THE VISUAL CONNECTION: A QUALITATIVE STUDY OF FOURTH AND FIFTH GRADE TEACHERS' USE OF VISUALS WITHIN TECHNOLOGY-ENHANCED CURRICULUM

By

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To my Mom and MC, who believed in me every step of the way.

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experience with insanity, laughter, silence, camaraderie, peace, chaos, and everything in between. Thanks especially for listening and being a friend.

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The purpose of this study was to explore teachers' descriptions of their use of visuals in technology-enhanced classrooms during literacy instruction. I wanted to see how teachers used visuals as another way to encourage learning, thinking, and communicating in the increasingly heavily technological and visual contexts of the 21st century. This examination could enhance our understanding of what teachers are asking students to do and what counts as an acceptable use of visuals for classroom instruction. This study may also add to the understanding of how current integration of visuals in technology-enhanced contexts may inform future literacy considerations within a visually-rich, digitally-connected global network. Thus, inquiry on teachers' use of visuals in technology-enhanced curricula may promote discussions related to the availability, use, and integration of technology and visual literacy principles, tools, resources, and practices, as well as encourage reflection of such practices. Specifically, I asked the research question: How do fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced, literacy instruction? To better understand their responses, I

asked two more guiding questions: What are teachers doing with visuals and technology in the classroom? What are teachers trying to accomplish when they use different strategies, methods, and/or resources?

For six weeks of the school year, I observed teachers using visuals as a tool: a mediator in the process of guiding students' meaning-making. To better understand what I gleaned from the observations and to directly examine teachers' beliefs and perceptions of visuals in technology-enhanced environments, I conducted individual interviews. Their responses were interpreted using inductive domain analysis, which helped illuminate and problematize the ways teaching and communicating with visuals were enacted within the context of 21st century technologies.

CHAPTER 1
A MULTIPLICITY OF LITERACY LANDSCAPES

Introduction

Throughout millennia, we have relied on the acquisition of knowledge, skills, and competencies embedded in specific times and contexts in order to survive and thrive (Knobel, 1999; New London Group, 1996; Street, 2003). When humanity lived in caves, we relied on skills to communicate and work together to hunt and feed families. As populations thrived and developed, changing contexts demanded new knowledge and skills. We invented and crafted new tools that increased productivity, mobility, and communication, such as calendars, navigation systems to deliver goods, and electronic communication. From humble beginnings to traveling into outer space and connecting digitally to people all over the world, the acquisition of skills and knowledge and the need for literacy has always been an indispensable part of our existence and prosperity.

Historically, literacy included the ability to read and write in standard forms (Brandt, 2001; Hagood, 2000; New London Group, 1996; Seels, 1994; Street, 2005). However, as technologies and contexts changed, so did literacy (National Council of Teachers of English, 2008). Views of literacy have broadened to include what it means to think of literacy as a social practice (Gee, 1996; Street, 2003), which focuses on how people use literacy to construct everyday meanings within specific contexts (Brandt, 2001; Hicks, 2002; Purcell-Gates, 1995; Street, 2005). Literacy encompasses diversity and complexity (Genishi & Dyson, 2009), where learners are impacted by which literacies are valued in informal settings outside of school that include a multitude of them (Kitson, Fletcher, & Kearny, 2007; New London Group, 1996).

At the interstices of our literacy experiences, visuals have been consistently embedded in our history (McCloud, 1993) and discussions of literacy (Callow, 2005; Debes, 1974; Wyatt-Smith & Kimber, 2009). When people lived in caves, for example, they took pigments to cave walls to relate stories such as the hunt for food. Later they created calendars to plan when to plant crops. Images are also present in ancient Egyptian tapestries and medieval illuminated manuscripts (Lehrer, 2009). Image-centric objects have been and remain present throughout our culture, communications, and the economy (Altisen, 2002; Avgerinou, 2001; Duncum, 2010). In present-day environments, the rise of image-centric technologies emphasizes the need to learn to "read" (understand) and "write" (communicate with) visuals (Avgerinou, 2007). Visuals have been used to create templates and designs to plan and execute innovative technologies, such as cell phones, computers, airplanes, automobiles, and space craft.

Visuals have and continue to impact us in various ways, including aesthetic and affective manners. For example, many of us include household decorations and personal images on a mantelpiece. They can serve as visual aids to memory, spark emotions, emphasize what we value, and more. Images are intimately linked to our bodies, mind, and social contexts (Fleckenstein, 2003).

While I allude to images and image-centric objects, visuals should not be mistaken exclusively for images. Images are at the heart of visuals, but they are rarely present on their own. In this paper, the term "visuals" refers to multimodal representations (Duncum, 2010; Jewitt, 2008; Wyatt-Smitth & Kimber, 2009). They can be found in confluence with other communicative modes such as sound, text, and video

(Duncum, 2004) that are common in contemporary life. Examples include interactive digital presentations, phone interfaces, and online videos.

Each image, along with text, symbols and other meaning-making modes, comprise unique visuals that demand distinctive and diverse literacies that fluidly interact according to the visual modes employed. Seeing and understanding quick response (QR) codes, for example, necessitates knowledge of the purpose behind QR codes, which are two-dimensional codes that can be read by supported mobile devices with camera capability. Users also need knowledge of software necessary to "read" the codes. Once the information is downloaded into a device, the user relies on other literacies to fully grasp and understand the content. These other literacies can include language, printed sign systems, mathematics, and other skills that have historically and contextually been considered necessary to become literate (Brandt, 2001; Knobel, 1999; New London Group, 1996; Street, 1995).

Visuals like QR codes thrive within 21st century life – a digital age – marked by technological advances and innovations that are constantly transforming and in flux (Albright & Walsh, 2003; Avgerinou, 2009; Callow, 2005; Noble, 2004). Part of this digital age includes a renewed emphasis on the acquisition of what have been dubbed "21st century skills", which include creativity, innovation, critical thinking, problem solving, communication, and collaboration (National Council of Teachers of English, 2008; Partnership for 21st Century Skills, 2007). This emphasis comes with the caveat that these "new" skills are couched in, anchored to, and embedded with new and emerging technologies that emphasize an increasingly fast-paced and connected world. Computers, for example, have been and are changing the way human beings

communicate, learn, work, and play (Shaffer, Squire, Halverson, & Gee, 2005), and how

we think about literacy within a digital, globally-networked context (Elkins & Luke, 2000;

Gee, 1991; Knobel, 1999).

At any time, we can access software that connects us synchronously (in real

time) or asynchronously (the message is pending a response) with others across the

globe via computer, cell phone, and other devices. Computers are increasingly present

in classrooms and workplaces. Electronic games have navigated beyond gaming

platforms to mobile technologies. Technologies continue to change our environments,

cognitive development, and interactions, (Albright & Walsh, 2003; Avgerinou, 2009;

Callow, 2005; Wilson, 2003) and they have facilitated and transformed the proliferation

of information and visuals (Avgerinou, 2001; Callow, 2005; Mayall & Robinson, 2009;

Noble, 2004) via multi-media texts.

Woven into the fabric of these technological landscapes, visuals remain an

important component of our relationships and interactions with people and the world

(Avgerinou, 2009; Gaylean, 1983; Serafini, 2010; Sosa, 2009; Styles & Arzipe, 2001).

Perhaps they are more important than before, since precursors of current technology,

such as television (Debes, 1969) and the home computer (Portewig, 2004), emphasized

visuals. To facilitate navigation within these heavily technological and visual contexts, a

visual literacy is necessary (Sosa, 2009; Wilhelm, 2005) as another way of learning,

thinking, and communicating in the 21st century.

Achieving visual literacy involves a series of visual competencies integrated with

other ways of meaning-making which a person uses to think, learn, and communicate

with others (Seels, 1994), and interpret visual information, actions, objects, and symbols

(Braden & Hortin, 1982; Debes, 1969). The viewer is learning to "read" and "write" visual messages (Avgerinou, 2007) by recognizing the basic "language" used in each media form, being able to judge the credibility and accuracy of the information presented, evaluating author's intent and meaning, and appreciating the techniques used to persuade and convey emotion (Scheibe, 2004). Visual literacy is not limited to a set of competencies and skills, however. It is a social practice (Street, 2003) in which visuals are consumed, used, problematized, and otherwise transformed as people establish everyday meanings in specific cultural contexts (Gee, 2010; Street, 2003, 2005).

Statement of the Problem

Image-rich, technology-enhanced environments are unavoidably part of our students' present and their future, for which they must be prepared. According to the National Council of Teachers of English (NCTE), 21stcentury readers and writers need to create, critique, analyze, and evaluate multi-media texts (2008). They are not simply consumers of media and information. Many learners invest much time engaging with visually rich environments both in the electronic and physical realms (Hinchman, Alverman, Boyd, Brozo & Vacca, 2003; Jukes & Dosaj, 2006). They regularly watch and create movies and blogs, post on social network sites, create illustrations, music, and even construct self-made merchandise.

While reading, writing, and math remain central literacy concerns, navigating the 21st century means understanding and learning from the more "fluid and dynamic interconnectedness that is made possible by newer technology" (Adams & Hamm, 2001, p.1) that embraces visuals, from which we can garner multiple understandings.

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Education stakeholders need to exploit the information and communication technologies that are common in learners' lives (International Reading Association, 2009).

In the conversation of visuals and their influence on learning within contemporary, digitally-connected environments, many scholars suggest the conscious integration of visuals in education to offer additional opportunities to facilitate learning (Avgerinou, 2001; Debes, 1969; Fleckenstein, 2003; Fransecky & Debes, 1972; Grant, Hutchinson, Hornsby & Brooke, 2008; Portewig, 2004; Segovia Aguilar, 2010; Sosa, 2009). A visual literacy is needed to "read" visual messages by recognizing the basic "language" used in each media form, which can offer opportunities to explore new and conflicting ideas and make connections with others in the world (Avgerinou, 2001; Considine, 1986; Debes, 1969; Pressley, Pigott, & Bryant, 1982; Segovia Aguilar, 2010; Serafini, 2010). Portewig (2004) asserts that to "attain visual literacy, we must be aware of the rhetorical situation of using visuals as well as how to communicate, think about, and represent the visual" (p. 32). Image-centric resources in the classroom are an important influence onliteracy acquisition (Dyson, 1999; Johnson, 1990), not just in traditional learning settings, but within increasingly technology-saturated, visually-rich environments.

It is important to note that research in visual learning has illuminated the power of visuals to improve learning (Pressley, Pigott, & Bryant, 1982; Considine, 1986; Segovia Aguilar, 2010), increase student attention (Considine, 1986; Gaylean, 1983; Zambo & Brozo, 2008), help them make sense of the world (Serafini, 2010), and reach acceptance of self and others (Gaylean, 1983). In addition, research in educational technology has explored if digital tools have made an impact in practices, objectives,

and learning (Beeland, 2002; McKendrick & Bowden, 1999; Mayall & Robinson, 2009; Messaris, 1994; Rakes, Rakes, & Smith, 1995; Yeh & Lohr, 2010), as well as the belief that technology enhances learning, productivity, and performance (Davies, 2011; Evans, 2005). However, there are several challenges to the integration of visual literacy in technology-enhanced education.

One challenge is that there are different understandings of what visuals are, how they may be used, and how they impact thinking, learning, and communicating. This has fostered some confusion as to how they may be used in instructional settings. For example, because technology and visuals may inform part of many learners' daily lives, we may easily confuse and equate technological savvy and being submerged in image-rich environments as evidence of mastery, where the understanding and applications of technology and visuals are assumed to have been internalized. It is also plausible that this could lead to an understanding that visuals are easily comprehended, apprehended, and used; that they afford "basic" and "low" level cognitive demands and technology is essentially a tool to continue traditional literacy work (Evans, 2005).

In addition, research has been limited to a few studies dealing with limited graphical representations, where the focus was on particular types of graphics, such as maps (Coleman, 2010). Much focus has instead been given to the design of visual materials for the classroom, where an understanding of visuals is assumed (Omar, 2000; Portewig, 2004). Because of these and other challenges, research on what is happening with visuals in the classrooms is lacking. There is a need to ascertain the instructional strategies, methods, and resources currently used by teachers to integrate visuals in technology-enhanced literacy instruction (Mayall & Robinson, 2009). Felten

(2008) stresses that the saturated presence of technology and visuals does not mean students or educators are automatically instilled with visual literacy skills, in the same way that eating a chocolate every day of the week does not teach a person how to make chocolates. It is important and pertinent, therefore, to explore teachers' use of visuals and their awareness of the rhetorical situation of using visuals for instruction. Such knowledge can serve to enhance our understanding of teachers' integration of visual literacy tenets, inform future literacy considerations and practices, raise new questions, and foster reflection of current practices.

Purpose and Rationale

The purpose of this study was to explore how fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced literacy instruction. It was my intent to learn about teachers' practice and beliefs, as well as the availability, use, and integration of technology tools and visual learning and literacy principles (Moore & Dwyer, 1994; Omar, 2000). I believe that situating this study within a technology-rich context helps capture the nature of changing and transforming 21st century classroom environments, highlights the increasing importance of visuals, and presents several implications for future research.

This study takes place at a time when many people work within multiple heavily visual, hectic, accelerated, and connected technology-enhanced environments. Many of us now participate in, and form part of, a "media-saturated culture, [where] we consume visual images, responding with our senses, emotionally, cognitively, all at once and somewhat hungrily, as if we are popping a chocolate into our mouths" (Way, 2006, p. 15). On any given day, a digitally-connected person can write and answer e-mails with

attached images, send text messages with emoticons to express emotion, update a

visual profile on a social networking site, run a search for information and images, watch

videos online, create a visual résumé, and more.

In education, all student teachers are now immersed in education programs

where technology integration is mandatory (Gronseth et al., 2010) and educational

policies continue to make technology integration in K-12 classrooms a priority (Davies,

2011; Earle, 2002; Evans, 2005; Mims, Polly, Shepherd & Inan, 2006). This influences

what is taught and the way it is presented (Leu & Kinzer, 2000). Indeed, many believe

that it is critical that teachers integrate and use technology in the classroom (Gronseth

et al., 2010; International Reading Association, 2009; International Society for

Technology in Education, 2008; Partnership for 21st Century Skills, 2007). In addition,

contemporary technologies are "deeply dependent on literacy and each technology

makes a unique demand on the literacy skills of users" (Snyder, Jones, & Lo Bianco,

2005, p. 11). Several scholars have pointed out a multitude of literacies necessary to

thrive in 21st century life that highlight the complexities of literacies and how they are

impacted by networked, globalized, fluid, and transforming digital societies. These

literacies include, but are not limited to, "visual, aural, media, computers, cultural, social,

eco" (Avgerinou, 2009; Gee, 2007; Kress, 2007), techno, information, and digital

literacy. Of these multiple literacies, several scholars have called attention specifically to

visual literacy as an increasingly important literacy within the continued development of

technology (Avgerinou, 2009; Felten, 2008; New London Group, 1996; Sosa, 2009; &

Stokes, 2002).

Over time, many types of technologies such as mobile phones, tablets, and computers (including laptops), have progressively emphasized the use of images (Snyder, Jones, & Lo Bianco, 2005). Visuals are also increasingly present in learning and teaching resources across a wide range of formats (Portewig, 2004; Sims, O'Leary, Cook, & Butland, 2002; Yeh & Lohr, 2010). For example, picture books are frequently used in the elementary classroom; the Internet is often a source of information; electronic, image-rich applications are reaching the hands of students; and more. In addition, visually rich technologies such as video games have been used to promote meaningful and naturally occurring learning and literacy within socially diverse environments (Gee, 2003; Shaffer, Squire, Halverson, & Gee, 2005; Squire, 2006). An understanding of the visual representation of ideas in technology integration is just as important as using language, text, and other representations (McLoughlin & Krakowski, 2001), and several argue that it is critically important (Avgerinou, 2001; Felten, 2008; Portewig, 2004; Sosa, 2009; & Stokes, 2002).

Experiences in digital environments emphasize networked relationships within social, cultural, and linguistically diverse environments (Lam, 2009) where visuals abound (Avgerinou, 2009; Callow, 2005; Duncum, 2010, Noble, 2004). It is necessary to learn what teachers are doing with visuals in technology-enhanced environments, as part of what they are expected to do and know in today's digital and visually-saturated environments includes:

- Designing and developing appropriate learning experiences and assessments (International Society for Technology in Education, 2008; Mims, Polly, Shepherd & Inan, 2006).

- Consideration of how images and sound may amplify text (National Council of Teachers of English, 2008).

- Consideration of how tools can make artists and designers of students not traditionally considered talented in such areas (National Council of Teachers of English, 2008).

- Having knowledge of how visuals can influence student thinking, learning, and communicating (Mayall & Robinson, 2009).

Facilitating visual literacy integration in contemporary K-12 education is important (Alvermann & Hagood, 2000; Callow, 2005; Kress, 2000). Therefore, it is also important to explore how much of the visual literacy rhetoric is present in contemporary classroom instruction. This can help illuminate existing, new, shifting, or changing considerations of the way visuals are perceived and used in 21st century environments.

Guiding Questions

How do fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced, literacy instruction?

1. What are teachers doing with visuals and technology in the classroom?

2. What are teachers trying to accomplish when they use different strategies, methods, and/or resources?

Significance of the Study

As technology continues to spread, so does the presence of visual elements in today's teaching (Avgerinou, 2001; Stokes, 2002). However, attempts to ascertain instructional strategies, methods, and resources used to integrate visuals in such technological environments have not been prevalent (Mayall & Robinson, 2009; Omar, 2000). Because facilitating visual literacy in curricula is important (Alvermann & Hagood, 2000; Callow, 2005; Felten, 2008; Kress, 2000), research on teachers' use of visuals in technology-enhanced curricula will be informative for stakeholders on three fronts.

First, a description of teachers' current use of visuals has the potential to add to the understanding of how teachers consciously perceive, use, and interact with visuals in education in confluence with technology. It is necessary to learn what teachers are doing with visuals in technology-enhanced environments, because they are expected to design learning experiences (International Society for Technology in Education, 2008; Mims, Polly, Shepherd & Inan, 2006), consider how images may amplify text (National Council of Teachers of English, 2008), how students can become artists and designers (National Council of Teachers of English, 2008), and know how visuals can influence thinking, learning and communicating (Mayall & Robinson, 2009). Exploring various perspectives can serve to inform practices, raise questions, and foster reflection of current integration of visuals and technology.

Second, knowledge of these perspectives could enhance our understanding of teachers' awareness and integration of visual literacy rhetoric. It can also illuminate what teachers are asking students to do and what counts as acceptable use of technology and visual representation. This can encourage comparisons of past and current practices in relation to what teachers are expected to know and do and what teachers expect students to know and do.

Finally, this study may add to the understanding of how current integration of technology and visuals may affect future literacy considerations within a visually-rich, digitally-connected global network. Thus, inquiry on teachers' use of visuals in technology-enhanced curricula may promote discussions related to the availability, use, and integration of technology and visual literacy principles, tools, resources, and practices, as well as encourage reflection of such practices.

Limitations

The operational definition of visual literacy was adapted for the use of this particular study, which has commonalities with other scholars' descriptions, but definitions and understandings vary across disciplines (Avgerinou, 2010; Moriarty, 1997). In addition, results cannot be generalized beyond the context of this particular research; it will be up to the reader to make connections to their own practice and experiences.

For the particular context of this study, the collaborators involved had prior experience in technology integration in their classes due to a technology initiative in which they had participated. I have provided a rationale for the selection of a pool of collaborators from this initiative in chapter three. This was done to maintain data transparency and expose influences that may impact the results of this study. In terms of the potential impact of the study, in the short term it can inform conversations of visuals in literacy and help ascertain visual strategies, methods, and resources teachers are using in literacy instruction. However, more research and conversations concerning teachers' use of visuals are needed to explore patterns of literacy instruction that could enhance our understanding of what and how visuals are legitimized, especially within digital landscapes. Finally, my subjectivity also impacts the study, which is provided in detail in Chapter 3.

Definition of Terms

The following are terms and definitions used throughout this study, with the caveat that definitions are "shifting and unstable", as well as "inaccurate, yet necessary" (Spivak, 1997, xii). Instead of "definitions", the word "understandings" better applies to these ideas, as they are free to be molded, weakened, strengthened, aggrandized,

limited, changed, and transformed by the unique experiences that make up our lives within the "mosaics of social worlds, arenas, and discourses" (Clarke, 2005, p. 154) we inhabit.

Image Literacies

This term is subsumed under 'visual literacy' and in this study it refers specifically to the competencies only involving images, such as photographs, illustrations, drawings, and other two-dimensional representations of the world; what we generally refer to, simply, as pictures.

Literacy

Literacy is a social practice that focuses on how people establish meanings in specific cultural contexts (Street, 2003; 2005). "It emphasizes not only cultural meanings but also the power dimension of reading and writing processes" (Street, 2005, p. 418). It allows us, then, to ask questions about literacy in terms of culture, context, and relations of power.

Multiliteracies

Multiliteracies comprises traditional skills of reading, writing, speaking, and listening compounded with the fluid, shifting, dynamic, transforming, and culturally and linguistically diverse connections between print, visual, audio, and multimodal texts (Duncum, 2004; Hagood, 2000). According to the New London Group (1996), a pedagogy of multiliteracies encompasses a multiplicity of representational modes broader than language alone, which are dependent on culture and context.

Technology-savvy

For the purpose of this study, technology-savvy was defined as having experience, familiarity, and comfort with more than basic technology skills that may

include, but are not limited to having: (1) access to technologies; (2) flexibility to explore features and functions; (3) seeing technology modeled by others; (4) opportunities to design and implement technology-rich lessons; and (5) personalized support throughout the learning and implementation process (Mims, Polly, Shepherd, & Inan, 2006).

Text

I borrow from Fairclough (2003) to define text broadly. Text can include written and printed items such as lists and lottery tickets, web-pages and videos, and transcripts of conversations or radio programs. Texts can also include visuals and sound effects (Clarke, 2005; Gee, 2003; Rapley, 2009) and encompass other modes, (Clarke, 2005) such as recorded video. There are possibly three analytically separable elements in the process of meaning-making that include the production of text, the text itself, and the reception of text, but meanings are made through the interplay among them (Fairclough, 2003; Gee, 2010). Habits of thought, perception, and behavior, for example, are socially shared and reflected in numerous "texts" belonging to different genres (Scollon & Scollon, 2001).

Visual Culture

A visual culture refers to cultural sites that involve imagery compounded with other communicative modes that may "employ more than vision" and are driven by global capital "whose signs now circulate day and night through international communication networks, saturate our cultural landscape, and impact our everyday thoughts and decisions" (Duncum, 2004, p. 252).

