survey questions 18-25, 30, 35-42. (Table 15) shows descriptive statistics: How Preservice Teachers Describe How Visual Imagery Supports Practice.

Table 15

Descriptive Statistics: How Preservice Teachers Describe How Visual Imagery Supports Practice (N=22)

		M	SD
Q 18.	I have various ways and strategies of developing my understanding of visual imagery/visual tools.	4.2	6.099
Q 19.	I know how to assess visual imagery/visual tools in a classroom.	4.4	6.024
Q 20.	I can adapt personal use of visual imagery/visual tools based-upon what students currently understand or do not understand.	4.4	5.594
Q 21.	I can adapt my visual thinking to different learners.	4.4	6.580
Q 22.	I can assess visual imagery/visual tools in multiple ways.	4.4	5.319

		M	SD
Q 23.	I can use a wide range of visual thinking approaches in a classroom setting.	4.4	5.594
Q 24.	I am familiar with common student understandings and misconceptions regarding visual imagery/visual tools.	4.4	3.435
Q 25.	I know how to organize and maintain visual imagery/visual tools.	4.4	5.319
Q 30.	I know about visual imagery/visual tools that I can use for understanding and doing	4.2	6.648
Q 34.	I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson.	4.2	7.758
Q 35.	I can choose visual imagery/visual tools to enhance students' learning for a lesson.	4.2	7.259
Q 36.	My teacher education program has caused me to think more deeply about how visual imagery/visual tools could influence the teaching approaches I use in my classroom.	4.2	3.492
Q 38.	I can adapt the use of visual imagery/visual tools that I am learning about to different teaching activities.	4.4	7.092
Q 39.	I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.	4.4	7.162
Q 40.	I can use strategies that combine content, visual imagery/visual tools and teaching approaches that I learned about in my coursework in my classroom.	4.4	8.173
Q 41.	I can provide leadership in helping others to coordinate the use of content, visual imagery/visual tools and teaching approaches at my school and/or district.	4.4	4.560
Q 42.	I can choose visual imagery/visual tools that enhance the content for a lesson.	4.2	7.758

The most important questions that specifically related to how visual imagery supports practice are Questions 19-25, 38-41 *M*= 4.4:

- I know how to assess visual imagery/visual tools in a classroom
- I can adapt personal use of visual imagery/visual tools based-upon what students currently understand or do not understand
- I can adapt my visual thinking to different learners
- I can assess visual imagery/visual tools in multiple ways
- I can assess visual imagery/visual tools in multiple ways

- I am familiar with common student understandings and misconceptions regarding visual imagery/visual tools
- I know how to organize and maintain visual imagery/visual tools
- I can adapt the use of visual imagery/visual tools that I am learning about to different teaching activities
- I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn

Preservice teachers' survey findings showed that the lowest scores for questions regarding how visual imagery supports practice is as follows: Question 18, I have various ways and strategies of developing my understanding of visual imagery/visual tools, *M*=4.2; Question 30, I know about visual imagery/visual tools that I can use for understanding and doing, *M*=4.2; Question 34: I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson, *M*=4.2.; Question 35: I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson, *M*=4.2.; Question36: I can choose visual imagery/visual tools to enhance students' learning for a lesson, *M*=4.2.; Question 42 : My teacher education program has caused me to think more deeply about how visual imagery/visual tools could influence the teaching approaches I use in my classroom, *M*=4.2.

The following (Table 16) shows descriptive statistics: How preservice teachers describe how visual imagery constrains practice. The respondents' questions that specifically related to how visual imagery constrains practice are survey questions 1-6, 16, 17.

Table 16

Descriptive statistics: How preservice teachers describe how visual imagery constrains practice (N=22)

		M	SD
Q 1.	I know how to solve my own visual imagery/visual tools problems.	4.4	4.615
Q 2.	I can learn visual imagery/visual tools easily.	4.2	3.898
Q 3.	I keep up with important visual imagery/visual tools.	4.4	4.722
Q 4.	I frequently play around the visual imagery/visual tools.	4.4	4.335
Q 5.	I know about a lot of different visual imagery/visual tools.	4.4	6.188
Q 6.	I have the technical skills I need to use visual imagery/visual tools.	4.4	4.827
Q 16.	I have sufficient knowledge about visual imagery/visual tools.	4.4	4.979
Q 17.	I can use a visual way of thinking.	4.4	6.024

In regards to answering the research question of how visual imagery constrains reflective practice, the most important questions that specifically related to how visual imagery constrains practice are Questions 1-6, 16, 17, *M*= 4.4. Preservice teachers' survey findings showed that the lowest scores regarding constrain are Question 2: I can learn visual imagery/visual tools easily, *M*=4.2.

The samples in this study consisted of preservice teachers in several areas of specialization with Mathematics having the highest number of respondents in this survey; they represented almost half of the total respondents.

Research Question 2a asks what are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their eportfolios to support reflective practice. The researcher previously addressed faculty perceptions and attitudes, which could potentially affect preservice teachers' decision-making. This dissertation supports the theory that there are two important aspects of attitude: one

of them is a belief aspect that uses cognitive processes to describe an object and its relation to other objects, the other is an affective aspect that leads to liking or disliking an object (Katz, 1960). Previously, as described earlier in this study, humans' attitudes can: (1) influence thinking (2) decision-making and (3) behaviors. Moreover, as a psychological construct, perception is associated with other constructs such as attitude or emotion. Perceptions influence the ways in which humans understand the world around them and how they make decisions (Berelson and Steiner, 1964).

Table 17

Descriptive Statistics for preservice teachers' attitudes and perceptions of the technology challenges of using visual images (N=22)

		M	SD
Q 6.	I have the technical skills I need to use visual imagery/visual tools.	4.4	4.827
Q 22.	I can assess visual imagery/visual tools in multiple ways.	4.4	5.319
Q 30.	I know about visual imagery/visual tools that I can use for understanding and doing	4.2	6.648
Q 34.	I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson.	4.2	7.758
Q 35.	I can choose visual imagery/visual tools to enhance students' learning for a lesson.	4.2	7.259
Q 39.	I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.	4.4	7.162
Q 42.	I can choose visual imagery/visual tools that enhance the content for a lesson.	4.2	7.758

The most important questions (Table 17) that specifically related to preservice teachers' attitudes and perceptions of the technology challenges of using visual images are Questions 6, 22, 39, *M*= 4.4: I have the technical skills I need to use visual imagery/visual tools; I can assess visual imagery/visual tools in multiple ways; I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.

Interview Data Analysis

Ten students that participated in this study and completed the survey questionnaire were also participants in an open-ended telephone interview. Qualitative data collection was post-survey. Data collected for the qualitative analysis included open-ended interviews, which was part of the second phase of the study. E-portfolios were collected as artifacts which lead to the third and final phase of this three-phase study. The interview phase was part of the methodology to help answer the qualitative guiding research question Q1: What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice?; and the sub-question Q1b: What are the differences in teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice? Open-ended interview questions were collected from 3 interviewees that volunteered to participate and answer questions via a telephone interview. They consented by agreeing to a question at the end of the initial survey to continue to support phase two of a three-phase study (see Appendix E.) The post-survey interviewees were selected by random purposeful sampling. This process permitted a range of preservice teachers to be represented from a range of subject disciplines. Areas included math, social studies, science, and other. The participants were contacted by email to schedule a telephone interview and in-depth probing yielded responses to the research questions whereby, the information was transcribed and then analyzed. Regarding analyzing the collected data, Creswell (1994) states that it is an eclectic process and that there is no right way. Furthermore, he outlines that a researcher could segment the information into coding procedures; attach codes to various categories, then further reduce all the data into 'themes or categories'. The various categories form the basis of an emerging story. Such a process will produce a

'higher level' of analysis. The final goal was to combine the data into a collected whole (pp.143-172). Triangulation of the categorized themes and patterns of the responses from the participants emerged from the semi-structured interview questions. The themes are listed in (Table 10). The coding of the interview transcripts revealed 7 themes. The themes that emerged as to *the most important* attitudes and perceptions that influence visual image use include: 1) Student engagement in their classrooms 2) Trial and error 3) Shared knowledge with classmates 4) Personal technology and research 5) Teacher mentors 6) Technology Used 7) Independent Learning. Quote excerpts from the interview transcripts illustrate the overlapping content. Through inductive coding methods, the themes identified to be overlapping are presented with quote excerpts from the interviewees to support the themed data. They are reduced into meaningful segments for interpretation. There are many ways to accomplish coding and analysis.

Researchers often use highlights to distinguish concepts and categories. For example, if interviewees consistently talk about teaching methods, each time an interviewee mentions teaching methods, or something related to a teaching method, you would use the same color highlight. Teaching methods would become a concept, and other things related (types, etc.) would become categories – all highlighted the same color. Use different colored highlights to distinguish each broad concept and category. What you should have at the end of this stage are transcripts with 3-5 different colors in lots of highlighted text. Transfer these into a brief outline, with concepts being main headings and categories being subheadings.

http://researchrundowns.wordpress.com/qual/qualitative-coding-analysis/

Themes and quotes derived from interview data to answer the guiding question of the *most important* attitudes and perceptions of visual image use and visual tools use:

Table 18

The *most important* attitudes and perceptions of visual image use and visual tools use:

Theme/Emergent Findings	Quote	Participant
Student engagement in their classrooms	When they see visuals used, they are so much more ready to participate and they pay more attention	Shawn
Student engagement in their classrooms	When you first enter it in different ways, some kids don't get it that first time, and you do it differently, some will get it that next time, so you have to enter it in different ways. So you have to do visual imagery…all the time.	Shawn
Student engagement in their classrooms	I did use my iPad in my own classes, but I wasn't allowed to at the school that I was at but we could check them out and the kids loved it.	Shawn
Student engagement in their classrooms	They got to manipulate and do it directly on the iPad. They could explore at their own pace.	Shawn
Student engagement in their classrooms	…but when they create it themselves and draw, create, they are more likely to retain it.	Shawn
Student engagement in their classrooms	I think that it is important that any time that you can to use pictures to add to a story or anything you can, whether you are teaching writing or grammar, it connects to and helps the students retain the material better.	Enya
Student engagement in their classrooms	Prezis…It's like Microsoft PowerPoint on steroids, it's really really cool and you can zoom in and zoom out, and things are hidden so…it's very animated and very visually striking so you can grab attention very quickly.	Enya
Student engagement in their classrooms	Kids love, and I mean really love when they get to use different things to learn subjects that may not always see as fun	Cody
Student engagement in their classrooms	Gaming apps are exciting for the kids. They play games and they	Cody

	are learning at the same time... Teaching is fun for us and fun for the kids when you can use games to inspire and teach.	
Student engagement in their classrooms	Graphic organizers are a good strategy because I have seen that it works.	Cody
Student engagement in their classrooms	...if a student is struggling with problem-solving, I resort to a photo or a picture to kind of push the process along. They usually get it if you give them options.	Cody
Student engagement in their classrooms	...they think that it is "play" and I see it as a way to get them to grasp the lesson. They are so much more engaged if I introduce fun visuals like that!	Cody
Student engagement in their classrooms	I would go as far to say that they are more interested in the message if it shows an image.	Wendy
Student engagement in their classrooms	It is fun to find the right visuals to connect with a problem.	Wendy
Student engagement in their classrooms	I have to use both formats in my classroom to help the students that learn that way, and I have to use it in my eportfolio to show that I understand that principle.	Wendy
Student engagement in their classrooms	Sometimes I videotape my students and share the video with supervisor.	Ingrid
Student engagement in their classrooms	Sometimes, I think that images cannot express ourselves enough... so, I think that a verbal description is still important. You have to combine imagery and description.	Ingrid
Student engagement in their classrooms	...they cannot focus for long and they cannot understand the verbal description, so pictures and videos will help them a lot.	Ingrid
Trial and error	Someone did show it to me first. Basically, it was trial and error.	Shawn
Trial and error	It takes a lot of trial and error actually because you are trying to figure out what is the best way that is going to work for them.	Shawn

Trial and error	…misconception is that every child learns the same way and that they are going to use something that is going to work for everybody and it's not. So, you have to figure out what's the best way for everybody to learn.	Shawn
Trial and error	More or less it is about networking to see what is coming up, what's new what is working and not working.	Enya
Trial and error	…you just have to find the time to figure out how to use some of those tools.	Cody
Trial and error	Eventually, as I get out there, I will learn more about visuals, but for now I guess, I keep it simple.	Cody
Trial and error	Trying to figure out what works best is not identified right away…it takes a little time to know how each student may receive information.	Wendy
Shared knowledge	…me and my fellow classmates when we were going through similar classes, we did a lot of Google Docs and sharing and stuff like that.	Shawn
Shared knowledge	also just talking to friends and taking podcast and things like that of things I just wasn't familiar with	Enya
Shared knowledge	I sometimes share tutorials with my friends or people that go to college with me.	Enya
Shared knowledge	My classmates and my friends use and upload pictures and videos in Facebook, and maybe Instagram, but not so much for school…but for personal things that we share.	Wendy
Shared knowledge	If you know how to use it, you may try it and if you see someone else use it, then you will probably try it in your classroom, if it looked at as successful.	Wendy
Shared knowledge	first graders, their attention span is so short and they cannot focus	Ingrid

	for long and they cannot understand the verbal description, so pictures and videos will help them a lot.	
Shared knowledge	I rely on information from peers and online things are useful.	Ingrid
Shared knowledge	Communicate by Facebook or in class.	Ingrid
Personal technology & research	I like to keep up with what everybody is doing, or what is trending or following things on Twitter or just talking to people to see what they are doing or using and how they are going about implementing things like visuals into the classroom.	Enya
Personal technology & research	webinars and they put out magazines, and I try to read them too to see what is going on and the latest in the classroom. That's where I get most of my information because they have a lot of good ideas too; it's a helpful website.	Shawn
Personal technology & research	I do a lot of online research, I get the magazine PAGE	Shawn
Teacher mentors	I watched one of my mentor teachers doing it one time (using visual tools, PowerPoint) and I started playing with it and then I tried to build it.	Shawn
Teacher mentors	She told me I was going too far, and above and beyond with visual imagery and I said our kids need to think outside of the box and they need to be independent learners.	Shawn
Teacher mentors	We are required to observe mentor teachers in the classroom and I try to learn different strategies to help with my future classrooms from what I may learn from them.	Cody
Teacher mentors	Sometimes when the mentors have new things, I try to watch and learn how they use new things.	Wendy

Technology Used	I am pretty knowledgeable. But it goes to the extent of PowerPoint, anything to do with Adobe, anything like that. Smart boards…we can do apps, so I am pretty knowledgeable, but I am sure there are some things that I don't know.	Shawn
Technology Used	It is really important to have a Smart board because it opens the doors to just so many other things. If you have that then you can do anything. You can do PowerPoint, and it can be active, you can do games, and I mean basically anything.	Shawn
Technology Used	I use my iPad, all the time. There's a lot of schools that have them in the classroom now and that's really good because a lot of kids have them all the time, so they might as well have them in schools.	Shawn
Technology Used	I think that it is really important to know how to use Microsoft Word and PowerPoint, I mean like…all the way through.	Shawn
Technology Used	Like to do essays… they can draw a picture, draw a comic book, anything like that.	Shawn
Technology Used	I use videos and of course pictures and cartoons and like…comic strips and things like that, it depends on what the content is…so things like that. Sometimes, I organize information into tables, or pie chart	Enya
Technology Used	Some type of grasp on the internet, web browsers… and to know how to use Google and Google images.	Enya
Technology Used	You Tube videos, pictures, you can create from scratch, you can start with a template.	Enya
Technology Used	…video collaboration, or a video collage or something like that to introduce the content.	Enya
Technology Used	There is a lot of software to use for visual support, but for	Cody

	me…uh, probably all of the Microsoft Office tools work for me.	
Technology Used	Diagrams are functional too. They are visual.	Cody
Technology Used	if you know how to use Microsoft Office, you can do a lot with visuals…you have Power Point…Excel can help with doing graphs, charts, spreadsheets and different kinds of tables…word images…you can put things in color.	Wendy
Technology Used	how to edit pictures and how to edit videos and insert videos in your Power Point	Ingrid
Technology Used	You have to know how to use a camera and have to know how to edit the video clips or use iPhone and upload it.	Ingrid
Independent Learners	Apps…I learned those by myself, there was really no training; I guess over time you just learn by yourself. You have to just figure it out.	Shawn
Independent Learners	I learned most on my own, but I learned about 30% more in college,	Enya
Independent Learners	I use and play with apps on my iPad, but I don't necessarily use them in the classroom yet.	Wendy

The following (Table 19) indicates the interview emerging themes which were grouped and color highlighted according to theme. Color codes and frequencies accommodate this data. Full descriptions, codes and notes of the interviews themes are presented in (Appendix H). Interview Coding Methods and frequency counts are also listed (Appendix I).

Table 19

Grouped interview questions to coded themes and frequencies

Interview Emerging Themes	Color Codes	Frequency of Coded Interviews

Student engagement in their classrooms	SE	41
Trial and error	TE	18
Shared knowledge with classmates	SK	11
Personal technology and research	PTR	5
Teacher mentors	TM	4
Technology used	TU	82
Independent Learning	IL	14

The next table presents interview data of *the differences* in preservice teachers' attitudes and perceptions of visual image use and visual tools use (Table 20). The coding of the interview transcripts revealed *the differences* in teachers' attitudes and perceptions that influence visual image use according to the lowest ranked (Table 19) themed responses. Excerpts from the interviewees' transcripts also highlight the differences (Table 19). Three differences were acquired from the lowest ranks of important attitudes and perceptions of preservice teachers. The three differences according to the lowest ranked rank attitudes and perceptions of visual image use and visual tools use are: 1) Shared knowledge with classmates 2) Personal technology and research 3) Teacher mentors

Table 20

The *differences in* attitudes and perceptions of visual image use and visual tools use

Interview Emerging Themes	Color Codes	Frequency of Coded Interviews
Shared knowledge with classmates	SK	11
Personal technology and research	PTR	5

Teacher mentors	TM	4

Artifacts Data Analysis

Artifacts that were collected in the third phase supported the qualitative data and findings. Five eportfolios were collected from participating preservice teachers and reviewed. The researcher then wrote about the journey and experiences of the teachers regarding their use of visual imagery to help answer the qualitative research sub-question Q1b: How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program? The visual data provided rich stories from the perspective of participant preservice teachers. Because the content was a physical record of the participants' eportfolios created for reflective purposes, the researcher was able to see a first-hand account of visual evidence in the data collected. Data analysis involves organizing what has been seen, heard, and read so that sense can be made of what is learned (Glesne & Peshkin, 1992). As a part of analysis, the researcher wanted to identify what types of visual image use was indicated in the eportfolios. An examination of (3) three eportfolios revealed the mixture of visual support used as part of their reflection in the eportfolios. The data collected provided rich visual evidence and detail of teachers' use of visual imagery in reflective studies, and also provided stories from the perspective of participant student teachers. Most importantly, the artifacts showed how teachers demonstrated their competency in using visual images.

The researcher searched for relationships in the eportfolios and a rubric was used to support this process. The Department of Education and North Carolina Wesleyan College (2013) utilized a reflection rubric to assess level of reflection on the Admission Essay as well as on their Student Teaching Portfolios. This rubric below

was used as a guide for each eportfolio analysis to better understand how preservice teachers' communicate with visual images for reflective practice. Researchers are advised to "display data" (Creswell, 1998; Merriam, 1988, 1998; Miles & Huberman, 1994; Wolcott, 1994) as a support to data analysis.

Three eportfolios were reviewed. The Reflection Rubric list below includes three categories that are specified and mandated by the North Carolina Department of Public Instruction and North Carolina State Board of Education, as a way to assess reflective practice in their state's preservice teachers' eportfolios. Categories were reduced to three areas to access reflection of knowledge. Points were applied from a 1) low 3) average and 5) high to each eportfolio regarding evidence of visual image use:

> *(5) Macro-Reflective:* Distinguished by a search for relationships, connections, justifications, consequences, evaluation, and critical processes. The reflection is driven by a vision in the form of personal, pedagogical, or social conceptual and decision-making framework. Assertions are specific, supported with evidence from experience and conceptually connected. The writer's perspective is multidimensional explaining how the event can be connected to a larger conceptual framework.
>
> *(3) Micro-Reflective:* Includes a self-awareness of the writers' own meaning-making process but limited to the immediate situation or event, lacking connections to a broader educational theory or framework. Assertions are specific and supported with evidence from experience. The writer's perspective may be multidimensional, representing more than one learner or groups of learners.
>
> *(1) Pseudo-Reflective:* A list, log, story, description or a narrative of an educational event. A reaction or retelling without thoughtful connection to other events. Assertions are general and not supported with evidence from experience, theory or research. The writer's perspectives are undifferentiated and general regarding the needs of learners (p.9).

Table 21

Artifacts Reflection Rubric of Visual Use
(NORTH CAROLINA WESLEYAN COLLEGE
Department of Education Reflection Rubric)

Artifacts Rubric Representing Student Use

Respondent- Enya

Reflection Rubric			
Score	***Pseudo-Reflective* (1)**	**Micro-Reflective (3)**	**Macro-Reflective (5)**
5	A reaction or retelling without thoughtful connection to other events.	Self-awareness of the writers' own meaning-making process but limited to the immediate situation or event.	Search for relationships, connections, justifications, consequences, evaluation, and critical processes
5	Assertions are general and not supported with evidence from experience, theory or research	Assertions are specific and supported with evidence from experience	Assertions are specific, supported with evidence from experience and conceptually connected.
5	The perspective is undifferentiated and general regarding the needs of learners	The perspective is multidimensional, representing more than one learner or groups of learners	The perspective is multidimensional in explaining how the event can e connected to a larger conceptual framework

To define summary score values: 1-5 is Pseudo-reflective, 6-10 is Micro-reflective, and 10-15 Macro- reflective represents a scale of use of visual imagery/visual tools.

The researcher notes that:

Enya (Table 21) had a high score of 15 for artifact representation and is therefore, highly Macro reflective in all three categories because: A range of visual aids were used to support learning: 1) Class Videos 2) You Tube videos 3) Student drawings 4) Photos of students learning 5) Illustrations 6) Maps 7) Posters 8) Book covers 9) Frames to support text. This information is useful in understanding how the preservice teachers incorporate visual imagery content for reflective practice in their eportfolios. Regarding other data in the study, this information provides descriptive qualitative image data for this study. There appears to be a distribution of visual and written content for the lessons. A standard template appears to be the main

foundation for the Power Point development; this is the case for all of the eportfolios reviewed. The Power Point examples supported a numerous visual images. The researcher notes (as in the other eportfolio examples) that very traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc. The respondent appears to be comfortable using multiple forms of visual aids to support classroom learning. Some assignments included drawing to problem-solve; and Enya states, "*I felt that this type of assessment served to better determine my students' comprehension versus a multiple choice assessment.*" This reinforces the concept that learning styles differ and that visual aids can support the learning process for this preservice teachers' classroom.

Table 22

Artifacts Rubric Representing Student Use

Respondent-Hanna

Reflection Rubric			
Score	***Pseudo-Reflective* (1)**	**Micro-Reflective (3)**	**Macro-Reflective (5)**
3	A reaction or retelling without thoughtful connection to other events.	Self-awareness of the writers' own meaning-making process but limited to the immediate situation or event.	Search for relationships, connections, justifications, consequences, evaluation, and critical processes
5	Assertions are general and not supported with evidence from experience, theory or research	Assertions are specific and supported with evidence from experience	Assertions are specific, supported with evidence from experience and conceptually connected.
3	The perspective is undifferentiated and general regarding the	The perspective is multidimensional, representing more than	The perspective is multidimensional in explaining how the

Reflection Rubric			
Score	***Pseudo-Reflective* (1)**	**Micro-Reflective (3)**	**Macro-Reflective (5)**
	needs of learners	one learner or groups of learners	event can be connected to a larger conceptual framework

The researcher notes that:

Hanna (Table 22) had a lower score of 11 for artifact representation. The researcher notes that a minimal amount of visual imagery was used. She exhibited a highly Macro reflective in all three categories as Enya, but at a lesser extent because: Four forms of visual imagery was used 1) Graphs 2) Mathematical diagrams 3) Charts 4) and a You Tube video. Traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc. The respondent clearly states multiple times in the classroom assessment that it is important to use visual aids to support learning and felt that if more visual aids were provided it would "enhance the learning process." Furthermore, the respondent acknowledges that students may be visual learners by stating, "Many students learn in a visual manner as well as through repetition." Minimal drawing will also occur with the lesson when the students are encouraged to "draw figures" with a ruler to support mathematical figures. You Tube was used to create videos of the preservice teachers' lesson "to enable the Spanish-speaking students to hear their questions read aloud to them." This type of technology was discussed in the preservice teachers' assessment, yet a link was not provided. This does however, serve as a form of a visual aid. A You Tube video was not identified as a tool in this format, in any other eportfolios reviewed. As

part of a lesson, another respondent Enya used a visual in the form of a You Tube channel to support learning.

Table 23

Artifacts Rubric Representing Student Use

Respondent- Shawn

Reflection Rubric			
Score	***Pseudo-Reflective* (1)**	**Micro-Reflective (3)**	**Macro-Reflective (5)**
5	A reaction or retelling without thoughtful connection to other events.	Self-awareness of the writers' own meaning-making process but limited to the immediate situation or event.	Search for relationships, connections, justifications, consequences, evaluation, and critical processes
5	Assertions are general and not supported with evidence from experience, theory or research	Assertions are specific and supported with evidence from experience	Assertions are specific, supported with evidence from experience and conceptually connected.
5	The perspective is undifferentiated and general regarding the needs of learners	The perspective is multidimensional, representing more than one learner or groups of learners	The perspective is multidimensional in explaining how the event can e connected to a larger conceptual framework

The researcher notes that:

Shawn (Table 23) had a high score of 15 for artifact representation and also exhibited a highly Macro reflective in all three categories as did Enya because: Power Point appears to be the main tool used to project visual images. Out of 27 PPT slides 11 had images inserted; 4 of the images were photos & Illustrations and 7 were diagrams, charts. The preservice teacher indicated that the classroom did not have an accessible Smart Board and therefore, an overhead had to be used. A standard

template appears to be the main foundation for the Power Point development. The Power Point examples supported numerous visual images; in some cases close to half. The main uses of visual imagery were photos, illustrations, diagrams, graphs and charts. The researcher notes that very traditional uses of visual imagery were used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc.; this was the case for most of the artifacts reviewed. This preservice teacher noted in her interview that "I think that it is important to use pictures and things like that to back up stories and things like that. I am talking about my content area. I think that it is important that any time that you can to use pictures to add to a story or anything you can, whether you are teaching writing or grammar, it connects to and helps the students retain the material better." The preservice teacher appears comfortable using drawings or sketching combined with text in activities in support of her belief.

The researcher utilized the rubrics to search for relationships; and applied scores based on the existing system, yet instead of from a written perspective, visual use was assessed as part of the reflective process. Although the eportfolios provided a detailed rendering of information about what the respondent knows regarding visuals, more specifically, the researcher was interested in knowing how this knowledge was presented. The initial scores identified each participant's level of use of visuals for reflective purposes. Scores can range from a 3 to a 15 for total points. A 3 would suggest a low level of use and a 15 would suggest a high level of use of visuals for communication of reflective knowledge. Later, in the recommendations section, the researcher notes that a rubric should be developed to include visual thinking principles to expand upon the written principles. Currently, the combination of a rubric which encompasses both principles does not exist. Examples (screenshots) of

some of the pages from the eportfolios are also presented to share how this evidence was illustrated in the artifacts (Appendix J). Written feedback from the observations of the researcher also accompanies the visual excerpts data.

Results and Interpretations

Interpretations of what the results mean are part of the discussion in this section. The categories and themes introduced here will be reviewed and explored as per the methodology presented in this study. The problem researched will readdress and review prior content as it relates to the research questions. A final recommended solution will be presented although an extension of the recommendations will be finally presented in the final chapter.

The survey questionnaires answered two key quantitative research questions, a central question and a subquestion. An interpretation of what those results mean is first accounted for in the survey questionnaires. Research Q2 asks: How do preservice teachers describe how visual imagery supports or constrains reflective practice? The second comparative subquestion is Q2a.: What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their electronic portfolios to support reflective practice? Most of the preservice respondents do not perceive technology challenges of using visual images. They indicate that support or constrain regarding reflective practice when using visuals and visual tools is not perceived as a challenge. The results from the surveys also indicated a positive correlation between Content Knowledge and Technology Pedagogy and Content Knowledge; thus accepting the H_0 (the null hypothesis) for this study. This data was an important because the correlations suggest that the content could be driving the utilization of the visual imagery imagery/tools by the preservice teachers. This data

connects the quantitative and qualitative paradigms as it supports findings in both of the methodologies.

There were three qualitative research questions, the guiding question and two subquestions helped to shape the patterns and themes. Two of the questions were supported by interview methodologies and one was supported by artifacts. Emerging themes of the *most important* attitudes and perceptions of visual image use and visual tools use were arranged into 7separate categories. Emerging themes of the *differences in preservice teacher* attitudes and perceptions of visual image use and visual tools use were also compiled. Content analysis revealed 3 of the most important differences according to a coded reference. The most salient concepts and quotes that derived from interview data of the differences in teachers' attitudes and perceptions of visual image use and visual tools use were also revealed.

The third qualitative research question supported the results that have been revealed regarding the review of artifacts after a review of the eportfolios. Research question Q1b: How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program?

After the respondents took the survey in phase one of this study, some then went on to complete interviews in phase two and in the final phase, a few respondents shared their eportfolios. The eportfolios samples are from teacher candidates in the Department of Middle-Secondary Education and Instructional Technology (MSIT). Each eportfolio is different because the reflection is based on the world-view of that particular preservice teacher. There are ranges of teaching and learning strategies presented in their performance assessments, yet flexibility was apparent in presentation structures among the individual eportfolios. Credible evidence of their

ability to have an effect on student learning was provided in their reflective eportfolios. Some teachers used more visual images than others, while some relied more on written content; they did however, all use visual images to support lessons and activities. It should be noted that as part of the actual reflection assignment and general information provided via the course outline for the eportfolio development, specified: Visual representation in the form of charts, graphs, and assessment instruments are a requirement as part of the document. They could provide other attachments, such as student work yet, they should be very selective and make sure that their attachments provided a clear, concise evidence of their performance related to the Teacher Education standards and their students' learning progress. Therefore, the researcher notes that utilizing visual representation is expected, and the assignment addresses the use of charts and graphs as part of the visual representation requirements. Regarding specific additional types of visual representation that were required was not listed.

All preservice teachers provided visuals as a form of communicating reflective practice beyond the required visual representation with the exception of one respondent with the pseudonym Hanna. As per the eportfolio artifact, respondent Hanna's mathematics assignments included visuals in the form of charts, graphs and diagrams only. It was revealed in her interview that she also has used You Tube videos for lessons, yet it was not part of her actual portfolio. The overall observed results indicate that preservice teachers illustrate evidence of reflective teaching and learning in their eportfolios in the following manner:

1) All used Power Point (Microsoft Office) as the main foundation to support multiple visuals combined with text.

2) A standard simple Power Point (PPT) template appears to be the main foundation for the Power Point development.
3) The researcher notes that very traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc.
4) The main uses of visual imagery were photos, illustrations, diagrams, and charts.
5) Drawing or sketching combined with text was included in activities
6) Two eportfolios utilized You Tube as a visual resource; one preservice teacher used You Tube links to support instruction while the other used a You Tube channel whereby, they recorded their lesson to support Spanish-speaking students' access to review at their own pace.
7) Overall, the preservice teachers do not appear to be comfortable using emerging visual technologies to support the lessons

Many implications can be discussed in light of the findings from this study. Both practitioners and researchers can be guided in their future practice by the implementations for solutions to the problem indicated in these findings. As a result of the patterns and themes represented in the surveys, interviews and artifacts, the findings for this study clearly show that many forms of visual imagery is used by preservice teachers to chronicle teaching and learning experiences; the visual representations expand beyond the course expectations of inclusion of graphs and charts. Most of these visual tools are traditional forms of imagery and media used to demonstrate reflective practice. The preservice teachers all acknowledge that visuals support them in demonstrating their competencies and supports teaching and learning. They also observe that technology can fail and another plan may be

necessary. Student engagement in their classrooms was perceived as important to teaching and learning; technology used was also important to how they present reflection; and some knowledge regarding accessing new information about visual tools was gathered as a result of shared knowledge with classmates. Lastly, they believe that trial and error was part of the teaching and learning process.

Collectively, Power Point was used to show photographs, drawings, charts, graphs, diagrams, posters and maps. You Tube was used to present work that they uploaded or it was used to share links that supported their lessons. The concept of using an iPad in their classrooms was expressed by two respondents in the interview. No other form of new or emerging media was used to reflect ideas in their eportfolios or to communicate with their classrooms. New or emerging media in the classroom could be considered to be Pinterest, iPad Apps, infographics, etc. The researcher believes that it is important to learn and to use visual tools that reflect what is available today, to support and align with learning that is occurring outside of the classroom. Respondent Shawn indicated in her interview that her classroom students likely have iPads at home and get excited when they are brought into the classroom, "I did use my iPad in my own classes, but I wasn't allowed to at the school that I was at but we could check them out and the kids loved it!" The researcher adds, that traditional methods of visual representation used is a foundation for classroom teaching and learning, however there are numerous discussions and conversations in blogs, educational meet-ups, and curated pages about the plethora of new visual tools that are evolving to support classroom teaching and learning.

Summary

Key points as per this chapter indicated that many categories and themes emerged in this study exploring how preservice teachers document and communicate

their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. Through qualitative data analysis, it was determined that the most important attitudes and perceptions of visual image use and visual tools use that emerged as themes include: 1) Student engagement in their classrooms 2) Trial and error 3) Shared knowledge with classmates 4) Personal technology and research 5) Teacher mentors 6) technology used 7) Independent learning. The three differences according to the lowest ranked attitudes and perceptions of visual image use and visual tools use are: 1) Shared knowledge with classmates 2) Personal technology and research 3) Teacher mentors. Furthermore, qualitative data determined that many forms of visual imagery was used by preservice teachers to chronicle teaching and learning experiences; and that the visual representations expand beyond the course expectations. Most of the visual tool choices are traditional forms of imagery and media used to demonstrate reflective practice. It was also revealed that the preservice teachers all acknowledge that visuals support them in demonstrating their competencies and also supports teaching and learning. Additionally, quantitative data analysis (Table 13) and (Table 14) showed the correlations between the mean scores for (Table 10) Content Knowledge (CK) and (Table 12) Technology Pedagogy and Content Knowledge (TPCK). The result indicated a positive correlation between Content Knowledge and Technology Pedagogy and Content Knowledge. These correlations suggested that the content could be driving the utilization of the visual imagery imagery/tools by the preservice teachers.

Based on the interpretations of the overall results, the final recommended solution is that the use of multiple types of visual imagery and visual tools should be used in the classroom to increase and support student engagement and

communication during the learning and teaching process; and that more concentration needs to be directed to new and emerging visual tools that may be reflective of what students are using on their own personal time. Visual thinking can support reflection and communication of eportfolio and is a 21st century skill set. Chapter 5 expands upon actionable solutions, recommendations and directions for future research.

Chapter 5: Conclusions and Recommendations

Introduction

Goals for this final chapter will be to construct an analysis of the results in the context of the literature described in chapter two. The researcher will provide answers to the research questions and offer additional conclusions beyond the research questions of other content that emerged in the study. Implications for future research, recommendations and practice will conclude this study. These recommendations support potential solutions to the problem statement based upon the results and interpretations. Subsequently, findings from the analysis of this study also supported the conceptual framework addressed in the literature review. Visual imagery in preservice teachers' eportfolios was the focus of the research, the review of the empirical literature included published studies and research regarding (1) visual thinking and learning as elements of rich learning environments (2) eportfolios as part of pedagogical documentation and reflective practice in Teacher Education course work (3) 21st-century literacy and the use of visual imagery as a language to chronicle learning experiences. These research literature streams were supportive in guiding discussion of this research.

This research utilized a mixed method approach to address and understand how preservice teachers document and communicate their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. Visual thinking and learning include the use of visuals – digital images, photographs, illustrations, renderings, maps, diagrams, graphics, infographics, animations,

sketchnotes, graphic recordings, videos, and social media – to communicate information.

Preservice teachers' perceptions were measured using three (3) instruments in this study: 1) An online Likert-like survey questionnaire was administered, yielding quantitative data 2) Open-ended interviews were administered via invitation to discuss individual eportfolios in-depth, which yielded qualitative data 3) Artifacts from participants were reviewed and the researcher wrote about the journey and experiences of the teachers; this data expanded upon the existing qualitative data. The adapted survey instrument used in this study was specifically selected because of the demographic target of preservice teachers and the technology component: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April). For this present study, the researcher collected data from student participants enrolled in a large state university in the southeast. SPSS software (*Survey Monkey)* was used to support the data analysis of the online questionnaires. This was a three-phase study. The initial survey questionnaires were administered to 24 student teachers who completed their Clinical Practice course. Interviews were administered to five (5) preservice teacher volunteer participants; as part of the second phase of the post-survey study. Additionally, three (3) eportfolios that were completed as part of Clinical Practice course work were collected for the third phase of the artifacts data. The quantitative and qualitative methods provided numeric and descriptive data for this study and supported answers to the research questions. To triangulate the data, the researcher used multiple sources of data in the form of survey results, open-ended interviews, and analytical notes and observations from artifacts, which were reviewed to answer

and address the questions. An analysis of the qualitative and quantitative data led to the conclusions for this study.

Conclusions

Conclusions in this chapter represent a broader and more encompassing role than findings. Although conclusions can be addressed separately or as a general discussion, in this chapter, the conclusions are presented as they relate to the research questions and then follow with an additional general discussion. Several study findings from the data revealed support to several conclusions. The conclusions are organized by the research questions presented in this study as follows:

Research Question Q1. What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice?

1. The preservice teachers perceived attitudes and perceptions that influence use are student engagement in their classrooms. When doing fieldwork they have discovered that visual image use and visual tools support learning and engage their students thinking. Evidence of this was presented in the interviews with Shawn, Enya and Cody, Wendy and Ingrid.
2. The preservice teachers in this study perceive that they learn what visual tools work via some trial and error and that shared knowledge is important inside and outside of the classroom to learn new technologies.
3. Some of the most important visual tools that preservice teachers found to be successful in their classroom lessons are photographs, drawings, and videos. They do, however, demonstrate that they are receptive to new

technologies. Many share and gather information on Google Docs, websites and by talking to classmates and friends.

Research Question Q1a. What are the differences in teachers' attitudes and perceptions towards use of visual imagery in eportfolios for reflective practice?

1. Perceived differences from the preservice teachers noted shared knowledge with classmates. Specifically, discussions suggesting differences in acquired information from peers.
2. Preservice teachers perceive personal technology and research as a difference.
3. Preservice teachers indicate that teacher mentors are viewed as a perceived difference. Discussions surrounded different strategies acquired in their mentor classrooms.

Research Question Q1b. How do preservice teachers use visual imagery to structure eportfolios and illustrate evidence of reflective teaching and learning practice within their teacher preparation program?

1. The findings in this study imply that preservice teachers use Prezi and Power Point as the main tools to show visual demonstrations. They mention the use of iPad's as a personal technology at home and in the field if available.
2. Preservice teachers use the required visuals in the form of charts and graphs for their Live Text eportfolios; they do however, incorporate other forms of visuals and tools to show the reflective process. Many preservice teachers stated that they favored graphic organizers.
3. Most of the visual evidence is using traditional forms of visual communication such as photographs, diagrams, charts, and graphs. There were virtually no newer forms of emerging media such as Pinterest, Apps, infographics, etc.

Research Question Q2. How do preservice teachers describe how visual imagery supports or constrains reflective practice?

1. Overall findings in this study imply that visual imagery does not necessarily support or constrain reflective practice
2. Although most respondents indicated that visuals did not necessarily support or constrain reflective practice, it appears that visual use supports practice if we look at codes that emerged in the interviews and in the artifacts.

Research Question Q2a. What are the preservice teachers' attitudes and perceptions of the technology challenges of using visual images in their electronic portfolios to support reflective practice?

1. These findings imply that overall the preservice teachers' survey findings for determining if visual imagery supports or constrains reflective practice, indicates that support or constrain of visual use is present in reflective practice; the same was determined for perceptions and attitudes regarding technology challenges in the use of visual images in preservice teachers portfolios.
2. The researcher notes that perhaps more challenges may be applied if the preservice teachers were incorporating newer visual technologies. Because they are using "familiar" visual resources such as photographs, charts, graphs, diagrams, etc., they may not perceive a challenge.
3. Finally, the preservice teacher respondents in this study believe that according to their interviews that technology could present a challenge if it fails.

Discussion

The purpose of this descriptive study was to use mixed methods to understand how preservice teachers document and communicate their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. As

the landscape of technology and Teacher education shifts, these types of studies are supporting key researchers discussions regarding eportfolios. When speaking to eportfolio practitioners at an eportfolio conference held at LaGuardia Community College in 2008, Yancey suggested that eportfolios are remaking the landscape of higher education and constitute a "tectonic shift" in higher education (http://www.aacu.org/meetings/annualmeeting/AM13/). She argued that eportfolios radically alter how students learn, how faculty teaches and how institutions assess the value of education outcomes.

The first central research question addressed in this study was: What are the most important attitudes and perceptions of preservice teachers that influence their use of visual imagery in eportfolios for reflective practice? The answers are based and revealed in the results of the interviews.

The second central research question addressed in this study was: How do preservice teachers describe how visual imagery supports or constrains reflective practice? The answer to this question was determined by responses from surveys regarding how the use of visual imagery and visual tools supports or constrains reflective practice in eportfolios. The results of this study support the research question examined. Specifically, the results looked at how visual imagery supports or constrains reflective practice.

The descriptive data that was surveyed included frequencies, means and standard deviations. In addition, the different teaching areas of specialization were also included in the survey. These included teaching areas of specialization in math, social studies, science, and literacy. Final survey findings in the preservice teachers' surveys to determine if visual imagery supports or constrains reflective practice indicated that most of the preservice respondents do not perceive technology

challenges when using visual images. They indicated that support or constrain regarding reflective practice when using visuals and visual tools was not perceived as a challenge.

Authors (Batson and Grush, 2011; Shrock, 2010; Yancey, 2011) determined that visual imagery as an education tool is becoming as common as text and strongly influences learning and teaching methods. This relates to the notion of visuals as part of class engagement.

It became clear as data collection progressed that the interviews and the artifacts in the form of eportfolios yielded more information and evidence to address the research questions. During interviews with individual focus students, they were candid about their experiences using visuals and visual tools. The researcher gathered more in depth information with this type of direct discussion with the preservice teacher. Some of the most striking moments during this research occurred when the artifacts were reviewed. The preservice teachers incorporated a considerable amount of visuals in their eportfolios. In some cases, 50% of the Power Point or Prezi lessons included visuals. Visual appear to be integrated into all of the eportfolios and this may support research in the field which indicates that visual thinking is now an agent of change in eportfolio development and in the classroom (Batson, 2012; Batson, 2011; Batson, 2010; Barrett, 2008; Campus Computing Project, 2011; EDUCAUSE, 2012; Eynon, 2009; Green, 2008; Yancey, 2009).

As an example of visual use, most preservice teachers used the required charts and graphics as part of their eportfolios. Additionally, some included maps and diagrams, as well as photos that were taken by the preservice teachers of themselves and their students. Researcher Barrett (2009) links to the notion of using visuals by acknowledging that portfolios tell a story of learning, and thus if teachers are using

visual tools to communicate their reflections, this use too would convey learning. The eportfolios also demonstrated opportunities for the classroom students to draw images for assessment purposes opposed to writing. This concept was introduced in a lesson plan for an English class and a science class. The idea of drawing illustrations supports researcher, Tufte (1990). He encourages the mingling of data-rich illustrations with scientific data and has demonstrated in books and lecture examples of information graphics which expand beyond verbal literacy.

What was also surprising to the researcher was the limited level of knowledge originating from sources other than classroom instruction on visual tools. There were very few (Smartphone cameras, You Tube) emerging media tools used and discussed. Related research by Barrett (2007) shows that preservice teachers must learn how to use emerging visual tools and technology effectively in their preparation programs21st century skills as it is a critical skill set. And, teachers with little or no experience with technology are less likely to incorporate its use in their classrooms. Most of the focus regarding visual tools was with traditional media such as photos, diagrams, charts, graphs, etc. Several participants learned many or most ways to communicate visually on their own. This may therefore, suggest that the university may want to develop a way for the preservice teachers to access emerging tools for teaching and learning as a group or outside of the classroom. Many discussed that a lot of trial and error occurred; some of this could be related to learning how to use the tools on their own time. Greenberg J., Pomerance, L. and Walsh K. (2011) theorized that as teachers gain experience by trial and error, reflection allows for growth; experienced teachers gain knowledge of their craft through systematic and informed reflection on their work; seasoned teachers are likely to identify connections between theory and practice.

It was also revealed that many participants shared their visual knowledge learned outside of their university setting. Many mentioned Facebook, Google Docs, and websites as the primary way to connect with their classmates regarding sharing information.

Overall the participants were successful in communicating their knowledge with visuals and visual tools. The researcher noted that several participants mentioned in the interviews that it was easier for preservice teachers that taught science, social studies to use visuals by comparison to math and English classes. It appears that this point was evident in the eportfolios. The eportfolio that demonstrated a mathematics concentration used diagrams, figures mathematical equations, and had less diversity of visual images. This qualitative data from the interviews and artifacts also relates to the quantitative findings. The quantitative results indicated a positive correlation between Content Knowledge and Technology Pedagogy and Content Knowledge. These correlations suggest that the content could be driving the utilization of the visual imagery imagery/tools by the preservice teachers as presented in the qualitative findings.

All preservice teachers made mention of the importance of using visuals to support learning. They also related use of visual images and tools to different learning styles. This also was specifically uncovered in the findings from one of the respondent's interview, whereby the preservice teacher wanted to seek the use of visuals as another way to teach her students that may learn differently. Respondent Shawn stated, "…some kids don't get it that first time, and you do it differently, and some will get it that next time, so you have to enter it in different ways. So you have to do visual imagery…all the time."

Limitations

The study also took place at this university. Regarding the response rate for this survey, 193 instruments were distributed and 24 respondents took the survey which yielded a survey return of 12.43%. The final response rate was 11.39 %, as a result of 2 respondents not completing the survey. A limitation of this study is that the response rate could have been higher; however the targeted group graduated or was starting a summer break when the surveys were distributed. As a result, some of the students may not have received the surveys if they did not open their university emails after their departure. It was however, close to half of the anticipated total survey sample of fifty preservice teacher participants. The response rate is acceptable based on accepted practice in research. Nulty (1992) argues that response rates from online surveys versus paper surveys differs and that class size could also produce liberal conditions for response rates, yet are acceptable and adequate (p. 310).

Validity and Reliability

The researcher utilized three methods of verification with this study to address the concerns of validity. Triangulation of the data from three different sources included survey questionnaires, interviews, and eportfolio artifacts. Merriam (1998) discusses the process of reframing concepts to reflect the underlying assumptions. The strategy of using three forms of data collection from 50 preservice teacher participants and, compare the data from the different participants supports in the notion of elimination of validity threats and increases the credibility of study conclusions.

The researcher examined the data provided in the interviews against the findings in the survey questionnaires to the artifacts in the form of eportfolios. Validity

and reliability checks were constantly made as the researcher compared and contrasted the various forms of supporting data.