Visuals

The term "visuals" here refers to multimodal representations (Duncum, 2010; Jewitt, 2008; Wyatt-Smitth & Kimber, 2009). Visuals are not limited to what can be

perceived with the eyes and can include other senses like sound and touch. For example, they can include two-dimensional images such as photographs, three-dimensional images such as statues, graphic representations of information such as Venn diagrams, sequential images such as videos, and others.

Visual Literacy

Visual literacy refers to a series of visual competencies integrated with other ways of meaning-making which a person uses to think, learn, and communicate with others (Seels, 1994), and interpret visual information, actions, objects, and symbols (Braden & Hortin, 1982; Debes, 1969). The viewer is learning to "read" and "write" visual messages (Avgerinou, 2007) by recognizing the basic "language" used in each media form, being able to judge the credibility and accuracy of the information presented, evaluating author's intent and meaning, and appreciating the techniques used to persuade and convey emotion (Scheibe, 2004). Visual literacy is not limited to a set of competencies and skills, however. It is a social practice (Street, 2003) in which visuals are consumed, used, problematized, and otherwise transformed as people establish everyday meanings in specific cultural contexts. For example, when looking at an advertisement, a visually literate person might ask: who created the advert? For what purpose was it created and in what context? What point of view is present? What has been omitted or altered? What does the advert say about our history/society? Why were particular images chosen? (Bamford, 2003).

Visual Literacy Practices

Based on the definition for visual literacy, visual literacy practices include integrating visuals in the curriculum to aid students' thinking, learning, interpreting, and

analyzing (Seels, 1994), and to provide opportunities in which students can learn to work freely with visuals to express themselves and communicate with others.

Visual Thinking

Visual thinking involves the organization of mental images in various compositions, shapes, lines, colors, and textures (Wileman, 1980).

Visual Learning

Visual learning includes learning from visuals and ongoing research concerning the design of visuals for instruction (Seels, 1994).

Visual Communication

Using visuals to disseminate information and communicate with others face-to-face or electronically/digitally.

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Organization of the Study

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This study is organized into five chapters, a section for references, and appendices. The first chapter, which provides an introduction, description of the problem, purpose of the study and rationale, guiding question, limitations, and definition of terms is followed by Chapter 2, which features a review of the literature. It first provides a background on the trajectory of our conceptions of literacy and how the conversation has broadened to include multiple literacies. It then frames visual literacy within this history and education and presents connections between technology and visual literacy practices in K-12 environments.

Chapter 3 presents the research design and methodology of the study, including the theoretical framework, and a description of the methods of data collection and analysis. Chapter 4 presents the results from the analysis, including discussion of the

findings. Finally, Chapter 5 presents the conclusions and implications for future

research, followed by a list of references and appendices.

CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

This section provides an overview of the research and theory informing this

study. Exploring visual literacy practices as part of teacher pedagogy involves engaging

with several focal points: conceptions of literacy, literacy models, the socio-cultural

perspective, multiple literacies, out-of-school learning, technology and 21st century life,

technology and education, visual culture, visual literacy, visual literacy and education,

and teacher's visual literacy integration within technology-enhanced curricula.

Literacy Then and Now

The idea of literacy, or the process of employing processes and skills to say, do,

and be, has been around ever since we have record or evidence of the beginnings of

our conscious existence (Chauvin, 2003; Debes, 1974). For example, as many of us

learned in school, the earliest caveman demonstrated a need for literacy learning to

communicate; first through body language and then pictorials (Debes, 1974). As time

passed and humanity proliferated around the world, human beings began to

communicate via language.

As different people from different backgrounds and languages met and

connected to exchange ideas, as well as learn, trade, and progress, the idea of writing

and literacy spread. This seed of knowledge acquisition, of curiosity and drive, planted

by a meeting of languages, is known as the "stimulus diffusion" of literacy (Bernard,

1999). Thanks to this interaction, different people created their own scripts to

communicate and literacy became conceptualized as the ability to read and write in

standard forms (Brandt, 2001; Hagood, 2000; New London Group, 1996; Seels, 1994;

Street, 2005) in order to interact with others and gain social, cultural, and economic capital. This later included basic mathematics.

For example, people might write letters to win the affection of a loved one, read and write inventories to effectively manage a business, or calculate math when in the process of bartering for a better price on merchandise. Literacy as the acquisition of skills, processes, and understandings to gain social goods became a necessity in our environment, which to this day provides bridges to every facet of modern life, from communication to employment. Literacy, however, is not such a narrow and easily discernible concept. To say that it is simply a process involving only one set of skills and understandings is to simplify and de-emphasize its depth, scope, and impact in our learning, interacting, reacting, reflecting, and otherwise engaging with our creating and thinking about ourselves and the world. Literacy is slippery, as all of our labels are (Spivak, 1997). It is in a state of constant flux; its meanings, applications, and acquisition may be different for different people in different contexts.

In a study of the impact of literacy across generations, Brandt (2001) looked for similarities in 80 interviews she conducted with a diverse group of Americans born between the late 1890s and the early 1980s, and analyzed their accounts "for their historical value", and "for their illumination of people's relationships to the social structures of their times and places, especially those in which literacy learning is implicated" (p. 10). Brandt found that depending on material, economic, and social circumstances, people would need to acquire a certain degree of literacy to prosper, but that varied greatly across and within generations. Even an eighth grade reading level, what would not suffice for a high school diploma for this generation, allowed older

generations to obtain gainful employment and even some degree of recognition. Connections to literacy historically depended on religious ideals, productivity, and good citizenship (Brandt, 2001). What mattered to a generation born in a society catering to their lives in terms of productivity, for example, needed and acquired specific literacy that was thought of and constructed differently for those born in a generation where people may have had good citizenship or religious ideals as their main goals.

This has significant implications to how literacy is approached in schools and how it impacts policy. Considerations of literacy across generations can impact what educators teach, how they teach it, and what they believe about literacy. The following sections offer a brief look at the history of our conceptions of literacy to glean an understanding of the complexity of literacy, current conversations, and their impact in education. Historically, literacy has been generally conceptualized as both an autonomous model and an ideological literacy model (Hagood, 2000; Kutz, 1997; New London Group, 1996; Street, 2003). The current move towards a transformation of educational practices and encouraging research and conversations of what literacy in the 21st century may mean for current and future literacy initiatives continues to be impacted by thinking about and problematizing these concepts.

The Autonomous Model of Literacy

Traditionally, literacy pedagogy has mostly been "restricted to formalized, monolingual, monocultural, and rule-governed forms of language" (New London Group, 1996, p.61). The premise was that by immersing oneself in literacy study – in reading and writing individually and independently – a person could learn the same things as anyone else and in the same ways. For example, a person living in extreme poverty was thought to have the same opportunities as another living under wealthier conditions

via the acquisition of literacy. Literacy itself would propel both persons forward to succeed in life by learning the same things in the same way. This narrow view of a standard acquisition of skills to become 'literate' has been called the 'autonomous' model of literacy, in which literacy is thought to automatically impact social and cognitive practices (Street, 2003). This model romanticizes and idealizes the acquisition of literacy as a cornerstone to life success without concern for social, economic, cultural, or personal circumstances (Hagood, 2000; Street, 2005). It emphasizes homogeneity, equality, and neutrality "despite ideological assumptions that underpin it" (Street, 2005, p. 417), such as notions of relations of power: who has it, what for, and who is allowed access to it.

The autonomous notion of literacy has impacted the education system of the United States, where the assumption is that if any two students can read the same article by applying fundamental and basic reading skills (Davenport & Jones, 2005), for example, they will both be successful at the same test. Even in today's rapidly changing environments and continuing conversations about literacy and literacy learning, the requirements of national standardized assessments remain the norm (Tan & Guo, 2010; Street, 2008). While literacy issues have been debated for many decades by the educational community (Davenport & Jones, 2005), contemporary national standards are fairly new. The impetus for regulating a national literacy education policy arose over a quarter of a century ago (Bomer, 2006), propelled by politicians such as George W. Bush, who touted new literacy policy reforms. Teachers in these times of literacy education policy debate became well-acquainted with words and terms such as "failure", "underperforming", and "closing the achievement gap." Part of the new educational

discourse was to look at what was wrong in an effort to improve pedagogy and to "leave no child behind." In an effort to address these issues, policy language encouraged education systems to turn to state test scores as effective ways to measure achievement and progress.

This method to measure achievement and progress became standard due to several influences including lack of information. According to Davenport and Jones (2005), before the age of internet and reliable databases, tests given to students in the United States may not have been kept for long periods of time. Lack of a history of test scores from influential education systems like California made long-term comparisons difficult. As a result, cursory explorations of the limited data available pointed to a straightforward and fundamental phonics approach that seemed to provide a more positive impact on literacy acquisition, as opposed to whole language or other approaches (Davenport & Jones, 2005).

Literacy policies began emphasizing the issue of phonics and other fundamental ways to learn the science of reading, divorced from the cultural, gendered, material, and other conditions of communities (Bomer, 2006; Camangian, 2011). This "back to basics" approach served to emphasize the autonomous model of literacy, in which teachers are "highly qualified" in the language of policy and teach to the test, leaving them poorly prepared to address the social, cultural, economic, and other conditions of their students (Camagian, 2011). Adults in schools have been pressed to ignore the unique interests and ways of learning of their students in favor of a view where students are narrowly defined as "readers" (Genishi & Dyson, 2009).

While no policy is without flaws, there have been debates about the pros and cons of a purely standardized approach to teaching. The autonomous model as an independent engagement with reading and writing has been challenged as Western imposition of literacy conceptions (Hagood, 2000; New London Group, 1996; Street, 1995; Street, 2005). Part of this conversation claims a lack of knowledge of the social contexts of students, and can serve to alienate many from a rounded education (Camangian, 2011). Literacy requirements have shifted to include not only the process and basics of reading, but reading to learn within (and dependent on) varying contexts (Schleicher, 2010). Not only that, but research suggests that such literacy as we may have coveted before is no longer sufficient (Knobel, 1999). The nature of literacy, of knowledge and expertise, continues to change rapidly (Bomer, 2006; Elkins & Luke, 2000; Knobel, 1999), and is continuously impacted by social, cultural, economic, technological and other contextual elements. This has helped steer the conversation of literacy within the educational community towards other, broader venues; towards an ideological model of literacy learning and an emphasis on the multiple literacies of people's lives.

Ideological Literacy and the Socio-Cultural Paradigm

In contemporary literacy conversations there has been a call to move away from autonomous notions of literacy as an independent cognitive endeavor (Bomer, 2006; Camangian, 2011; Hagood, 2000; Knobel, 1999; New London Group, 1996; Street, 1995; Street, 2005; Tan & Guo, 2010). The emphasis is now towards new understandings of literacies. Many literacy scholars continue to widen their focus to what is now known as "New Literacy Studies" (NLS) (Gee, 1991; Street, 1995; Street, 2003), which consider the nature of literacy (Gee, 1991) and what it means to "think of

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literacy as a social practice" (Street, 2003, p. 77). NLS addresses the perspective of an ideological literacy that focuses on how people use it to establish everyday meanings and learn in specific cultural contexts (Brandt, 2001; Hicks, 2002; Purcell-Gates, 1995; Street, 2005). This includes the knowledge of the impact of contemporary technology (Cooper, 2000), as well as the social, economic, and contextual complexities of literacy acquisition.

This approach stems from socio-cultural theory, which moves away from a narrow, behaviorist lens, towards one that is "wide enough to encompass both diversity and complexity" (Genishi & Dyson, 2009). Socio-cultural theory has its origins from the writings of Vygotsky, a Russian psychologist. Among his studies, Vygotsky explored how children learn and the tools they use to mediate their learning. It is from his academic and research endeavors that his theories were shaped on the premise of three aspects: concept development is fundamentally genetic, relies on social learning, and is mediated by tools and signs (Smagorinsky, 2007; Vygotsky, 1978).

First, genetic development suggests that literacy is not an isolated event, as it draws from the development of the species, the development of the individual, and the influence of events (Vygotsky, 1978). The second aspect, social learning, stems from Vygotsky's (1978) claims that a child's development begins at the social level through interaction with other people, such as parents, friends, and teachers. For example, a child can learn of the existence of an apple if the people in the environment in which she lives eat apples and share them with her. Their actions influence her actions and decisions concerning the apple. It is through interaction that the child learns that an apple is something she can safely eat.

The third aspect of Vygotsky's (1978) theories is mediation, which suggests that people learn and are transformed through action with tools or signs such as pencils, paper, computers, and language itself. Specific events and conditions of social interaction and development encourage learners to organize their behavior by creating external stimuli to use as mnemonic devices (Vygotsky, 1978) as a means of interacting with the environment (both concrete and symbolic). For instance: the child has learned the word for "apple." Instead of waiting around for an apple to come into view, the child remembers the coveted fruit and speaks to someone the word that represents the object, thus creating and using a sign that has the characteristic of reverse action. This means that the spoken word, (sign), does not directly influence or impact the environment, but transforms the child's relationship with the environment. It is a tool used to interact with others for varied purposes.

This idea of socially-embedded, contextualized, and mediated practices emphasizes the complexity of literacy in our lives. While certain cognitive enterprises may seem as if they are carried out independently, such as reading and thinking about a book, it is through the interaction with others that we explore the depth of our own thoughts and apply previously learned skills, methods, and processes to interact, impact, and influence our environments. Human nature "presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (Vygotsky, 1978, p. 88). Human mental activity never happens autonomously, even when it goes on "inside the head" (Bruner, 1996). In a way, we learn everything at least twice--socially and internally (Genishi & Dyson, 2009).

Education begins and continues in the home – within a social environment – around the dinner table as everyone talks to try to make sense of the day (Bruner, 1996).Language is an important mediator necessary for learning (Bakhtin, 1986; Genishi & Dyson, 2009). People obtain their words and expressions from other speakers in different contexts and for different purposes. Once appropriated, they then use those words to apply to their own meaning-making process. Learning, then, becomes more effective and more meaningful when done with others (Bakhtin, 1986; Collins, 2003).

In the book, *Reading lives: Working class children and literacy learning* (2002), Hicks explores the "histories that shape connections with school and workplace literacies" (p.1). By drawing on mixed genres and hybrid theoretical discourses, Hicks articulates a theory of literacy learning focused on social relationships. She argues it is not sufficient to draw solely from scientific discourses, but that socially situated literacies and "feeling and valuing are integral to what it means to know (p.2). Specifically, she suggests teachers "read" and attempt to understand children's lives in terms of class, gender and race. Hicks explores how literary form conveys imaginings, resistances, dependencies, longings, connection, transformation, productivity and limitation (2001). In order to reach and draw from caring, socially-situated literacies, meaningful dialogues need to be encouraged, initiated, continued, and problematized among both educators and students.

A study by Purcell-Gates (1995) extends this idea of dialogue and socially-situated learning. Purcell-Gates states that a cultural perspective "implies the study of difference rather than deficit" (p.186). Without an attempt to understand students'

backgrounds, institutionalized school systems keep power away from others (Brandt; 2002, Hicks, 2002; Purcell-Gates, 1995). The deficit mindset can then take hold of the community and many learners are treated as non-beings (Rogers, 2003; Purcell-Gates; 1995). In such environments, literacy practices can be misunderstood despite learners' active participation of literacies that are relevant to their lives (Brandt, 2001, Hicks, 2002; Purcell-Gates, 2003; Rogers, 2003). A child who stands out by voicing her opinions or interrupting to speak about their experiences as she might do at home, for example, might be construed as exhibiting "disruptive" behavior and an unwillingness to learn. Perhaps the child is negotiating her understanding--but reactions around her may lead to a missed learning opportunity.

The ideological--or situated (Kutz, 1997)--model of literacy addresses such opportunities. It takes the variability of context and space into consideration within contemporary, multifaceted environments (Street, 2003; Street, 2005). "It emphasizes not only cultural meanings but also the power dimension of reading and writing processes" (Street, 2005, 418). It allows us, then, to ask questions about literacy in terms of culture, context, and relations of power. In the context of education, we can think about what it is that teachers and students think of as important and necessary literacy within their environments--not just in school settings--as well as what literacy is not privileged and why. This raises questions for any literacy program (Street, 2005), such as

- What are the perceived power relations between teachers and students?
- What resources are being used?
- What literacies are being included and excluded?
- What directions are stakeholders headed in by taking on one literacy or another?
- How do stakeholders challenge traditional notions of literacy?

Brandt (2001) states that literacy acquisition is driven by motivation from "personal history, current condition, and future ambition" (p. 69). Literacy is a slippery notion and a difficult concept to define and understand (Collins, 2003) at any given time, because it is underpinned by ideologies from society and culture. It means different things to different people depending on the context in which they trade, acquire, and use literacies. Today's increasing cultural and linguistic diversity, propagated by exponential growth in technological innovation and global connections, has helped expand already slippery conversations of literacy (New London Group, 1996).

Multiliteracies and Out of School Learning

"What counts as literacy is locally and situationally defined through the actions of members of a social group" (Kitson, Fletcher, & Kearny, 2007). Local diversity and valued literacies play important roles in literacy learning and negotiating (New London Group, 1996). According to Street (1995), it is within culturally and contextually relevant situations that literacy flourishes. Within these practices is where we find "the behavior and the social and cultural conceptualizations that give meaning to the uses of reading and/or writing" (p.2). This suggests that we need to consider meaningful uses of literacy, not just how or how well learners read, write, and calculate mathematics.

The New London Group (1996) (NLG) has enhanced traditional and situated notions of literacy within our constantly changing environment with the term "multiliteracies", which interweave scaffolding, a diversity of texts, and meaningful tasks that can encourage agency for student learning (Cumming-Potvin, 2007). The NLG stated that "literacy pedagogy now must account for the burgeoning variety of text forms associated with information and multimedia technologies" (1996, p. 61). We should consider the multitude of literacies learners can acquire and engage with in their

communities and on a larger, digitally-connected scale. Lankshear and Knobel (2006) suggest an attempt to understand how old and new technologies, compounded with in-and-out of school literacies, are related and how they may impact practices.

Multiliteracies comprise the traditional, the new, and the ongoing. They include skills of reading, writing, speaking, and listening, and they are compounded with the fluid, shifting, dynamic, transforming, and culturally and linguistically diverse connections between print, visual, audio, and multimodal texts (Duncum, 2004; Hagood, 2000). A pedagogy of multiliteracies encompasses a multiplicity of representational modes broader than language alone, which are dependent on culture and context (Cope & Kalantzis, 2000; New London Group, 1996). This means that, while learning how to read, write, and use language within school contexts (Kutz, 1997), many learners continue to be engaged with literacy practices outside of school (Genishi & Dyson, 2009) within their local communities and within other culturally and linguistically diverse environments, in some cases made accessible by contemporary technology.

Schools must make efforts to recognize and make a connection between home and school literacies for all children (Genishi & Dyson, 2009; Hull & Schultz, 2001; Kinloch, 2009; Rogers, 2003). Integrating such diversity into the school curriculum will not only enrich it, but enable all children to be well versed in the language of power while simultaneously practicing and building on their home literacies. A pedagogy of multiliteracies serves to emphasize the increasing importance of learning about out-of-school literacy practices and how they can impact current pedagogy. Out-of-school experiences can provide insight and inform literacy scholarship and practice (Genishi &

Dyson, 2009; Kinloch, 2009), as they suggest learning potentials that may not be reflected in traditional school-based assessments (Hull & Schultz, 2001; Street, 2005).

In literacy research there has been documentation and analysis of diverse activities that take place outside of school in such contexts, which may contrast with school performance (Collins, 2003; Hull & Schultz, 2001; Moje, 2000). Some scholars are concerned that there is a disconnect between the learning that takes place in educational settings and the learning that happens outside of school (Gee, 2006; Gerber, 2009; Hull & Schultz, 2001; Kukulska-Hulme & Traxler, 2005; Street, 2005). The disconnect can include: differences in teacher and student attitudes and beliefs of what a student is supposed to be (Collins, 2003), views of minorities and their literacy practices (Purcell-Gates, 1995), and differences in access of students' preference of materials (Wilhelm & Smith, 2005; Worthy, Moorman, & Turner, 1999).

For example, in her study, Collins (2003) tells the story of an African American fifth grader named Jay and his academic struggles. While in school, Jay is an energetic young man that was excluded from class participation and often separated from his classmates due to a perception that he did not possess the necessary skills or abilities to succeed in a school environment. Outside of school, however, he demonstrated quick thinking, curiosity for learning, was self-confident as a good learner, and engaged in varied literacy practices. The same enthusiasm he had in his everyday literacy practices was seen more as an act of rebellion in class; an inability to sit still and learn the way others tried. His teacher's beliefs as to what a student is supposed to be were vastly different from those of Jay, who considered himself a successful learner.

In Purcell-Gates' (1995) work, she presents her study of an urban Appalachian minority family who are struggling with literacy in its most basic forms of reading and writing. Within the school system in which they participate, they are an invisible minority that is "not accepted by individuals and institutions in the urban mainstream" (Purcell-Gates, 1995, p.17). Because of the urban mainstream's notions of their socio-cultural and economic background, they were the subject of many jokes, surrounded by deficit-ridden views where they are blamed for not caring about their education. However, members of the family worried about acquiring literacy. They engaged with literacy practices that were relevant to their lives, such as reading labels from food cans, and began to take steps towards literacy.

Worthy, Moorman, and Turner (1999) conducted a reading preference survey of over 400 middle school children from diverse schools. The results included a list of over 20 choices. In terms of the accessibility of books, magazines, etc., students stated that they did not get the majority of their materials from school or the classroom. This stemmed, in part, from lack of resources. However, teacher and librarians' attitudes about materials also influenced their decisions to look elsewhere. Often teachers and librarians objected to the content and/or length. Reading materials that would be suitable for the diversity of preferences (and for low achievers) remained unavailable.

The concept of multiliteracies and the possibilities presented by these studies suggest significant implications for literacy acquisition in schools. That is not to imply that the experiences and preferences students may have outside school are more important or should take precedence over what and how knowledge is taught. Instead we can aim to further problematize thinking of literacy and literacy learning, reflectively

address the complexities and opportunities afforded by out of school experiences (Genishi & Dyson, 2009; Hull & Shultz, 2001; Kutz, 1997; Street, 2003), and explore potential relationships between the formal classroom and out-of-school informal learning (Hull & Shultz, 2001).