Conclusions in this study, as they relate to the research questions and study findings from the data revealed that:

1) the preservice teachers perceived attitudes and perceptions that influence use are student engagement in their classrooms
2) preservice teachers perceive that they learn what visual tools work via some trial and error and that shared knowledge is important inside and outside of the classroom to learn new technologies
3) some of the most important visual tools that preservice teachers found to be successful in their classroom lessons are photographs, drawings, and videos
4) preservice teachers suggested that math may be more challenging when using visual images and tools opposed to other areas of specialization
5) there are perceived challenges with technology and a need to have a plan in the event that technology fails; that the preservice teacher needs to "learn" about a new technology before introducing to their class or into a lesson
6) findings suggests that younger students, need more visual support
7) teachers use Prezi and Power Point as the main tools to show visual demonstrations
8) preservice teachers use the required visuals in the form of charts and graphs for their Live Text eportfolios they do however, incorporate other forms of visuals and tools to show the reflective process
9) most of the visual evidence is using traditional forms of visual communication such as photographs, diagrams, charts, and graphs
10) visual use supports practice
11) support or constrain of visual use is present in reflective practice
12) perceptions and attitudes regarding technology challenges is present in reflective practice
13) technology could present a challenge if it fails
14) content could be driving the utilization of the visual imagery imagery/tools

Recommendations

The analysis of the surveys, interviews and review of eportfolios of preservice teachers at a state university revealed how preservice teachers document and communicate learning using visual images in eportfolios for reflection. Recommendations based on the results and interpretations are listed below. Best practice of eportfolios as they relate to visual representation is important and needs to

be further discussed and reviewed so that solutions and strategies continue to evolve as technology grows. A continuation on the topic of eportfolios was addressed in a symposium: *E-portfolios Foundational Knowledge, Student Voices and Best Practices* (2013) in partnership with the International Journal of ePortfolios and the Association for Authentic, Experiential and Evidence-Based learning (AAEEBL). The conference has continued the discussion in seeking best practices for knowledge and use of ePortfolios. Recommendations and directions for future research are also highlighted by the researcher below. These topics need closer examination and may generate new questions:

Visual tools used for reflective purposes or for assessment is not a new instructional strategy. However, because visual tools are growing in availability, and because the perception is that using visuals as part a reflective process supports communication of eportfolios, it should be encouraged and instruction of visual image use should be applied to the process as it has the potential to enhance student learning and teaching. Batson (2010) supports this concept indicating that the topic of visual learning has been given more attention as our forms of media have been growing more technology-rich.

Some of their experiences as per the findings have led to other questions and recommendations for future research which include:

1. A recommendation for action based on the results and interpretations is for universities to cross-pollinate their School of Education with a School of Design in curriculum surrounding eportfolio development. By doing so, the preservice teacher may be able to communicate their thoughts more richly and effectively. Thus text and visual strategies could both be presented fluidly. This can address findings related to preservice teachers' interest in sharing knowledge of

new technologies. It also addresses their use of primarily traditional tools for reflection opposed to emerging visual tools.

2. Design faculty could deliver instruction of visual image use; it could support the student in having a plethora of options regarding technology to show their knowledge opposed to a limited number of options that may not be privy to a faculty member teaching education courses.
3. Subsequently, with the idea of departments beyond design departments using eportfolios as a form of reflection and assessment, many schools within a university could utilize the concept of incorporating a School of Design or similar, within their curriculum or as an elective to better understand the fundamentals of visual tools for communication. For example, the School of Engineering or Science could also foster collaboration as it does at Stanford University (http://dschool.stanford.edu/) They have a "design thinking" program as part of their university; students are enrolled in various degree-granting programs from school of computer science to education to learn how to utilize visual thinking skills to support what they learn in other programs.
4. As part of best practices, a "Visual Thinking" professional development workshop could be added to a School of Education's eportfolio instruction. It could also be a workshop presented to all students in all Schools within a university for those using an eportfolio. Since preservice teachers feel that visual thinking could better support communication of ideas and only some understand how to incorporate it and some do not, workshops could be held to support overall understanding of software, applications (apps), tools, and fundamentals of design. It could likely benefit faculty as well as students.

5. As part of best practice, the incorporation of more “group” activity in sharing visual tools amongst students may support teaching, learning and instruction. Because technology is evolving rapidly, various students may have new tools to share with peers and this “shared knowledge” may support their options in how they communicate.
6. Future research could look at specific areas of responses to the survey and interviews revealed in this research study as illustrated in the coded interviews. More research could examine the role of visual thinking and visual tools as it applies to individual emerging media tools used in the classroom. An example would be the use of a particular “app” as a visual tool used for reflective purposes. Research (Barrett 2002) that connects to this principle revealed that without instruction focused on the technologies and effective strategies, most students will not learn them or will learn them only minimally.
7. This study was broader in the sense that it was open to visual tools as a whole opposed to just one particular tool.
8. Further study recommendations could occur with larger samples because one of the limitations of this study was that the sample size was small and targeted only one university in the southeast. A larger replicated study could occur.
9. Further study recommendations could occur with any departments or Schools beside a School of Education that use eportfolios for reflective or assessment purposes. One of the limitations of this study was that it targeted one department, The School of Education.
10. A similar study could be planned that uses a longitudinal design to determine changes over time as more students become aware of the new technologies that support visual thinking and image use.

11. Because very few rubrics exist that support written reflection combined with visual reflection from Teacher education programs, rubrics supporting visual thinking could be designed and incorporated as part of the assessment process particularly if visual imagery and visual thinking will continue to be instrumental in the reflective process and in the way that students are assessed.
12. Conduct a study focusing on the relationship between different visual image use and different subject areas related to visual thinking and visual tools;
13. Conduct a comparative study between institutions to determine the variables that may account for differences between institutions.

The researcher reflects on her own classrooms, and sees parallels to eportfolios that are created with her design students; their goals are to produce an eportfolio for reflection and employment purposes. This is an important note in this study because the researcher attempts to use emerging visual forms of technology that duplicates what students are using on their personal time to keep them engaged. The researcher has found success in this emerging visual media and has identified how to use it for teaching and learning purposes. Three examples of how new visual forms of technology are used in the researchers classroom are:

1. Facebook Groups are used as a private hub for students to post and share ideas in the form of their work for critique purposes. These critiques occur outside of class and within the Face Book format and are posts from faculty as well as peer comments. Students post written content as well as design, illustrations, photos, videos, drawings, visual inspiration, sound inspiration, and research. Facebook Groups can be a resource for the reflective process

and it supports dialogue and the final portfolio. This addresses “shared knowledge” experiences outside of the classroom.

2. Pinterest is used to post visual images that may relate to inspiration for an assignment. Generally, the posts are based on Google images, stock photos, but many are uploaded images from their own design and content. It is used as a “mood board” to display the tone, color, and ideation of a projected project. The researcher also uses Pinterest as a library to house visual images of various categories to support student thought. Teaching tools and videos that support course content are included. Oftentimes, the researcher adds the students to be contributors to the boards so that the library becomes a place of shared knowledge; a community whereby, visual ideas are presented and are accessible virtually for an infinite time. This also addresses “shared knowledge” experiences outside of the classroom.
3. Many apps are used that support visual representation and are also emerging technology tools that the researcher incorporates into the classroom. They include:
    a. apps such as Vine, which allows the students to take videos that are 30 seconds long or Keek, which is 6 seconds long
    b. Layar, which permits the students to create augmented reality pictures which makes a 2-D photo moving and active photo
    c. Penultimate allows the students to draw directly onto an iPad; the drawing can also be presented on an existing photo.

Summary

The findings from this study as related to the study questions, contextual framework and emergent themes are presented academically. The purpose of this descriptive study was to use mixed methods to understand how preservice teachers document and communicate their learning in working eportfolios and for reflective practice, to understand if the use of visual imagery supports them in demonstrating their competency in a teacher education course. Findings from this study provide recommendations for teaching, learning and ways to support better performance, and learner outcomes for preservice teachers. The results provide insights into how preservice teachers will be evaluated in the light of new teacher education performance measures. It could support the direction of the newly adopted effectiveness system for teacher evaluation and professional growth which was developed in 2012 as part of the Race to the Top Initiative (RT3), in Georgia. Teacher Education programs could benefit from what was learned in this study at this particular university which is based in the southeast. Because this study addresses preservice teacher practice, perception and performance in education courses, it is a significant study with regard to the planned state-wide teacher evaluation and professional growth implementation scheduled to launch in Georgia during the school year 2014-2015. No studies currently identify how practitioners specifically communicate their visual knowledge or their perceptions of using visual imagery in reflective practice. Also, the annually administered Campus Computing Survey (2010) shows portfolio activity at nearly half of all institutions of higher education in the United States and growing. The findings could support current and future state-wide teacher evaluation needs.

Reflections of the researcher's experience with this research process as a result of this study include parallels of Teacher Education and Design Schools. The researcher's personal bias and values based on many years of teaching design students how to communicate visually, impacted the researchers' understanding of the importance of being able to utilize text and imagery interchangeably. Concluding thoughts from the researcher are:

As the 21st century moves forward and digital technology and innovation expands, understanding how to use visuals and visual tools appears to be a valued skill set if we look at the progressive digital trends. There is a shift in learning and teaching and the use of visual imagery aligns with this experience. The results from this study, also reinforces previous theories that visual image use supports various learning styles. Previous studies have tended to look at visual thinking in regards to learning styles, while this study uncovered the use of particular visual image use and visual thinking tools that preservice teachers' perceive to support their reflective practice in eportfolio development; this had not been previously discussed in other studies. Findings from this study may speak to larger populations beyond this classroom about the importance of visual image use in communication of ideas. The role of the arts and design as it relates to visual image use will likely be necessary to include in schools, universities and businesses globally. An understanding of how to incorporate visual thinking and or visual tools could ultimately impact our individual creativity, reflective processes, and independent levels of thinking. Furthermore, the fundamentals of visual thinking knowledge will be pivotal in innovation; and global success will depend on it. We could prove to be more effective communicators; and potentially be better creators. Visual thinking is a vital

field and can contribute to the bigger conversation surrounding technology and 21st century skills needed. Best practice in achieving twenty-first century literacy is now a matter of developing in students a set of abilities and skills that allow aural, visual and digital proficiencies to converge (Yancey, 2012; Batson, T. 2011; Bass, R., and B. Eynon, 2009; Media Consortium, 2005). The researcher adds, that as digital technologies advances and innovation progresses, we should now be considering and discussing how visual thinking and visual tools will impact the 22nd century. These findings offer insights and highlights with several considerations for teacher education, eportfolio development and global business.

Finally, the results of this study indicate that perceptions of using visuals in preservice teachers' portfolios support reflective practice. More studies must be conducted regarding the types of visual thinking tools as well as effective instruction that needs to be delivered in conjunction with curricular changes.

References

Abbitt, J. (2011). Measuring Technological Pedagogical Content Knowledge in Preservice Teacher Education: Journal of Research on Technology in Education. (43) 4.

Akah, Binaebi and McBride, C. (2012) Sketchnotes: Field Guide for the Busy yet inspired professional. Columbus, Ohio. Retrieved from: http://brightbirdpress.com

Allport, G. W. 1935. Attitudes. In C. Murchison (Ed.), Handbook of Social Psychology. Worcester, MA: Clark University Press.

Allport, G. W. 1954. The nature of prejudice. Reading, MA: Addison-Wesley.

Arnheim, R. (2004). Visual Thinking. Berkeley, CA: University of California.

Arnheim, R. (1969). Visual Thinking. Berkeley, CA: University of California.

Association of American Colleges and Universities, AACU. (2012, January). EPortfolio Forum Look What I Can Do: Reclaiming a Focus on Learning. Forum conducted with AAC&U's Annual Meeting, Washington, DC. Retrieved from: http://www.aacu.org/meetings/annualmeeting/AM13/.

Avgerinou, M.D. (2009). Re-viewing visual literacy in the "bain d'images" era. TechTrends, 53(2), 28–34.

Barber, P. J., & Legge D. 1976. Perception and information. London: Methuen.

Barrett (2013) Portfolios for public review. Retrieved at: www.electronicportfolios.org.

Barrett, H. (2010). Balancing the Two Faces of ePortfolios. Educação, Formação & Technologias, 3(1), 6-14. Retrieved from http://eft.educom.pt

Barrett, H. (2008). Categories of ePortfolio tools. Retrieved from http://www.electronicportfolios.com/categories.html.

Bartlett, F. C. 1932. Remembering: A study in experimental and social psychology.Cambridge, UK: Cambridge University Press.

Barton, James & Angelo Collins (1997) Portfolio Assessment: A Handbook for Educators. Dale Seymour Publications

Basken, P. (2008). Electronic portfolios may answer calls for more accountability. Chronicle of Higher Education, Retrieved from http://www.chronicle.com/free/v54/i32/32a03001.htm

Bass, R., & B. Eynon. (2009). Capturing the visible evidence of invisible learning. Academic Commons, Retrieved from: http://www.academiccommons.org/issue/january-2009

Batson, T. (2013). Campus technology: The Taming of the MOOC—With ePortfolio Evidence, January, 16, 2013. Retrieved from: http://campustechnology.com/articles/2013/01/16/the-taming-of-the-mooc.aspx

Batson, T. (2011). A Survey of the Electronic Portfolio Market Sector: Analysis and Surprising Trends. Retrieved from http://campustechnology.com/Articles/2011/10/12

Batson, T. (2010). AAEEBL: ePortfolios, Finally! Campus Technology. Retrieved from http://campustechnology.com/articles/2010/04/07/eportfolios-finally.aspx

Batson, T. (2012). AAEEBL: It's All About Evidence-Based Learning--Supported by ePortfolios. Campus Technology. Retrieved from http://campustechnology.com/articles/2012/02/15/evidence-based-learning-supported-by-eportfolios.aspx

Batson, T. (2010). AAEEBL: Review of Portfolios in Higher Education: A Flowering of Inquiry and Inventiveness in the Trenches. Campus Technology. Retrieved from http://campustechnology.com/articles/2010/12/01/review-of-portfolios-in-higher-education.aspx

Batson, T. (2011). The Student Portfolio is the New Book: New Practices, Profession, and Scholarship. Campus Technology, Retrieved from: http://campustechnology.com/articles/2011/02/02/the-student-portfolio-is-the-new-book.aspx

Batson, T. (2007). The e-portfolio hijacked. Campus Technology. Retrieved from: http://www.campustechnology.com/articles/56617/

Batson, T. (2010). The testing straightjacket. Campus Technology. Retrieved from: http://campustechnology.com/articles/2010/07/07/the-testing-straitjacket.aspx

Batson, T. (2012). The Wait is Over: The LMS and the ePortfolio merge to serve a Culture of Learning. Campus Technology. Retrieved from: http://campustechnology.com/articles/2012/05/16/the-lms-and-the-eportfolio-merge.aspx?=CTCLV

Batson, T. (2012). 12 Important Trends in the ePortfolio industry for education and for learning. Campus Technology. Retrieved from: http://campustechnology.com/articles/2012/09/19/12-important-trends-in-the-eportfolio-industry.aspx

Batson, T. & Grush, M. (2011). Digital visual asset management beyond the library. Campus Technology. Retrieved from: http://campustechnology.com/articles/2011/11/09/digital-visual-asset-management-beyond-the-library.aspx?sc_lang=en

Berelson, B., & Steiner, G. A. 1964. Human behavior: An inventory of scientific findings. New York, NY: Harcourt, Brace & World.

Borko, H. & Stecher, B. (2012). Measuring instructional practice in science using classroom artifacts. Journal of Research in Science Teaching. 49(1), 38-67.

Bourzac, K. (June 2007). Getting the picture: Teachers discuss the importance of visual aids. MIT Technology Journal (online). June 18, 2007. Retrieved from: http://www.technologyreview.com/article/408073/getting-the-picture/

Bruner, J. (1973). Going Beyond the Information Given. New York: Norton.

Burke, Kay (1997). Designing Professional Portfolios for Change. Palatine, Illinois: IRI/SkyLight Training & Publishing

Buzan, T. (2006). The ultimate book of mind mapping. Hammersmith, London: Thorsons Publishing.

Buzan, T., and Buzan, B., (1994). The mind map book: How to use radiant thinking to maximize your brain's untapped potential. London : BBC Books.

The Carnegie Foundation for the Advancement of Teaching (2006) The Carnegie Foundation for the Advancement of Teaching. Stanford, CA. Retrieved from: http://www.carnegiefoundation.org/programs/index.asp?key=38

Calfee, R, & Sperling, M. (2010). On Mixed methods: Approaches to research in language and literacy: New York, NY. Teachers College.

Cambridge, D., Cambridge, B. & Yancey, K. B. (2009). Electronic portfolios 2.0: Emergent research on implementation and impact. Sterling, VA: Stylus.

Campus Computing Project. (2011). The 2011 national survey of information technology in U.S. higher education: Gains in going mobile; Slow movement to cloud computing. Retrieved from: http://www.campuscomputing.net/sites/www.campuscomputing.net/files/GreenCampusComputing2011_4.pdf

Carnegie Mellon University. (2013). Formative vs Summative Assessment - Enhancing Education - Retrieved from: www.cmu.edu/teaching/assessment/basics/formative-summative.html

Chau J. & Cheng, G. (2010). The Hong Kong Polytechnic University: Towards understanding the potential of e-portfolios for independent learning: A qualitative study. Australasian Journal of Educational Technology, 26(7), 932-950.

Chavanu, B. (2012) Sketch-note iPad application. Retrieved from: (http://www.makeuseof.com/tag/author/bchavanu/)

Christensen, R. (2002). Effects of Technology Integration Education on the Attitudes of Teachers and Students. *Journal of Research on Technology in Education*, 34(4) p.411-434.

Clark, E. and Eynon, B. (2009). E-portfolios at 2.0: Surveying the Field. Association of American Colleges and Universities (AAUP). Winter 2009, Vol. 11(1).

Clive Thompson, Power of Visual Thinking, Wired Magazine, September 27, 2010. Retrieved from: (http://www.wired.com/magazine/2010/09/st_thompson_visual/)

Creswell, J.W., & Plano Clark, V.L. (2007). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.

Creswell, J. (1994). Research design: Qualitative and quantitative approaches. Thousand Oaks, CA: Sage.

Creswell, J.W. (2007) Qualitative Inquiry & Research Design – Choosing Among Five Approaches, SAGE Publications, Thousand Oaks, California

Center for Digital Storytelling. Retrieved from: http://www.storycenter.org

COATT: Preparing Teachers for the Evolving Classroom. (2009) Retrieved from: http://www.coatt.net/

Dake, D. (1993). Visual thinking skills for the digital age. Annual Conference of the International Visual Literacy Association (25th, Rochester, New York).

Dahlstrom, (2012). ECAR Study of undergraduate students and information technology. (Research report). Louisville, CO: EDUCAUSE Center for Applied Research. Retrieved from: http//www. educause/ecar

DfES (2005) e-Strategy: Harnessing Technology Transforming Learning and Children's Services

Dale, S., Wright, H. & Gerber, R. (2006) Digi-Journies: Preservice Teachers' Growth and Self-Reflectivity, University of Alabama, paper.

Davis, M., & Waggett, D. (2006). Enhancing Pre-Service Teachers' Reflective Practice via Technology Competencies and ePortfolio Development. In C. Crawford et al. (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2006 (pp. 3106-3107). Chesapeake, VA: AACE.

Day, Michael (2010). Eportfolios for Lifelong Learning and Assessment. San Francisco, CA: John Wiley and Sons.

Day, Michael (2009). Issue Brief: Electronic Portfolios. Retrieved from: www.ncte.org/college/briefs/eportfolios.

Dewey, J. (1904). The relation of theory to practice in education. In M.L. Borrowman (Ed). Teacher Education in America: a documentary history. New York: Teachers College Press.

Dewey, J. (1944). Democracy and education. Prometheus Books. (Original work published 1910).

Dewey, J. (1944). How we think. Buffalo, New York: Free Press. (Original work published 1916).

Donis A.Dondis (1974). Primer of Visual Literacy. MIT Press

EDUCAUSE. (2012). Midwest Regional Conference 2012. Learning to think with our eyes: An examination of visual thinking. Retrieved from: http://www.educause.edu/midwest-regional-conference/2012/learning-think-our-eyes-examination-visual-thinking

EDUCAUSE. (2012). Social Media ePortfolios A session at the EDUCAUSE Learning Initiative 2012 Annual Meeting. Retrieved from: http://www.educause.edu/events/educause-learning-initiative-2012-annual-meeting/social-media-eportfolios.

Eisner, E. (1989). Structure and magic in discipline-based art education. In D.Thistlewood (Ed.), Critical studies art & design education, 14-26, Longman/NSEAD.

Eynon, B. (2009). The future of ePortfolio roundtable. Academic Commons, Retrieved from: http://www.academiccommons.org/commons/essay/futureeportfolio-roundtable

Eisner, E. (1998). Cognition and representation. In L. Bridges (Ed.), The kinds of schools we need (pp. 9-56). Portsmouth, NH: Heinemann.

European Institute for E-Learning, EIfEL. Learning futures: 10 eportfolio challenges. Sept. 2009. Retrieved from: http://www.eife-l.org/

Evertson, C., Hawley, W. & Zlotnik, M. (1985) Making a Difference in Educational Quality through Teacher Education. Journal of Teacher Education. 36, 3, 2-12.

Feldman, E. B. (1976). Visual literacy. Journal of Aesthetic Education, 10(3), 195-200.

Felten, P. (2008). Visual literacy. Change: The Magazine of Higher Learning, 40(4), 60-64.

Fischman. (2009). Electronic portfolios: A path to the future of learning. Wired Campus. Retrieved from: http://chronicle.com/blogs/wiredcampus/electronic-portfolios-a-path to-the-future-of-learning/4582

Flynt S., and Brozo W.(2010). Visual Literacy and the Content Classroom: A Question of Now, Not When. The Reading Teacher, 63(6), pp. 526–528

Frankel, F., & DePace, A. (2012). Visual strategies: A practical guide to graphics for scientists and engineers. Cumberland, RI: Yale University.

Fransecky, R. B., & Debes, J. L. (1972). Visual literacy: A way to learn---A way to teach. Washington, DC: Association for Educational Communications and Technology.

Forcier, R. (1999). The computer as an educational tool: Productivity and problem solving. Upper Saddle River, NJ: Prentice Hall.

Friere, P. (2000). Pedagogy of the oppressed (M.B. Ramos, Trans.). New York: The Continuum International Publishing Group Inc. (Original work published in 1970).

Fries, C.C. (1952). The Structure of English (New York).

Fulmer, C. (1993). Developing a reflective practice of professional development. School Business Affairs, 59(9), 23-26. Abstract from: ERIC: Item EJ470520.

Gardner, H. (1993). Multiple intelligences: The theory in practice. New York, NJ: Basic Books.

Gardner, H. (1993). Frames of mind: The theory of multiple intelligences. Tenth Anniversary edition. New York, NY: Basic.

Gardner, H. (1989). Zero-based arts education: An introduction to Arts Propel. Studies in Art Education, 30(2), 71-88.

Gardner, H. (1999). Intelligence reframed: Multiple intelligences for the 21st century. New York, NY: Basic.

Georgia Department of Education (2012). Teacher keys effectiveness system. Retrieved from http://www.doe.k12.ga.us

Georgia State University (2012), Program manual, Fall 2012 Retrieved from:http://education.gsu.edu/ece/docs/ECE_BSED_Program_Manual_Fall_2012.pdf

Gibbons, L. & Jones, L. (1994). Novice teachers' reflectivity upon their classroom Management. (ERIC Document Reproduction Service No. ED 386 446).

Glatthorn, A. A. (1998). Writing the winning dissertation: A step-by-step guide. Thousand Oaks, CA: Corwin.

Glesne, C., & Peshkin, A. (1992). Becoming qualitative researchers: An introduction. White Plains, NY: Longman. Weiss, R. S.

Green, K., (2008). Campus computing 2008: The 19th national survey of computing and information technology in American higher education. Campus Computing Project.

Hartnell-Young, Elizabeth and Morriss, Maureen (1999*). Digital Professional Portfolios for Change*. Arlington Heights: Skylight Professional Development.

Haslam, E., (2002). Learning to See, Learning to Teach: Developing Video Case Studies From One's Own Practice. Conference Presentation and Proceedings, Society for Information Technology & Teacher Education International Conference (SITE) 2002, Nashville, Tennessee.

Ittelson, J. (2008). Convergmagazine: Know Your ePortfolio. Summer 2008. Retrieved from: www.convergmag.com

Jakes, D. (2007). Web 2.0 and the new visual literacy. Technology and Learning, 27(9), 21.

Jenkins, H. (2006a). Convergence Culture: Where Old and New Media Collide. New York: New York University Press.

Jenkins, H. (2006b). "Fun vs. Engagement: The Case of the Zoobinis," Confessions of an Aca-Fan, June 23, Retrieved from: http://www.henryjenkins.org/2006/06/fun_vs_engagement_the_case_of html#more

Jenkins, N. (2006). San Francisco: Visualizing a Safer City. Juicy Geography. Retrieved from: http://www.juicygeography.co.uk/googleearthsanfran.htm

Jenson, J. D. (2011). Promoting self-regulation and critical reflection through writing students' use of electronic portfolio. International Journal of ePortfolio, 1(1), 49-60.

Johnson, R.B., and Onwuegbuzie, A.J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educ Researcher, 33 (7). The H.W. Wilson Company.

Jung, C.G. ([1921] 1971). *Psychological Types*, Collected Works, Volume 6, Princeton, N.J.: Princeton University Press.

Katz, D. 1960. The functional approach to the study of attitudes. Public Opinion Quarterly, 24, 163-204.

Kenney, K. (2008). Visual communication research designs. Routledge, New York, NY.

Kellner, D., & Share, J. (2005). Toward critical media literacy: Core concepts, debates, organizations and policy. Discourse: Studies in the Cultural Politics of Education, 26 (3), 369–386.

Knapp. L. (2006). “An Investigation into Visual Design in the Development of Educational Web-Based Projects. University of Wollangong. Retrieved from: http://www.library.uow.edu.au/adt-NWU/uploads/approved/adt NWU20060725.145249/public/02Whole.pdf

Lyles-Folkman, K. (2013). Pinterest: Visual Thinking, Visual Learning, Visual Literacy. http://pinterest.com/klylesfolkman/ and

Lyles-Folkman, K. (2013). Scoop.it: Visual Thinking, Visual Learning, Visual Literacy. http://www.scoop.it/t/visual-thinking-visual-learning-visual-literacy

MacArthur Foundation (2011). Digital Media & Learning Competition Provides $2 Million for Innovations in Digital Badges: MacArthur Foundation, September 15, 2011.Retrieved online at: www.digitallearning.macfound.org/

Metros, S., and Woolsey, K. (2006). Visual Literacy: An Institutional Imperative Educause Review, 41(3) : May/June. Retrieved from: http://www.educause.edu/ero/article/visual-literacy-institutional-imperative

McKinney, M. (1998). Preservice teachers' electronic portfolios: Integrating technology, self-assessment, and reflection. Teacher Education Quarterly, 25, 85-103.

Merriam, S. (1998). Qualitative research and case study applications in education. San Francisco: Jossey-Bass.

Mishra, & Koehler (2006). The Technological Pedagogical Content Knowledge framework , ISTE (International Society for Technology in Education). Journal of Research on Technology in Education, 43(4), 283.

Moore, D. M., & Dwyer, F.M. (1994). Visual literacy: A spectrum of visual learning. Englewood Cliffs, NJ: Educational Technology.

Murray C (2006) Is Anybody Out There?. Exploring User Engagement in the eportfolio Process, conference paper. Oxford.

Murray C & Smith A. (2006) From application to graduation and beyond: Exploring user engagement with e-portfolios and the e-advantage. Published Dissertation. Retrieved from: http://www.eurodl.org/?p=archives&year=2007&halfyear=1&article=255#DFES_(2005)_e-Strategy

National Council of Teachers of English, NCTE. (2007)Electronic Portfolios: Principles and Practices. Conference on College Composition and Communication (CCCC). Sept. 07. Retrieved from: http://www.ncte.org/cccc/resources/positions

New Media Consortium (2005). A Global Imperative: The Report of the 21st Century Literacy Summit.

North Carolina Department of Public Instruction. (2013). The Teacher Education Handbook: A Handbook for all teacher education majors at North Carolina Wesleyan College, (p.9).

Parkes, K. A., & Kajder, S. (2010). Eliciting and assessing reflective practice: A case study in Web 2.0 technologies. International Journal of Teaching and Learning in Higher Education, 22(2), 218-228.

Peck, Roxy et al. (2012). Introduction to Statistics and Data Analysis. Brooks/Cole Publishing, 4th ed., Portland, OR.

Pavio, A. (1971). Imagery and verbal processes. New York. NY: Holt, Rinehart, and Winston.

Pavio, A. (1978). On exploring visual knowledge. In B. S. Randhawa & W. E. Coffman (Eds.), Visual learning, thinking, and communication (pp.113-131). New York: Academic.

Pfeffer, J., & Salancik, G. 1978. The external control of organizations. New York, NY:Harper and Row.

Pinnegar, S., & Daynes, J. (2006). Locating narrative inquiry historically: Thematics in the turn to narrative. In Clandinin, J. (Ed.), Handbook of narrative inquiry: Thousands Oaks, CA: Sage.

Plaisir, J. Y., Hachey, A. C., & Theilheimer, R. (2011). Their portfolios, our role: Examining a community college teacher education digital portfolio program from the students' perspective. Journal of Early Childhood Teacher Education, 32(2), 159-175.

Posner, G. J. (2005). Field experiences: A guide to reflective teaching. (6th edition). NY: Allyn and Bacon.

Randhawa, B. S. (1978). Visual trinity: An overview. In B. S. Randhawa & W. E.Coffman (Eds.), Visual learning, thinking, and communication (pp. 191-211). New York: Academic.

Rhine, R. J. 1958. A concept-formation approach to attitude acquisition. Psychological Review, 65: 362-370.

Rogers, C. (2007). Teachers College Record, Review: John Dewey and Our Educational Prospect: A Critical Engagement with Dewey's Democracy and Education May 17, 2007. Retrieved from http://www.tcrecord.org

Rohde, M., (2012). Sketchnote Handbook, The: the illustrated guide to visual note taking. Sanfrancisco, CA: Pearson Peachpit Press.

Salancik, G., & Pfeffer, J. (1977) An examination of need-satisfaction models of job attitudes. Administrative Science Quarterly, 22, 427-456.

Salancik, G., & Pfeffer, J. (1978) A social information processing approach to job attitudes and task and task design. Administrative Science Quarterly, 23, 224-253.

Salpeter, J. (2005). Telling tales with technology. Technology and Learning,25(7), 18-24.

Sarnoff, I. 1960. Psychoanalytic theory and social attitudes. Public Opinion Quarterly, 24(2): 251-279.

Sketchnote Army (2012). The Worldwide community of sketchnotes. Retrieved from: (http://sketchnotearmy.com)

Sherin, M.G., & van ES, E.A. (2005) Using video to support teachers' ability to notice classroom interactions. Journal of Technology and Teacher Education 13(3), 475-491.

Shields, M. (2013). Publisher's are in love with this new photo platform. Adweek. 3/2413. Retrieved from: http://www.adweek.com/news/technology/publishers-are-love-new-photo-platform-148129

Shrock, K. (2010). Kathy Shrock's guide to everything Infographics: Review of the video Infographics as creative assessment. Retrieved from: http://vimeo.com/kathyschrock/infographicspromo http://www.schrockguide.net/infographics-as-an-assessment.html

Smolin, L.I. & Lawless, K.A. (2003). Becoming literate in the technological age: New responsibilities and tools for teachers. The Reading Teacher 56(6), 570-577.

Soho (2010). The role of thinking and writing the news story. English Journal, 99(4), p30-36.

Strudler, N., & Wetzel, K. (2005). The diffusion of electronic portfolios in teacher education: Issues of initiation and implementation. Journal of Research on Technology in Education, 37(4), 411-433.

Swan, C. (1991). Language and Typography. London: Lund Humpheries.

The Institute for the Future for University of Phoenix Research Institute (2011). 2020: Visual Literacy Skills Required. Retrieved from http://bit.ly/2020skills

The Visible Knowledge Project (2005) Contributed by Coventry, M. Georgetown University, Posted online at: http://www.indiana.edu/~histsotl/blog/scholarship/projects/

Thompson, C. (2010). Power of visual thinking, Wired Magazine. Retrieved from http://www.wired.com/magazine/2010/09/st_thompson_visual/

Thurstone, L. L. 1931. The measurement of social attitudes. Journal of Abnormal and Social Psychology, 26(3): 249-269.

Tosh D, Light T.P, Fleming K, Haywood J (2005) Engagement with Electronic Portfolios: Challenges from the Student Perspective. Canadian Journal of Learning and Technology, 31 (3).

Tufte, Edward (1997). Visual Explanations: Images and Quantities, Evidence and Narrative. Chelshire, CT. Graphics.

Tufte, Edward (1990). Envisioning Information. Chelshire, CT. Graphics. Underwood, J., & Underwood, G. (1990). Computers and learning: Helping children acquire thinking skills. Oxford, United Kingdom: Blackwell.

Villano, M. (2006). “Electronic Student Assessment: The Power of the Portfolio,” Campus Technology, 8/29/2006. Retrieved from: http://www.campustechnology/article.aspx?aid=41130

Villano, M. (2006). Eportfolios: Hi Octane Assessment. Campus Technology.8/16/05. Retrieved from: http://campustechnology.com/articles/40445_3/

Voss, J. (2010). Darwin's Pictures: Views of Evolutionary Theory, 1837-1874. New Haven, CT: Yale University Press.

Vygotsky, L.S. (1978). Mind in Society: The Development of Higher PsychologicalProcesses. Cambridge, MA: Harvard University Press.

Wilde, J. & Wilde, R. (2000). Visual Literacy: A Conceptual Approach to Graphic Problem Solving. Watson-Guptill Publications, New York: NY.

Wursta, M., Brown-DuPaul, J., & Segatti, L. (2004). Teacher education: Linking theory to practice through digital technology. Community College Journal of Research and Practice, 28, 787-794.

Yancey, K.B. (2009). Peer review. Electronic portfolios: A decade into the twenty-first century: what we know, what we need to know. A Publication of The Association of American Colleges and Universities. 1(11).

Yancy, K. B. (2009). Reflection and electronic portfolios: Inventing the self and reinventing the university. In D. Cambridge, B. Cambridge, & K. Yancey (Eds.), Electronic portfolios 2.0 (pp. 5-16). Sterling, VA: Stylus Publishing, LLC.

Yancy, K. (2007). Best Practices on e-portfolios: Conference on College Composition. Retrieved from: http://insidehighered.com/news/2007/03/26/portfolio

Appendixes

Appendix A

E-Portfolio Technology Providers

E-portfolio Technology Providers

The following listing includes brief notes on companies providing electronic portfolio platforms, support services for open source platforms, or learner-oriented management tools that help users develop artifacts for their ePortfolios. This is not a review but a compilation of information noted from interviews and research; the claims made in each case come from the company and not from the author. All companies included in the listing below were interviewed based on 20 standard questions asked of each interviewee. Company contact info where provided is for convenience.

FolioTek, Columbia, Missouri, ePortfolio launch in 2001. Sells in U.S. with interest in expanding globally. Provides weekly upgrades. Pearson serves as a FolioTek reseller. Can keep account after graduation. Has an iPhone app. Contact Rita Wheeler, rita@foliotek.com; 888-365-4639 X 308.

Distinguishing value: Easy entry point. Start with "presentation" module and then easily "graduate" to other modules.

Livetext, LaGrange, IL, founded in 1998. New product: Field Experience Module. Smart phone app: iPad, iPhone, Android. Mostly U.S., but expanding in South America and the Middle East. Easy tie-in to accreditation agencies and their standards. Individual accounts. New release start of 2012. Started in K-12, moved focus to higher education, now exploring K-12 once again, starting with teacher education. Contact Katie Kalmus,

Distinguishing value: Robust outcomes assessment, does reporting, "fewest clicks to get started." Measures learner growth. User-friendly interface.

RCampus, produced by Reazon Systems, Santa Ana, CA. Software development started in 1999, incorporated in 2003. RCampus has modules that can be turned on or off: RCampus LMS, RCampus Eportfolios, iRubric, RCampus Outcomes, RCampus eCommunities. Region: North America. Individual accounts available. In addition to education: corporate training and compliance. iRubric is licensed to Sakai as a plug-in; RCampus licenses TurnItIn. RCampus emphasizes authentic assessment; encourages creativity; higher ed and K-12 about 50-50. Subscription model. Partners with Google Apps. iPhone app in development; has metadata scheme for artifact management. Contact Katie Rossomano at (949) 222-2266

Distinguishing value: Company run by academics, software determined by feedback from educators, colleagues, and students. Software allows for authoring within the system itself; produces accreditation reports; provides K-12 standards.

Desire2Learn, Kitchener, Ontario also Baltimore, MD, with offices around the world, founded in 1999. Sells worldwide, latest release for the electronic portfolio (ver. 3.5) was in August 2011. Electronic portfolio and the D2L LMS are bundled; each leverages functionalities from the other. ePortfolio moving to hosting service and individual accounts soon. Smart phone app: Blackberry, iPhone, Android. Contact info at http://www.desire2learn.com/contact/.

Distinguishing value: Provides both LMS and ePortfolio within one platform and the two "projects" share functionalities. System itself can serve as a multimedia file generator (audio now; video later). Active user group.

Digication, Providence, RI and Palo Alto, CA, founded 2002. Is in partnership with Google Apps. Individual accounts; institution keeps assessment data; individual keeps ePortfolio functionality. Through Google Apps: free digital accounts with Digication (no assessment management functions with these accounts). "Three or four clicks and Digication is enabled." Almost daily updates. Smart phone app: IOS and Android. Contact jyan@digication.com.

Distinguishing value>: Ease of use and flexibility. Expressive and free-form but "mapped" to meet accreditation needs. "Do what you want," but you will also end up with a data structure.

Learning Objects, producers of Campus Pack, in Washington, DC, with employees around the world, founded in 2003. Markets internationally, around 400 institutions around the world; strong use in the U.K. In Campus Pack: portfolio and PDP (personal development plan); allows use of social media apps; has Social Assignments and Activities module to incorporate these apps; Social Network and Academic Commons module networks institution; cross-department collaboration using social media; creates co- and non-curricular community. Used in corporate, government, and non-profit sectors. Individual accounts: basic functionality now, more later. Contact 202-265-3276 or info@learningobjects.com.

Distinguishing value: Student engagement out of classroom, social media incorporation; institution can decide how "open" Campus Pack modules are. Integrated with Pearson Learning Studio; complies with IMS standards. Learner focused; assessment is the persona created in Campus Pack. Seeking to make true Web 2.0 portfolio.

TaskStream, New York City, organized 1998, founded 2000, markets internationally, versions available in a variety of languages. Offers separate platforms, AMS (Accountability Management System) and LAT (Learning Achievement Tools); each is multi-component. TaskStream collaborates with institutions to develop their new processes: "vendors must partner with institutions." Use in corporate sector, training and HR purposes (performance assessment). Configure software for customer; claims "largest provider" of this kind of software. Offers individual subscriptions. Smart phone app, and iPad. Contact

learnmore@taskstream.com or 800-311-5656.

Distinguishing value: Through ongoing collaboration with customers, ensures their success; with institutions, work with understanding of vision, roles, experience, and data types. Focus on whole context but also the group level. Collaboration built into software. They continue as partners over time.

Longsight, based in Ohio with offices in NY, IN, OH, WI, and CA, founded in 1978, a service provider for open source solutions. Supports both the Open Source Portfolio (OSP) and Sakai, within which OSP is embedded.. Customizes Sakai for each customer, using the community release version, meaning that customers always have the latest version. For the moment the version is Sakai 2.8 (a new release is in beta right now). Other Sakai service-providers: Three Canoes, rSmart. Contact Scott Siddall at siddall@longsight.com or 866-224-5751, ext. 801.

Distinguishing value: Open source is free code only, not free support. Most institutions need help deploying Sakai and Longsight has a well-established reputation for strong support in customizing Sakai for each customer. Has an MOU with Three Canoes, another Sakai service provider.

Chalk & Wire, Ridgeway, Ontario, Canada; all employees are educators; formed in 1995. Once user has an account through an institution, can continue subscription. Does not sell directly to the public, however. Market in U.S. primarily but also in Australia and New Zealand, in higher education and to organizations. One product that is "multi-variant." IOS and Android mobile apps. Contact ask@chalkandwire.com or 1-877-252-2201.

Distinguishing value: Flexibility and ease of use. Training is minimal. Keeps learner at the center but can also produce reports for accreditation review. They limit number of new clients to 15 per year to maintain the level of service they are known for.

NobleHour, produced by TreeTop Software, in Lakeland, FL, founded in 2011 (preceded by SweatMonkey), not an ePortfolio provider, but NobleHour supports community-based learning, helping students engage in "folio thinking" (cf. Helen Chen of Stanford), active, self-initiated, independent learning that results in authentic (real-world) experience. Contact info@noblehour.com; beta release of NobleHour this month (current users of SweatMonkey will be migrated to NobleHour). Web-based; sold to institutions for student use, both K-12 and higher education.

Distinguishing value: So much of education software has been institutionally-centered; NobleHour is student-centered. Though NobleHour is purchased by the organization, the intended user is the student. NobleHour helps students engage in what George Kuh at IUPUI has called "high-impact educational practices" shown to have a high impact across all segments of education (http://www.aacu.org/leap/hip.cfm).

Sherston, Tag Developments, the assessment division of Sherston Software, Ltd., providers of Red Pen Tool: http://www.maps-ict.com/redpentool.mov, of LiveAssess: http://www.maps-

ict.com/liveassess.mov, and of MAPS 3: http://www.maps-ict.com/maps3.mov. Located in Lambeth, London, U.K., with an office in the U.S. Red Pen, an online annotation tool, and LiveAssess, a student project support system resulting in a storyboard record of the project are incorporated into MAPS 3 but can be purchased separately. Contact support@mapseportfolio.com.

Distinguishing value: The three Tag tools provide unusual and valuable additional functionality for portfolio activities. Short videos available for more information. Some development for Tag in collaboration with Goldsmiths University in London.

PebblePad from PebbleLearning, in Telford, UK, with office in Australia, founded in 2003. Most popular ePortfolio in the U.K. and Australia, interest in expanding geographically, new version in spring designed for U.S. market. Individual accounts; often used by educators themselves; emphasis on personal ownership--software requires user to agree to personal data being used in institutional reports; iPhone app. Published book called *Pebblegogy: ideas and activities to inspire and engage learners*, 2011. Digital version on Amazon. Contact enquiries@pebblelearning.co.uk. [note spelling of "enquiries"].

Distinguishing Value: Users work with PebblePad to author artifacts instead of creating artifacts with other programs and uploading to PebblePad. Personal space is private: no "sense of surveillance." The separate gateway allows the user to share artifacts and make them available for assessment and aggregate reporting. Emphasis is on good learning design.

Symplicity, in Arlington, VA, offers an electronic portfolio (http://www.symplicity.com/reflection) but it is only one among dozens of products that Symplicity offers--all of them are management tools for higher education (see http://www.symplicity.com/products). Good example of separating products to support a single function.

Blackboard, the major LMS player in the world, has gathered 3 or more ePortfolio systems through acquisitions and its own development. In interviews with representatives from Blackboard Learn, I could not be certain about how Blackboard figures or will figure in the ePortfolio world. Blackboard now offers the Blackboard Content System for ePortfolio functionality.

eFolioWorld, technology from Avenet, the Minnesota Colleges and Universities portfolio system, is now extended to the University of Minnesota system as well. Developed in 2001, serves both institutional assessment management and individual student ePortfolios; Avenet Web Services now providing business services for eFolioWorld; SaaS. Contact efolioinfo@avenet.net, in Minneapolis.

iWebFolio, from Nuventive. Also known for TracDat, marketed since the 1990s, Nuventive founded 2000. Headquartered in Pittsburgh, sales office in CA; most clients in the U.S. or primarily in the U.S. iWebFolio can be customized, includes templates and AAC&U VALUE rubrics, a library of donated materials from the community. Student ownership of portfolio, has user conference each June, new

release out soon; Web-based. Can continue account after graduation; individual accounts; at some institutions, students buy their own iWebFolio accounts; does have institutional reporting capability. Contact Courtney Francis at cfrancis@nuventive.com.

Distinguishing value: Student can see who looks at submitted evidence, has an array of management tools for student; strong community; student-centered.

Adobe, San Jose, CA, with offices throughout the world, began as PostScript in 1982 but now has large array of well-known products. Sells to all market segments including K-12 (primary and secondary) and higher education. Included in this list because Adobe apps can and do author portfolio artifacts, the artifacts can be organized using Adobe's proprietary metadata set, can create files in U.S. government and universally recognized standard file types, can produce publication-quality artifacts, and because Adobe has shown interest in electronic portfolios. Some applications are moving to SaaS (see Acrobat.com).

Distinguishing value: As the market for electronic portfolios expands, and expectations for quality and standards-based digital publishing increase, Adobe is able to provide the tools to meet those expectations. Adobe Acrobat (and the PDF file format it creates), Photoshop, Creative Suite, Flash Player, AIR, Shockwave, Digital Publishing Suite and more, used on behalf of building high-quality personal portfolios may be the future of the electronic portfolio market sector. All file types can be embedded in a PDF document: The significance of that should be apparent to all who are interested in electronic portfolios.

Epsilen, The Epsilen Environment, majority owned by the New York Times; SunGuard is re-seller and technical partner; located in Indianapolis with users in 130 countries (an "Epsilen global network"), free accounts to individuals, but a fee charged for institutions; heavy focus on community. Epsilen designed to teach; has links within it; is an enabled learning environment; K-12, higher education, corporate sector. IOS, Adroid apps; iPad soon.

Distinguishing value: Access to New York Times Knowledge Network, moving toward functionality to help students find and manage internship experiences; incorporating Web 2.0 tools, goal is to become a cultural tool. Can serve LMS needs.

Mahara, claimed by some to be the world's fastest-growing electronic portfolio system, is open source and easily used in conjunction with Moodle (both created in New Zealand). Support companies: Synergy: http://www.synergy-learning.com/mahara/mahara_support.php--U.K.; Lambda Solutions: http://www.lambdasolutions.net/mahar-support--Canada; Remote Learning: http://www.remote-learner.net/mahara_story--U.S.

eLumen, an assessment enterprise system for outcomes-based learning. An example of how assessment,

unbundled from ePortfolio, can evolve into a platform for new forms of learning. Located in Minneapolis. Founded in 2003, arising from the portfolio "breadbasket," Minnesota and the Minnesota State Colleges and Universities system (MnSCU), provides platform for institutions to install that "talks to" any or all core enterprise management systems; a new approach to outcomes-based assessment carrying the idea to the logical next step; 30 institutional clients; can generate grades based on meeting outcomes; an alternative to course structure. Assessment can be based on evidence in ePortfolios. Contact info@eLumen.info.

Distinguishing value: Designed to incorporate the future, to support either assessment as-is, or as it could be in an outcomes-and-evidence-based learning design; and/or, the university or college as is, or how it could be.