Multiliteracies and Technology

Instances of literacy are fragmented within local communities and within the greater, global connections that require interacting across different cultures using various dialects and languages. Many learners actively use, construct, reconstruct and negotiate multiple literacies within local cultures that are increasingly globally connected through 21st century technology. They currently engage with various modes of meaning-making and representations that include print, visuals, audio, and others (Hinchman, Alverman, Boyd, Brozo & Vacca, 2003; Jukes & Dosaj, 2006). This includes watching television, surfing the Internet, digitizing print materials, and interacting with the visual display in cell phones. People can now consume, create, and critique in a variety of representations. These activities have "specific cognitive, cultural, and social effects" (New London Group, 1996, p. 64). Working within complex technological environments can lead to various opportunities such as engaging with meaningful literacy practices, learning through social interaction, learner self-monitoring (Chandler-Olcott & Mahar, 2003; Davidson, 2009) and cultural and linguistic literacy enrichment (Lam, 2009).

In a study by Chandler-Olcott and Mahar (2003), two middle-school girls participated in online communities, where they shared the products of their lessons and learned new skills. This included working with online mentors to design and create pages, conduct research of elements to incorporate in the sites, joining an art

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community, sharing and critiquing artwork, and others. Within complex online environments, both girls engaged in meaningful literacy practices that were both enriching and satisfying. They learned new things, managed and monitored their learning, and interacted with mentors and peers they may otherwise not have had access to.

Davidson (2009) highlights children's use of technology not as independent to learning in school, but as something that should be understood as blurred in its relationship to print-based learning. Davidson's study examined the literacy practices of two children as they used technology and print sources in collaboration with their family to search for information about reptiles. Davidson recorded the search process and the interactions of the 2 and 6-year-old along with their parents, occasionally participating in the interaction. The children never made a distinction between what they did in school and what they were doing at home, but combined what they had learned in school with new understandings garnered from using technology to "become" and "be" experts of what mattered to them (Davidson, 2009).

A study by Lam (2009) expands this notion of learners' increasing literacy when engaged in something that matters to them. The study examines the development of multiliteracies in a young adolescent girl through her use of instant messaging in the context of transnational migration. Lam observed the young Chinese girl's online literary practices and instant messaging (IM) exchanges, and conducted interviews. The adolescent kept in touch with friends and family she had left behind when her family immigrated to the United States. Through networked technologies such as IM she was able to "access and nurture the social relations and linguistic resources that kept her

connected to the social, economic, and cultural changes in her hometown" (Lam, 2009, p. 391). The author argues that a multiliteracies perspective is needed to emphasize the need to broaden our understandings of literacy compounded by socio-cultural and linguistic diversity of increasingly technological and globalized societies.

Learning to read, write, and calculate mathematics within a social and culturally diverse environment that is now globally connected and transformed by technology adds to the complexity and literacy needs of our students (Chandler-Olcott & Mahar, 2003; Davidson, 2009; Genishi & Dyson, 2009; Hull & Shultz, 2001). It is no longer possible to adopt the "aloof and dissociated role of the literate Westerner" (McLuhan, 1964, p.4). Electronic media has moved mankind towards a collective identity, a "global village" (McLuhan, 1964), in which we participate and collaborate with others (International Society for Technology in Education, 2007; McLuhan, 1964) and our actions determine what counts as literacy (Kitson, Fletcher, & Kearny, 2007). This suggests that we are constantly moving from, to, and between the electronic/digital, social, and the somatic. Lived experiences within these environments become important in literacy considerations.

This suggests a need for educators to broaden the kinds of texts they bring to the classroom (Albright & Walsh, 2003) to reflect on student's lived experiences and establish connections between school and home literacies (Banks, 1992; Hagood, 2000; Hull &Schultz, 2001), considering linguistic and cultural interconnections that are enmeshed in the multimodal realities of 21st century life (Duncum, 2004; Hagood, 2000).

Technology and 21st Century Life

Adding to the complexity of changes in how we think about literacy is the impact of ever-evolving digital technologies on out-of-school experiences. It is difficult to ignore how technology has brought about a revolution in the acquisition of literacies as raw material to work, produce, and communicate with. Kress (2007) compares it to the invention of the printing press that caused global change in the ways in which we read and write. Technology continues to change and literacy follows suit (National Council of Teachers of English, 2008). While humankind has survived the millennia by employing and applying skills and competencies to acquire social, cultural, and economic goods, there has been renewed emphasis of the acquisition of previously taught and acquired skills in the context of a digital age–our 21st century life.

In order to succeed in 21st century life, it is anticipated that students will need more than basic content competency to acquire higher level content knowledge (National Council of Teachers of English, 2008; Partnership for 21st Century Skills, 2007). The skills that are emphasized are couched in, anchored to, and embedded within new and emerging technologies that highlight an increasingly fast-paced and connected world. Many teachers, for example, require that 21stcentury students use technology to demonstrate creativity, critical thinking, and problem solving (National Council of Teachers of English, 2008; National Educational Technology Standards, 2007), as well as know how to ethically use and present information with technology (National Council of Teachers of English, 2008; National Educational Technology Standards, 2007; Partnership for 21st Century Skills, 2007). These competencies have been dubbed "21st century skills."

Many of today's jobs now depend on the acquisition and mastery of 21st century skills. While we can only make educated guesses as to what students may need for tomorrow's jobs, many of which may not have even been invented yet, the holistic, connected, and integrated nature of 21st century skills suggest the demand for such skills will only increase. In today's jobs, for example, if a person is able to read, write, and calculate math, they might not understand how to work a computer, even though computers depend and work on print information and mathematics. To fully navigate computers, a person would need knowledge of the 'Qwerty' keyboard, the computer operating system, different software demands, formatting conventions, and the ability to recognize and interpret computer semiotics. By the time they are ready to dive into the Internet, however, another set of processes and skills are needed. These can lead to social knowledge construction (Wehrli, 2009), as digital technologies favor networked relationships within social, cultural, and linguistically diverse environments (Lam, 2009). The mindset needed to engage the digital is different to approaching traditional pen and paper production; it includes multiple literacies and need to be learned as well.

The Partnership for 21st Century Skills (Partnership for 21st Century Skills), along with other organizations like the National Council of Teachers of English (National Council of Teachers of English) and the International Reading Association (International Reading Association), have emphasized the focus on necessary skills that are couched in contemporary technology. The Partnership for 21st Century Skills (2007) has organized these skills into a framework of four umbrella groups:

- Core subjects and 21st century themes–this group includes the mastery of content area subjects like Science, Math, and English.

- Learning and innovation skills–this group includes application of skills like creativity, innovation, critical thinking, problem solving, communication, and collaboration

- Information, media, and technology skills–this addresses information, media, and information and communication (ICT) literacies

- Life and career skills--this includes areas like adaptability and flexibility (Partnership for 21st Century Skills, 2007).

This concept of 21st century skills has emphasized the shift to an economy based on knowledge careers, which demands competency in new and expanding skills such as technology and information literacy and global networking (Ananiadou & Claro, 2009). The International Reading Association (2009) encourages education stakeholders to exploit the information and communication technologies that are common in learners' lives and consider the implications for education. National Council of Teachers of English (2008) suggests that 21st century learning may be different because of technological tools and elements. They provide various elements to consider, including:

- the "extent of students' access to 21st century tools both in and out of school"

- the "extent to which tools can make artists, musicians, and designers of students not traditionally considered talented in those fields"

- the "extent to which images and sound may amplify the text"

- the "extent to which student products can emulate those of professionals"

- "students' level of ethical and legal practice as they remix products" (adapted from National Council of Teachers of English, 2008, p.3)

Technology continues to change our social and semiotic landscape, impacting the way we communicate, work, play (Shaffer, Squire, Halverson & Gee, 2005), and think about literacy within a digital, globally-networked context (Elkins & Luke, 2000; Gee, 1991; Knobel, 1999). Contemporary conversations concerning the emphasis of

21st century skills and technology in education have called for educators to take into account traditional literacy models and the different elements of 21st century student work (National Council of Teachers of English, 2008). Such ongoing conversations and increasing technological innovations and use have been influencing what and how it is taught (Leu & Kinzer, 2000), including what educational programs are given emphasis and federal funding (Davies, 2011; Evans, 2005).

Technology: Policy and Teacher Preparation

Educational policies have recognized the impact of technology on learners' lives, making technology literacy an educational priority (Davies, 2011; Earle, 2002; Evans, 2005; Mims, Polly, Shepherd, & Inan, 2006). Technology literacy can be defined as the skills (which may include traditional and 21st century skills) used to access the "best information, doing so in the shortest time, using this information to identify and solve the most important problems, and then communicating these solutions to others" (Leu & Kinzer, 2000, p. 114). The popular belief is that technology enhances learning, productivity, and performance (Davies, 2011; Evans, 2005), which is believed to be linked to success on a global scale (Department of Education, 2010b; Evans, 2005; International Society for Technology in Education, 2007).

This belief has most recently played out in the 2001 "Enhancing Education Through Technology Initiative" (EETT) (Department of Education, 2010a) and the 2010 "National Educational Technology Plan" (Department of Education, 2010b). The EETT initiative aims to improve student achievement in elementary and secondary grades through the use of technology. The goals include increasing technology literacy, integrating technology in teacher training and curriculum development, and implementing research-based instructional methods (Department of Education, 2010a).

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The National Education Technology Plan seeks to apply contemporary workplace and personal technologies to the education system to improve student learning, enhance effective practices, and use data-based research for improvement (Department of Education, 2010b).

There is ongoing debate, however, about if and how technology integration improves learning (Mayall & Robinson, 2009; Mims, Polly, Shepherd, & Inan, 2006). Conversations among educators and researchers include whether technology can really serve to enhance the curriculum (Wehrli, 2009; Brandt, 2001) or if its benefits outweigh concerns (Harris, 2005; Tobin, 2000). The debate continues in light of early and limited research on whether and how teachers integrated technology to help students increase literacy (Mayall & Robinson, 2009). Federally funded projects like the Preparing Tomorrow's Teachers to Use Technology (PT3) grants (Mims, Polly, Shepherd, & Inan, 2006) and the efforts of researchers continue to add to the repertoire of integration of technologies to improve teaching and learning (Jonassen, Howland, Moore & Marra, 2003; Mishra & Koehler, 2006).

Unfortunately, school experiences continue to grow ever distant from what many students currently experience in their everyday lives (Brandt, 2001; Hull & Schultz, 2001). Formal literacy acquisition in schools has traditionally focused on thinking, logic, organization of information, analysis, and sequencing as purely verbal skills (Hagood, 2000; New London Group, 1996; Street, 2005), despite the fact that we are visual beings before we are verbal beings (Chauvin, 2003; Debes, 1974). John Debes (1974) asked, "Can we sustain the intellectual development that is apparently begun through television and then subsequently, apparently, reduced by inappropriate experiences in

school?" (p. 7). These "inappropriate" experiences speak to strict traditional ways of teaching and learning that do not consider how literacy engagement and acquisition has changed in students' lives--especially now that there is a heavier emphasis on technology and visual communication--where print literacy alone, while just as important as ever, may not be sufficient. Arguments in favor of technology integration include taking advantage of many students' increasing interest and technological mastery (Avgerinou, 2009), and the idea that technology can be used to establish experiential, interactive, and authentic learning (Oblinger, 2003). However, simplistic metaphors concerning the educational merit of technology abound and some educators cling to literacy notions that privilege verbal and print literacy (Callow, 2008; Debes, 1969).

Lev Vygotsky (1978) explored and sought to clarify such simplistic metaphors used to explain the use of tools (such as technology) and their role in higher psychological functions. Vygotsky sought to "understand the behavioral role of the sign in all its uniqueness" (p. 54) and how "tool and sign are mutually linked yet separate in the child's cultural development" (p. 54). As a result of his studies, Vygotsky found that the use of tools is external and must lead to changes in objects, while use of signs is internal and provides a way to master oneself. The link made unclear by fuzzy metaphors is that once we learn to master nature and oneself, by altering nature we alter man's own nature. In other words, the higher psychological function of internalization is achieved by the "internal reconstruction of an external operation" (Vygotsky, 1978, p. 56).

This process of internalization casts the illusion that the link between tool and sign in higher psychological functions disappears as the child grows older, by seemingly

perfecting and developing old methods of memorizing through sign usage. Vygotsky (1978) explains that the process is best represented by a spiral, where we keep going back to the same point, but expanding and advancing to higher levels, so that it only seems as if we skipped old methods of memorizing and remembering through sign usage. What is at first learned and memorized then transitions, through activity, into higher order psychological processes, which makes new experiences available in which we can make connections, internalize and further expand our fields of perception.

While further arguing the merits and limitations of technology integration are beyond the scope of this paper and addressed elsewhere, the impact of technology in education is undeniable. As research in educational technology continues to impact policy and funding (Davies, 2011; Evans, 2005; Kozma & Anderson, 2002), and explores how digital tools have made an impact in practices, objectives, and learning (Mayall & Robinson, 2009; Beeland, 2002; McKendrick & Bowden, 1999; Messaris, 1994; Rakes, Rakes, & Smith, 1995), teacher education programs also continue to be impacted (Gronseth et al., 2010; Mayall & Robinson, 2009; Mims, Polly, Shepherd, & Inan, 2006; Mishra & Koehler, 2006; Niess, Zee & Gillow-Wiles, 2010).

Technology integration initiatives have flourished in teacher preparation programs across the United States (Gronseth et al., 2010). All educators are now pressed to continuously learn new technologies, tools, skills and techniques as they quickly become obsolete and make way for new ones (Mishra & Koehler, 2006). Within these rapidly changing and shifting digital spheres, teachers are expected to use technology to

- facilitate experiences that advance student learning, creativity, and innovation

- design and develop appropriate learning experiences and assessments

- model digital work and learning

- promote and model digital citizenship and responsibility

- engage in professional growth and leadership (International Society for Technology in Education, 2008)

For current student teachers, policy language, current research, and teacher preparation programs increasingly emphasize the importance of technology in the curriculum, which has been inevitably tied to literacy teaching and learning (Bomer, 2006; Camangian, 2011; Davenport & Jones, 2005; Gronseth et al., 2010). Part of the focus of these programs includes technology skills such as knowing how to use software. Adherence to learning technology skills alone, however, proves inadequate for technology integration (Mims, Polly, Shepherd, & Inan, 2006). Mims, Polly, Shepherd and Inan (2006) analyzed thirty-three Preparing Tomorrow's Teachers to Use Technology (PT3) projects and concluded that, in addition to basic technology skills, successful technology integration may include

- access to technologies

- flexibility to explore features and functions

- seeing technology modeled by others

- designing and implementing technology-rich lessons

- obtaining personalized support throughout the learning and implementation process

Technology use, application, and education do not depend solely on a set of isolated skills, but are embedded within, between, across, and around the social and the somatic. Technology integration does not happen at the level of each teacher, but socially, by seeing technology modeled by others, obtaining peer support (Mims, Polly,

Shepherd, & Inan, 2006), and participating in local and global learning communities (International Society for Technology in Education, 2008). In the same way, part of students' literacy learning with technology includes communicating and collaborating with others (International Society for Technology in Education, 2007) within diverse contexts.

Despite educational technology research, conversations, innovations, policies, and inclusion in teacher preparation programs, there are many challenges when it comes to the realities of technology integration in schools. For example, many teachers feel that they are insufficiently prepared to use technology in their classrooms and that even when they do include it, they do not believe it is well integrated (Cradler, Freeman, Cradler, & McNabb, 2002). In addition, in the contemporary educational sphere, where standardization is the norm, such policies that connect literacy with technology risk "the peril of limiting literacy to a set of de-contextualized skills" (Evans, 2005, p. 2). For example, there have been tendencies to adopt the latest technology trends in order to align curriculum with the push to implement new technologies in schools (Buckingham, 2003). In some cases, technology is seen simply as a tool to acquire word processing skills (Evans, 2005). Separating learner's use of technology from the social structures and ideologies within which they operate risks a simplification of literacy that an autonomous model posits. The emphasis on de-contextualized skills de-emphasizes the holistic development of all abilities (Ananiadou & Claro, 2009).

It becomes necessary, then, to expand our fields of perception and consider current trends, social structures, and ideologies that could increase our understandings of literacy in a technology-saturated, globally-networked life. Using technology is more

than the use of tools as a means to an end; they are constitutive aspects of our social and cultural landscape (Evans, 2005). This research specifically focuses on one area for consideration: the impact in literacy education of an increasingly visual culture in light of technological innovations.

Visual Culture

We live in a highly visual culture in which advances in technology have greatly affected our students' cognitive development (Albright & Walsh, 2003; Avgerinou, 2009; Callow, 2005; Duncum, 2010, Noble, 2004; Wilson, 2003). Students now prefer obtaining information quickly (Albright & Walsh, 2003), processing images, sound and video, multitasking, seeking hyperlinked information, and interacting with many. They also prefer learning to be immediately relevant and useful (Jukes & Dosaj, 2006). Increased use of technology has emphasized the expectation of literacy learning where there is more ability to work freely with information and imagery (Avgerinou, 2001; Callow, 2005; Mayall & Robinson, 2009; Noble, 2004). A simple example is how it is now commonplace to expect students and teachers to incorporate technology into their presentations, such as electronic slides or other presentation software.

Digital image capture is now part of a variety of mobile devices. A phone can be used to capture images which can then be uploaded, stored, and shared in social networking spaces or turned into a digital scrapbook. Phones and other devices can also include global positioning system software that includes visuals such as maps and icons. Tablet applications rely heavily on images to access content and programs. In addition, many search engines now include images in the results list. Quick response (QR) codes are more prevalent in advertisement and allow people to download image-rich information to an equipped mobile device, which may include video clips and static

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images. These and many other image-rich technologies continue to appear and thrive. In education, educators are using online freeware to create, post and share image-rich lessons. Students can create interactive and multimodal presentations and interactive whiteboards are used to present and manipulate visuals and information. Some scholars are now publishing online and including images and video-clips of their data; simulators are used to recreate real-world situations; and much more.

Today's young people, known as the Millennial generation (Gee, 2003), are growing up in a much more visual world than previous generations because of television, computers and the internet (Sullivan, 2002). They are very comfortable with visual materials such as graphic novels (Schwarz, 2002), for example. One study of the reading preferences of forty-nine boys found they 'privileged highly visual texts…[which] stimulated visual thinking' (Wilhelm & Smith, 2005, p.788). There are several scholars who place emphasis and value on multimodal learning in light of literacy opportunities afforded by technology (Buckingham, 2003; Jewitt, 2008; Kress, 2000; Wyatt-Smith & Kimber, 2009). Duncum (2004) states that ''there is no avoiding the multimodal nature of dominant and emerging cultural sites'' (p. 259). Such sites can facilitate student learning and cultural awareness within the context of a global society.

Mirzoeff (1998) suggests that the visual culture we inhabit is "best imagined and understood visually, just as the nineteenth century was classically represented in the newspaper and the novel" (p.5). He highlighted the importance of text, but also looks at the benefits of thinking more broadly about "texts." This may include visuals such as graffiti (Moje, 2000), picture books, television, film (Callow, 2005), and the Internet (Callow, 2005; Lankshear, 1997; Malloy & Gambrell, 2006). This is not to imply that

anything and everything is a visual. Indeed, "there are no exclusively visual sites" (Duncum, 2004, p. 252), as they may include other communicative modes such as sound and text. However, images do afford a "sensual immediacy" (Callow, 2005, p.9) that is missing from text alone (Callow, 2005; Duncum, 2004; Fleckenstein, 2003; Mirzoeff, 1998). Duncum (2010) offers seven principles as a starting point to think about and examine various forms of imagery, which can be helpful in understanding the complexities of today's technology and visually mediated world. They include power, ideology, representation, seduction, gaze, intertextuality, and multimodality.

Street's (2005) situated model of literacy "emphasizes not only cultural meanings but also the power dimension of reading and writing processes" (p. 418). In the same way, considerations of power are central to conversations of images (Duncum, 2010). Images are compounded with different cultural, political, social, and economic agendas that assert "ideas, values, and beliefs that serve the interests of those for whom they are made" (Duncum, 2010, p. 6). Even as we construct them, they have the power to construct us into a multitude of possible subject positions (Albright & Walsh, 2003).

In terms of ideology, images are sites of ideological tensions and struggle, where certain discourses are privileged as others are put down (Callow, 2005; Duncum, 2010; Kress & van Leeuwen, 1996; Sturken & Cartwright, 2001). We are surrounded with images that offer ideologies that speak to our assumptions and feelings, while revealing who we were, who we are, and who we want to be, even as other images reject them (Duncum, 2010). They are produced within contextually bound dynamics of social agendas (Duncum, 2010; Sturken & Cartwright, 2001). They invite questions and answers of who has power, good versus evil, and our place in the world.

Representation has to do with how ideologies are presented visually. Not only do images invite us to question what is there, but what is not there (Buckingham, 2003; Duncum, 2010). Which people, economic hierarchy, race, sex, and others are given emphasis? Representation emphasizes the importance of frames, body language, objects and other elements that are used to create a visual (Duncum, 2010). By thinking of images in terms of representation we can problematize and invite deeper understandings of the relationship of power in social landscapes.

Images also invite the viewer to an experience that is not immediately accessed through text: seduction. Images are seductive in that they appeal to our senses, appealing to our affective dimension even as we consider image composition and critique our understanding of them (Callow, 2005; Duncum, 2010). Images can offer arguments on different views of the world and individual ideologies, drawing a range of emotions from mild interest to visceral reactions to the grotesque (Duncum, 2010).

Closely related to seduction is the gaze. The gaze refers to how we look at images. People are predisposed "to see certain things in certain ways" (Duncum, 2010, p. 8). For example, we might watch a 1920's film in the context of a class. There are specific elements we could look for and our thoughts may center on the different elements employed for movie-making at that time. Watching the latest action movie at the theater or in the comfort of our homes we employ a different gaze, focused on other elements and for different purposes that could include aesthetic pleasure. How people use gaze can produce silent discourses that can affect literacy (Jewitt, 2008). For example, we look differently depending upon our gender (Duncum, 2010). This could

affect how we think of education--who can acquire it, for what purposes, and in what ways.

Images are also influenced by countless other cultural texts (Duncum, 2010; Wilson, 2003). Cultural sites such as the Internet emphasize the idea of intertextuality through hypertext (Duncum, 2010), where users are encouraged to explore and click to other places at any time. Wilson (2003) suggests that we pay attention to contemporary visual culture texts, as they can inform us "about our contemporary lives, they probe and problematize contemporary society, and they raise issues pertaining to our values and our aspirations" (p. 217). Consumers of images are not passive; they make associations to all kinds of text (Duncum, 2010).