Fri, Dec 2, 2011 Jay Sprout elearningthatsucks.com

It's encouraging to see e-Portfolios becoming what I've considered "real" portfolios to be as a writer and graphic designer - a showcase for your work and abilities. Your post inspired me to write my own. http://elearningthatsucks.com/2011/12/02/e-portfolios-that-suck-too-much-resume-and-not-enough-recipe/

Thu, Oct 20, 2011 Joe Scudder Illinois

I think portfolios are so 10-years ago. I began teaching a portfolio course in 1994 when I taught at Indiana University at Bloomington. I have personally supervised about 1000 undergraduate student portfolios since that first course. After about 10 years of supervising a portfolio course where students had a mandatory capstone experience (there were other options beyond portfolios), we are moving away from them. Although I have many students who credit their portfolios as instrumental in getting a job offer, I would say 25% of students did the portfolio simply to fulfill their graduation requirements. Many unclaimed print and electronic portfolios sit in my office as evidence of this. Here is what I have learned. First, making portfolios mandatory creates a demand characteristic to produce an artifact that may or may not be genuine. Two of my relatives who attended Wisconsin universities with portfolio requirements have related that they sometimes created essays because they were forced to write about their formative experiences when in reality, they did not have any true feelings about the topic. So, mandatory portfolios can produce meaningless artifacts. Second, some of these portfolio companies are expensive services that students cannot easily continue to develop as a lifetime portfolio project at a reasonable cost. Many students lose access to their portfolios a few months after graduation. Third, many students are never taught to create portfolios that are organized by their strongest competencies or qualities. I have seen portfolios from other departments on my own campus that are little more than a collection of writing samples organized by rigid templates (cookie-cutter approach). Finally, few portfolio companies provide students with multiple formats for their work. Many values still exist for bringing a print portfolio in a nice-looking portfolio case to an interview. Sending through mail a self-running DVD portfolio can also be a great thing that is doable for $1-$2 per job application. Online portfolios can be great, but slowness of the Internet in prime

work hours can slow media presentations to a crawl. As a person who has done this for over 15 years, it is my opinion that much of the portfolio buzz is created by profit motives or persons who have vested interests in assessment for institutional purposes rather than true improvement of the educational experience. I still believe in the power of portfolios when they are an informed choice that can be updated as a flexible vehicle for frequent job changes in a market where lifetime employment at one institution is unlikely.

Mon, Oct 17, 2011 Emilie Udell US

Learning Objects' Campus Pack is actually LMS-neutral and has a strong integration with all major learning management systems including Blackboard Learn, CE/Vista, Moodle, Pearson Learning Studio, Desire2Learn, Sakai, and more. www.learningobjects.com

Sun, Oct 16, 2011 Lori Hager University of Oregon

I concur with Helen B's comment. We are using wordpress at the UO for learning eportfolios - and in this instance, it works well because it is student and instructional driven - rather than assessment-driven. WP has solved many of the concerns institutions have related to privacy when using an open source social media platform. One of the most interesting findings about student and faculty usage is that this platform fosters application and transference to professional domains, and "real world"applications. So, we see students employing both the technology and the process in their professional work and in connecting curricular and co-curricular learning - something that can be difficult to capture.

Sun, Oct 16, 2011 Helen Barrett United States

You reviewed the commercial and open source market here. However, in my experience, the largest growing category of student-centered ePortfolio tools are so-called Web 2.0 tools: blogs (such as WordPress and Blogger), wikis (such as Wikispaces and Google Sites), and web site authoring tools (such as Weebly and Yola). Next month, Seattle Pacific University will receive one of four 2011 Sloan-C Effective Practice Awards for its use of Wordpress.com as bPortfolios: Blogging for Reflective Practice --http://bit.ly/pamT5d Worthy of special mention is the GoogleApps Education ecosystem, providing a variety of tools for authoring, storage and data transferability. When looking at portfolios across the lifespan, it is important that portfolio data not be locked into silos, but exportable into open formats. I have also spoken about how the boundaries are blurring between social networking and ePortfolio development. The new Facebook Timeline is an interesting platform for lifelong and life-wide learning, reflection, storytelling, & meaning-making. As asked in a comment on my blog, "How will those of us using ePortfolios in higher education compete with a social network that already dominates (and in some cases defines) our students' lives?" http://blog.helenbarrett.org/

Fri, Oct 14, 2011 Trent Batson North Kingstown, RI, U.S.

Good question about why include Adobe in this article. Here's one reason: PDF is one of the few file formats officially classified as a standard file format by the US Govt. This is important because persistence of evidence and being able to access evidence is important for those use portfolios in their careers and over a lifetime. You can also embed any other kind of multi-media file in a PFD file -- audio, video, text, etc. Secondly, to create a really rich portfolio, Adobe tools are among the best. One can create portfolios with applications other than an eportfolio platform. Cheers Trent (and, hi, Ray and Marij)

Thu, Oct 13, 2011 Ian Knox Australia

We are now in our third year providing a free global ePortfolio hosting service, foliospaces.com, built on Mahara. Whilst I agree with Andrew that we have not seen much widespread use of ePortfolios in Higher Education yet, there is a definite trend that it is changing rapidly. Our user base has increased 300% this year, and we now have users in virtually every country in the world. I would suggest that early adopter teachers, those at the cutting edge, are already using ePortfolios with great success in their classes. The platform doesn't really matter, the pedagogy does. Whether students are showcasing achievement, reflecting on practice, or developing course resources, there is a useful role for ePortfolios. This semester I have trialled an open Social Media Marketing course, using a combination of Google+, Twitter, FolioSpaces, Moodle and Facebook. Sounds chaotic, but it is the most exciting (and best received) course I have ever convened. Student reflection, collaboration, contribution and the ability to include outside experts has contributed to a great learning experience for all of us. As we move beyond the lecture theatre, ePortfolios will become an integral part of the lifelong learning journey.

Thu, Oct 13, 2011 DT US

Also Check out 'CourseDirector' for ePortfolios if you are using Google Apps it has strong integration. In the Google Apps Marketplace.

Thu, Oct 13, 2011 Marij Veugelers Netherlands

I miss in this overview the Sakai portfolio tool (or OSPI in the past). This tool is widely in use in the US and also used in the NL. Further on is in the NL Blackboard and also Sharepoint eportfolio in use by many universities of applied sciences. I agree with Andrew from Australia that many of these tools not known are in the NL.

Thu, Oct 13, 2011 Ray Tolley UK

PS. Here in the UK I am able to supply a local version of eFolioWorld, hosted externally, and thus completely portable as not embedded within an institution. Also, can be scaffolded to individual institution/organisation requirements. BW Ray T

Thu, Oct 13, 2011 Ray Tolley UK

Strange? Great minds think alike? In mid 2007 I drafted a paper "Who is Hijacking our ePortfolios?" in which I argued that there was no one definitive way of using an ePortfolio. See:
http://issuu.com/efoliouk/docs/who_is_hijacking_our_e-portfolios

Wed, Oct 12, 2011 Andrew Sydney

Guide appreciated as I had not heard of most of these however just a note that Moodle was created in Australia... Also how on earth is Adobe PDF related to portfolios? To be honest I haven't seen much widespread use of portfolios in higher education.

Appendix B

Schmidt et al. (2009) Permission to Adapt Survey

Kimberly,

You can use the TPACK survey, as outlined in the link I sent you previously. All you have to do is send an email to Dr. Crawford indicating how you will use it so that she can track how it's being used by various parties. You have done that.

Use the TPACK survey in peace.

Usage Terms: Researchers are free to use the TPACK survey, provided they contact Dr. Denise Schmidt (dschmidt@iastate.edu) with a description of their intended usage (research questions, population, etc.), and the site locations for their research. The goal is to maintain a database of how the survey is being used, and keep track of any translations of the survey that exist.

Sincerely,

_____

Dr. Matthew J. Koehler
Professor
Michigan State University
Ph: 517.353.9287 Fx: 517.353.6393
Web: http://mkoehler.educ.msu.edu

From: Evrim Baran <ebaran@metu.edu.tr>
To: Kimberley Lyles <lylesink@yahoo.com>
Sent: Tuesday, February 12, 2013 2:37 AM
Subject: Re: Permission Request to adopt the TPACK Survey Instrument

Dear Kimberly,

I am glad that you are planning to use the survey in your research context. I give the permission. Please also inform us about the progress of your research. I will be happy to read the outcome of your study.

Good luck with the dissertation,

Best,

Evrim

----- Forwarded Message -----
From: Kimberley Lyles <lylesink@yahoo.com>
To: "dschmidt@iastate.edu" <dschmidt@iastate.edu>
Cc: Pittman Joyce <jap386@drexel.edu>
Sent: Friday, January 25, 2013 9:35 PM
Subject: Permission Request to Use Study

January 25, 2013

Dear Denise A. Schmidt:

My name is Kimberley Lyles-Folkman and I am doctoral student at Drexel University in the Educational Leadership and Learning Technologies program. I am currently preparing to conduct dissertation research and my topic is: Examining Perceptions of Preservice Teachers' Communicating with Visual Imagery in ePortfolios for Reflective Practice. The research location will be at Georgia State University (GSU); it will include a small population of 50 participants; and the central research questions are: (1) What are the most important perceptions of teachers' that influence their use of visual imagery in eportfolios for reflective practice? (2) How do teachers describe how visual imagery supports or constrains reflective practice?

It is my intention to use the survey instrument: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April). The intent of this letter is to request permission to use this instrument to gather data for my dissertation. Please feel free to contact me or my Chair, Dr. Joyce Pittman at: (jap386@drexel.edu).

I would appreciate your consideration and response.

Sincerely,

K. Lyles-Folkman

Kimberley Lyles-Folkman
5850 Heritage Lane
Smoke Rise, GA 30087
404-668-7051

Appendix C

Villano, M. (2006). Electronic Student Assessment: The Power of the Portfolio

	20 SMART TIPS AND PRACTICES
1	The ePortfolio technology can be the architecture of the major itself, acting as the mechanism by which curricular objectives are supported and measured.
2	Collectively, ePortfolios can be mined to get a sense of overall program quality.
3	ePortfolios have become source material by which to gauge the value of the faculty-student interaction.
4	ePortfolios can boost students' ability to integrate learning and to make connections..
5	ePortfolios can help administrators/faculty evaluate the institution's capacity to deliver on curricular promises.
6	In order for ePortfolio efforts to succeed, schools must document the impact of the technology on students, faculty, and the institution.
7	Most ePortfolio efforts fall into three main categories: developmental, reflective, and representational.
8	The three main flavors of ePortfolio (above) may be mixed to achieve different learning, personal, or work-related outcomes.
9	At some schools, students can use the ePortfolio system to access personalized academic information and reports on academic history, take placement tests, and check on their placement recommendations.
10	ePortfolios offer better ways to collaborate on development of standards, criteria, and measurement.
11	Consider adopting ePortfolios gradually, in a handful of departments.
12	ePortfolios can allow students to participate in the campus housing lottery and submit evaluations of their resident advisers.
13	Students can customize their ePortfolios by adding RSS feeds of their interests from the web.
14	ePortfolios can be programmed to let students interface with the school's content management system.
15	Watch unchecked growth in ePortfolios: Adding applications can clutter ePortfolio systems, and organizing the apps after the fact can be challenging.
16	Some schools integrate ordinary ePortfolio sharing and assessment features with tools for community interaction such as asynchronous discussion. Individuals with common interests in particular areas can find each other and build connections across disciplines and groups.
17	Don't think only of institutional constituents creating ePortfolios: Each virtual community can have its own portfolio, welcoming newcomers into the fold.
18	Why not incorporate your students' learning records as a standalone application your own faculty—and educators at other schools—can download for free and use at their convenience?
19	Why not use ePortfolios to evaluate student thinking on new ePortfolio-based (or other) curricula or courses your institution has debuted?
20	Think careers: ePortfolios are effectively used to help students articulate their own values and then relate them to career goals.

Appendix D

Preservice Teachers' Perception of Communicating with Visual Imagery in ePortfolios for Reflective Practice Survey. Adapted survey instrument: Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt, D., Baran, E., Thompson, A., Koehler, M.J., Shin, T, & Mishra, P., 2009, April).

Preservice Teachers' Perception of Communicating With Visual Imagery in E-portfolios For Reflective Practice Survey

Volunteer Consent to Take Part in a Study and Survey Document

Dear Student,

Currently, I am a doctoral student at Drexel University and I am enrolled in the Educational Leadership and Learning Technologies program. I am conducting a study and you are cordially invited to participate as a volunteer research participant in this research study. The project title is: Preservice Teachers' Perception of Communicating with Visual imagery in E-portfolios for Reflective Practice. The survey will follow this volunteer consent letter. Your participation is being requested because you are a student enrolled in the Teacher Education program offered at Georgia State University. If you participate in this research, there are three volunteer phase options. Phase one of this study will have you participating in an online survey following this invitation. The participant at the end of the online survey is given the choice to end their participation with the study or continue on to Phase two of the study. If the participant decides to continue participating in Phase two of the study, they will participate in a semi-structured interview that will occur this semester and be administered via phone. Phase three of this study is to review artifacts in the form of your personal eportfolio. If you decide to make your eportfolio available for review as part of this study, please forward a link to your eportfolio at kbl22@drexel.edu and label subject line as GSU eportfolio. Since this study exclusively examines preservice teachers, this study uses the following fixed criteria to define preservice teachers as research participants in this study:

a) 18 years of age or older
b) Enrolled as a current full-time student in the Teacher Education program at Georgia State University
c) A preservice teacher that has completed eportfolio reflections

Your participation will take approximately 10 minutes for the online survey and 20 minutes for the telephone interview. Participation in this research is strictly voluntary. Your individual name or identification number will not at any time be associated with your responses. Your responses will be kept completely confidential and will not influence your course grades. We expect a total of 50 people that will be in this research study taking place here and nationally. There is no cost to you for participating in this study. Participation in this study should pose no risk. This study will be used to learn more about preservice teachers' perceptions when using visual imagery for reflective purposes in eportfolios.

This research has been reviewed and approved by an Institutional Review Board. You may talk to them at (215) 255-7857 or email HRPP@drexel.edu for any of the following:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research subject.
- You want to get information or provide input about this research.

I appreciate your help. Thank you for your time.

Best Regards,

Kimberley Lyles-Folkman
Doctoral student, Drexel University
kbl22@drexel.edu

Dr. Joyce Pittman,
Principal Investigator and Committee Chair
Drexel University
jap386@drexel.edu

You are agreeing to participate in the research study when you complete this survey.

Thank you for taking time to complete the following questionnaire. Please answer each question to the best of your knowledge. Your thoughtfulness and candid responses will

be greatly appreciated. Your individual name or identification number will not at any time be associated with your responses. Your responses will be kept completely confidential and will not influence your course grade.

Preservice Teachers' Perception of Communicating With Visual Imagery in E-portfolios For Reflective Practice Survey

DEMOGRAPHIC INFORMATION

Your GSU e-mail address

Gender

- Gender a. Female
- b. Male

Age range

- Age range a. 18-22
- b. 23-26
- c. 27-32
- d. 32+

Major

- a. Early Childhood Education (ECE)
- b. Elementary Education (ELED)
- c. Other

Area of Specialization

- a. Art
- b. Early Childhood Education Unified with Special Education
- c. English and Language Arts
- d. Foreign Language
- e. Health
- f. History
- g. Instructional Strategist: Mild/Moderate (K8) Endorsement

- h. Mathematics
- i. Music
- j. Science-Basic
- k. Social Studies
- l. Speech/Theater
- m. Other

Year in College

- a. Freshman
- b. Sophomore
- c. Junior
- d. Senior

Are you completing an educational computing minor?

- a. Yes
- b. No

Are you currently enrolled or have you completed a practicum experience in a PreK-6 classroom?

- a. Yes
- b. No

What semester and year (e.g. Spring 2013) do you plan to take Clinical Practice? If you are currently enrolled in or have already taken please list semester and year completed

What semester and year (e.g. Spring 2013) do you plan to take Clinical Practice? If you are currently enrolled in or have already taken please list semester and year completed

Preservice Teachers' Perception of Communicating With Visual Imagery in E-portfolios For Reflective Practice Survey

Visual imagery is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, visual imagery is referring to the use of visuals or visual tools to communicate: digital images, photographs, illustrations, renderings, maps, diagrams, graphics, infographics, animations, sketchnotes, graphic recordings, videos, and social media; it refers to visual thinking and learning to communicate information.

Please answer all of the questions and if you are uncertain of or neutral about your response you may always select "Neither Agree or Disagree"

TK (Technology Knowledge)

Q 1. I know how to solve my own visual imagery/visual tools problems.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 2. I can learn visual imagery/visual tools easily.

- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 3. I keep up with important visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 4. I frequently play around the visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 5. I know about a lot of different visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 6. I have the technical skills I need to use visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

CK (Content Knowledge) Mathematics

Q 7. I have sufficient knowledge about mathematics.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 8. I can use a mathematical way of thinking.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 9. I have various ways and strategies of developing my understanding of mathematics.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Social Studies

Q 10. I have sufficient knowledge about social studies.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 11. I can use a historical way of thinking.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 12. I have various ways and strategies of developing my understanding of social studies.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Science

Q 13. I have sufficient knowledge about science.

- Strongly Disagree
- Agree Strongly

- Disagree
- Agree
- Neither Agree or Disagree

Q 14. I can use a scientific way of thinking.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Q 15. I have various ways and strategies of developing my understanding of science.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Literacy

Q 16. I have sufficient knowledge about visual imagery/visual tools.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Q 17. I can use a visual way of thinking.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Q 18. I have various ways and strategies of developing my understanding of visual imagery/visual tools.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Q 19. I know how to assess visual imagery/visual tools in a classroom.

- Strongly Disagree
- Agree Strongly
- Disagree
- Agree
- Neither Agree or Disagree

Q 20. I can adapt personal use of visual imagery/visual tools based-upon what students currently understand or do not understand.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 21. I can adapt my visual thinking to different learners.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 22. I can assess visual imagery/visual tools in multiple ways.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 23. I can use a wide range of visual thinking approaches in a classroom setting.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 24. I am familiar with common student understandings and misconceptions regarding visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 25. I know how to organize and maintain visual imagery/visual tools.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

PCK (Pedagogical Content Knowledge)

Q 26. I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in mathematics.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 27. I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in literacy.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 28. I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in science.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 29. I can select effective teaching approaches regarding visual imagery/visual tools to guide student thinking and learning in social studies.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

TCK (Technological Content Knowledge)

Q 30. I know about visual imagery/visual tools that I can use for understanding and doing

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 31. I know about visual imagery/visual tools that I can use for understanding and doing literacy.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 32. I know about visual imagery/visual tools that I can use for understanding and doing science.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 33. I know about visual imagery/visual tools that I can use for understanding and doing social studies.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

TPK (Technological Pedagogical Knowledge)

Q 34. I can choose visual imagery/visual tools to enhance the teaching approaches for a lesson.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 35. I can choose visual imagery/visual tools to enhance students' learning for a lesson.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 36. My teacher education program has caused me to think more deeply about how visual imagery/visual tools could influence the teaching approaches I use in my classroom.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 37. I am thinking critically about how to visual imagery/visual tools s in my classroom.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 38. I can adapt the use of visual imagery/visual tools that I am learning about to different teaching activities.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 39. I can select visual imagery/visual tools to use in my classroom that enhances what I teach, how I teach and what students learn.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 40. I can use strategies that combine content, visual imagery/visual tools and teaching approaches that I learned about in my coursework in my classroom.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 41. I can provide leadership in helping others to coordinate the use of content, visual imagery/visual tools and teaching approaches at my school and/or district.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 42. I can choose visual imagery/visual tools that enhance the content for a lesson.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

TPACK (Technology Pedagogy and Content Knowledge)

Q 43. I can teach lessons that appropriately combine mathematics, visual imagery/visual tools and teaching approaches.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 44. I can teach lessons that appropriately combine literacy, visual imagery/visual tools and teaching approaches.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 45. I can teach lessons that appropriately combine science, visual imagery/visual tools and teaching approaches.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree
- Agree Strongly
- Agree

Q 46. I can teach lessons that appropriately combine social studies, visual imagery/visual tools and teaching approaches.

- Strongly Disagree
- Disagree
- Neither Agree or Disagree

Phase Two and Phase Three:

- I am willing to volunteer for a twenty (20) minute telephone interview only.
- I am willing to volunteer for a twenty (20) minute telephone interview (and) I will also volunteer to share my eportfolio for research purposes

My email address is

Appendix E

Preservice Teachers' Perceptions of Communicating with Visual Imagery in E-portfolios for Reflective Practice Post-Survey Interview Questions

Title: Preservice Teachers' Perception of Communicating with Visual Imagery in E-portfolios for Reflective Practice

Principal Investigator: Dr. Joyce Pittman
Co- Investigator: Kimberley Lyles-Folkman, Doctoral Student
Sponsor: Drexel University

Post-survey semi-structured interviews for the Preservice Teachers' Perceptions Interview will be selected from the participants who volunteer for the post-survey interviews by voluntarily providing their email address on the online survey. The interviews will be held by telephone and audio recorded. The volunteers will be informed that their interview will be audio recorded and it will be at their discretion. Full consent and ethical information is provided on the initial survey form.

The following questions will be asked:

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice?

2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice?

3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom?

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively?

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools?

6. Explain how you can adapt your visual thinking knowledge to different learners.

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students?

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration?

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice?

10. How would you describe reflective practice?

Appendix F

Letter of Permission from Participating University

DEPARTMENT OF MIDDLE-SECONDARY EDUCATION
AND INSTRUCTIONAL TECHNOLOGY

P.O. Box 3878
Atlanta, GA 30303-3978
Phone: 404/413-8060
Fax: 404/413-8063

18 February 2013

Ms. Kimberley Lyles-Folkman
Drexel University
kbl22@drexel.edu

Dear Ms. Lyles-Folkman,

On behalf of Georgia State University - College of Education, I will agree to support your request to collect data from students in initial teacher preparation programs in the Department of Middle-Secondary Education and Instructional Technology on the following terms:

- Participation by students from our department will be entirely voluntary.
- You will not contact any GSU students directly. Rather, you should write a letter that explains the nature of your study and includes all expectations that you have for any of our students who volunteer to participate. We will distribute the letter to our students and instruct them to contact you if they are interested in participating.
- All work that is shared by the students in their e-portfolios will remain the property of the student.
- Results of your study will be shared with any student participants and with the Associate Chair of the Department of MSIT.
- Pseudonyms will be used for all participants, and no reference shall be made to Georgia State University, the College of Education, or the Department of Middle-Secondary Education and Instructional Technology in any presentations or publications that result from the use of data obtained from students at Georgia State University.

I wish you the best in your study.

Best regards,

Mary Ariail, Ph.D.
Associate Chair
mariail@gsu.edu
(404) 413-8382

Appendix G

IRB Human Subjects Protocyl- Confirmation Letter

Drexel UNIVERSITY
Office of Human Research

APPROVAL OF PROTOCOL

April 29, 2013

Joyce Pittman, Ph.D
School of Education
Mailstop: Drexel University

Dear Dr. Pittman,

On April 29, 2013 the IRB reviewed the following protocol:

Type of Review:	Initial
Title:	Perceptions of Preservice Teachers Communicating with Visual Imagery in e-Portfolios
Investigator:	Joyce Pittman, Ph.D
IRB ID:	1304001988
Funding:	Internal
Grant Title:	None
Grant ID:	None
IND, IDE or HDE:	None
Documents Reviewed:	Application Form, Proposal, Data Collection Tools, Invitation Email, Permission Letter, and Consent Form

According to 45 CFR 46.110, this study is Approved Expedited Categories 6 and 7. This study will enroll 50 subjects recruited from Georgia State University College of Education, to complete surveys, interviews and e-portfolio review.

The IRB approved the protocol from April 29, 2013 to April 28, 2014 inclusive. Before April 28, 2014 or within 30 days of study close, whichever is earlier, you are to submit a completed Continuing Review Progress Report and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of April 28, 2014 approval of this protocol expires on that date.

Attached are stamped approved consent documents. Use copies of these documents to document consent.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL.

Sincerely,

Danyelle S. Gibson

1601 Cherry Street, 3 Parkway Building, Suite 10444, Philadelphia, PA 19102 | Tel: 215.255.7857 | Fax: 215.255.7874
research.drexel.edu/compliance | orrc@drexel.edu

Appendix H

Interview Coding Methods

Interview Respondent -Shawn

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice?

   I am pretty knowledgeable. But it goes to the extent of PowerPoint, anything to do with Adobe, anything like that. Smart boards…we can do apps, so I am pretty knowledgeable, but I am sure there are some things that I don't know. I learned those by myself, there was really no training; I guess over time you just learn by yourself. You have to just figure it out.

2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice?

   It is really important to have a Smart board because it opens the doors to just so many other things. If you have that then you can do anything. You can do PowerPoint, and it can be active, you can do games, and I mean basically anything. The kids are so much more apt to get involved in it too. When they see visuals used, they are so much more ready to participate and they pay more attention; it seems that they are so much more interested and once they look at it, they soak it in….it's different then you telling them out loud then them seeing it for themselves. When you first enter it in different ways, some kids don't get it that first time, and you do it differently, some will get it that next time, so you have to enter it in different ways. So you have to do visual imagery…all the time.

3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom?

   I don't know if this would be considered one but, me and my fellow classmates when we were going through similar classes, we did a lot of Google Docs and sharing and stuff like that. Anything that we had we would load it on there and anyone could see it and… something that I use all of the time is…I use my iPad, all the time. There's a lot of schools that have them in the classroom now and that's really good because a lot of kids have them all the time, so they might as well have them in schools.

   I did use my iPad in my own classes, but I wasn't allowed to at the school that I was at but we could check them out and the kids loved it. We did the Khan Academy App, that was great and there was one for their textbook, and that was really cool too. And they really enjoyed doing that. There was an app, well not necessarily an app, a website that they did on their iPads in science, where they talked about different convergent boundaries and they showed them the animation and they could switch it, they could do different landscapes, they could do different time periods, it was really cool. They got to manipulate and do it directly on the iPad. They could explore at their own pace.

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively?

   I think that it is really important to know how to use Microsoft Word and PowerPoint, I mean like…all the way through. Essentially as a math teacher,

with Word you can create your own figures and everything. So when you know how to do that you already have all of the tools that you need to put things on the board, to copy it on their papers, put it on the board. You can honestly do it better than the textbooks. And then it is yours and no one can say it's copyrighted. So, when you know how to do all of those things, I think it's so great. You need to know how to do all of those things too! I watched one of my mentor teachers doing it one time (using visual tools, PowerPoint) and I started playing with it and then I tried to build it. Someone did show it to me first. Basically, it was trial and error.

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools?

   I do a lot of online research, I get the magazine PAGE, I'm not sure if you are familiar with it…it is Professional Association of GA Educators, and they have webinars and they put out magazines, and I try to read them too to see what is going on and the latest in the classroom. That's where I get most of my information because they have a lot of good ideas too; it's a helpful website.

6. Explain how you can adapt your visual thinking knowledge to different learners.

   It takes a lot of trial and error actually because you are trying to figure out what is the best way that is going to work for them. I start out with visual image, and what I do is let them go from there. I let them draw their own graphic organizer. I give them all the tools that they have, to get an understanding that they can do their best. I grade them on their graphic organizers. If their keys or points are not connecting then it's not going to help them, but when they create it themselves and draw, create, they are more likely to retain it.

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students?

   It doesn't always work, and that it is true that the misconception is that every child learns the same way and that they are going to use something that is going to work for everybody and it's not. So, you have to figure out what's the best way for everybody to learn. With the misconceptions of visual imagery, I had a teacher mentor once told me not to do as much with visual imagery. I said to her, "but we don't know what really works with visual imagery, so we should try it to see what works and everything that we can and how they are going to react to it. So, I would say that a misconception is if they don't have it, they won't need it. I think if we don't try it, then they will never know. She told me I was going too far, and above and beyond with visual imagery and I said our kids need to think outside of the box and they need to be independent learners.

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration?

   A strategy that I would use would be to tell them that it's going to be graded. When I gave students the opportunities to do it themselves and they knew that they were not going to be held accountable for the information that they put into it, they weren't as apt to try. They didn't seem to care. Knowing that they are responsible for their work is definitely a big strategy. The visual tools would be graphic organizers for math…I like to have them create their own shapes, because otherwise they get confused…such as prisms. I say that we are going to

the computer lab and you're going to create your own shapes; once they were in there and building it themselves they realized that it had two sides and if not, it wasn't going to work for them. That was good hands on. They are many tools out there, you just have to get out there and take them to it!

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice?

   In math and science, I like to give kids choices. Like to do essays… they can draw a picture, draw a comic book, anything like that. Those that are artistic like to do that kind of stuff. Granted, it may not always be the best, but at the same time it allows them to understand the concept. They have to sit there and put it on paper. It is different than just quizzing them on something. I use a lot of posters, collages, they love doing that. The students that like the written can choose to do a written reflection. I even tell them that they can use stickers and a lot of the girls do and some of the boys.

10. How would you describe reflective practice?

    When you sit down and decide whether it works or didn't and I do that a lot. You can be reflecting while it is going on, reflect on the unit, what worked, what didn't work, what needs to used next year, what needs to be changed, what needs to be thrown out. You basically reflect all the time, on teachers, on your classroom management. Everything!

Notes:

Keywords: trial and error

Addressed the VT issues of:

- Visual imagery gives choice to learning
- You have to figure out what's the best way for everybody to learn
- When they create it themselves and draw, create, they are more likely to retain it.
-

Quotes: Excitement, "They love doing that"- references to using visual tools (2x's). iPad apps, drawing tools; referring to drawing-" it may not always be the best, but at the same time it allows them to understand the concept."

"When they see visuals used, they are so much more ready to participate and they pay more attention; it seems that they are so much more interested and once they look at it, they soak it in….it's different then you telling them out loud then them seeing it for themselves. When you first enter it in different ways, some kids don't get it that first time, and you do it differently, some will get it that next time, so you have to enter it in different ways. So you have to do visual imagery…all the time."

"I learned those by myself, there was really no training; I guess over time you just learn by yourself. You have to just figure it out."

Visual tools commonly mentioned: Microsoft Word, PowerPoint, graphic organizers for math, Smart Board, iPads

Personal resources: I do a lot of online research,

Ownership: So when you know how to do that…You can honestly do it better than the textbooks. And then it is yours and one can say it's copyrighted.

Appendix H (cont'd)

Interview Coding Methods

Interview Respondent - Enya

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice?
   Well, I am an English major, so graphs and things like that are not my style. I guess I would say pretty good at it if I have to use a visual or something like that. If I have to use a graph or excel or any data like that…charts. But, I would say that I am not so much up on that but as far as using a graphic organizer for my kids or anything like that I would say I am pretty good at that putting those together in order to help them further see what we are doing or to keep them on task, whatever the graphic organizer may be for. I am up on and I am pretty good at getting visual images to tie together with content areas…with pictures or different things that we may be doing to tie into content areas.

2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice?
   Ummm, I think that it is important to use pictures and things like that to back up stories and things like that. I am talking about my content area. I think that it is important that any time that you can to use pictures to add to a story or anything you can, whether you are teaching writing or grammar, it connects to and helps the students retain the material better. I am talking about student Practicum I and Practicum II when you go into the classroom…that's when you get students in training.

3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom?
   I use videos and of course pictures and cartoons and like…comic strips and things like that, it depends on what the content is…so things like that. Sometimes, I organize information into tables, or pie chart and stuff like that. Outside of the classroom, hmmm…I use things like…we take pictures of things and like upload stills and put them on…not Instagram, I never use Instagram…not Instagram, Facebook, but not Instagram…I don't know. I guess we kind of collaborate. But not really…

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively?
   I think that people need to stay on top of it. It is important to know how to use things simply like You Tube and at a minimum know how to work with a web browser and something like that. And, know how to store information and to bring it back up. And, I think that it is important also to have a back-up plan because technology can fail. Some type of grasp on the internet, web browsers… and to know how to use Google and Google images. I learned most on my own, but I learned about 30% more in college, and in grad school, ummm, at school from taking IT classes and also just talking to friends and taking podcast and things like that of things I just wasn't

familiar with so… and Previ. Previs are kinda cool, so I think those things learned in college, I didn't teach myself. But I think because the skills that I have were acquired over time as a student in college but I learned those skills also overtime as an individual. Previs are software…I think it is software it's on the internet so you can access it. It's like Microsoft PowerPoint on steroids, it's really really cool and you can zoom in and zoom out, and things are hidden so…it's very animated and very visually striking so you can grab attention very quickly. There are a lot of pictures that you can put in there, you can embed, You Tube videos, pictures, you can create from scratch, you can start with a template. Previ is something that I really enjoy working with…or found new, through the school.

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools? Umm, I don't know if I have any strategies, I like to keep up with what everybody is doing, or what is trending or following things on Twitter or just talking to people to see what they are doing or using and how they are going about implementing things like visuals into the classroom. More or less it is about networking to see what is coming up, what's new what is working and not working.

6. Explain how you can adapt your visual thinking knowledge to different learners. Well, it's sort of different for different learners, so if I am using a picture sometimes I will use two pictures just to compare them…just in case they need help or a different jump from where we are coming to where we are going. And, if I see a spot for it…I guess I think about organizing or a chart, some sort of table, I think that helps.

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students? For the students, I don't know if there are challenges except when technology is not good in the classroom. So whatever you might be displaying is hard to see or the wording is small or things like that. Sometimes with graphic organizers, if they're too complicated they can have a tough time with that and sometimes the simpler you go with a graphic organizer the better off you are uh, for them otherwise, I think it is better for them.

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration?
Definitely use a lot of pictures, still pictures, umm if I am understanding the question, so for instance I once did a lecture on a couple of poets that were married and before I did that I used a picture of their hands, which is a sculpture from the 1800's fastened together which focused as the backdrop. That helps to focus them and to get them interested in what I am saying. So, a lot of pictures. I use a lot of videos too… to back up a theme or something like that to introduce the content. If I am doing something more serious stereotypes, I will introduce stereotypes with a video collaboration, or a video collage or something like that to introduce the content.

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice?

For my portfolio, I would say that I use pictures of my students…myself. Or if they are doing something where they are acting out of place, or I would have something in my portfolio to show that they are engaged. I have used charts to show data to show whether or not they are grasping onto my data and an assessment of hard work to sort of get a feel for how the teaching is going and if it needs to be revisited if they are not getting it. I've also used videos of myself to show my supervisor where they have observed me and for instance in another portfolio that I have in a webpage it shows a lot of what my class is all about or there is a picture them to understand, it is so much easier with a picture to understand how a classroom might be set up. There is not too much more communicating than that.

10. How would you describe reflective practice?

It is constantly ongoing. It is a constant thing. I am doing it all the time. If I going through a classroom I am testing the isles, back up… it's things like that. I am constantly making decisions and analyzing my approach… and if it is helping or hindering their learning. I just went through a lot of things after a lesson where you just think about… it definitely always occur either during or right after and later on, I will go back and say well that didn't work and I or it did and I will present that a few weeks later…. But I will say, it's in the moment and right after teaching…it is a constant thing.

Notes:
Uses and relies on visuals to support assessment as part of Practicum.
Seems to avoid emerging media in the form of visual imagery for teaching; ie. Instagram and shy about using Facebook and other emerging media.
Respondent recognizes that people need to stay on top of visual use; from my perspective there is so much more emerging media that could be integrated into a classroom for learning and teaching purposes.
Visual approach is different for different learners

Keywords: graphic organizers, still pictures, video
Addressed the VT issues of:
- Visual images are good to tie together with content areas
- Using visual images helps the students retain the material better.
- Visuals are evolving and you have to stay on top of the changes

Quotes:
"I am pretty good at getting visual images to tie together with content areas…with pictures or different things that we may be doing to tie into content areas."

I think that it is important to use pictures and things like that to back up stories and things like that. I am talking about my content area. I think that it is important that any time that you can to use pictures to add to a story or anything you can, whether

you are teaching writing or grammar, it connects to and helps the students retain the material better.
I use videos and of course pictures and cartoons and like…comic strips and things like that, it depends on what the content is…so things like that. Sometimes, I organize information into tables, or pie chart and stuff like that.
I never use Instagram…not Instagram, Facebook, but not Instagram…
I guess we kind of collaborate. But not really…
I think that people need to stay on top of it. It is important to know how to use things simply like You Tube and at a minimum know how to work with a web browser and something like that. And, know how to store information and to bring it back up.
I think that it is important also to have a back-up plan because technology can fail.
Some type of grasp on the internet, web browsers… and to know how to use Google and Google images. I learned most on my own, but I learned about 30% more in college, and in grad school, ummm, at school from taking IT classes and also just talking to friends and taking podcast and things like that of things I just wasn't familiar with so… and Previ. Previs are kinda cool, so I think those things learned in college, I didn't teach myself.
I like to keep up with what everybody is doing, or what is trending or following things on Twitter or just talking to people to see what they are doing or using and how they are going about implementing things like visuals into the classroom. More or less it is about networking to see what is coming up, what's new what is working and not working.
Well, it's sort of different for different learners, So if I am using a picture sometimes I will use two pictures just to compare them…just in case they need help or a different jump from where we are coming to where we are going.
Sometimes with graphic organizers, if they're too complicated they can have a tough time with that and sometimes the simpler you go with a graphic organizer the better off you are uh, for them otherwise, I think it is better for them.
So, a lot of pictures. I use a lot of videos too… to back up a theme or something like that to introduce the content.
I've also used videos of myself to show my supervisor where they have observed me and for instance in another portfolio that I have in a webpage it shows a lot of what my class is all about or there is a picture them to understand, it is so much easier with a picture to understand how a classroom might be set up.

Appendix H (cont'd)

Interview Coding Methods

Interview Respondent-Cody

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice? From my perspective, I would say I know some things, probably knowledgeable, but not proficient at using a lot of visuals. If there is a Smart board it gives me more options to use visuals. I actually have more access if a Smart board is available. Sometimes I use gaming apps, which I guess, are visuals. Kids love, and I mean really love when they get to use different things to learn subjects that may not always see as fun. You know some kids like math and some really struggle. It is a good thing when you can introduce a little fun into learning about math.

2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice? Do graphic organizers count? That works in a math class to help the kids classify ideas. They can be used for any subject. I am not sure if visuals have as much flexibility in a math classroom or lesson as it would in a science or history class. I do know that you can't just show math equations all day and think that will keep the kids interested, so you have to know how to use graphic organizers, gaming apps, Power Point. I have heard about many new apps for iPads that could be used, but I have not introduced them into my classroom yet. I have to learn them first. In some cases the kids have learned or discovered apps at their homes already. This generation of kids are starting early with technology…which is good.

3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom? Gaming apps are exciting for the kids. They play games and they are learning at the same time. That is pretty different when you think about it. Teaching is fun for us and fun for the kids when you can use games to inspire and teach. As far as outside of the classroom…if I am in contact with another person in my subject area, I may share some thoughts and discuss it on Facebook. It is more about learning what is going on in other classrooms and to see if they have solutions to problems that I may be seeking. I wouldn't say that it is extensive collaboration or anything like that, but we do connect about some classroom activities beyond our classes. You Tube is a good place to go to retrieve information and I sometimes share tutorials with my friends or people that go to college with me. Tutorials are good for just general things in terms of how to cook certain things…or for how to learn about different ways to do things.

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively? The basics start with just understanding how to maneuver a computer. How to search for what you may need. You have to then know how to save it and upload

and download information. Visuals are everywhere, so once you know how to find exactly what you need for a lesson or for an assignment, you should be somewhat organized. There is a lot of software to use for visual support, but for me…uh, probably all of the Microsoft Office tools work for me. I don't really use Photoshop, but it looks like you can do some pretty cool things with that software too. Of course, there is always the issue of technology not working properly or not working at all. Everybody runs into that problem at some point, so that would make it not so effective.

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools? We are required to observe mentor teachers in the classroom and I try to learn different strategies to help with my future classrooms from what I may learn from them. No job yet, but when I get a classroom, I will do what I know and add the strategies that I learned in college and in the field. Graphic organizers are a good strategy because I have seen that it works. You get to witness what the students are drawn to and they are drawn to visuals and creating shapes. They seem to like different technology, and are anxious to use it. They don't have the same kind of fear associated with technology that older people may have. Young students are open to learning new technology.

6. Explain how you can adapt your visual thinking knowledge to different learners.
Kids that have different options have a better chance of learning in some cases. I know that kids need to write, but I know that it is good to switch to different ways of teaching and sometimes that means letting them draw to show me what they know. Sometimes if a student is struggling with problem-solving, I resort to a photo or a picture to kind of push the process along. They usually get it if you give them options.

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students? You do not have to be an artist to know how to use visuals. I believe that many people see all of the cool apps and drawing tools for the iPad and think that you have to have an artistic background to use those things. It seems to me that technology is all about visualization. It is for everybody! Sometimes it can be overwhelming when you see the blogs and the discussions about new tools coming up everyday…you just have to find the time to figure out how to use some of those tools.

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration? Gaming apps work. The students do not get bored. If I couple that with math projects, it's always a winner. I look at my students and see that they think that it is "play" and I see it as a way to get them to grasp the lesson. They are so much more engaged if I introduce fun visuals like that! Diagrams are functional too. They are visual.

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice? In most cases, I share my charts and graphs to show levels of how they are learning. I mesh the written and the visual this way. I probably should use more visuals, but I don't think that it is as easy for my area…math…maybe it's easier to show visuals in science because you could use videos, posters, opposed to data. Eventually, as I get out there, I will learn more about visuals, but for now I guess, I keep it simple. You know, when you asked for us to show our eportfolios, I didn't because it doesn't really show a lot of really cool visuals like some of the other eportfolios.

10. How would you describe reflective practice?
You try to study your own experiences to improve the way you work. For me, I do a lesson, think about how I did…and did the students learn from it or like it. If it isn't an efficient way to teach, I change it! I once had a class that enjoyed a website that I used, so I know that it will be good to use that website again, because it was so effective. In the end, you have to be sure that you managed your classroom well. It's about change and thinking and rethinking. From your lesson to room arrangement to the timing or delivery of a lesson, you think about, does it work or not?

Appendix H (cont'd)

Interview Coding Methods

Interview Respondent-Wendy

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice?
   If you mean the basic things like photos and stuff like that…umm, probably good with those types of things. Well yes, I use visuals along with things that I write about and I use visuals to show what's happening in my content area. Mainly Prezi and Power Point are used to show those kinds of things in the classroom. Yes, things meaning photos and pictures are what I know about.
2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice?
   It is good to use photos, pictures, charts because it helps the students to grasp the information better. I would say…maybe really important. I noticed that the students enjoy the subject better when they see these types of things. I would go as far to say that they are more interested in the message if it shows an image.
3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom? Oh, there is a lot of stuff happening with different types of tech tools.
   Sometimes it is too much to learn and sometimes it seems that it is difficult to figure out how to use all of the new things…like apps…there are so many! I probably would say that I use and play with apps on my iPad, but I don't necessarily use them in the classroom yet. Most of the things that I use in the classroom…well, I already mentioned. My classmates and my friends use and upload pictures and videos in Facebook, and maybe Instagram, but not so much for school…but for personal things that we share.

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively?
   You have to know how to use so much! But…my guess is that if you know how to use Microsoft Office, you can do a lot with visuals…you have Power Point…Excel can help with doing graphs, charts, spreadsheets and different kinds of tables…word images…you can put things in color. Yes, that is really key and then you have to know how to insert the photos and pictures…that would be important too. You have to know how to search in the browser and know how to search in You Tube.

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools?
   Well, there are a lot of teacher's websites that are helpful and I just soar around and look to see what other people are doing. You just have keep looking at what is going on, what is new and then you have to figure out if or how you can use it in your classroom. There is a lot of information out there and you just have to dissect it. Certainly, I hear from my friends or classmates about things that they read or see, you just have to keep looking

and talking about it. Sometimes when the mentors have new things, I try to watch and learn how they use new things.

6. Explain how you can adapt your visual thinking knowledge to different learners.
   We know that there are a lot of different learners in a classroom. Trying to figure out what works best is not identified right away…it takes a little time to know how each student may receive information. Sometimes they get to draw to show an idea instead of writing out an idea, sometimes they respond to a photo and I watch and then try to bring that into my class again. You have to watch to know what works and doesn't work!

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students? Everybody does not know the same thing or how to use it the same way.
   There is a lot of stuff out there to learn and bring into the classroom, but we don't get to test everything. If you know how to use it, you may try it and if you see someone else use it, then you will probably try it in your classroom, if it looked at as successful. Every day when I go on teaching websites, there is something new to use and think about.

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration?
   I probably could use more, types of visual tools, but I know that photos work, so I download photos to show or guide their thinking. They really like to see certain websites, so I connect some of the sites to my lessons to tell a better story. The availability of these kinds of visual sources is endless on the internet! It is fun to find the right visuals to connect with a problem.

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice?
   So, do you mean in Live Text? My eportfolio? It sounds like I am repeating myself, but usually pictures, photos, graphs, charts and things like that are what I use. Nowadays, you must use both so they cannot really be separated. There are a lot more visual resources when you use technology. I have to use both formats in my classroom to help the students that learn that way, and I have to use it in my eportfolio to show that I understand that principle.

10. How would you describe reflective practice?
    Well, it is important to review what you are doing, what you are learning. I think about things like, did that work or not? What can I do to make it better? What can I do to change it? You can't stop reflecting if you are teaching because you have to always analyze the situation and then you may have to adjust your lesson. It is the core of what teachers should do…and always.

Addressed the VT issues of:

"I would go as far to say that they are more interested in the message if it shows an image."

-

Quotes:
"if you know how to use Microsoft Office, you can do a lot with visuals…you have Power Point…Excel can help with doing graphs, charts, spreadsheets and different kinds of tables…word images…you can put things in color."
Visual tools commonly mentioned: Prezi and Power Point.

Appendix H (cont'd)

Interview Coding Methods

Interview Respondent- Ingrid

1. How knowledgeable are you in using visual imagery in your eportfolios for reflective practice? For about 10 months, I have been doing the eportfolio. I'm not a pro, but I know basic stuff. Like how to edit pictures and how to edit videos and insert videos in your Power Point or…what's that called?… oh yeah, Previ. Previ is another format of Power Point where you can zoom in or zoom out. That's the only feature and I think that with Previ, that once you lose your internet, it's not convenient to use. But with Power Point you can use everywhere whether if you have internet or not.

2. What do you see as important visual imagery/visual tools to use in the classroom for reflective practice? You mean while I am teaching? I taught Mandarin students and English, but the type of students were different. So when I taught Mandarin, most of them were college students, so they can understand a lot of verbal description even without pictures or videos. But when I taught English, my students were first graders, and I was teaching ESL… first graders, their attention span is so short and they cannot focus for long and they cannot understand the verbal description, so pictures and videos will help them a lot.

3. What different types of visual imagery and or tools do you use in the classroom and outside of the classroom? Pictures, video,…You Tube, both. Sometimes I videotape my students and share the video with supervisor.

4. What do you see as important technology skills and knowledge that are needed to use visual imagery and visual tools effectively? You have to know how to use a camera and have to know how to edit the video clips or use iPhone and upload it.

5. What strategies do you employ to develop your understanding of visual imagery and or visual tools? Take pictures of things that are really attractive that's useful for students or classroom… also take video to prepare beforehand and set up target more clearly and notify them that I will video tape them. I rely on information from peers and online things are useful. Communicate by Facebook or in class.

6. Explain how you can adapt your visual thinking knowledge to different learners. Share format with them and visual knowledge.

7. What challenges and misconceptions regarding visual imagery/visual tools exist for students? There's misconception about visual or imagery… it sounds like you have to be the pro of technology when actually not. They like coloring and draw pictures… the students.

8. What types of effective teaching approaches regarding visual imagery and or visual tools would you select to guide student thinking and learning in your area of concentration? I think most of the time I will introduce my work and then the students will ask me- how do you do that?...And then I will share the knowledge that I know. The students have to be motivated and curious about that then we can share it.

9. How do you use visual imagery for communication as compared to written formats in electronic portfolios for reflective practice? In my eportfolio, I include everything that you said. Sometimes, I think that images cannot express ourselves enough... so, I think that a verbal description is still important. You have to combine imagery and description.

10. How would you describe reflective practice? For educators it's extremely special to reflect yourself in a short period, cause you'll always have different problems almost everyday... and reflective thinking is very important.