Finally, visuals are multimodal. A majority of visuals include sound, gestures, text, labels and others (Duncum, 2010; Jewitt, 2008; Wyatt-Smith & Kimber, 2009). Each mode contributes a part of meaning (Jewitt, 2008), each anchoring such meaning in different ways (Duncum, 2010). Duncum (2010) provides an example of an image of children playing instruments, set to happy music. He then changed the music to something dark that was perceived as threatening. The meaning changed to the possibility of something bad about to happen to the children in the picture. Such anchoring within multimodal sites emphasizes the complexities of a visual culture mediated by technologies that facilitate and encourage the audience not just to consume visuals, but to manipulate and create them.

The power of visuals has been part our literate history since the time of cavemen (Chauvin, 2003; Debes, 1974). Our engagements with such visuals then and now contribute to our literate lives and hold possibilities and implications for the educational

landscape, especially in light of developed, developing, emerging, and future technologies.

Visuals and Literacy Acquisition: Then

Over many years our species communicated through body language and cave paintings and moved on to establish "systematic sequential use of conventionalized visual images" such as hieroglyphs and Japanese kanji (Debes, 1974, p. 3). Evidence of sequential and visual images used to communicate and/or produce aesthetic response exists throughout our history in examples such as in a Pre-Columbian picture manuscript discovered around 1519; in Egyptian paintings; and in 18th century paintings (McCloud, 1993). There is also evidence of multimodal texts that combined image and text, such as medieval illuminated manuscripts (Wyatt-Smith & Kimber, 2009).

In education, image literacies necessary to engage with such visuals have historically played influential roles (Wyatt-Smith & Kimber, 2009). For a medieval child who was afforded the opportunity of education, for example, the world was like an illustrated book, full of signs and symbols that needed interpreting (Lehrer, 2009). When writing notes along the margins of their texts, even the words medieval illuminators wrote would often take a shape, such as a cross (Lehrer, 2009), which served as another layer of meaning. Image and word were the same; the image of a crucified Christ was a book itself, where the marks on the body were letters of instruction (Lehrer, 2009).

In many cases, becoming socially successful, gaining economic security and moral improvement depended on successful understanding of the word and image (Lehrer, 2009). Somewhere along this history, however, the importance of integrating

visual representation to communicate, think, and learn seems to have lessened in comparison with textual learning. In the United States, specifically, formal literacy acquisition in schools has traditionally focused essentially on reading, writing, and mathematics (Brandt, 2001; Debes, 1974; Hagood, 2000; New London Group, 1996; Seels, 1994; Street, 2005).

Within these contexts, in the U.S. we have regarded thinking, logic, organization of information, analysis, and sequencing as purely verbal skills despite how we are visual beings before becoming verbal beings (Chauvin, 2003; Debes, 1974). Through what Brandt (2001) called "literacy sponsors"--agents who set the terms for literacy access and wield "powerful incentives for compliance and loyalty" (p.19), such as schools--people gathered more and more of this verbal and print literacy to use as "raw material, as labor power, as an instrument of production, and as a product" (Brandt, 2001, p.171). Active participation with literacy sponsors increased literacy learning that was relevant to people's lives (Brandt, 2001; Hicks, 2002; Purcell-Gates, 1995; Rogers 2003).

There has been a call to move beyond the limitations of this narrow view of literacy to something broader in order to recognize other factors that are impacting literacy acquisition, one of these being the increasing importance and impact of visuals in our various landscapes, including the digital (Albright & Walsh, 2003; Avgerinou, 2001; Callow, 2005; Fleckenstein, 2003; Kress, 2000; Kress & van Leeuwen, 1996; Mirzoeff 1998; New London Group, 1996; Schwarz, 2002; Sosa, 2009; Sturken & Cartwright, 2001; Wilhelm & Smith, 2005). Participants in a 21st century digital life are continually bombarded with visuals that they must negotiate, explore, reject, or

appropriate. Visuals form part of "new" multimodal literacies which are anchored to technology and are culturally, ideologically, and contextually bound (Duncum, 2004, 2010; Kress & van Leeuwen, 1996; Mirzoeff, 1998; Sturken and Cartwright, 2001). We need to carefully consider the contextually anchored literacy demands placed on our students when they participate with and in their technology-enhanced communities. This includes careful reflection of how in and out-of-school interaction with visuals presents one avenue that impacts students' learning and engagement with the curriculum. Forming part of a visual culture includes the processes of visual thinking, learning, and communication, which have been dubbed "visual literacy."

Visual Literacy: Now

The next point in the trajectory of literacy acquisition emphasizes the idea of constant change (Brandt, 2001) afforded by technological advances (Adams & Hamm, 2001) that emphasize visuals. While several scholars have pointed out a multitude of literacies necessary to thrive in 21st century life (Avgerinou, 2009; Gee, 2007; Kress, 2000, 2007; New London Group, 1996), visual literacy has been identified as an essential literacy with the development of technology (Altisen, 2002; Avgerinou, 2001, Braden & Hortin, 1982; Chauvin, 2003; Debes, 1974; Mayall & Robinson, 2009; Moore & Dwyer, 1994; Sosa, 2009) that is essential for the creativity and problem-solving (Seels, 1994) needed for 21st century life (National Council of Teachers of English, 2008; National Educational Technology Standards, 2007; Partnership for 21st Century Skills, 2007). Thanks to a period of technological firsts, such as the advent of television and the Internet, we are now in what Avgerinou (2009) calls the era of "bain d'images", or a bath of images.

As a concept, visual literacy was impacted by the growth of technological advances (Mayall & Robinson, 2009) of the 1960s (Debes, 1974) and concerns over possible detrimental impact of such advances on children (Avgerinou, 2001), which resulted in a "surge of image literacies" (Monnin, 2008, p. 2). There were several developments having to do with visual literacy during this period of technological firsts. The International Visual Literacy Association was born, where people from diverse backgrounds gathered to discuss theories and applications of visuals (International Visual Literacy Association, 2011). The University of Rochester established The Center for Visual Literacy (Pett, 1988). Another development was the creation of the newsletter Visuals are a Language, developed by John Debes and his associates at the Eastman Kodak company (Pett, 1988).

The term "visual literacy" was coined during the 1960s as well, which has been attributed to John Debes. His definition of the term is one of the most quoted and used even today (International Visual Literacy Association, 2011). Debes (1969) defined visual literacy as

> "a group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication" (p. 27).

However, visual literacy finds its home in many disciplines, such as anthropology, social sciences, art, psychology, architecture and others. Because of this brew of rich and diverse viewpoints, though there have been advances in visual literacy concepts

from what was first proposed by Debes (1969), many scholars have focused on improving, transforming, and establishing the definition of visual literacy (Braden & Hortin, 1982; Brill, Kim, & Branch, 2007; Clark-Baca, 1990; Kress, 2007; Moore & Dwyer, 1994; Sucy, 1985). While there is still debate as to what consensus can be reached about the definition and competencies of visual literacy, there have been several scholars (Avgerinou, 2001; Brill, Kim, & Branch, 2007; Clark-Baca, 1990; Messaris, 1994; Moriarty, 1997; Seels, 1994) who have worked towards establishing commonalities of visual literacy across the disciplines. Understandings of visual literacy, however, depend on the discipline and context.

In light of ongoing contention as to the definition of visual literacy (Braden & Hortin, 1982; Kress, 2007; Sucy, 1985; Clark-Baca, 1990; Brill, Kim, & Branch, 2007) due to its roots in so many areas, for the purposes of this research I adapted a definition from several scholars (Avgerinou, 2007; Braden & Hortin, 1982; Debes, 1969; Seels, 1994; Sheibe, 2004). In this study, visual literacy refers to a series of visual competencies integrated with other ways of meaning-making which a person uses to think, learn, communicate with others (Seels, 1994), and interpret visual information, actions, objects, and symbols (Debes, 1969; Braden & Hortin, 1982). The viewer is learning to "read" and "write" visual messages (Avgerinou, 2007) by recognizing the basic "language" used in each media form, being able to judge the credibility and accuracy of the information presented, evaluating author's intent and meaning, and appreciating the techniques used to persuade and convey emotion (Scheibe, 2004).

Visual literacy is not limited to a set of competencies and skills, however. It is a social practice (Street, 2003) in which visuals are consumed, used, problematized, and

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otherwise transformed as people establish everyday meanings in specific cultural contexts. Visuals can include two-dimensional images such as photographs, three-dimensional images such as statues, graphic representations of information such as Venn diagrams, sequential images such as videos, and others.

This definition is meant to help situate, describe, and shed light on understanding visual literacy for this paper (keeping in mind that definitions are slippery and fluid). Negotiating several understandings helped to develop a framework for this study explored later in this chapter.

Visual Literacy and 21st Century Classrooms

Schools have traditionally emphasized print and textual literacy (New London Group, 1996; Street, 2003). Many educators may still be fixated on traditional, text-based ways of teaching the curriculum focusing on words and texts as ways to acquire knowledge, largely obviating multimodal texts, communication media (Albright & Walsh, 2003; Felten, 2008; Fleckenstein, 2003; Luke, 2003), broader definitions of "text" such as visuals (Moje, 2000), and the Internet (Lankshear, 1997; Malloy & Gambrell, 2006), despite the multiplicity that now exists with 21st century technologies. To name a few, people now have access to mobile devices that rely on visual information for quick navigation of applications, web pages, and other programs. Advertisements are continually placed in high trafficked areas in different ways, such as scrolling or electronic billboards, and quick response (QR) codes pique passerby's curiosity and encourage interaction and information exchange.

Many students are engaged in practicing, fluidly navigating, and blurring the boundaries of school literacies and visual out-of-school literacies. They are constantly watching movies, advertisements and commercials, blogging, posting on social

networks, sharing, watching, and creating videos, and much more. For years, many scholars have recognized the power of visuals to improve learning (Considine, 1986; Pressley, Pigott, & Bryant, 1982; Segovia Aguilar, 2010), increase student attention (Considine, 1986; Zambo & Brozo, 2008; Gaylean, 1983), make sense of the world (Serafini, 2010), and accept themselves and others (Gaylean, 1983).

Styles and Arzipe (2001) conducted a case study of children's responses to visual text by children ages 4-11. They found that engagement with the images in the book fostered employment of high level cognitive skills. They found links between seeing and thinking, especially in cases where the children did not have a developed vocabulary. Replacing verbal exchange and writing with drawings, the children demonstrated knowledge they were not yet able to articulate.

In another study, Hassett and Curwood (2009) reported on research that attempted to describe multimodal education (focusing heavily on print's synergy with images) within the strict structure of a standardized educational system. The study was designed to examine how literacy learning can be shaped through children's engagement with interactive and visual texts. They found that when a teacher provides open-ended activities in response to these texts, reading becomes a socio-cognitive process that involves the use of tools such as images as part of conceptual thinking. They suggest that students could acquire the necessary concepts to interpret and produce complex relationships between text, image, and design if their teachers operated in a multiliteracies pedagogy. Teachers operating within a pedagogy of multiliteracies can guide and support students in navigating multimodal resources.

Students that engage in multimodal and socio-cognitive spaces become critically oriented to constantly evolving text forms.

Sturken & Cartwright (2001) emphasize that "to explore the meaning of images is to recognize that they are produced within dynamics of social power and ideology" (p. 21), which exist within all cultures. They explain that ideologies are produced through and projected onto images. This suggests that social categories are not natural, but constructed, and can take visual form (Rose, 2001). Within curriculum development there is ongoing concern to help students understand and adequately represent the realities of the social condition (Gay, 2004). Incorporating the use of visuals in the classroom and fostering visual literacy could become a vehicle to study, represent, and understand these realities, as visuals can capture learner's attention, which is a prerequisite for learning (Zambo & Brozo, 2008).

Teachers, Technology, and Visual Literacy

Various scholars (Braden & Hortin, 1982; Mayall & Robinson, 2009, Moore & Dwyer, 1994) emphasize the need for the development, application, and assessment of visual literacy in K-12 curricula. Despite research that speaks to the benefits of visual literacy (Chandler-Olcott & Mahar, 2003; Hasett & Curwood, 2009; Styles & Arzipe, 2001; Wilhelm & Smith, 2005), little progress has been made in classrooms in the U.S. to explicitly include visual literacy with traditional verbal and print-based literacy--despite an apparent adoption of technology and media in the curriculum (Debes, 1974; Sosa, 2009).

Buckingham (2003) states that "[the] media are undoubtedly the major contemporary means of cultural expression and communication: to become an active participant in public life necessarily involves making use of the modern media" (p. 5).

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Becoming an active participant within networked, image-rich environments, however, can be a very difficult task for many educators who have had an education very different from their students' (Fleckenstein, 2003) and tend to separate the online and technical environment from school. The current educational push for standardized assessments may also be influential. There seems to be a stark contrast and ongoing struggle between current, standardized curricula that remains the norm (Street, 2008; Tan & Guo, 2010;) and the call for programs such as technology integration. On the one hand, educators may find themselves teaching to the test, while on the other they may dedicate, to a lesser extent, time to integrating technology, which touts learning through collaboration and includes the design of visual materials (Mims, Polly, Shepherd & Inan, 2006).

A curriculum that includes instructional strategies, methods, and resources to integrate technology, visual literacy tools, and techniques implies teachers should have, at minimum:

- knowledge of technology literacy standards (International Society for Technology in Education, 2008; Mayall & Robinson, 2009).

- knowledge of design (Mims, Polly, Shepherd & Inan, 2006) and visual literacy standards (in places where there are no such standards, or they are integrated with other standards, then they should have knowledge of how visuals can influence student thinking, learning, and communicating) (Mayall & Robinson, 2009).

- professional development opportunities to engage with technology and visual literacy tools (International Society for Technology in Education, 2008; National Council of Teachers of English, 2008; National Educational Technology Standards, 2007).

Unfortunately, in many cases, some or all of these are missing. Mayall and Robinson (2009) surveyed teachers in Illinois regarding visual literacy resources and tools. The results indicate that while over 80% of teachers were aware of technology

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standards, fewer than 40% were aware of standards related to visual literacy. Despite

having the technology and the knowledge to use them, teachers aware of the visual

literacy standards stated they felt they did not have the time or the resources to

incorporate them. In addition, even though teachers were willing to actively integrate

technology, visual literacy was not perceived as an important part of technology

integration, even though there is information that supports and encourages such a

connection (Altisen, 2002; Avgerinou, 2009; Chauvin, 2003; Sosa, 2009).

In many cases visual literacy continues to be an important, but missing piece, in

most technology integration courses (Avgerinou, 2009; Sosa, 2009). Part of the unease

and hesitance to delve into visual literacy practices in technology-enhanced curriculum

lies in teacher concern about first gaining competence and feeling comfortable with

technology use and integration (Cradler, Freeman, Cradler & McNabb, 2002). While a

growing number of educators are interested in integrating technology in the curriculum,

surveys show that they feel they need more opportunities to engage with technology

(Cradler, Freeman, Cradler & McNabb, 2002). According to information from twenty-six

studies, surveys, and reports conducted in 2002 by the Center for Applied Research in

Educational Technology (CARET) related to professional development in educational

technology:

- only 20% of teachers consider themselves well prepared to use technology in their classes.

- technology continues to be included in classrooms as an education resource.

- at least 84% of teachers believe technology improves the quality of education but two-thirds of them do not believe it is well integrated (Cradler, Freeman, Cradler & McNabb, 2002)

It is pertinent, therefore, to explore how teachers who consciously use visuals and are experienced with technology-enhanced curriculum use these visuals in their pedagogy. Does increasing technology integration in the curriculum point to an increasing, albeit possibly intuitive, rise in the importance and various uses of visuals in teachers' pedagogy? This knowledge can help promote reflection of visual literacy integration, and provide examples of instructional strategies, methods, and resources used to integrate visual literacy tools and techniques.

Visual Literacy: Putting the Concept to Work

A better understanding of what visual literacy can look like is necessary to explore how visual literacy is connected to education within situated contexts. It becomes necessary to operationalize this definition to put it to work within the particular research context of this paper. This study draws from Seels (1994) and Avgerinou's (2007) work on operationalizing visual literacy. Seels (1994) described visual literacy in terms of visual thinking, learning, and communicating, where

- visual thinking includes visualization, metaphorical thoughts, and right brain/left brain mental modes.

- visual learning includes design, research, and reading.

- visual communicating includes aesthetics such as art and other media.

Adding to this idea, this study draws from Avgerinou's (2007) identification of eleven visual literacy competencies necessary to acquire the "abilities to understand (read) and use (write) images, as well as to think and learn in terms of images" (Avgerinou, 2003, p.36). These abilities include:

- KNOWLEDGE OF VISUAL VOCABULARY. Knowledge of the basic components of visual language (e.g., point, line, shape, form, space, texture, light, color, motion).

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- KNOWLEDGE OF VISUAL CONVENTIONS. Knowledge of visual signs and symbols, and their socially agreed meanings (within the western culture).

- VISUAL THINKING. The ability to turn information of all types into pictures, graphics, or forms that help communicate the information.

- VISUALIZATION. The process by which a visual image is formed.

- (VERBO-)VISUAL REASONING. Coherent and logical thinking that is carried out primarily by means of images.

- CRITICAL VIEWING. Applying critical thinking skills to visuals.

- VISUAL DISCRIMINATION. The ability to perceive differences between two or more visual stimuli.

- VISUAL RECONSTRUCTION. The ability to reconstruct a partially occluded visual message in its original form.

- (SENSITIVITY TO) VISUAL ASSOCIATION. The ability to link visual images that display a unifying theme. Also: (SENSITIVITY TO) VERBO-VISUAL ASSOCIATION. The ability to link verbal messages and their visual representations (and vice versa) to enhance meaning.

- RECONSTRUCTING MEANING. The ability to visualize and verbally (or visually) reconstruct the meaning of a visual message solely on the evidence of given information which is incomplete.

- CONSTRUCTING MEANING. The ability to construct meaning for a given visual message on the evidence of any given visual (and perhaps verbal) information.

As no learning happens independently, even when it goes on in our minds (Bruner, 1996), this study also draws from Vygotsky's (1978) socio-cultural theory in which people learn through a social process. Visual literacy as visual thinking, learning, and communicating suggests a constant process of external (social) and internal (in the head) negotiation (Genishi & Dyson, 2009). Visuals can mediate our learning, are socially embedded, and include principles such as power, ideology, representation, seduction, gaze, intertextuality, and multimodality (Duncum, 2010). They are complex sites of literacy learning compounded with ongoing technological innovation.

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Using these ideas to put the concept of visual literacy to work, I created a working model of socio-cultural visual literacy to draw from to approach this research (Figure 2-1). For example, a lesson that incorporates visual literacy practices can encourage collaboration (socio-cultural practice), describe the basic components of a visual (visual learning), and include other modes such as audio. One possible example is a lesson where learners have to create a story using a program that helps the user create comic strips. Learners can come together to discuss character and setting designs, particular conventions such as sweat drops to indicate character discomfort, and elements of plot, and other considerations. In addition, learners can include sound effects, music, or other audio to enhance the story. Once the product is finished they could share their work, and explain how their choices impacted the story. As a concept, visual literacy includes the juxtaposition of visuals, audio, and other modes of communicating, learning, and thinking that are culturally situated (Avgerinou, 2003, 2007; Seels, 1994).

Summary

This chapter explored literacy from a historical perspective and emphasized the connections between literacy, technology, and visual literacy in terms of the social and the somatic. As a result, it should be apparent that defining or pinning down any of these concepts is not an easy or exact task. The rich background from a diversity of perspectives accommodates many possibilities from which this study draws. The combination of ideas to create a working model for this research makes it possible to think about the visuals teachers use within a technology-enhanced curriculum. It allows me to ask questions about what visuals are privileged and why, how they are used, and to what purpose.
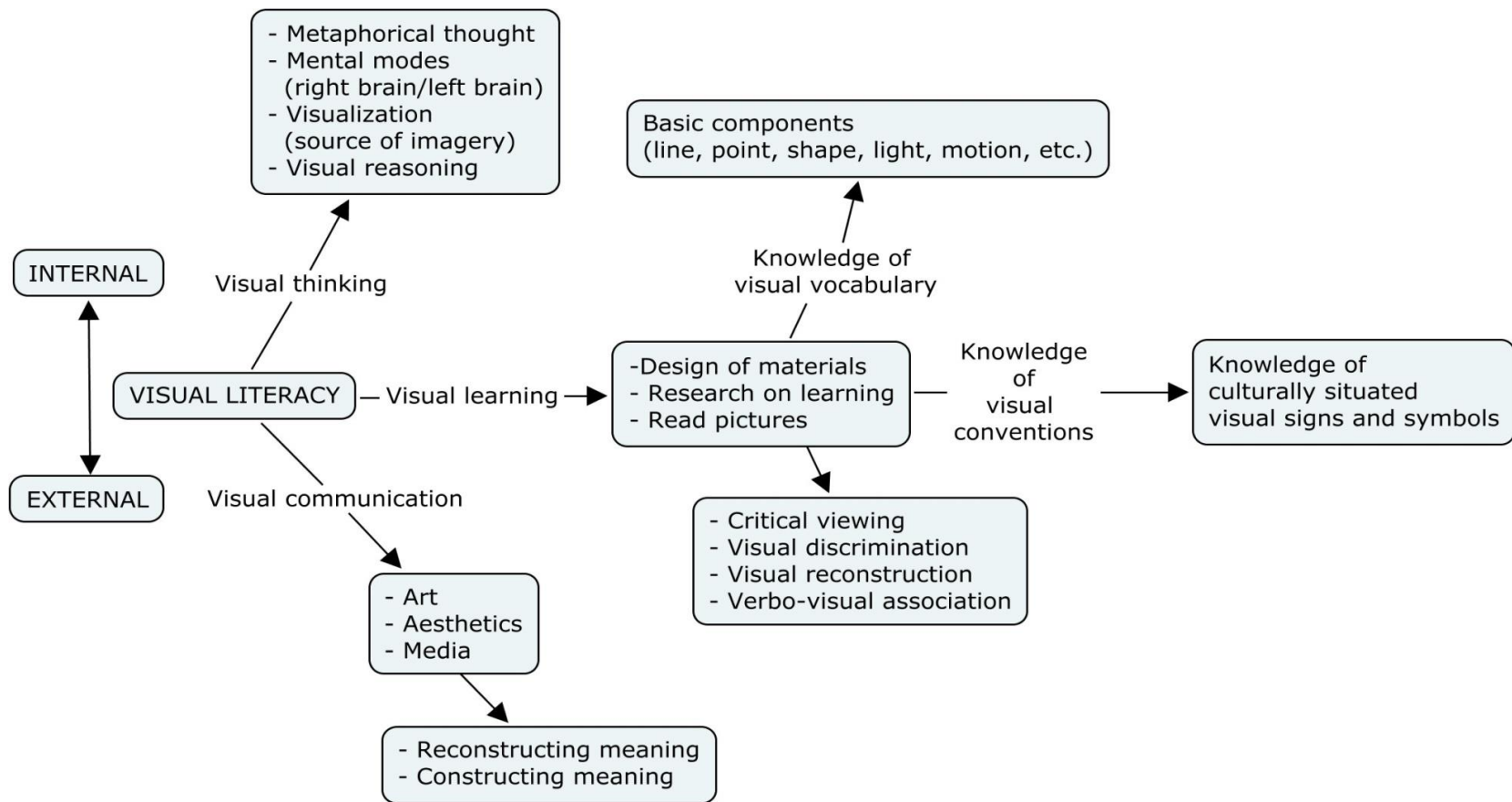
Figure 2-1. Model of sociocultural visual literacy. [Adapted from Seels, B. 1994. Visual Literacy: The definition problem. (Page 105, Figure1). In Moore and Dwyer (Eds.), *Visual literacy: A spectrum of visual learning* (97-112), Educational Technology Publications, NJ.] [Adapted from Avgerinou, MD. 2007.Towards a visual literacy index. (Page 31). *Journal of Visual Literacy, 27*(1), 29-46.]

CHAPTER 3
METHODOLOGY

Introduction

As mentioned previously, technology integration in education programs

(Gronseth et al., 2010) and K-12 classrooms is an educational priority (Davies, 2011;

Earle, 2002; Evans, 2005; Mims, Polly, Shepherd & Inan, 2006). Part of engaging with

technology includes being immersed in visuals that abound in contemporary

environments, which requires visual literacy skills. It is important to recognize that

visuals present integral and powerful ways to improve learning and make connections

with ourselves and the world (Considine, 1986; Gaylean, 1983; Pressley, Pigott, &

Bryant, 1982; Segovia Aguilar, 2010; Serafini, 2010). However, visual literacy is often a

missing component when learning about, engaging with, and using technologies in and

for education--student teachers are taught little, if any, of its methods, strategies, and

principles (Avgerinou, 2009; Sosa, 2009). Much focus in the research has been given to

the design of visual materials for the classroom because it has been assumed that

teachers and students have an inherent understanding of visuals for teaching and

learning (Omar, 2000; Portewig, 2004).

Focusing only on the design of visuals for instruction ignores the question of how

teachers are making design choices and why. Thus we might inadvertently ignore the

influence and impact of visuals on both teaching and learning in classrooms. There are

many questions that can be explored. For example, what are teachers doing with

visuals and technology? What are they trying to accomplish? How are they trying to

accomplish it? What strategies are they using? How do teachers talk about and

understand the use of visuals in technology-enhanced education? What assumptions are teachers making about the use of visuals and technology in the classroom?

This study addresses an area of interest shared by stakeholders who explore connections between technology integration and literacy learning (Bomer, 2006; Camangian, 2011; Davenport & Jones, 2005; Gronseth et al., 2010). One of the problems extant in the research of visual literacy is that attempts to ascertain teachers' instructional strategies, methods, and resources currently used to integrate visuals in technology-enhanced instruction have not been prevalent (Mayall & Robinson, 2009). With current technology educational initiatives influencing what and how it is taught (Leu & Kinzer, 2000), it is necessary to learn what teachers are doing with visuals in technology-enhanced environments, as they are expected to design learning experiences (International Society for Technology in Education, 2008; Mims, Polly, Shepherd & Inan, 2006), consider how images may amplify text (National Council of Teachers of English, 2008), how students can become artists and designers (National Council of Teachers of English, 2008), and know how visuals can influence thinking, learning and communicating (Mayall & Robinson, 2009).

The central guiding question for this study was: How do fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced, literacy instruction? To help direct and guide my thinking, I asked two additional questions: What are teachers doing with visuals and technology in the classroom? What are teachers trying to accomplish when they use different strategies, methods, and/or resources?

I believe that situating this study within a technology-rich context helps capture the nature of changing and transforming 21st century classroom environments, highlights the increasing importance of visuals, and presents several implications for future research. Knowing what happens with visuals in technology-enhanced classrooms can help inform current and future visual literacy research, educational policies, and begin to inform questions about the implicit and/or explicit nature of visual literacy pedagogy currently extant in education. This chapter provides the methodology and methods used to complete this study. It includes the research approach, subjectivity statement, and the research design, which provides information concerning collaborators, building rapport, context, data collection, data analysis, limitations, trustworthiness, and validity.

Research Approach

To direct their research methodologies, qualitative researchers think about what counts as knowledge and where it can be found. They ask what it means to know and how we can glean knowledge (Creswell & Miller, 1997). Knowledge creation and acquisition, along with human interaction, are increasingly diverse and dynamic, currently situated not just in physical social contexts, but within globally connected virtual/digital spaces. For example, at any given time a person in the United States might log on to the Internet from their personal computer and "call" or connect with someone in Australia, Costa Rica, New Zealand, Puerto Rico and other places using available networking software. This may happen synchronously (in real time), or asynchronously (where the message is waiting for recipients to log on).

A part of what each individual brings to the conversation includes what they know, their social, cultural, and linguistic backgrounds, and complexities of their situated

lives. Part of the complexities of human experiences involves being aware of self and the context in which one lives and works (Andrews, 2009). This means that, for qualitative researchers, knowledge is seen as something that takes place within the individual (Hatch, 2002). Individual backgrounds and experiences impact, affect, and add to understandings and the analysis of research.

This study is informed by a constructivist paradigm that approaches literacy as a socio-cultural practice, where all learning takes place within a social context (Brandt, 2001; Hicks, 2002; Purcell-Gates, 1995; Street, 2005). Constructivism was used in this study to help the researcher examine, interpret, and understand teachers' uses and beliefs of the impact of visuals in literacy instruction within technology-enhanced curriculum. This meant that it was important and relevant to gather contextually-situated data to explore teachers' construction and organization of experiential reality, as well as conduct interviews to investigate and understand their realities.

The ontological nature of constructivism asserts that a single reality does not exist (Hatch, 2002). What, then, does it mean to "know" and how does knowledge construction happen? Within a constructivist perspective, all of us construct, question, inquire, affirm, take a stance, identify, and transform our understandings of our individual realities so that there is not just one knowledge or "truth", but many (Lather, 2006). Meaning-making depends heavily on each individual's background and experience. Knowledge is not and does not need to be "true" and match ontological reality, "it only has to be 'viable'" in how it fits into someone's experiential limits" (Glasersfeld, 1989, p. 163). There is no such thing as an "objective" truth (Crotty, 1998; Glasersfeld, 1989).

In constructivism, meanings are conceptual structures born through engaging with the world (Crotty, 1998; Glasersfeld, 1989). Humans are predisposed to a social nature in which they develop, learn, and grow through interactions with others that can happen even inside one's mind (Bruner, 1996; Vygotsky, 1978). Within this context, knowledge is created by individuals, as they are meaning-making vehicles. Knowledge can be mediated by several factors including culture, context, social interaction, and language (Bakhtin, 1986; Johnson, 1990; Street, 2003). Applying constructivism to this research (and in education research in general) has certain implications that influence this study (adapted from Glasersfeld, 1989):

- A distinction is made between generating understanding ("teaching") and emphasizing a repetition of behaviors ("training"). Here, teaching is not learning a series of facts, but making connections to, between, and among facts, skills, methods, and the multiplicity in our lives. Training is limited to regurgitating facts and repeating behaviors without that emphasis on connection and understanding.

- The viewpoint emphasizes peoples' attempts to make sense of their experiential world.

- There is a realization that language is not used to transfer knowledge, but it can be used as a tool in the process of guiding students' meaning-making. A teacher can encourage, for example, synthesis; making connections among data and reaching conclusions.

In this research, these implications also apply to visuals. Visuals are believed to be used to generate understanding, emphasize how people make sense of their experiential world, and guide students' meaning-making. Even "visual images are always constructed, and visualization is an accomplishment involving perspective and directional gaze, so none of these is directly and straightforwardly 'evidential' or 'representational'" (Mason, 2002, p. 108). Meanings remain subjective for each individual; they influence a person's construction, organization, and understanding of

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experiential reality (Glasersfeld, 1989). Knowledge, truth, and reality are constructed by the researcher and the collaborators of this study.

In addition, constructivism influenced several key aspects of the research design and methodological decision-making of this study. First, collaborators' perspectives were the most important, which meant that I needed to maintain a constant focus on their perspectives to illuminate their truths. As the researcher, I was a meaning-making vehicle (Glasersfeld, 1989). I synthesized, analyzed, made connections, discussed, and reached conclusions which were influenced, mediated, and enriched by my background, interactive experiences with the collaborators of the study, and the situated context of the research. Keeping in mind that, within a constructivist paradigm, there is the possibility of many "truths" and that I had a role in knowledge interpretation and creation, I needed to design the study in a way that provided diverse and rich opportunities to explore the collaborators' many possible "truths" concerning the use of visuals in a technology-enhanced environment.

Second, knowledge is fluid, living, shifting, and constantly taking shape and transforming within the complexities of the context in which it takes place and is created (Hatch, 2002). This means that I needed opportunities to experience the collaborators' situated realities. Observing the use of visuals within teachers' technology-enhanced classrooms would help me explore and navigate several knowledge mediators including context, social interaction, and language.

Finally, knowledge is something that takes place within the individual (Hatch, 2002). Simply exploring the context where visuals are used would not provide me with sufficiently rich data to answer the research questions. I needed to think about what

data collection methods would foster opportunities to examine how the teachers in this study individually expressed and gave shape to their realities. This would also allow me to learn of the teachers' backgrounds and experiences with visuals and technology.

Subjectivity Statement

Qualitative researchers do not assume an objective stance, as they are encouraged to apply their own subjectivities and understandings of experiential reality/ies to make sense of the data (Glasersfeld, 1989; Hatch, 2002). "Objectivity is a chimera: a mythological creature that never existed, save in the imaginations of those who believe that knowing can be separated from the knower" (Guba & Lincoln, 2005, p. 208). It is important, then, for researchers to state their subjectivity so that readers can form their own understandings of how this can impact every aspect of the study. The researcher, after all, is a key factor in any qualitative study (Creswell, 2009). Therefore, in the next paragraphs I provide clarification regarding my subjectivity as it relates to this study of the use of visuals by teachers in technology-enhanced classrooms.

During my more than ten years' experience as a teacher employed in K-12 and various other educational settings in the United States and Puerto Rico, I consistently integrated visuals in my pedagogy. My interest in the use of visuals in education has its roots in my own childhood. As a child, my mother encouraged me to draw and make my own representations of school content—and then I discovered graphic novels. My notebooks suddenly filled with graphs and stick figures working their way through complex science formulas and battling math monsters. As graphic novels began to permeate my already rich reading life, I expanded my reading to other subjects and became more interested in learning about other cultures. Visuals helped broaden my thinking.

From then on, visuals influenced every aspect of my life and I would integrate them in classes I taught. I was happy when, in one of my first professional development courses, images and visuals were touted as an effective way to facilitate and differentiate instruction for English language learners. However, I integrated visuals in all of the subjects I taught, which included Language Arts, ESOL, Spanish, French, Mathematics, Young Adult Literature, and others. More and more, technology became a conduit to facilitate this integration. However, it was not until later in my teaching career that I began reading about visual literacy and its complexities within an increasingly digital context.

I am now an avid reader of visual literacy literature; of its complexities and possibilities within 21st century life. My engagement with visuals is not limited to using tools to create and teach with visuals, but they immerse imbibe my life holistically in terms of thinking, learning, and communicating. I draw diagrams and create other visual representations to help me think through problems, I create websites and videos both to teach and learn, and I reach out to others interested in visual literacy using technology such as online social networks.

Since making the decision to pursue a doctorate, I have also had the opportunity to conduct research that has fostered additional considerations of visuals and have led me to become an advocate of visual literacy integration in schools. This is not to suggest that visuals will preclude traditional ways of teaching, but add to and enhance them. This study is heavily influenced by my experiences, beliefs, motivations, appreciation, and engagement in visual literacy in education. I believe all students would benefit from educators who are not only aware of the visuals with which students

are constantly bombarded and interact with, but who apply visual literacy strategies, techniques, and tools within the curriculum.

The Research Context

At the beginning of the 2010 Fall semester, I had the opportunity to join a research team at the University of Florida involved in a year-long technology integration initiative within Science, Technology, Engineering, and Math (STEM) classrooms. Despite the initiative's focus on STEM, participating districts did not limit who could participate. A range of all grade levels and subjects such as Reading and Language Arts were included. The initiative was part of Florida's 2010-2011 Enhancing Education Through Technology (EETT) funding that was part of a larger effort known as the Florida Digital Educators (FDE). The initiative was funded with Title II-D funds and the projects selected from over twenty districts involved over 1,000 teachers and directly reached more than 70,000 students. Funded districts represented a range of diversity, with a mix of urban and rural districts and varying economic conditions. The initiative focused on improving teacher technology practices and students' technology proficiency.

My experience as a member of this team became important for my research. I wanted to find teachers who not only reported having experiences integrating technology in the classroom, but who had experiences that moved beyond basic technology skills, which I found through the EETT initiative (the rationale for selecting teachers who participated in the EETT initiative is explained in-depth in the next sections).

In deciding which district to approach for this study, I first identified several school districts in which teachers had actively participated during the technology

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initiative grant period (i.e., districts with high percentage of teacher participation in the online submission of materials). I then narrowed the list to those districts that were more easily accessible. I needed to take into consideration travel time and costs. I then looked at districts' project goals. Goals that referred to design, technology integration to improve student achievement, and/or access to innovative technology could potentially increase my chances of obtaining collaborators who had gained experience with integrating both technology and visuals in their classes. For example, a goal where teachers would participate in designing digital and age-appropriate learning experiences could point to the use of visuals.

This led me to a rural district located in the southeastern United States (Tables 3-1 and 3-2). The projects of this particular district have set out to transform the learning environment and culture of the schools so students can compete in a global, digital economy (Table 3-1). While there were other participating districts that also implemented similar projects in schools, the district chosen for this project included one of the highest numbers of teacher participation, (forty-one out of ninety-two teachers), increasing the chances of finding tech-savvy collaborators for this study.

Recruiting Collaborators

To recruit collaborators for this study, I contacted the district's assistant superintendent and the schools' technology liaison via telephone and e-mail, respectively. Ongoing communications included confirming my identification, presenting a copy of IRB documents, requesting clearance documentation, and establishing first contact with teachers who had participated in the technology initiative. It was decided that first contact with teachers would happen through an e-mail created by me and sent

Table 3-1. District summary of participants and projects overview

	Number of schools	Number of students	Number of teachers	Target grades	Projects overview/goals
Elementary	3	650	32	K-5	Prepare leaders to reform instruction aligned with NGSSS Empower teachers with skills to integrate technology to improve student engagement and achievement
Secondary	1 MS 1 HS	1,592	60	6-12	Expand access to innovative digital technologies Design and develop digital age learning experiences

Note. MS = middle school; HS = high school

Table 3-2. Diversity within the district

Rural (R) or Urban (U)	County Population	Student Pop.	Teacher Pop.	Schools	FCAT Grade	% Free Lunch	% Living Below Poverty	% Unemployment	% Diversity	Funding 2006-2007 2007-2008 2008-2009 2009-2010
R	29,235	3,275	242	H2 M1 E5 C2	C C	61.59	19.3	9.5	WNH 70.47 BNH 23.24 H 2.63 API 0.76 AI/AN 0.12 M 2.78 ELL 0.3	$9,761.16 $8,078.77 $8,250.80 $8,027.77

Note. H = high schools; M = middle schools; E = elementary schools; C = combination schools; WNH = white, non-Hispanic; BNH = Black, non-Hispanic; H = Hispanic; API = Asian/Pacific Islander; AI/AN = Am. Indian/Alaskan native; M = multiracial; ELL = English language learners

out by the technology liaison with an introduction. I was given permission to communicate with teachers who responded to the e-mail.

A total of eight teachers from one elementary school responded to the email. This included five fifth-grade teachers and three fourth-grade teachers. While the minimum number of collaborators was met, no teacher from the secondary level expressed interest in participating, which further limits this study. However, the eight collaborators from the school represented rich and diverse teaching experiences (described in a future section of this chapter) and used both technology and visuals on a weekly (if not daily) basis, which was important for this study.

After the first contact via e-mail, two phone call conversations took place to set up an informal meeting to discuss aspects of the study, which lasted half an hour. Over a six-week period, I met with collaborators a minimum of once a week (data collection details are explained in the following sections). As all teachers who responded were from the same school, I first met them in small-group settings at their school. They were asked if they use visuals and technology at least once a week for instruction. All teachers met these criteria and agreed to participate in the study.

Selecting Collaborators

I call them "collaborators" to emphasize a blurred boundary where none of the persons involved, including myself as researcher, are considered "experts." Understandings, clarity, and new lines of inquiry were reached by exploring the knowledge and truths constructed by the collaborators, who have unique backgrounds and experiences that have helped shape their realities. Borrowing from Smagorinsky et al. (2006), collaborators form part of a "cultured rhizome in which authority is shared, multiple perspectives are included, each perspective is reterritorialized, and greater

attention is given to the cultural context of development" (p. 87). Our backgrounds and experiences affect and add to our understandings and the analysis of this research.

In terms of data, printed text and dialogue are part of what we construct in order to better understand the world. None and all can be called "author" and no one "truth" is absolute, for it is in the interactions between them--their ideologies, backgrounds, cultures, subjectivities, and experiences--that we can begin to glean meaningful knowledge.

While most qualitative studies do not fit neatly into any model (Hatch, 2002), many facilitate in-depth focus on small samples (Patton, 2002). To explore various perspectives, I decided to select a minimum of six collaborators from the different school levels. For example, a minimum of six collaborators could include two teachers from elementary, two from middle school, and two from high school. However, due to the lack of participation interest at the secondary level, I selected eight collaborators from the elementary level. Three were fourth-grade teachers and five were fifth-grade teachers.

Taking into consideration the research question and technology considerations, purposive, criterion-driven sampling (Patton, 2002) was used when selecting collaborators. In other words, the selected teachers reflected predetermined criterion characteristics (see the next section for a detailed explanation).

Sampling Criteria

I wanted to find teachers who self-identified as technology-savvy. This meant I needed to find teachers that had experiences that moved beyond the use of basic technology skills. The reason for this is that while policy language and current teacher preparation programs have emphasized the connection between technology and

literacy teaching and learning (Bomer, 2006; Camangian, 2011; Davenport & Jones, 2005; Gronseth et al., 2010), adherence to basic technology skills alone may be inadequate for technology integration (Bauer & Kenton, 2005; Mims, Polly, Shepherd, & Inan, 2006). For example, if a computer is used solely for word processing, the connection between technology, visuals, and literacy teaching and learning might be disregarded.

Hooper and Rieber (1995) described five phases of teachers' use of technology and the skills each entails:

- FAMILIARIZATION: In this phase teachers are familiar with the technology, may have had professional development and learned to navigate various technologies, but the experience ends at the workshop level.

- UTILIZATION: In this phase, teachers try out the technology in the classroom, but might be satisfied with its limited use. There would be little to no impact on teaching if there was a malfunction or if the teacher decided to stop using it.

- INTEGRATION: Hooper and Rieber (1995) describe this as the "breakthrough" phase. At this stage, teachers consciously design their instruction to include technology in such a way that the lesson could not proceed as planned if the technology were to fail. For example, a lesson focusing in online research of serpent species could not continue if there was an interruption in Internet access. It would be much like missing a book or a chalkboard.

- REORIENTATION: This phase demands a change of focus on students' learning instead of teachers' instruction. The teacher establishes a learning environment where the roles of student and teacher are fluid and exchanged; where the teachers do not feel the need to be the experts of the technology used. Students are encouraged to appropriate the technology in innovative and creative ways.

- EVOLUTION: In this last phase, the focus is on evolution and adaptability. This means the classroom is open to constant change to meet contemporary demands, challenges, and potentials provided by new technology and understandings of how people learn.

It is rare to find a classroom where a teacher has moved beyond the utilization stage (Bauer & Kenton, 2005; Hooper & Rieber, 1995). According to Cradler, Freeman, Cradler and McNabb (2002), hesitance to delve into visual literacy practices in

technology-enhanced curriculum lies in teacher concern about gaining competence and feeling comfortable with technology use and integration. As this research focused on the use of visuals for literacy instruction within technology-enhanced classrooms, I needed to find collaborators that reported experience, familiarity, and comfort with more than basic technology skills within the utilization stage that may include, but is not limited to:

- access to technologies

- flexibility to explore features and functions

- seeing technology modeled by others

- designing and implementing technology-rich lessons

- obtaining personalized support throughout the learning and implementation process (Mims, Polly, Shepherd, & Inan, 2006)

Therefore, those who self-identified as technology-savvy meant they reported having the means, motivation, and experience using technology in the classroom to enhance teaching on a daily or near-daily basis. I needed to find teachers that depended on technology to deliver part of their instruction and who reported having had experiences that included using visuals for instruction. To increase my chances of finding teachers that met these criteria, I looked for those teachers who had experiences through the EETT initiative, which is explained in the next section.

EETT Workshop

The Enhancing Education Through Technology (EETT) initiative I was involved in focused on goals that included improving technology integration, increasing access to technological tools, and strengthening teacher and administrator information and communications technology (ICT) skills through a professional development program

known as the Florida Digital Educator (FDE)Teaching and Learning Institutes (Table 3-3

for FDE goals). Teachers from the funded projects came together for four days in a

workshop environment where they learned, shared ideas, explored engaging teaching

practices, and created projects using digital tools (Table 3-4 for institute goals).

Table 3-3. FDE goals

Florida Digital Educator Goals	Seamlessly integrate technology in the curriculum
	Facilitate systemic change to transform the learning environment
	Advocate through effective communication
	Share best practices
	Create and sustain collaborative communities
	Promote authentic, student-centered learning
	Improve student achievement
	Create, promote, and expand access to digital content
	Conduct program evaluation and research activities

Note: Adapted from "Florida Digital Educators"(n.d.), Retrieved from
http://etc.usf.edu/fde

Table 3-4. FDE Teaching and Learning Institutes' goals

Develop educators' ICT skills including the ability and knowledge to	access
	manage
	integrate
	evaluate
	construct
	communicate
Use tool-based software	presentation
	word processing
	spreadsheets
	video editing
	graphics
	digital audio
Use hardware	computer
	mobile devices
	interactive whiteboards

Note: Adapted from "Florida Digital Educators"(n.d.), Retrieved from
http://etc.usf.edu/fde

In the district selected for this research, out of ninety-two teachers in the schools

participating in the EETT initiative, a total of forty-one teachers from the five schools

actively participated (Table 3-5). While participation in the institute was limited to four

days of workshops, teachers were presented with opportunities to learn new things and discuss technology integration within a social context where they could move beyond basic technology skills. Topics covered include internet searching, safety and copyright, word processing, digital audio, electives, and an action plan for the classroom. It also included the use of visuals such as presentations, charts and graphing, spreadsheets, digital images, video, and graphics. I felt that this movement from basic to more authentic and diverse technology integration opportunities improved my chances of finding collaborators who self-identified as actively using technology and visuals in literacy instruction.