Appendix I

Interview Coding Methods

Codes and frequency counts:

SE 1) Student engagement in their classrooms 4, 12, 8, 7, 10 =41

TE 2) Trial and error 2, 6, 3, 2, 5= 18

SK 3) Shared knowledge with classmates 3, 5, 1, 2=11

PTR 4) Personal technology and research 1, 2, 2=5

TM 5) Teacher mentors. 1, 1, 2,=4

TU 6) Technology used 12, 10, 14, 25, 22=83

IL 7) Independent Learning 4, 1, 7, 1=13

Appendix J

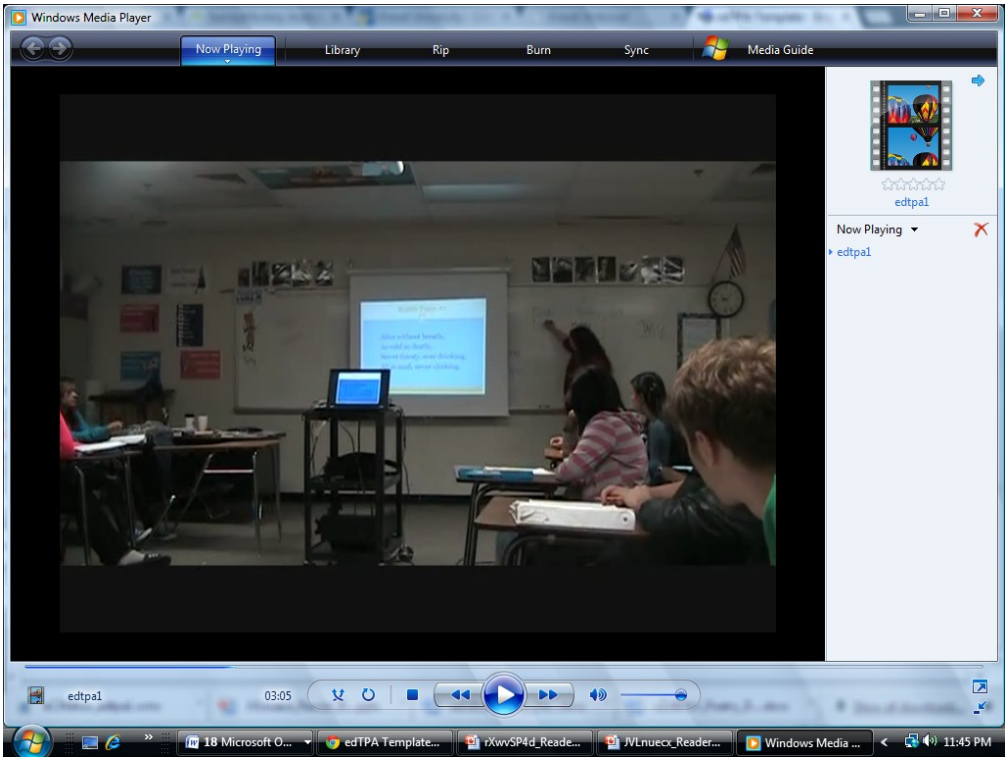
Artifact- eportfolio, visual excerpts and observation notes:

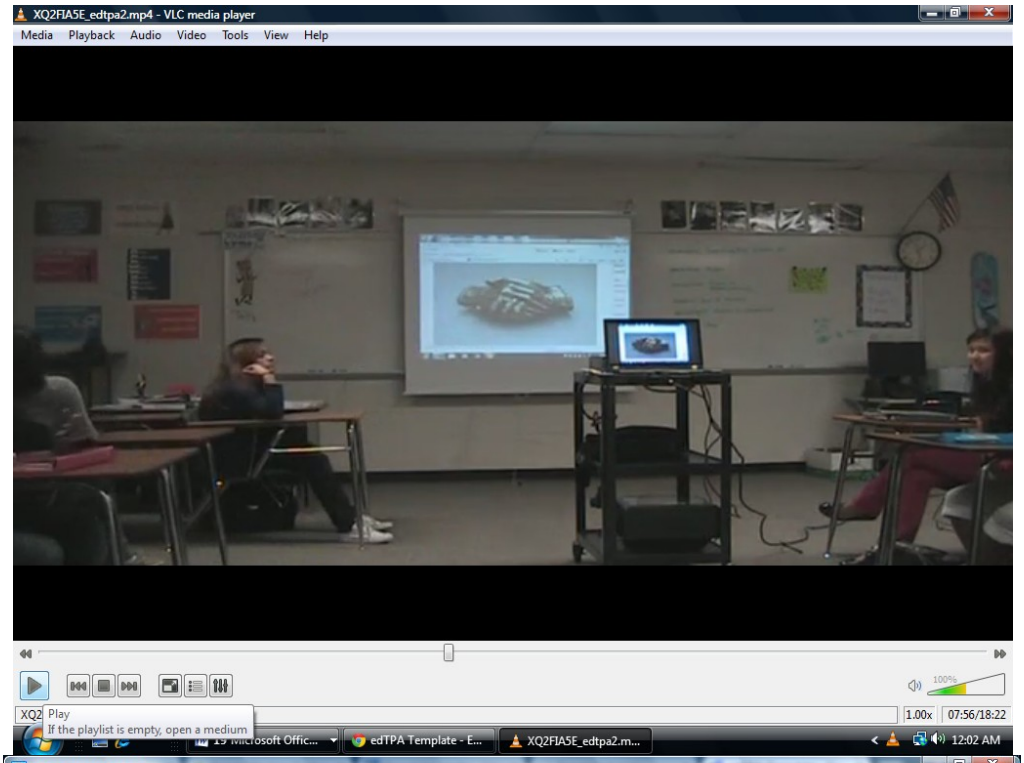
Respondent: Enya

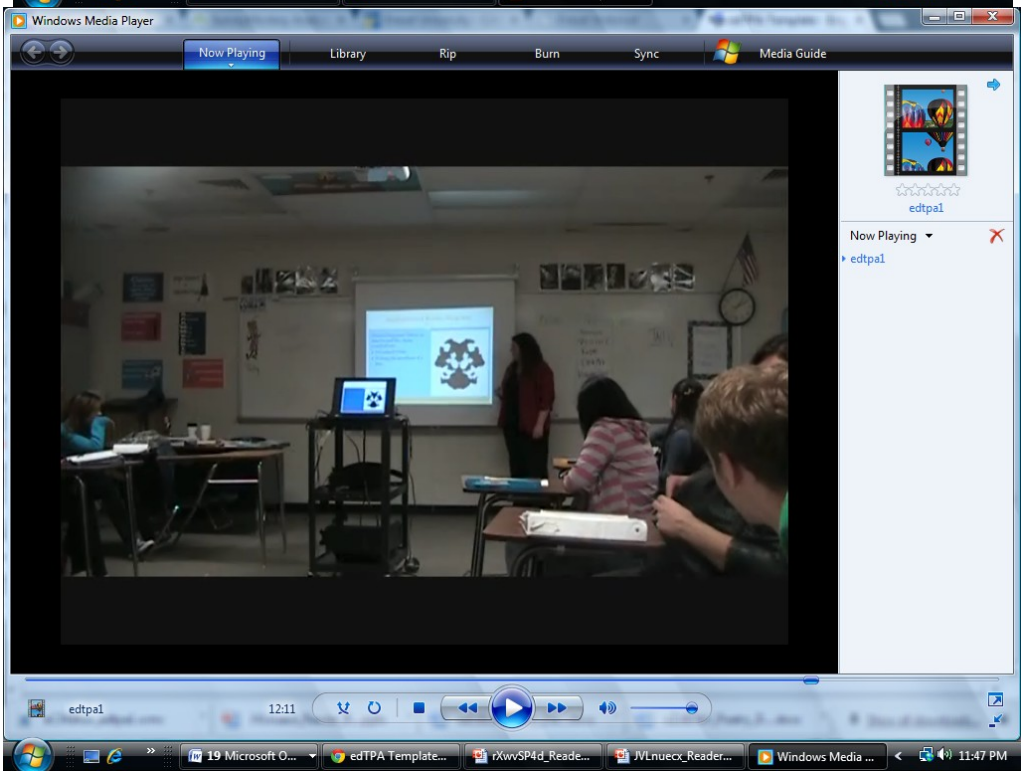
E-portfolio examples of a class lesson: (with visual excerpts)

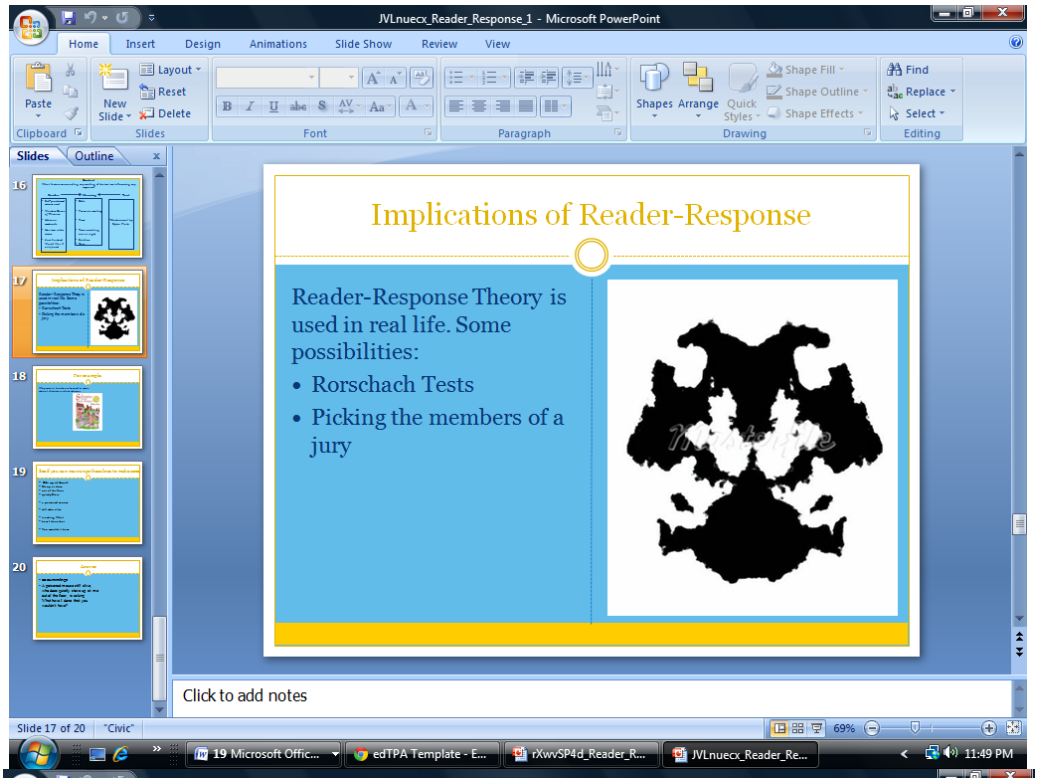
Respondent Enya included these forms of visuals in eportfolio:

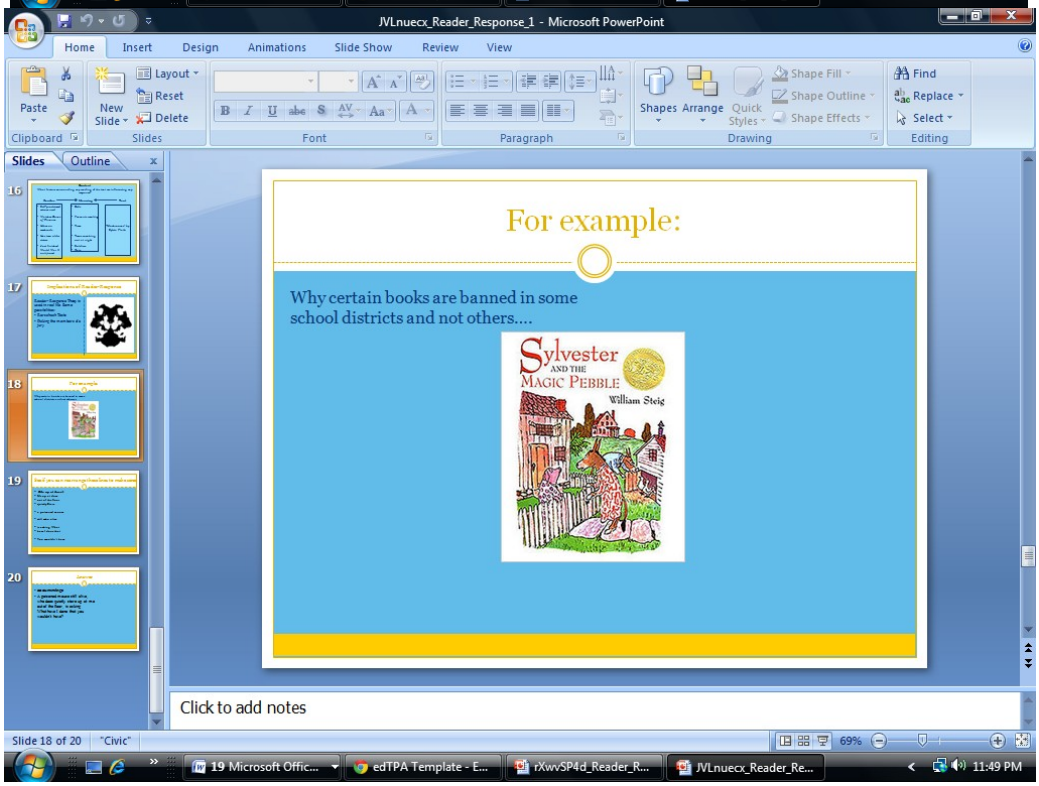
- Class Videos (examples shown indicate visual image use for lesson)
- You Tube videos
- Student drawings
- Photos of students learning
- Illustrations
- Maps
- Posters
- Book covers
- Frames to support text

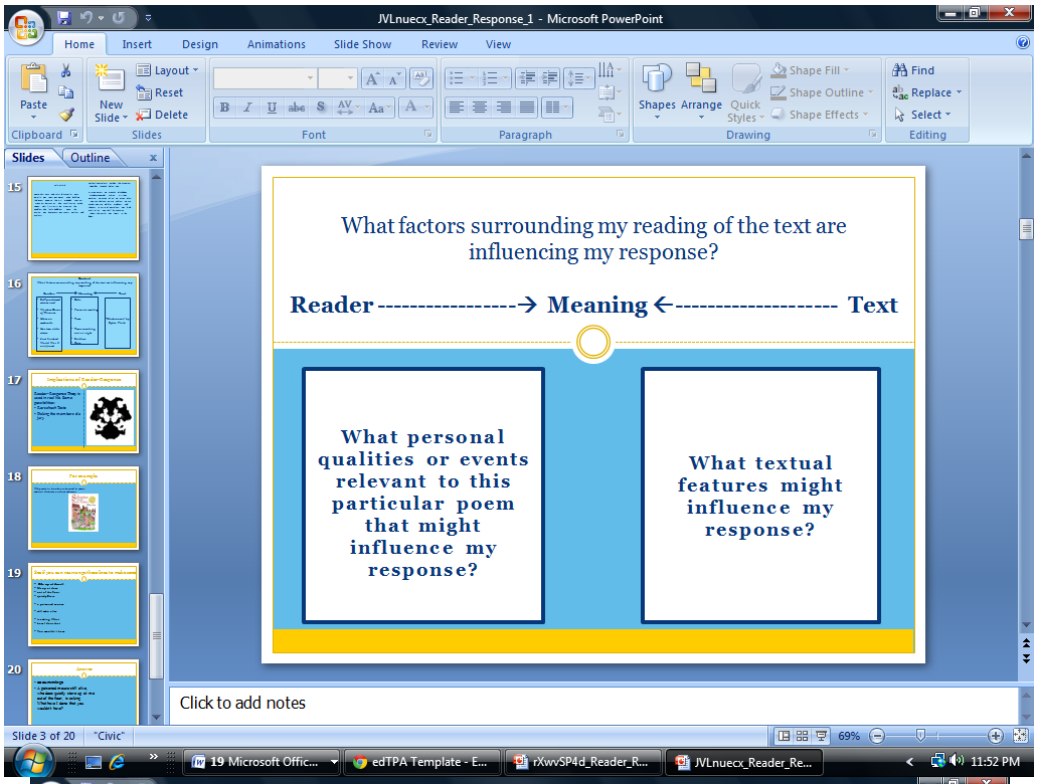


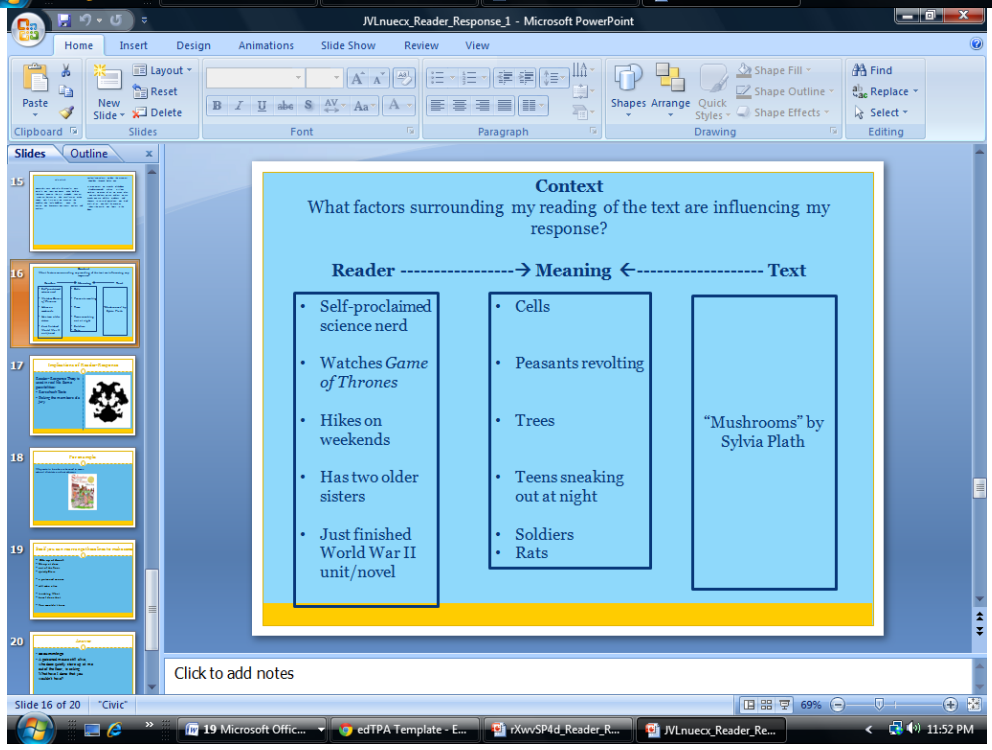

XQ2FIA5E_edtpa2.mp4 - VLC media player
Media Playback Audio Video Tools View Help
Play
If the playlist is empty, open a medium
1.00x
07:56/18:22
edTPA Template - E...
XQ2FIA5E_edtpa2.m...
12:02 AM


Windows Media Player
Now Playing
Library
Rip
Burn
Sync
Media Guide
edtpa1
Now Playing
edtpa1
edtpa1
12:11
19 Microsoft O...
edTPA Template...
rXwvSP4d_Reade...
JVLnuecx_Reader...
Windows Media ...
11:47 PM


JVLnuecx_Reader_Response_1 - Microsoft PowerPoint
Implications of Reader-Response
Reader-Response Theory is used in real life. Some possibilities:
• Rorschach Tests
• Picking the members of a jury
Click to add notes
Slide 17 of 20


JVLnuecx_Reader_Response_1 - Microsoft PowerPoint
For example:
Why certain books are banned in some school districts and not others....
Sylvester and the Magic Pebble
William Steig
Click to add notes
Slide 18 of 20

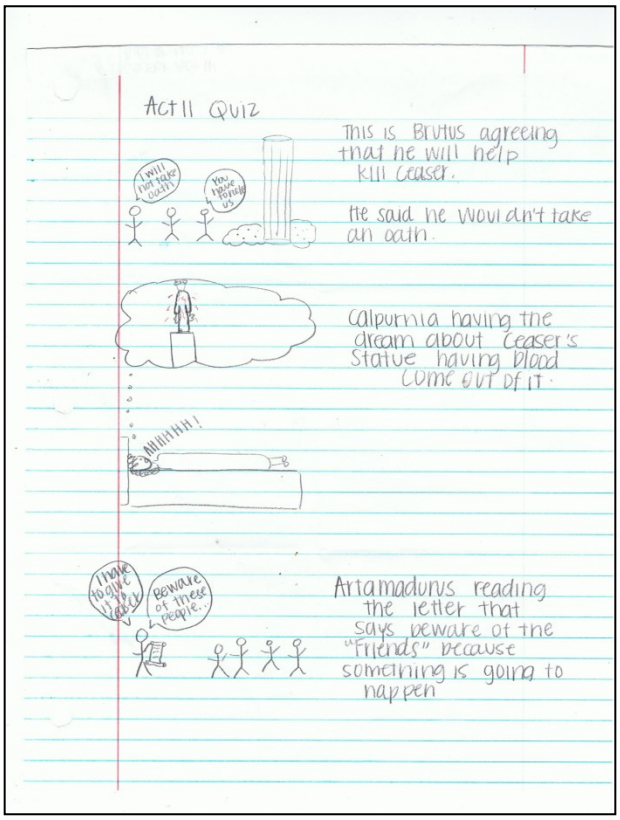


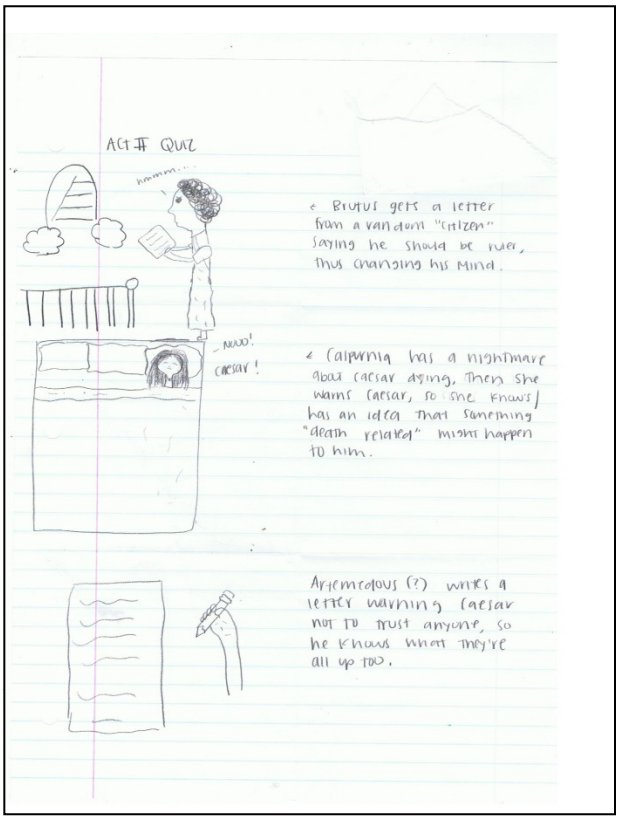


- NOTES:
- Respondent- Enya
- Reading/poetry class
- Out of 20 PPT slides only 2 had images inserted

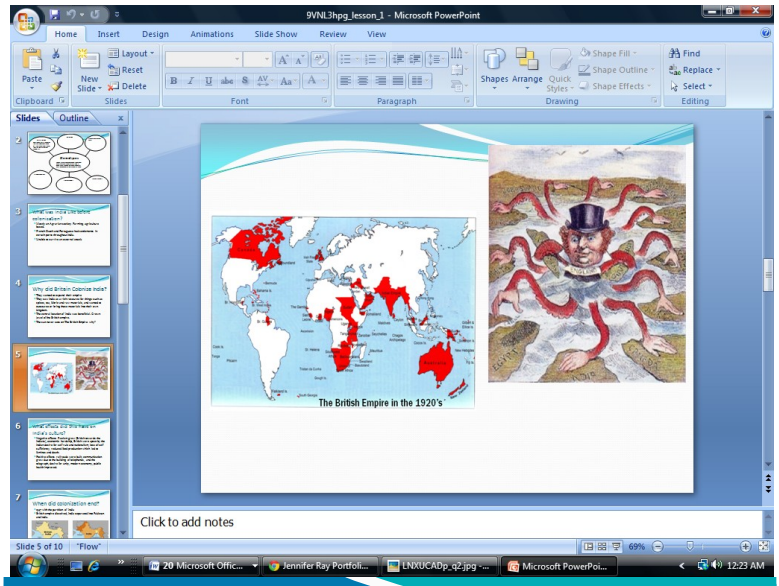
- 2 had frames to support lists
- PPT was a template
- PPT template consisted of 2-colors and a font color
- Video support included as part of the eportfolio; class lesson presented
- 2 videos were included in the eportfolio; videos were to include an example of "positive learning environments" and both videos chosen to represent lesson examples included visual aid support

In portfolio examples of a class lesson: History (visual excerpts)
The preservice teacher selected two pictures to show as examples, Respondent Enya wrote:
"I chose to include artifacts from a quiz I gave students. The instructions were: Please create three pictures and three descriptions of those pictures that you feel are the most important parts of Act II in Julius Caesar. I felt that this type of assessment served to better determine my students' comprehension versus a multiple choice assessment. I included to examples below. Additionally there is a picture of students re-enacting a scene from the play."