Table 3-5. EETT active participants

Projects	Participating teachers
Elementary	21
Secondary	20

The Collaborators and Their Classrooms

A total of eight teachers from one elementary school participated in this study. This included five fifth-grade teachers and three fourth-grade teachers. Due to the parameters of confidentiality for this study and to maintain anonymity, I will refer to the collaborators using pseudonyms and assigning their classroom a number (Table 3-6). I will first briefly provide general information about teachers and their classrooms as a group and then provide a more detailed breakdown of information of each collaborator.

Teaching experiences ranged from one year to over twenty-five years. While some of the teachers had not taught outside of elementary, there were teachers with experience teaching at secondary level. Their professional trajectories included a variety of grades and subjects taught. In terms of technology, all teachers stated they had used at least a computer throughout their teaching career. Only one of the teachers

admitted to using very little technology at the beginning of her career, as computers

started coming into schools around her fourth year of teaching. However, all teachers

reported they had been using technology for instruction at least on a weekly basis for

some years, though to varying degrees of comfort. Teachers who were at the beginning

of their career expressed most discomfort but a willingness to continue learning about

and implementing technology. All teachers admitted to using visuals in their instruction

at least once a week, with and without technology.

Table 3-6. Collaborators

Teacher pseudonym	Classroom number	Grade taught
Ms. Maria	1	5
Ms. Ladasha	2	4
Ms. Penelope	3	5
Ms. Poppy	4	4
Mr. Jesse	5	4
Mr. George	6	5
Mr. Rudy	7	5
Ms. Lana	8	5

All classrooms were equipped with document readers, microphones, projectors,

and computers (Table 3-7). Some technology was unique to a particular teacher due to

budget and time constraints, such as the use of iPads® in one of the science

classrooms and the use of iPods® in one of the fourth grade classrooms. Classroom

environments were similar in that posters and visual materials, including student work,

covered the walls. All classrooms followed an inclusion model. One of the classrooms

was unique in that it was an advanced class. Students stayed in the classroom with the

same teacher all day long instead of moving to other classrooms for math and science

classes. However they attended "specials", on certain days that included classes like

music and art.

Table 3-7. Technology available to collaborators

Teachers	Subjects taught by teachers	Electronic technology available	Software and technology used by one teacher
5th grade group (5 teachers)	all subjects (2), gifted (1), Science (1), and Math (1)	Document reader; projector, microphone, computer, digital cameras	iPads® (Science)
4th grade group (3 teachers)	All subjects	Document reader, projector, computer,	iPod®

Ms. Maria, class 1

Ms. Maria was a fifth-grade teacher with thirteen years of experience in the classroom. Most of her professional career was spent in advanced elementary classes, teaching science and all subjects to students in elementary. She also taught science at the middle school level for close to three years of her career. When identifying as a technology-savvy teacher, she expressed high interest, motivation, and use of technology. She has had her students submit articles online, participate in a digital showcase, and use computers, video cameras, and laptops for their projects. Ms. Maria stated her class would feel different if she did not use technology at least once in the lesson. She mentioned using an overhead projector, a computer, Internet sources, videos, and presentation software as just some of what she liked to use for her lessons. As for visuals, she stated she enjoyed showing and discussing videos, as well as charts and graphs and anything she could "get her hands on".

Ms. Ladasha, class 2

Ms. Ladasha had close to twenty years of teaching experience at the elementary level. In her career she had mostly taught science and history, but in most recent years

she taught all subjects in the fourth grade. When identifying as a technology-savvy teacher, she expressed a high appreciation for the computer and document reader, which she professed she used on a daily basis. Ms. Ladasha also stated she liked trying new technology and found it helped her more effectively connect with the students, as technology is something that motivated them. In terms of visuals, she stated she liked to use charts and graphs, videos, pictures, guided notes, and Internet sources.

Ms. Penelope, class 3

Ms. Penelope was a first-year teacher who taught reading, language arts, and social studies in the fifth grade. When identifying as a technology-savvy teacher, she mentioned she liked to use a lot of technology for teaching. Such technology includes a computer, a document camera, projector screens, iPads®, and presentation software like Prezi®. She enjoyed using technology, especially for research projects, because she believed such use increased her students' comprehension of concepts, as well as their excitement and enthusiasm for learning. As for the use of visuals, she stated she likes to use a lot of images for vocabulary teaching, as well as manipulatives such as PlayDoh®, so students can touch and feel concepts in addition to seeing them. For example, when teaching prefixes like "sub-", she would provide an image of a submarine and have students create a submarine and other words with that prefix using PlayDoh®.

Ms. Poppy, class 4

Ms. Poppy had been a fourth-grade teacher for around ten years. During the first eight years of her career, she taught writing, language arts, and social studies. During her most recent years, she taught all subjects for an advanced class and a mainstream class. When self-identifying as a technology-savvy teacher, she mentioned she liked to

use a document camera, projector and her laptop. This technology allowed her to face her students, limiting the amount of time she would have to turn her back towards them. Ms. Poppy also stated that the document camera facilitated showing her students just about anything she wanted, while her laptop and projector combination allowed her to create and use content-based games for each lesson. As for the use of visuals, she stated that in addition to the visual aids she placed under the document camera, she liked to use visual writing aids and models including Venn diagrams, T charts, and sequencing charts.

Mr. Jesse, class 5

Mr. Jesse had been a teacher for nine years. During the first two years of his career, he taught all subjects in ESE inclusion classrooms. The rest of his time had been spent teaching science and math to fourth-grade students. When self-identifying as a technology-savvy educator, he mentioned he had been using technology since the first day of his teaching career. He stated his preferred technologies for the classroom were the overhead projector and document camera, because they facilitate student access to information. In terms of visuals, he felt they were critical to instruction and he emphasized that, while a lot of things can be visuals, they have to relate to the content being taught for them to be useful.

Mr. George, class 6

Mr. George was a fifth-grade mathematics teacher with almost ten years of experience. During these ten years he was primarily a mathematics teacher, but he did have some years' experience teaching all subjects. When identifying as a technology-savvy teacher, he was the least enthusiastic of the group. However, he mentioned a reliance on the computer and document reader to provide easier access to materials. In

terms of visuals, he preferred to project information using the document reader and to decorate the classroom with helpful images, charts, and graphs.

Mr. Rudy, class 7

Mr. Rudy was the only teacher of the group who had interrupted his teaching career. His career began twenty years ago at an elementary school where he used the school's Apple® lab for creative writing and problem solving. Following that experience, there was a twelve-year gap where he was a summer camp director. He then returned to teaching second and fourth-grade and then language arts for five years. His most recent experience includes teaching science to fifth graders. When self-identifying as a technology-savvy teacher, he mentioned his high comfort level when using technology for instruction, and he claimed to use it every day. Mr. Rudy stated that he enjoyed using PowerPoint® and encouraged students to write on computers for about fifteen minutes daily, depending on the availability of computers. In terms of visuals, Mr. Rudy mentioned using text, images, videos, and other visuals easily found online, and he also emphasized the importance of self-created visuals for instruction.

Ms. Lana, class 8

Ms. Lana began her teaching career twenty-eight years ago. For nineteen of those years she taught all subjects in third grade. She then decided to make the move to fifth grade reading, language arts, and social studies. When self-identifying as a technology-savvy teacher, she admitted to using very little at the beginning of her career. Computers were not in the classrooms yet and as a college student she was learning how to run a film projector and work an overhead projector using transparent paper. It was not until around the fourth and fifth year of teaching that computers first started to show up in the classrooms, where she had her first experience with Apple®

hardware. In recent years, she stated an inclination for software that allows students to

create content, such as iMovie®, GarageBand®, PowerPoint®, and Keynote®. With her

students, she has created commercials and mini-movie trailers. In her teaching, she

used a document camera and computer to complete exercises, watch videos, and listen

to music. In terms of visuals used in her classroom, she self-identified as a visual

learner. Ms. Lana stated that she likes to teach the way she learns best. She decorated

her classroom with anchor charts and other visual aids.

Data Collection

In constructivism, meanings are conceptual structures that are born through our

interactions with the world (Crotty, 1998; Glasersfeld, 1989). Any truth is subjective, an

approximation, where meaning is mediated by several factors including context and

language (Bakhtin, 1986; Johnson, Sullivan, & Williams, 2009; Street, 2003). I needed

to find data sources that looked at several perspectives and ways of communicating to

glean and understand the realities constructed by the collaborators of the study. These

included videotaped observations of teacher-directed literacy instruction, field notes,

and video-taped, semi-structured individual interviews.

There were two main reasons why I chose these data forms: the need for

teachers to maintain a regular class routine and the need to explore the multiplicity of

data. I would spend some time building rapport with each teacher so that they felt

comfortable with my presence--I did not want the classroom procedures and dynamics

to change because of it. Data collection methods needed to be powerful enough to

answer the research question while remaining unobtrusive. In addition, these methods

needed to provide various opportunities to explore the context, use of visuals, language,

actions, and behaviors of collaborators. Observations, field notes, and interviews facilitated these processes.

In the next sections I outline the data collection processes and methods chosen and a rationale for each one, focusing on the two phases of data collection that occurred. Then, I discuss how data were analyzed and interpreted. Data was collected during the Fall 2011, Spring 2012, and Summer 2012 semesters (Table 3-8).

Table 3-8. Data collection

Data sources		Quantity	Duration (per teacher)	Totals
Observations (video)	(secondary)	Minimum once a week	10-60 minutes per visit; 180 minutes total	1440 minutes
Semi-structured interviews	(primary)	1 per teacher	60 minutes	480 minutes
Field notes	(secondary)	Ongoing	N/A	N/A

The first phase included collecting data from classroom observations. The collection was driven by the guiding questions and following questions at each stage of the research. Videotaped observations of teacher-directed literacy instruction counted as secondary data gathered during the first phase of the study. Data analysis emerged in response to the collected data.

The second phase of collection consisted of semi-structured interviews drawing from the analysis of the observations. Analysis gathered from secondary data served to inform the collection process of the primary sources of data. The primary source of data for the second phase included a one-hour, individual, semi-structured interview to discuss what was gleaned from the observations and expound on teachers' utterances when it comes to using visuals and technology for instruction.

Building Rapport

I remembered what it was like to teach a class and suddenly have someone walk in, invited or uninvited. They would observe, jot down notes, and try to be an "unobtrusive" presence in the back of the room. There was constant nervousness and hyperawareness of everything happening in the classroom. Afterwards, questions circled in my head and I wondered what the feedback would be, if any. It is no easy task to allow a stranger to share your classroom for an extended period of time without knowing who they are, what they want to accomplish, or if they care about your work. I knew that building rapport needed to be an integral part of the design for this research.

I began to build rapport by meeting informally with the teachers and sharing personal stories of my experiences in K-12 education and as a Ph.D. candidate. I also made connections with teachers individually by asking for their personal stories. For example, I learned that one of the teachers was highly invested in working with the school community outside of the classroom and was always signing up for activities, including fund-raisers, and encouraging students and their parents to attend.

When discussing the schedule for data collection, the collaborators had full control over when I would walk into the classroom. Before and after data collection, I made myself available to all collaborators for informal chats. Once they felt more comfortable with me, they asked questions about the data collection (e.g., they wanted to know if I got the information I needed), commented on the day's lesson, shared personal stories, or engaged in other informal conversations.

Observations of Classroom Literacy Instruction

According to Marshall and Rossman (2006), "observation entails the systematic noting and recording of events, behaviors, and artifacts (objects) in the social setting

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chosen for study" (p. 98). This method of data collection "assumes that behavior is purposeful and expressive of deeper values and beliefs" (p. 98). In qualitative inquiry, observation falls within a continuum, where the researcher's role in the observation ranges from passive to active levels of participation (Spradley, 1980). Participant observation, in particular, is a kind of qualitative study that includes ethnography's field methods (Hatch, 2002). The distinction between participant observation as a study and data collection strategy is blurry in the literature (Hatch, 2002). The term "observation" for this research parallels participant observation in that it has a narrower focus than full ethnography (Hatch, 2002).

The goal for observation in this study was to construct an understanding of the use of visuals in technology-enhanced classrooms from the perspectives of the participants. In other words, it was an attempt to see through the eyes of the teachers. My role leaned heavily on the passive/non-participant side of the continuum. My major contributions to the observations took place in the analysis, which include my previous experience in visually-rich instructional settings. For example, I am well-versed with the creation of visually-rich electronic materials for presentation of content. This knowledge was beneficial when asking questions and follow-up questions when exploring teachers' reasons and reasoning behind using and favoring resources. For the analysis, I also drew from that knowledge to explore teachers' comments more in depth.

Conducting observations of teachers was helpful in this research because they facilitated the illumination of teachers' language use, behaviors, and practice with visuals in their pedagogy. I was able to see what visuals they were using and how they were using these visuals. It also led me to formulate other questions that helped answer

the research question in a more informed way. For example, what visuals were valued in teacher-led literacy instruction? Was there a preference of one type of visual? What was the purpose of these visuals?

Observations were conducted over six weeks during teachers' regular instructional periods. Most teachers adopted an open door policy for me. I was invited to come in at any time of the day on days they informed me they would dedicate a significant amount of class time to direct instruction. This allowed me to observe them at different times during those weeks, where they taught different subjects and classes with different classroom dynamics.

While field notes have been traditionally used to record observations (Hatch, 2002; Marshall & Rossman, 2006), two observational records--videotaped observations and field notes--were integrated in this study in an attempt to capture the complexity of teachers' actions. They helped me increase the quality of other data collected, interpret data, and continuously question the data to reach deeper understanding. Had I relied solely on written observations, I may have missed many nuances in the data I managed to glean from the videotaped observations. With both records I could compare my notes with what I saw in the videos, add details, and question my initial observations and interpretations. Gathering this type of data also helped me formulate highly contextualized interview questions in the second phase of the study.

Video Recordings of Classroom Observations

An assumption in this study is that knowledge is constructed by collaborators and the researcher, therefore multiple data sources, such as video, can serve as an avenue into the experiences, beliefs, and motivation of the teachers. Experiences inside an active classroom are complex, as there are many elements at play that are fast-moving.

At any given time, students are interacting and responding to situations provided by the teacher, while maintaining the pace and momentum. The class may quickly switch from lecture to inquiry to activity to wait time to discussion and to any number of activities. In such a fast-paced, living, dynamic, and fluid atmosphere, videotaping can be used to write detailed transcripts and pick up subtle details, as well as be replayed to ensure accuracy. In addition, it can be used to document the context visible through the lens, allowing it to be analyzed in ways not possible with field notes alone (Hatch, 2002). In addition, videotaping as a form of data collection is valuable for discovery and validation, as it documents behavior such as facial expressions, emotions, and gestures (Hatch, 2002; Marshall & Rossman, 2006). Videos provided a source of data that was used for multiple reasons:

- Using digital video to collect the data helped convey a strong sense of direct experience with what was studied

- Digital video presented a sense of permanence as a record

- Video could be taped, copied, and edited in real time

- Videos allowed for inclusion of other voices that would otherwise not be heard

- Using videos gave me the ability to create a more direct connection to the audience.

- Videos were easily accessible for others to check, question, and reinterpret findings.

- They afforded the ability to edit and annotate clips to highlight information

- Videos potentially increased the quality of the study (Hatch, 2002; Johnson, Sullivan, & Williams, 2009; Shuck & Kearny, 2006)

I used programmed sampling for the videos, which involves "filming according to a predetermined plan… to stipulate which events are likely to be significant" (Marshall & Rossman, 2006, p. 120). Guided by the research design and this study's conceptual

framework, the collaborators were videotaped during teacher-directed literacy

instruction. For the purposes of videotaping, literacy instruction here is defined in

simplistic terms as instruction in reading, writing, and/or mathematics. In cases where I

was only able to observe content area instruction such as social studies or science,

(due to time restrictions or teacher availability), I focused on instruction of content-

specific vocabulary, reading, and writing. A minimum of one observation a week took

place on different days in which the teachers reported they were including visuals in

their instruction.

I created a log of the videotaping to ensure I was obtaining rich data for literacy

instruction. The information on Table 3-9 represents the number of times I observed a

particular subject being taught. It does not reflect the number of videos, as on more than

one occasion teachers switched from one subject to the next during one observation.

The majority (54/72) of observations occurred during literacy instruction (reading, math,

English, and writing).

Table 3-9. Video log by subject taught

Subject	Number of times observed
Reading	25
Math	16
Science	11
Language Arts/English	8
Social Studies	7
Writing	5

Videotaping the observations facilitated many processes and helped me create a

more direct connection with the data. However, as Plowman (1999) pointed out, video

does not capture unobservable processes such as thoughts, attitudes, feelings, and

perceptions. Video tapes are sources of data and not data themselves, as data is

purposefully constructed by the researcher (Johnson, Sullivan, & Williams,

2009).Therefore, it became necessary to use other data to triangulate, such as field notes and interviews.

Field notes

Field notes present secondary data from the researcher's observation (Hatch, 2002; Marshall & Rossman, 2006). They were used to complement the videos, as they can include impressions, wonderings, interpretations, and other information that help provide descriptions of the events in the videos and interviews. Usually, raw field notes describe the research context, conversations, and actions of participants (Hatch, 2002). In this study field notes are primary data which, in tandem with videotaping, allowed me to focus on preliminary interpretations. Taking these notes encouraged me to produce further questions, reflect on observations, and explore other contextual details that might be blurred through traditional field notes protocols. In traditional field-note protocols, a lot of attention needs to be paid to describing the context being observed (Hatch, 2002). By using video to capture part of the context through the lens, I was freed to focus on other aspects of the context that might not otherwise have been visible. Videotaping also helped me avoid tallying and trying to standardize the observations, thus striking a balance between reportable data and my interpretations of observations.

To help fully answer the research question, it was important to document several aspects of teachers' use of visuals and technology in the classroom. This included what visuals were used, how teachers used these visuals, and shifts in teachers' language, actions and/or behaviors as they used visuals and/or technology for instruction. For example, a teacher may temporarily stop instruction to state something such as: "this

picture will help it stick in your head." Events like these encouraged me to think about teachers' beliefs concerning the use of visuals and technology for instruction.

I maintained a structured record of field notes during videotaped classroom observation and throughout the study that included my first impressions, feelings, thoughts, reactions, observations of teachers' actions, description of events, and interactions. First, I took note of the day and time in which the observation took place, the teacher, grade level, subject taught, and the number of the observation. For example: "Teacher: XY. First observation. Fifth grade; 11/03/11; early morning." Then the process of note-taking was divided in three stages.

I began the process with raw field notes, which included key words and phrases that would help jog my memory later and complement what was videotaped (Hatch, 2002). Anecdotal notes and contextual information were also documented (Emerson, Fretz & Shaw, 1995) in the first stage. These helped me remember specific moments, words, actions, or ideas that related to the research question. After leaving the classroom I revisited and expanded (Emerson, Fretz, & Shaw, 1995) these notes and added any further impressions or ideas, including details of the context and instruction.

In this stage I also generated more questions concerning what I had observed. For example, I noted one of the teachers mentioned that a picture would help the information "stick." This led me to questions I could later ask, such as: "do you think all pictures have the potential to help information 'stick'? In what way/s does a picture help information 'stick'"? Finally, I focused on reflections and my interpretations about the events observed as they related to the research question (Emerson, Fretz, & Shaw, 1995).

Semi-Structured Interviews

In qualitative research, formal interviews are designed to delve into the understandings of the informant and allow the interviewer to follow leads while guiding the interview (Hatch, 2002; Marshall & Rossman, 2006). Through such interviews, both researcher and collaborators have the opportunity to generate data that includes detail, vividness, nuance, and richness (Rubin & Rubin, 2005). Interviews are commonly used in qualitative research because they can illuminate motivations, beliefs, feelings, and worries of particular events or experiences (Lincoln & Guba, 1985). They can help the researcher glean "events and experiences that have not been observed" (Hatch, 2002, p. 91).

For the second phase of this study, I conducted semi-structured interviews. "Semi-structured" here means I generated questions to help guide the interview process, not to force a particular order or structure to the event. As is characteristic of qualitative research, questions were open-ended, which fostered opportunities for collaborators to explain and expand on their experiences and unique perspectives. I asked questions such as: what are your favorite visuals to use for instruction and why? How important do you believe visuals to be within a technology-enhanced curriculum? What kinds of skills do you believe students need to effectively engage in a technology-enhanced curriculum? As the researcher, this allowed me to generate and ask new or additional questions in response to collaborator comments within the context of the discussion (Hatch, 2002).

The collaborators of this study each participated in a one-hour, computer-mediated, video-recorded, semi-structured interview (the next section offers a rationale on the use of computer-mediated interviews). The questions I asked were highly

contextualized for each collaborator, as they were informed by the first phase of the data collection and analysis (Appendix: Interview Guide Sample). The text from the interviews that was analyzed consisted of typed transcripts of the conversations that took place.

Computer-mediated interviews

After the first phase of data collection, circumstances led me to move to another state. This meant that I had to choose among the options available to me to determine how I would collect the second phase of the data once the analysis of the first data set was completed. Traveling back and forth presented financial difficulties. Another option was to conduct computer-mediated interviews. Computer-mediated communications (CMC) can include chat-rooms, forums, instant messaging, and e-mails (Kozinets, 2010). This idea presented several possibilities, as well as challenges.

I wanted to gain the data in a way that would still allow for rich interviewing (Hatch, 2002; Marshall & Rossman, 2006) and offer opportunities that included detail, vividness, nuance, and richness (Rubin & Rubin, 2005). I also wanted to use something that allowed me to observe non-verbal cues, such as facial expressions, emotions, and gestures. This meant I needed to find a medium that allowed me to retain aspects of face-to-face communication, such as the ability to maintain increased synchronicity, as opposed to e-mail communications, for example, which increase response latencies. I use the term "synchronicity" as a continuum, not as a dichotomy that might have been prevalent years ago when referring to more limited technology (Kalman & Rafaeli, 2007).

According to Kalman and Rafaeli (2007), synchronicity is a property of conversation, not necessarily of the medium being used. When people communicate,

"they decide on the level of synchronicity they prefer for each conversational exchange they are involved in" (p.5). Current technologies have made modulating synchronicity easier. For example, one can choose to immediately respond to a text message or save it for later, thus decreasing synchronicity.