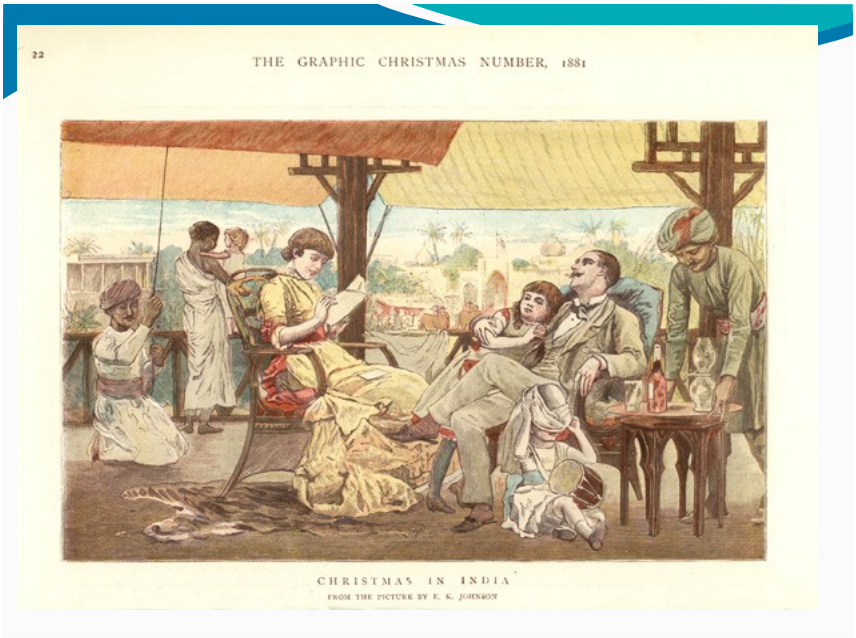


In Portfolio example: (visual excerpts)
A PPT included 10 slides. 50% of the slides included images to support the lesson; one of the 5 images was a chart and the other 4 images were illustrations, maps, posters.



When did colonization end?

- 1947 with the partition of India
- British empire dissolved, India separated into Pakistan and India.


22
THE GRAPHIC CHRISTMAS NUMBER, 1881
CHRISTMAS IN INDIA
FROM THE PICTURE BY E. K. JOHNSON


THE EMPIRE NEEDS MEN!
AUSTRALIA
CANADA
INDIA
NEW ZEALAND
All answer the call.
Helped by the YOUNG LIONS
The OLD LION defies his Foes.
ENLIST NOW.

In Portfolio example: (visual excerpts)
As part of Enya's teaching philosophy written words were included with 2 photos of the students participating in lessons.

PHOTOGRAPHS OF STUDENTS LEARNING LESSONS
In a classroom

PHOTOGRAPHS OF STUDENTS LEARNING LESSONS
Re-enacting a play

In Portfolio example: (visual excerpts)
As part of a lesson, respondent Enya used a visual in the form of a You Tube channel to support learning.

Researcher Final Notes:

A range of visual aids were used to support learning: 1) Class Videos 2) You Tube videos 3) Student drawings 4) Photos of students learning 5) Illustrations 6) Maps 7) Posters 8) Book covers 9) Frames to support text. There appears to be a distribution of visual and written content for the lessons. A standard template appears to be the main foundation for the Power Point development; this is the case for all of the eportfolios reviewed. The Power Point examples supported a numerous visual images. The researcher notes (as in the other eportfolio examples) that very traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc. The respondent appears to be comfortable using multiple forms of visual aids to support classroom learning. Some assignments included drawing to problem-solve;

and Enya states, "*I felt that this type of assessment served to better determine my students' comprehension versus a multiple choice assessment*." This reinforces the concept that learning styles differ and that visual aids can support the learning process for this preservice teachers' classroom.

Appendix K

Artifact- eportfolio, visual excerpts and observation notes:

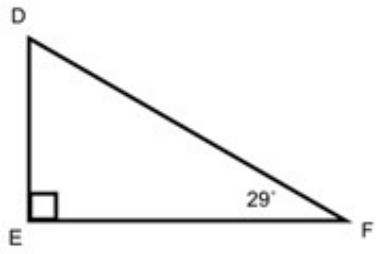
Respondent: Hanna

E-portfolio examples of a class lesson: (visual excerpts)
Respondent Hanna's mathematics assignments included these forms of visuals in the eportfolio:

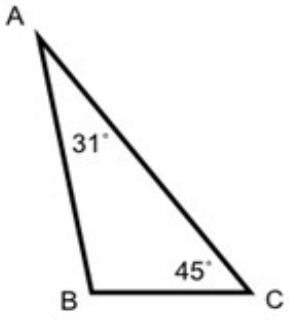
- Mathematic diagrams
- Graphs
- Charts
- YouTube videos of teacher lesson

Find the missing angle in each triangle.

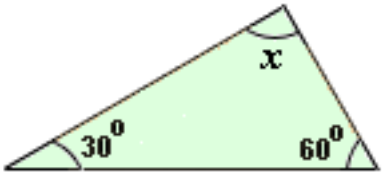
6.



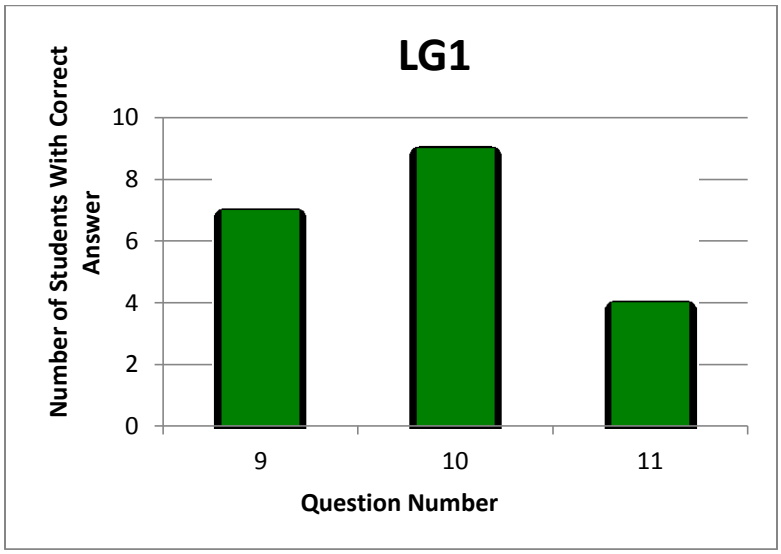
7.

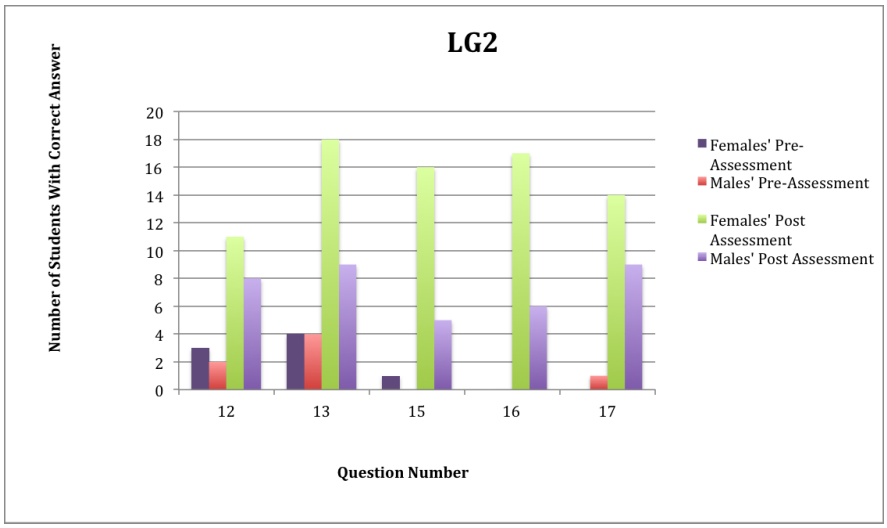


8.



E-Portfolio Learning Goal example: (visual excerpts)





NOTES:

- Respondent- Hanna
- Mathematics class
- The visual images represented were mathematics diagrams, charts, graphs, and a You Tube video
- Power Point (PPT) was discussed in the reflection although not represented
- No video, illustrations or photo support included as part of the eportfolio; or class lesson presented
- No emerging media represented

Excerpts from respondent Hanna:

"Students will use rulers and protractors as tools to foster their learning throughout the lessons and activities of the unit. I have also recorded myself reading the various worksheets and assignments aloud in several YouTube videos to enable the Spanish-speaking students to hear their questions read aloud to them. Many different forms of technology will be used throughout the instruction of the unit in order to ensure the students are given every opportunity to master the concepts of the lessons."

"The first station requires students to use a protractor in order to determine the missing angle measures in different figures. The second station requires students to define triangles based on their side lengths and angle measures. At the third station, students to will be given a figure and a scale factor, and they must use a ruler to draw a similar figure based on scale factor."

"I also feel the students were not successful with the first learning goal of the unit, because they were not given enough visual aids to help them with understanding the different definitions of triangles. Many students *learn in a visual manner as well as through repetition.* The students *would have greatly benefited from a graphic organizer containing the different definitions or a web diagram of the steps to take when given certain information in mathematics problems."*

"Graphic organizers organize information in ways similar to the human brain. Giving students these tools would have greatly benefitted them, and I feel they did not succeed with this particular learning goal because they were not given enough helpful resources."

"Throughout the unit, I realized I am greatly lacking when it comes to having a resource arsenal. I really and truly need more resources to give to my students to enhance their education and help with their learning process. *Students need various worksheets, homework assignments, warm-up questions, notes pages, graphic organizers, diagram, and activities in order for them to master a concept and enjoy it in the process.* I want to become more involved in teacher workshops as part of my professional development, and I also want to become a more effective teacher."

Researcher Final Notes:

The researcher notes that a minimal amount of visual imagery was used. Four forms of visual imagery was used 1) Graphs 2) Mathematical diagrams 3) Charts 4) and a You Tube video. Traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc. The respondent clearly states multiple times in the classroom assessment that it is important to use visual aids to support learning and felt that if more visual aids were provided it would "enhance the learning process." Furthermore, the respondent acknowledges that students may be visual learners by stating, "Many students learn in a visual manner as well as through repetition." Minimal drawing will also occur with the lesson when the students are encouraged to "draw figures" with a ruler to support mathematical figures. You Tube was used to create videos of the preservice teachers' lesson "to enable the Spanish-speaking students to hear their questions read aloud to them." This type of technology was discussed in the preservice teachers' assessment, yet a link was not provided. This does however, serve as a form of a visual aid. A You Tube video was not identified as a tool in this format, in any other eportfolios reviewed. As part of a lesson, another respondent Enya, used a visual in the form of a You Tube channel to support learning.

APPENDIX L

Artifact- eportfolio, visual excerpts and observation notes:

Respondent -Shawn

E-portfolio examples of a class lesson#1: (with visual excerpts)
Respondent Shawn had two 6th grade science assignments included; this is one of two. These forms of visuals were in the eportfolio:

- Photos
- Illustrations
- Maps
- Diagrams
- Charts
- Graphs

NOTES:

- Respondent- Shawn
- Science class
- Out of 27 PPT slides 11 had images inserted; 4 of the images were photos & Illustrations and 7 were diagrams, charts
- Power Point (PPT) was a template
- PPT template consisted of 2-colors and a font color
- No video support included as part of the eportfolio; or class lesson presented

In portfolio examples of a class lesson#1 in Power Point: Science (visual excerpts)
The preservice teacher selected 4 images to show as examples of each type of visual aid used. Respondent Shawn wrote in the lesson plan outline:

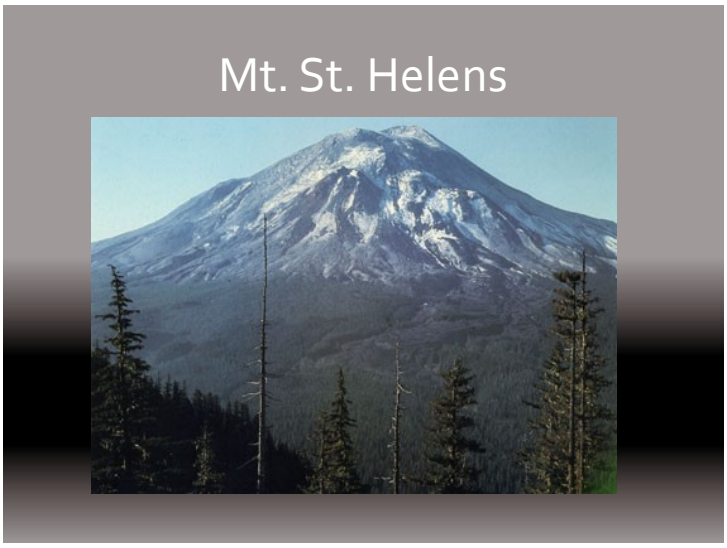
> *The class is considered to be English language learner (ELL) students. The lesson is differentiated in order to facilitate the needs of visual, auditory, and kinesthetic learners. Visual learners will be able to follow along with the slides and will greatly benefit from the images provided in the PowerPoint presentation. Auditory learners will be able to benefit from the teacher reciting the lesson out loud and emphasizing key terms and concepts. Kinesthetic learners will be able to benefit from the activity following the lesson.*

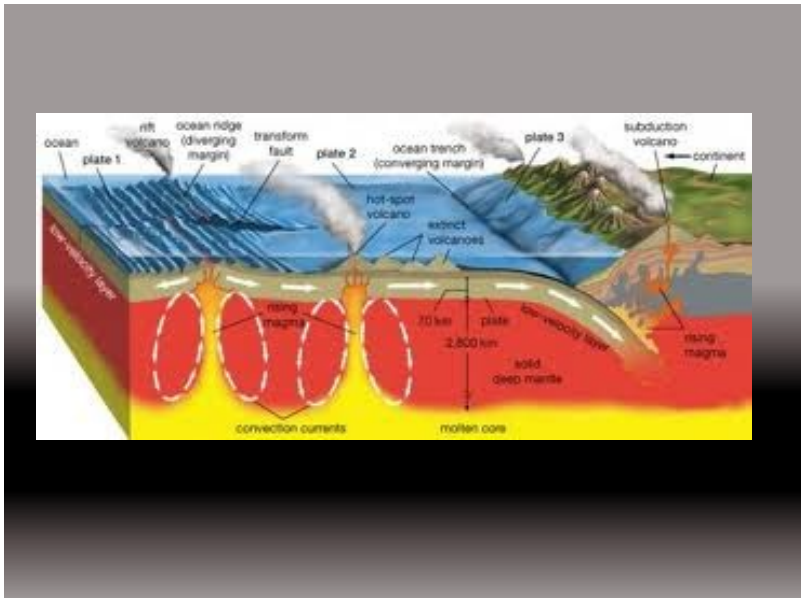
E-portfolio examples of a class lesson#2: (with visual excerpts)
Respondent Shawn included these forms of visuals in eportfolio:

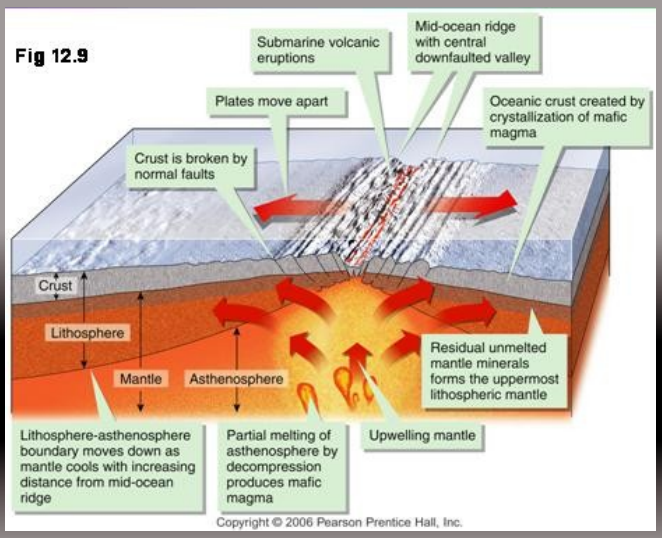
- Photos Illustrations
- Maps
- Diagrams
- Charts

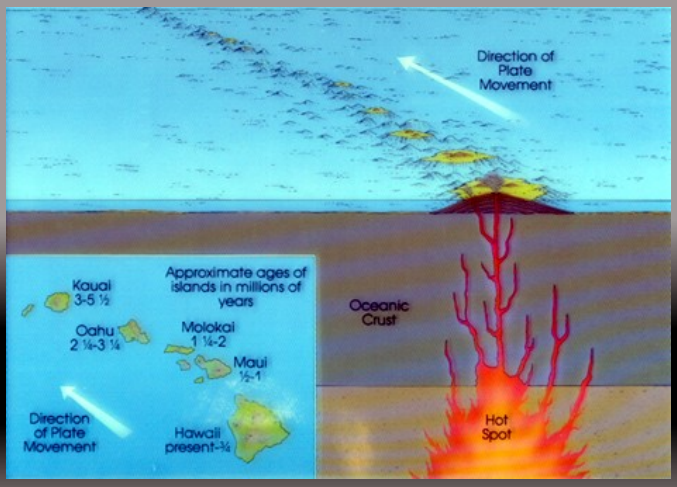
In Portfolio example: (visual excerpts)

- NOTES:
- Respondent- Shawn
- Science class
- Out of 18 PPT slides 7 had images inserted; 4 of the images were photos & illustrations and 7 were diagrams, charts
- PPT was a template
- PPT template consisted of 2-colors and a font color
- No video support included as part of the eportfolio; or class lesson presented
-

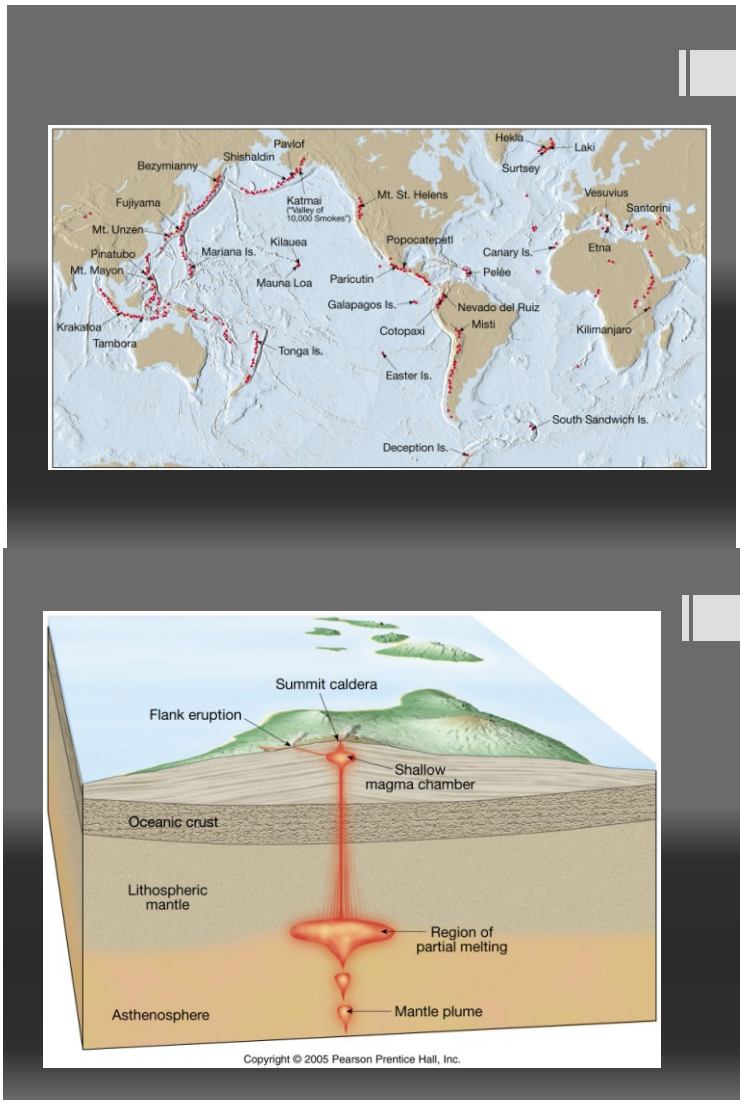








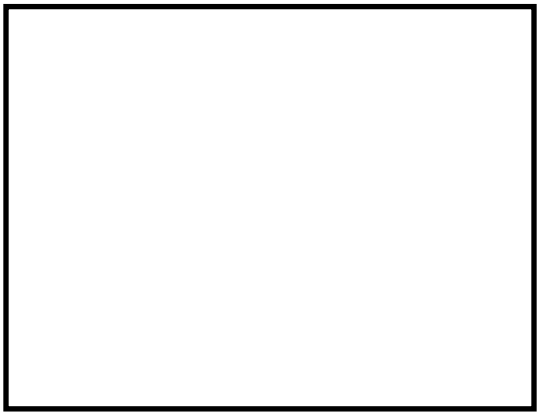
Another Lesson featured the same types of visuals in addition to maps:



Notes:

- This lesson plan included an activity sheet that requested a drawing assignment for several questions to answer science questions to support the lesson:

  Draw a house and label where you would place retrofitting reinforcements to prepare for an earthquake.



- Draw a cross-section of a piece of Earth where an earthquake has occurred. Label the epicenter and the focus.

An activity sheet utilized illustrations to guide the lesson:
Look at the different types of volcanoes below. Label each one with the correct name. (presented is an example of one of three images):

Another activity sheet had 3 activities that all requested the student to draw to respond to the question and then write about the image created (presented is an example of one of three drawing requests):

- Sketch a hot spot and label where magma is forming. Pinpoint where the formation of a volcano could occur. Explain what is happening in the drawing.

Notes: Multiple graphs were used in the assessment presentation
Excerpt from respondent Shawn:

The lectures given in a PowerPoint presentation included many photographs and diagrams of various illustrated and real-life earthquakes and volcanoes. The presentation of these visual images better enabled the students to distinguish the various characteristics of volcanoes and earthquakes. Furthermore:

Many students did not describe in written form the environmental effects of volcanoes and how those can eventually affect a population. *Even though students were shown photographs and diagrams presenting the extent of damage caused by both volcanoes and earthquakes, they were still unable to grasp the concept as a whole.* The students are in sixth grade and are all between the ages of eleven and thirteen years old. Perhaps they were not mentally mature enough to understand the complexities of the causes of earthquakes and the extent of their effects.

The students were also unable to describe the cause of volcanic eruptions and earthquakes verbally and in written form, because they do not have the vocabulary background to fully and successfully describe such concepts.

Researcher Final Notes:

Power Point appears to be the main tool used to project visual images. The preservice teacher indicates that the classroom did not have an accessible Smart Board and therefore, an overhead had to be used. A standard template appears to be the main foundation for the Power Point development. The Power Point examples supported a numerous visual images; in some cases close to half. The main uses of visual imagery were photos, illustrations, diagrams, graphs and charts. The researcher notes that very traditional uses of visual imagery was used by comparison to some of the new and emerging visual aids and available tools such as Pinterest, Infographics, viral video, storytelling apps, etc. By comparison this preservice teacher that noted that the instruction was for an ESL classroom and this preservice teacher had more images in

the Power Point and activity assignments than the classrooms that did not specify if their classroom was an ESL classroom. The preservice teacher appears comfortable using drawings or sketching combined with text in activities. This teacher does not use emerging visual technologies to support the lessons.