Humans prefer high synchronicity, perhaps because we are inclined to face-to-face interactions (Kalman & Rafaeli, 2007). According to Salmons (2010), there are four types of synchronous communication for online interviewing: text-based, multichannel meeting, immersive 3-D environment, and video call. Text-based interviewing such as chatting would allow for high synchronicity, but I would not be able to glean non-verbal cues, as well as any uncomfortable silences that may occur. A multichannel and 3-D environment meeting would similarly limit the interviews. A video call proved to be the most faithful to a face-to-face interview, so I decided to use Skype™ and Google Voice™ chat to communicate with the collaborators for the second phase of this study.

Skype™ and Google Voice™ chat are free online software that allow people to communicate via video call. This medium allows for highly synchronous interaction conducted in a way that closely resembles the natural turn-taking, face-to-face communication, which includes verbal and non-verbal cues. They are also a medium that the collaborators of this study were familiar with and could easily access.

Data Analysis Processes

The ultimate goal for analysis was to investigate how fourth and fifth-grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced, literacy instruction. Data analysis was ongoing and recursive as framed by the research questions and the goals for the different data collection phases. In the first phase, the goal was to collect secondary

data through observations and field notes. In the second phase, the goal was to gather primary data to expand on and explain the observations from the first phase. For both phases, a type of inductive analysis (domain analysis) was used to analyze the data. This type of analysis focuses on the descriptions of situations and the patterns within them and is specifically looking for semantic relationships (i.e. x is a type of y or x is a way to do y, etc.).

Domain analysis was useful because it helped me think first about particular parts of the data and combine them into a meaningful whole. In other words, I was able to look for patterns across the observations and semi-structured interviews to reach encompassing, explanatory statements (Potter, 1996). Specifically, I followed Hatch's (2002) outline of inductive analysis, which is a slightly modified version of Spradley's (1980) domain analysis. Hatch's outline is adaptable and provides more flexibility than others (Hatch, 2002).

The steps in inductive analysis involve systematically searching for patterns inside particular pieces of evidence to come up with categories, establish domains-- which are symbolic categories containing other categories (Spradley, 1980)--and look for themes across domains. Spradley (1980) ascertains that domains can be represented by identifying two types of terms: included terms (these are given categories) and cover terms (they encompass a set of categories linked by a semantic relationship). According to Spradley (1980), there are nine semantic relationships researchers need to consider when conducting domain analysis including strict inclusion (X is a kind of Y), spatial (X is a place of Y), cause-effect (X is a result of Y), rationale (X is a reason for doing Y), location for action (X is a place for doing Y), function (X is used

for Y), means-end (X is a way to do Y), sequence (X is a step in Y), and attribution (X is a characteristic of Y).

Hatch (2002) states that not all of these relationships will be salient to the research. Indeed, a researcher may need to drop some of the relationships found because they may not be relevant or pertain to the research question. However, it is necessary to perform comprehensive analysis of potential relationships, as this can provide insight and illuminate other relationships. In addition, in order to move beyond the surface of the data to reach a deeper understanding, analysis, complexity, and richness, the researcher looks to interpret the findings from domain analysis. This means searching across domains for themes in the form of new links, relationships, or domains (Hatch, 2002).

To complete domain analysis throughout the study, I used Hatch's (2002) steps to inductive analysis, including:

- Reading the data and identifying frames of analysis.

- Creating domains based on semantic relationships discovered within frames of analysis.

- Identifying salient domains, assigning them a code, and putting others aside.

- Rereading data, refining salient domains and keeping a record of where relationships are found in the data.

- Deciding which of your domains are supported by the data and then searching data for examples that do not fit with or run counter to the relationships in your domains.

- Completing an analysis within domains.

- Searching for themes across domains (followed by a master outline of relationships among domains, including support data).

In the following sections, these steps are elaborated and explained within the context of this study.

Reading the data and identifying frames of analysis

In both phases of data collection, once data were collected and transcribed, I completed a thorough reading of transcripts, watched the videos, and continued to take notes in the field notes record. This helped me make further connections with the data and allowed me to begin reflecting on how the contributors used materials, language, and actions when incorporating visuals into the lesson. I also considered other elements such as gestures, actions, pauses, events, environment, and reactions. As Hatch (2002) recommends, I asked what my initial frames of analysis would be. In other words, I needed to decide how to break the data into parts I could analyze. These analyzable parts can focus on small units, such as words or short expressions, or sweep more broadly to include blocking complete interchanges (Hatch, 2002).

In this study, the analyzable parts included words, phrases, and sentences that conveyed a complete idea. I decided to begin arranging my analysis around parts that had qualities of visual literacy tenets and technology use. This proved to be helpful because it provided some guidance for beginning the examination of data and remained flexible enough for potential reframing or refocusing of the analysis later on.

For the first phase of the study, the original frames of analysis included "use of visuals" and "use of technology". In the data, I looked for instances where visuals and visual literacy principles were enacted through teachers' language, but I also looked at other contextual cues, such as expressions, mannerisms, and use of materials. I used word processing software to facilitate cutting and pasting of data to new documents. I identified the analyzable parts in the data and pasted them on new pages in a new

electronic document. I thought about ways to summarize the data by thinking of

possible included terms to name specific elements found. This helped me organize the

data in three ways: the first document contained the analyzable parts, the second

document contained the meaningful units organized by the included terms, and the last

document featured only the included terms that were identified from the data.

The initial analysis of the data from the second phase of the study was carried

out in a similar fashion, but was informed by the analysis of the first data set. For the

second data set I decided to first approach the information with broad frames of analysis

to avoid limiting or reducing the data too soon. The frames included "comments related

to visuals" and "comments related to technology". For both phases of the study, I began

coding processes and then followed Hatch's (2002) steps for inductive analysis.

Creating domains based on semantic relationships discovered within frames of analysis

Hatch (2002) describes this step as a process to develop categories of meaning

that are linked by particular relationships that are present in the data. For something to

be considered a category, it needed to have specific elements that could be related to

other categories semantically. Establishing domains helped me reach an understanding

of how the collaborators in this study organized their understandings of visuals and

technology in education, as well as how collaborators operate in their world.

I began representing domains by going through the analyzable parts of the data

and identifying included terms. I also looked for similarities among the included terms,

which allowed me to group them to facilitate the identification of semantic relationships

that would help generate cover terms. I went through the sets of included terms,

thinking about the research question, the data, and Spradley's (1980) list of possible

semantic relationships. I scoured the data, looking for these relationships. Following Hatch's (2002) example, I would ask myself: What are examples of strict inclusion in the data? What is an example of X being a kind or type of visual (or technology) in this comment?

Once completed, this was followed by creating cover terms that combined several of the categories into sets. The content and meaning in the included terms were explored carefully before deciding on the cover terms that best summarized the essence of the analyzable parts of the data. I will illustrate this process by drawing from the first example of the three I have included below from my data. I saw that teachers used several visual cues, such as color and shapes, as part of their instruction. I identified the cues used in all classes. When asking myself about examples of strict inclusion, I asked myself what the teachers were attempting to do when they used these cues. I identified them as being kinds mnemonic devices, meant to encourage students to more meaningfully engage with content (further discussion on this is in the next chapter). A domain includes three parts: included terms, the semantic relationship, and the cover term (Hatch, 2002). Therefore, a plausible domain for this example could be: colors, circling information, highlighting (included terms) are types of (semantic relationship) mnemonic devices (cover term) (Table 3.10).

I prepared electronic domain analysis worksheets like the one shown in Table 3.9 and labeled them according to the study phase. Domains from phase 1 of the data collection were initially labeled D1 through D9 to facilitate the identification of the domain being searched before they were consolidated into a master document. I included O to indicate if the data came from the observations, or I to indicate if the data

came from the interviews. A thorough domain analysis was particularly helpful for later

stages of the analysis in order to reach depth and complexity.

Table 3-10. Domain example from domain analysis worksheet

Included terms	Semantic Relationship	Cover Term
Colors Circling information Highlighting Wrapping information in different figures Body as a visual Underlining information	are types/kinds of	mnemonic devices
Organizing information Identifying information Copying information Repeating information	are used to	facilitate internalization of visual information
Relational/personal To others' experiences To a text To the world	are types of	connections emphasized when using visuals

Identifying salient domains, assigning them a code, and putting others aside

Hatch (2002) recommends exploring all semantic relationships to avoid early

data reduction. Once the domains have been established, the next step is to reduce the

data to points that are salient to the study. After I explored all semantic relationships in

the data and identifying domains, I reanalyzed them. I began by looking at domains with

few included terms. Hatch (2002) cautions not to eliminate domains based on the

number of included terms, as they could hold powerful or insightful data, but this

provided a starting point that allowed me to think of the relevance of the information. I

asked myself if the domains were pertinent or important to understand the observations

and the collaborators' constructions of their world. I asked if domains were relevant to

answering the research question and if there were other terms I may have missed or

would see later in the data.

After identifying and selecting the domains, I used Hatch's (2002) method of coding the salient domains. I assigned a Roman numeral to the different domains and a capital letter to each included term. To draw from the previous example, the domain of "mnemonic devices" was assigned "I" and colors, circling information, and highlighting information were assigned A,B,C, respectively (e.g. IA, IB, IC). These codes were marked directly on the electronic worksheets (Table 3.11).

Table 3-11. Assigning codes to salient domains

Included terms	Semantic Relationship	Cover Term
A Colors B Circling information C Highlighting D Wrapping information in different figures E Body as a visual F Underlining information	are types/kinds of	I mnemonic devices

Rereading data, refining salient domains and keeping a record of where relationships are found in the data

In this step, a researcher goes over the data again to make sure that there is data to support the existing domains. I went over the data again, read through the salient domains, and explored the relationships extant among categories. Hatch (2002) explains that, while most relationships will have already been discovered, there is a chance other included terms will be discovered and added to the salient domains.

In terms of record keeping, as I read through the data, I identified where the examples were located on both the data document and the domains document. To do this, I used the codes I previously assigned to the domains (e.g. IIC), bracketed the examples, and then cut and pasted parts of each example to a new document in a table next to their respective domains. Table 3.12 shows an example for some of the included terms. On the domain document, I then typed the page numbers where the complete

examples could be found (Hatch, 2002). This process encouraged me to look more

closely at the data to garner a better idea of the importance and richness in the domains

(Hatch, 2002).

Table 3-12. Exploring data and domains

Data units	Included terms	Semantic Relationship	Cover Term
The different sections and explanations are separated by color. She uses red and then blue then green.			
She has taken a highlighter and is highlighting parts of the passage. This shows up for everybody to see on the overhead.	A Colors B Circling information C Highlighting D Wrapping information in different figures E Body as a visual F Underlining information	are types/kinds of	I mnemonic devices
"Okay so when you do this" – she pinches her nose with her left hand, raises her right and waves as she crouches – "you are going where?"			

Checking that domains are supported by the data and searching data for examples that do not fit with or run counter to the relationships in the domains

This part of the process meant I needed to take a step back from the data, look

at the big picture, and check to see if there was enough data to support the domains. In

addition, I needed to determine if the data were robust enough to include the domains identified. Finally, I needed to find data that ran counter to, or did not fit, the relationships found in the data (Hatch, 2002). Hatch (2002) emphasizes that asking these questions and, in particular, searching for counterevidence, is important, as this will help the researcher think deeply about the validity of the evidence. In other words, the findings need to be viable in how they fit with the data. Glaser and Strauss (1967) encourage reaching what they call "saturation," where the researcher cannot find new or additional data from which to glean categories. Hatch (2002) cautions that saturation is something that can rarely be achieved, but a good indicator that findings are viable is that elements of the domain continue to repeat themselves.

For this step, I revisited the domains I considered important to my research question. I then looked at the data again and asked what was going on with the data that potentially did not fit with what I included in the domains. This was important, as it allowed me to confront the data for any contradictions, which helped me make further decisions as to the viability of findings.

Completing domain analysis

There are descriptive qualitative studies that stop at the previous step, at the point of data saturation (Glaser & Strauss, 1967; Hatch, 2002). To move the analysis to deeper, richer levels, I needed to shift my focus on the raw data and to the included terms and the domains themselves. Following Hatch's (2002) steps, I grouped the domains and searched for new ideas and new links that might lead to the discovery of themes that gathered qualities that ran across domains.

I revisited all of the included terms, the semantic relationships, and the cover terms. Looking at the included terms has the possibility of revealing connections among

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included terms within domains, which could mean grouping several included terms under another domain to identify new relationships. In other words, I considered the question: do any of the included terms have a commonality that links them (Hatch, 2002)? To complete this process, I asked myself if I could group included terms differently, thus creating a new domain. This paved the way for the final layer of analysis where I was able to determine the themes emergent from the data.

Searching for themes across domains (followed by a master outline of relationships among domains, including support data)

This requires another step back to look at the domains. There is a focus on the big question: what does it all mean (Hatch, 2002)? It requires another reading of the data, this time considering how all of the pieces relate to the data set. Spradley (1980) recommends going back to look for semantic relationships--this time among the domains. According to Hatch (2002) the first step is to look for commonalities among the domains and determine what is similar about them. Next, he recommends looking for what is different among the domains. Again, this helps the researcher engage the data and pushes the analysis to glean overarching themes (Hatch, 2002). Finally, he recommends constructing a meaningful whole to represent the data analysis.

I followed these steps carefully, making sure to read through the data while exploring similarities and differences in the domains. For the last step, I created what Miles and Huberman (1994) call data displays, which means representing data in some sort of visual format. This proved to be a very useful tool for me. I created a map of both my observations (Table 3.13) and interviews analysis (Table 3.14), which graphically represented the relationships across the different elements of the research. This helped

me reach a better understanding of the relationship between the parts and the whole.

They then served as master outlines from which to write findings (Hatch, 2002).

Table 3-13. Analysis of observations

Themes	Assertions	Domains
1 - Information capture	The ways teachers first introduced and interacted with technology and visuals helped determine their perceived importance and purpose.	1.1 Ways to access information (technology and visuals) 1.2 Visuals are important 1.3 Visuals have to be read
2 - Visual contextualization	Teachers purposefully used visuals for various purposes that helped enhance and enrich the lessons.	2.1 Ways to activate and enrich students' background knowledge 2.2 Ways to enhance comprehension 2.3 Ways to connect with the content
3 - Internalizing information	Teachers emphasized meaningful engagement with content to increase the probability of deep understanding. They encouraged students to use and engage with visuals in various ways to aid this process.	3.1 Visuals as mnemonic devices 3.2 Asking questions to analyze visuals
4 - Externalizing information	Teachers encouraged multimodal construction and reconstruction of content taught through visuals.	4.1 Summarizing content 4.2 Teaching others

Attrition

As data analysis for the first phase neared its end, I began contacting

collaborators to set up times in which we could meet virtually and conduct the interviews

for the last phase of the study. Communication was, for the most part, conducted via e-

mail, as it was the collaborators' preferred method of contact. Of the eight collaborators,

only two provided me with their telephone number, which I used on one occasion to

establish communication for the second phase of data collection.

Table 3-14. Analytical insights from the interviews

Themes	Assertions	Domains
1.Navigating technology	The term "technology-savvy" may mean different things in different contexts. Asking teachers what this meant for them allowed me to think more carefully about their perceived teaching context.	1.1 Technology used for teaching 1.2 Ways to engage with technology 1.3 What to look for when choosing technology for instruction 1.4 Reasons for using technology
2.Visual literacy definitions	From teachers' definitions of visual literacy, I realized how they perceive their relationship to visuals, as well as their beliefs of visuals as easier tools for learning. Teachers reflected on their own practices and how visuals promote visual thinking, learning, and communicating.	2.1 Characteristics of a visually literate teacher 2.2 Visuals are concrete and "easily done" 2.3 Text as a visual 2.4 What to look for when choosing visuals for instruction
3.Visuals as powerful and necessary ways to learn	I noticed teachers contextualized the use of visuals as critical to teaching and learning literacy.	3.1 Visuals are critical to learning 3.2 Students as visual learners 3.3 Teachers as visual learners 3.4 Ways visuals facilitate internalization and externalization processes

Of the original eight collaborators, only six responded and participated in the

video interview. One of the fifth-grade teachers had left to teach in another county and

became unreachable. One of the fourth-grade teachers never replied, despite repeated

attempts via e-mail. I carefully considered how this attrition could impact this study and

if I needed to recruit new collaborators. After much deliberation, I decided to move forward with the second phase of the data with six collaborators.

This decision was based on three reasons. First, per completed IRB, the minimum number of collaborators that would allow me to move forward with this study included six teachers. This meant that I could effectively answer my research question and sub-questions despite attrition. However, I needed to be mindful of how my analysis was impacted by my missing collaborators, as some patterns that may have emerged from the data could impact my ability to ask questions based on specific incidents in specific classrooms. Second, I found most of the patterns gleaned from the data sets were common throughout, as opposed to being found within isolated or a couple of classrooms, which pointed to robustness. Finally, the parameters of the study were sufficiently flexible that if the data collected in the second phase proved too thin, I could extend and revise the IRB to either search for additional collaborators or conduct further interviews with the six that remained.

Limitations

No method is without limitations. Analysis work is never truly complete and there is never a "right" answer in qualitative research (Willis, 2007). In the case of this study, there are several limitations. First, results cannot be generalized beyond the context of this particular research. The study design potentially influenced the collaborators in this study to reflect on their definitions and use of technology and visuals before the research took place. For instance, they knew the study required teachers who self-identified as "tech-savvy", which may have guided their plans for teaching. In terms of context, the geographical location in which the study took place presents elements (e.g., PD experiences, resources available, willingness to use technology and visuals) which

may or may not be present in other locations. It will be up to the reader and other researchers to make connections to their own practice and experiences and to apply the ideas in this study to related data.

Second, there is the limitation of the methods themselves. While the methods presented here proved sufficient to answer the questions for this study, other methods may enrich, challenge, question, and/or affirm the results. It will be up to future research to use other methods to explore the use of visuals and technology in classrooms.

Finally, my background in visual literacy and technology, as well as my relationship with the EETT research team at the University of Florida, also impacted this research. Teachers may have been initially influenced by monetary incentives given to them by the EETT initiative. Perhaps their interest in and use of technology stemmed from the incentive and experiences provided by the state-wide initiative. Future research will help illuminate how teachers with and without PD-related technology integration use and describe their use of visuals for literacy instruction.

Despite limitations, there are various ways in which I accounted for the trustworthiness and validity of this study, which are explained in the next section.

Trustworthiness and Validity

Within the limits of our experiences, analysis, methods, framework, design, and other limitations, a study should provide a certain degree of validity. That is to say, that the findings are sound and justifiable by evidence (Schwandt, 1997). In qualitative studies, validity is seen as a strength that is used to determine the accuracy of findings from the viewpoint of the researcher, participant, or readers (Creswell, 2009). Mishler (1990) asserts that validation is a process of evaluating the trustworthiness of interpretations and observations. However, there are different ways to conceptualize

"validity" in qualitative research and there are many who hold different ideas of what "truth" means and how to find it (Hatch, 2002; Schwandt, 1997). Among radical postmodernists, there is no such thing as validity since there is no such thing as an absolute truth, but only linguistically-mediated social constructions (Schwandt, 1997). My definition of validity includes fallibilistic validity, where a researcher can check for plausibility of the findings within the context and constraints of the research frame (Schwandt, 1997). In other words, it allowed me to explore teachers' enactment and descriptions of different "truths" within their practice. It allowed me to remain as faithful as possible to their situated, constructed realities.

As this is a study that employed domain analysis, in order to increase the credibility and validity of the findings, enough information had to be gathered to reach a certain degree of saturation (Glaser & Strauss, 1967). Social worlds are not monolithic and can produce multiple and conflicting meanings (Clarke, 2005; Fairclough, 2003), so the more the elements in the domains that repeat themselves, the more trustworthy and convincing the analysis (Hatch, 2002). To account for the trustworthiness of the research, several strategies were used, including stating researcher subjectivity (in the subjectivity section), using peer reviewers, triangulating data sources, peer debriefing, member checking, and maintaining an audit trail.

Peer reviewers

To reach agreement, dissertation committee members served as auditors. This was done as a way to obtain other observations, challenges, and interpretations of the information. Auditors provided assessment and ongoing support throughout the research process.

Triangulation

The design of this study was created to facilitate reaching saturation of the data. To accomplish this, several sources of data were collected to help inform an answer to the research question. These include video-taped observations, interviews, and field notes. Gathering different sources of data--data triangulation--can aid in contextualizing, verifying, extending, and clarifying information gleaned from different sources (Lincoln & Guba, 1985; Mason, 2002).

Peer debriefer

A peer debriefer is a person who reads, reviews, questions, and provides feedback on the study (Schwandt, 1997). I recruited the aid of a fellow Ph.D. student specializing in education. The topic of this research was new to her, which ensured a fresh perspective. I shared the study with her at different intervals, including after the first and second phases of data collection and analysis.

We communicated and collaborated via social media and computer-mediated voice and video communication. Her feedback and questions served to improve the robustness of the writing, the depth of data analysis, and encouraged my taking different paths in how I navigated and thought about the data.

Member checking

I solicited collaborators' input on data transcription, findings, and interpretations (Creswell, 2009). As data were gathered, they were transcribed and offered to collaborators. This technique is recognized as "the most crucial technique for establishing credibility" (Lincoln & Guba, 1985). Collaborators can help clarify, expand, or problematize the data, which could result in more in-depth information.

Audit trail

I also maintained an audit trail, meaning I documented all aspects of the research project to establish further trustworthiness (Lincoln & Guba, 1985). This may provide other researchers the opportunity to explore the data, provide other viewpoints, and replicate the study.

Summary

The purpose of this study was to investigate how fourth- and fifth-grade teachers who self-identified as technology-savvy educators described their use of visuals during teacher-directed, technology-enhanced, literacy instruction. To help direct and guide my thinking, I asked two additional questions: what were teachers doing with visuals and technology in the classroom? What were teachers trying to accomplish when they used different strategies, methods, and/or resources? In this chapter I have described the research design and process associated with this study. This chapter situated this study within a constructivist perspective, using domain analysis to analyze the data. Included in this chapter was my subjectivity, research context, sampling procedures and considerations, as well as my data analysis methods. Finally, I discussed issues of limitations, trustworthiness, and validity.

Chapter 4 provides the findings for the study. It describes the technology teachers used for direct instruction. It explores the connection between technology and visuals, describes what visuals teachers used for literacy instruction, and how they used these visuals. It also describes how visuals were described by teachers in this study. Finally, Chapter 5 presents the conclusion of this study.

CHAPTER 4
FINDINGS

Overview

The purpose of this study was to examine how fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced literacy instruction. To better understand teachers' responses, I also examined what teachers are doing with visuals and technology in the classroom. In addition, what are teachers trying to accomplish when they use different strategies, methods, and/or resources? Chapter 3 described the analyses performed on the datasets in order to address the purpose of this study.

This chapter provides the findings from the domain analysis in relation to the research questions. The themes gleaned from the analysis provided the structure for this chapter (Table 4.1 and 4.2). To present the findings, I first share and explain the insights gained from the context within which the observations took place. Then I share and explain the analytical insights from the interviews.

Summary of findings: The Visual Spiral Framework

Looking at the use of both technology and visuals helped provide a sense of the context within which observations took place, as well as an understanding of what teachers perceived as a technology-enhanced classroom. The most prominent finding was that teachers used four processes when including visuals in their instruction. These processes were not linear, but cyclical in nature, akin to a spiral where previous processes are tapped to further expand learning. Teachers constantly came back to one or the other (or more) of the processes as they guided students through a lesson. In addition, these processes--while technology-enhanced in this study--are not dependent

on technology, but are certainly facilitated by technology. I have assigned a particular order to the processes, drawn from the themes gleaned from the data, which I refer to as the Visual Spiral Framework (VSF), to facilitate explanation and discussion. It is not intended that this order be construed as a hierarchy or that each process happens independently from the others. In the following paragraphs I discuss the connections between the themes and this framework.

Table 4-1. Analysis of observations

Themes	Assertions	Domains
1.Information capture	The ways teachers first introduced and interacted with technology and visuals helped determine their perceived importance and purpose.	1.1 Ways to access information (technology and visuals) 1.2 Visuals are important 1.3 Visuals have to be read
2.Visual contextualization	Teachers purposefully used visuals for various purposes that helped enhance and enrich the lessons.	2.1 Ways to activate and enrich students' background knowledge 2.2 Ways to enhance comprehension 2.3 Ways to connect with the content
3.Internalizing information	Teachers emphasized meaningful engagement with content to increase the probability of deep understanding. They encouraged students to use and engage with visuals in various ways to aid this process.	3.1 Visuals as mnemonic devices 3.2 Asking questions to analyze visuals
4.Externalizing information	Teachers encouraged multimodal construction and reconstruction of content taught through visuals.	4.1 Summarizing content 4.2 Teaching others

Table 4-2. Analytical insights from the interviews

Themes	Assertions	Domains
1.Navigating technology	The term "technology-savvy" may mean different things in different contexts. Asking teachers what this meant for them allowed me to think more carefully about their perceived teaching context.	1.1 Technology used for teaching 1.2 Ways to engage with technology 1.3 What to look for when choosing technology for instruction 1.4 Reasons for using technology
2.Visual literacy definitions	From teachers' definitions of visual literacy, I realized how they perceive their relationship to visuals, as well as their beliefs of visuals as easier tools for learning. Teachers reflected on their own practices and how visuals promote visual thinking, learning, and communicating.	2.1 Characteristics of a visually literate teacher 2.2 Visuals are concrete and "easily done" 2.3 Text as a visual 2.4 What to look for when choosing visuals for instruction
3.Visuals as powerful and necessary ways to learn	I noticed teachers contextualized the use of visuals as critical to teaching and learning literacy.	3.1 Visuals are critical to learning 3.2 Students as visual learners 3.3 Teachers as visual learners 3.4 Ways visuals facilitate internalization and externalization processes

First, teachers encouraged quick information capture, where they had the material available in different modes for students to see and engage with (such as pictures or manipulatives) and reflect on. During the introduction of these materials they emphasized the importance of visuals and demonstrated how to "read" them. Second, teachers provided students with visual contextualization, where they included a series of visual cues and verbal explanation of the visual, inviting students to make several kinds of connections to the information presented. In some cases, the cue itself demanded

connections with culturally-specific meanings (e.g., how the picture of a white dress may be associated with marriage in some cultures, but not in others). Visuals were used as ways to activate and enrich students' background knowledge, as a way to enhance comprehension, and as a way to connect with the content. Third, teachers encouraged the internalizing of information, which demanded closer engagement with the content, where they asked students to identify, copy, analyze, or repeat different aspects of information within the visuals employed. Finally, teachers encouraged the externalization of the information presented. Students were expected to use the information gleaned from the visuals to construct and reconstruct knowledge, create new material, and/or present material learned by using visuals and other modes (Figure 4.3). Students, for example, were encouraged to summarize content or practice what they learned by teaching peers. Each process is further explained in the next sections.

Teachers used visuals as a tool, an important mediator in the process of guiding students' meaning-making. Visuals were used to help mark learning beginnings, to encourage students to think consciously about concepts, and to concretize abstract information. Visuals were used as an activating and sticking mechanism that created bridges to understanding and fostered internalization of information. In addition, findings suggest that:

- technology was primarily used by teachers as a teaching strategy to facilitate students' access to content.

- teachers prominently relied on self-created visuals and basic visual elements to help students make connections with content.

- students were encouraged to be receptors of visual information and to reconstruct visuals discussed in class.

In the next sections, I map out the context of this study by discussing the themes
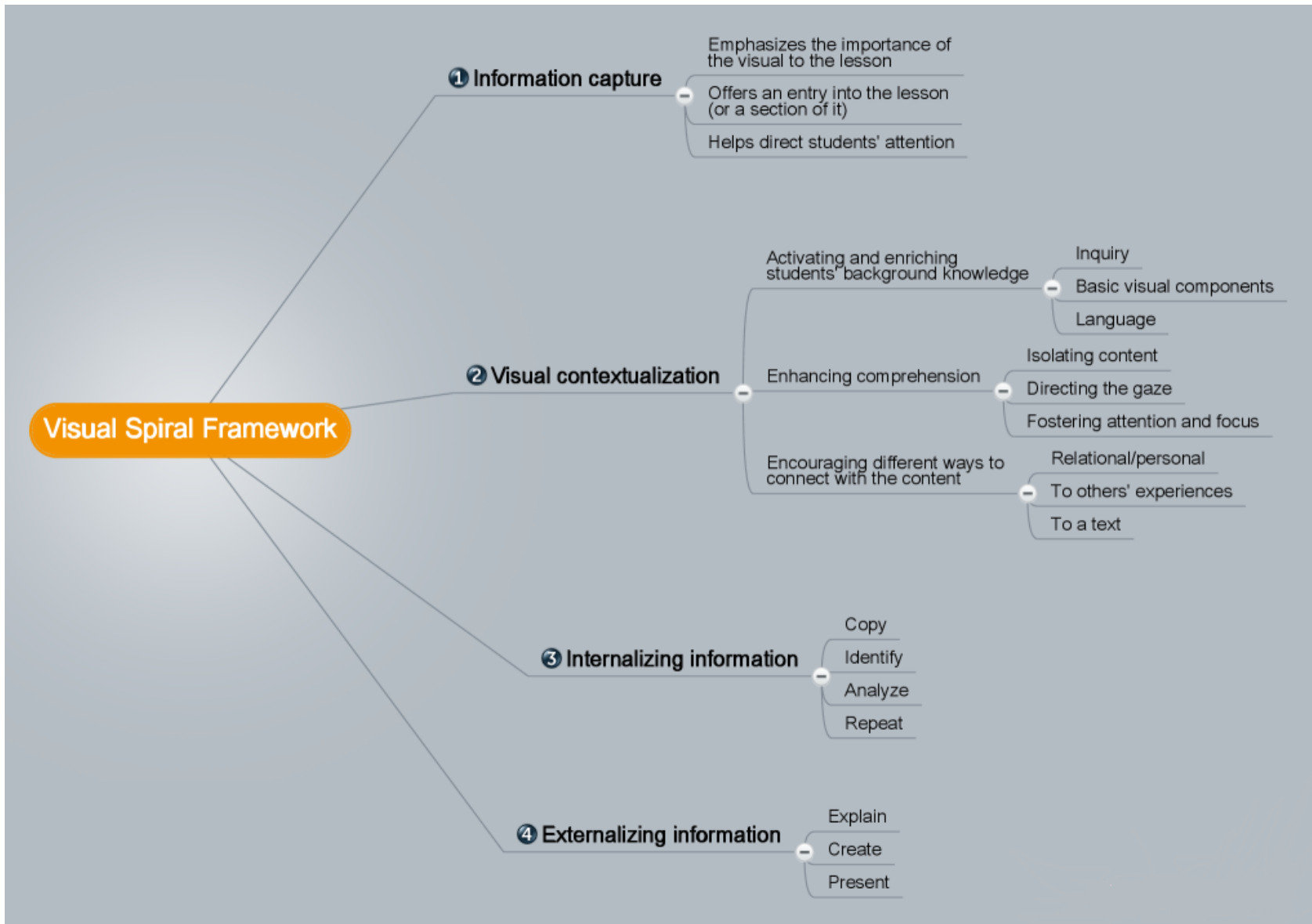
Figure 4-3. The Visual Spiral Framework

gleaned from the analysis, thus sharing the processes teachers used to provide students with the opportunity to engage with technology and visuals as part of their learning. I then share the analytical insights from the interviews, which helped further explore, question, and challenge the analysis gleaned from the observation data.

Theme 1: Information capture

Simply put, information capture is seeing a visual that is being presented. "Seeing" here implies a cursory inspection of the material. While immediate connections might be made (i.e., I see a picture of a bride and groom and they look happy), comprehension or a deeper understanding is not fully expected (i.e., Who are the two in the picture? Why is this picture important? What can we learn from this image? How is this relevant to the lesson?). In this part of their instruction, teachers included different ways to help students access visual information, assigned importance to visuals, and emphasized ways visuals can be read.

1.1 Ways to access information

Teachers in this study had access to various technology (Table 4.3) and other multimodal resources (Table 4.4). This included projectors and document cameras to show presentations via PowerPoint®, web-pages, worksheets, newspapers, books, and others. There were also iPads®, iPods®, and Promethean® boards (SMART Boards®). However, some of these were rarely used, possibly because some of them, such as the iPads®, were shared among teachers. The iPads® were used by only one teacher in the time I conducted the observations.

Employing technology in the classroom helped enhance the lessons in several ways. It helped facilitate students' access to information, provided diverse ways for students to engage content, increased the synchronicity between teachers and

students, and facilitated making connections among self, text, visuals, and content. In

the following paragraphs I discuss in detail the technology that was used, including how

their use helped enrich the lesson in the ways mentioned above.

Table 4-3. Technology used by teachers

Hardware	Teachers using the hardware by class	Software/ other	Teachers using the software by class	Multimodal elements present
Computers Overhead	Classes 1-8	PowerPoint®	Classes 1, 3, 7, and 8	Images Text
projector	Classes 1-8	Edline.net©	Class 1	Interactive
Document reader	Classes 1-8	Wikipedia®	Classes 1, 2, and 7	elements
iPad®	Class 7			
iPod®	Class 2	Google Search™	Classes 1, 2 and 7	Special effects
Microphone	Classes 1 and 2			
SMART Board®	Class 1	Video	Classes 1 and 7	
Cell phone	Class 2			Video Audio

Table 4-4. Visuals and other resources used for literacy instruction

Print resources	Worksheets
	Book
Manipulatives	Fake money
	3-D model
	Tiara
	Reindeer antlers
	Computer cable
	Planet cards
	Classroom door
	World globe
	Crayons
	Marker
	Plastic pan and soil
	Graduated cylinder
	Sculpting putty
Life-forms	Baby rat snake
	Map of the world
2-D representations	Posters
	Newspapers (including shoppers)
	Graphic novel
	Picture books

Despite the different technology available, teachers most often used a combination of computer, document reader, and overhead projector to facilitate students' access to information. They showed documents, websites, videos, worksheets, newspapers, the day's agenda, and other reading material. For example, Ms. Poppy, class 4, used the combination of computer and projector to project standardized test-like short narratives with multiple choice questions. These short texts usually included no more than two text-related illustrations. Mr. Rudy, class 7, used the same technology on many occasions for various purposes. Daily, he would begin by projecting the day's agenda using a presentation slide, followed by slides of content with one to several images on each slide. George, class 6, used the projector to share and work through standardized math test problems. The worksheets included number calculation problems and word problems. On occasion, one or two of the word problems included diagrams, illustrations, charts, or graphs.

The other teachers used the technology to provide access to information in similar ways. For example, Ms. Maria, class 1, showed slides with regional maps and tables of information to discuss changes in the weather by region. Ms. Ladasha, class 2 projected newspaper ads to guide students in an exploration of advertising strategies, as well as figure out real world mathematics problems when purchasing goods. Mr. Jesse, class 5 used the document camera to show how to solve mathematics problems. Finally, Ms. Lana, class 8, created exercises and games using the document camera, where students could come up to the board to complete tasks by filling in the blank, for example.

While teachers many times used technology to facilitate access to print-centric resources, they also took the opportunity to integrate multimodal resources to address their students' different ways of learning. I noted the presence of multimodal elements during instruction, including images, interactive elements, objects, special effects, video, and audio. Teachers also used other multimodal resources, such as manipulatives and graphic novels, sometimes on their own and sometimes in tandem with technology.

Modes that were most frequently used included a combination of images and text that were directly related with the content presented. Ms. Penelope, for instance, used PowerPoint® slides for her vocabulary lessons. Each slide included one image (clipart, or an image taken from an Internet search) that was relevant to, or provided, clues as to the meaning of the vocabulary word that was typed next to the image. The definition of each word was also included in the slide. On one occasion, she presented the word "genial" along with an image of two men shaking hands. Mr. Jesse also had students engage with images from a textbook and created his own visuals.

Another mode commonly employed included manipulatives. Ms. Maria combined manipulatives and images in some of her lessons. In one lesson, she showed students a two-dimensional image of the globe, followed by showing and spinning a globe of the world, encouraging student comparison. In addition, she showed tables which contained organized information of what the students would be learning about different aspects of the world.

With a computer, document reader, projector, multimodal resources, image-centric resources, and manipulatives, access to content was facilitated in ways not possible with a black or white board. For example, a child who has lost their place in the

reading can simply look up to a projected image of a document and continue to follow along or quickly capture the teacher's attention. Projecting information on a wall or screen also caters to those students who may need to shift their focus. They have the opportunity to look at their paper and switch from that view to looking up at the screen or wall, which allows them to remain connected to the content. Including images and other modes during instruction potentially increases diverse opportunities in which a learner approaches a subject.

In addition, this use of technology possibly helps increase the synchronicity between teacher and students. In other words, a teacher could fill in a blank or underline information for emphasis while still facing the students, thus maintaining the connection established by direct interaction with the class. Any conversation or discussion taking place would not be interrupted by the teacher pausing, turning her back to write, and then trying to re-engage students with the information. In this way, the use of technology facilitated directing and continuously engaging students' attention by placing information for everyone to see and maintaining open lines of communication.

Finally, this technology facilitated the understanding of the process of modeling tracking the reading and making connections with the images and content. When Ms. Poppy tracked her reading with a pencil and underlined or circled, for example, students were able to clearly see and mimic the process. An illustration became a very important aspect of the text, as the teacher modeled how to glean information from the image. This kind of practice could help students learn to identify and discriminate important chunks of information that might be needed in the future. In short, the processes of simultaneously tracking the reading, maintaining increased synchronicity, highlighting

important information, visually checking for understanding, and directing attention were facilitated by the teacher's use of that particular technology.

For the most part, teachers were the sole users of this technology. Few of them (Ms. Ladasha and Ms. Lana) used the technology in ways that diverged from "show and tell." Their use and preference for this kind of "show and tell" use of technology may arise from several possibilities, including experience (or inexperience) with technology, technology preference, preferred teaching method, and preferred strategies used to achieve objectives. First, the technology initiative in which these teachers participated may have influenced the type of technology they integrated in the classroom. Perhaps their training favored the use of document readers, projectors, and computers.

Second, customary use of print for instruction easily transfers to the use of the computer, projector, and document reader to facilitate access to the information. For example, traditionally, teachers have had to write on the board and have students take notes, photocopy information, or rely on verbal dissemination. Similarly, a document camera can be used for project writing, which may provide a safe and comforting way for teachers to experiment with and integrate technology. In addition, the observations that took place represent just part of the school year, which may not accurately reflect the spectrum of technology that may have been used throughout the year.

1.2 Visuals are important

When teachers included visuals in their lesson, they emphasized their importance. Visuals helped provide an entry into a lesson (or section of a lesson) and direct students' attention. Teachers emphasized the importance of visuals in several ways: providing time for quick reflection, directly calling attention to visuals, and asking questions about the visuals.

Each time teachers showed a visual, they allowed time for the students to see the image or images shown. Ms. Penelope, for example, had a silent wait, watch, and continue approach. Most of the time, Ms. Penelope would step up next to the projected visual, look at the students with slightly raised eyebrows, and wait for a few moments. Ms. Maria, Ms. Poppy, and Mr. George, like Ms. Penelope, would similarly allow a few seconds of silence and reflection when a new visual was introduced before verbally directing attention to it. Mr. Rudy, Ms. Lana, Mr. Jesse, and Ms. Ladasha would ask a question (e.g., "What do you see here"?) to immediately and explicitly call attention to the visual in question before waiting quietly a for few moments as the students examined the visual.

During one lesson, students in Ms. Penelope's class had a brief moment to look at the vocabulary word "genial" and see the image of two smiling men shaking hands. A quick first look could emphasize the positive nature of the word genial, as it points to people being friendly. In addition, quickly reading the provided definition could help students to reach a general understanding of the word, which was an objective of the day. After the initial pause to look at the image, teachers encouraged a more focused exploration and reflection of the visuals presented.

For example, during one of the science lessons, Mr. Rudy brought in a snake he caught in his backyard. He told the students they would try to figure out what kind of snake it was. With the snake in hand, he walked around the classroom. When students asked what kind of snake it was, he repeated that they needed to look carefully at the live snake, as it would be their job to do an Internet image search to find out. By doing this, he emphasized the importance of obtaining quick first impressions of the snake,

which in turn would help students conduct a more precise search. In addition, he emphasized the students' responsibility in their own learning. The snake served as an important visual, an entry point into the lesson, piquing students' interest and motivation to further explore what they were seeing.

Calling attention to visuals and providing a few moments for students to see them helped indicate and emphasize their importance to the lesson. By doing this, teachers invited student-driven exploration of the visuals, allowing them to begin to make assumptions as to the information about to be explored and its relevance to the lesson. Visuals provided an additional entry point to the lesson, calling for students to delve into their background knowledge the further teachers encouraged that initial image capture that would eventually lead to a deeper exploration of content and context.

1.3 Visuals have to be read

Through inquiry, teachers encouraged their students to look at a visual as a whole and to isolate different elements to glean more meaning. Much like what readers do, they asked their students to chunk bits of information to better understand the visuals they were "reading". Their emphasis on the process suggested that visuals are not so simple that a cursory glance will do. Instead, teachers encouraged students to read visuals by helping them isolate content and directing students' gaze. This suggests that visuals have, in a sense, elements of text that need to be read, such as structure, subject, and plot, which students can use to extract meaning, infer, and draw conclusions.

The teachers explored the subject of the visuals, the meaning beyond a simple first glance, and especially the connections to the content or text of the lesson. For

example, Ms. Maria used a two-dimensional map charting weather patterns that was

color coded depending on the climate of each area.

Ms. Maria: So when you look at these temperatures during the same time–*She runs her finger along the coast of California*--of the year look at the temperatures here--*she points*--on the coast. Look at the temperatures inside the valley--*she slides her fingers along the valley temperatures on the illustration on the right.*

Field notes: When the teacher slides her finger over the information, she stops to look at the class, eyebrows slightly raised. She points and pauses, waiting expectantly.

After giving students a few moments to look at the information, she isolated parts

of the visual by asking questions such as: "What do we see? Red represents what?"

Ms. Maria encouraged students to think about the visual representation of temperatures

in the valley and the numbers provided in the table. She emphasized the importance of

all of the elements in the table, including color, from which to gain information. By doing

this, she encouraged students to think of visual elements as text features (i.e., visuals

can be read). In addition, she used the words "look at", as well as pointing, as an

orienting strategy, ascribing importance to particular parts of the data. She asked

students to think about the content, the context, and what they already know in order to

read into the visual. Similarly, Ms. Penelope used language to isolate information in a

visual.

Ms. Penelope: What does this guy look like in this picture?–*She keeps a finger pointed on the image of the man on the right.* –Now what does his face–*she slides her hand over the angry man's face*–say?

She emphasized that the image is trying to "say" something to the viewer. She

suggests that images are structured intentionally (there is a message in the cartoon

man's face), that there is visual grammar to engage with when looking at images (the

face is arranged in such a way as to communicate information), and that the visual text

might be similar to the viewer's previous experiences (Ms. Penelope asks what the man looks like, implying this is something the students have seen or experienced before.) By doing this, she asks students to carefully engage with visuals and look beyond a simple first glance. This suggests that visuals are one way to glean information. She wants them to form relational connections by looking beyond the simple first glance. It may encourage reflection questions such as: have I seen this before? Have I looked like that or felt like that before? Have I seen anyone look and feel that way and why? Ms. Maria, Ms. Penelope, and the other teachers helped structure the process of reading visuals, emphasized the skills needed to read different types of visuals, and emphasized that taking time to read visuals is a necessary aspect of better understanding them.

Theme 2: Visual contextualization

Where information capture meant seeing a visual, visual contextualization might be thought of as looking, where more meaning and deeper connections are established with what is seen. Specifically, I use the term visual contextualization to refer to the use of multimodal strategies to aid in activating and enriching students' background knowledge, enhancing comprehension, and encouraging different ways to connect with the content. To do this, teachers used visual, verbal, and non-verbal cues to model ways to discriminate key information from the visuals they employed. For example, they used basic visual elements such as lines and color to isolate information, used particular vocabulary to direct attention, and used their bodies to provide other visual cues, such as placing hands to their temple to indicate a headache.

2.1 Ways to activate and enrich students' background knowledge

When attempting to activate students' prior knowledge during a vocabulary lesson, teachers asked three kinds of questions: questions about the content (What

information is here?), inference questions (What do you think will happen?), and reflection questions (Is this what I expected? How does this relate to my experiences?). Through inquiry, students were tasked with investigating the visuals they were shown and then sharing their findings with words. Simply put, they began to construct meaning from the visuals as they answered questions that guided them along several thinking paths. By encouraging the externalization of students' initial understandings of the visuals presented, teachers could make adjustments to, or ask, new questions, or help fill in any necessary information in students' background knowledge. In turn, an initial line of inquiry of visuals presented the potential for higher-level questioning.

During one lesson, Ms. Penelope showed a slide featuring the word "feverishly," including the definition underneath the word. To the right of the text was an image of a blond woman dressed in red clothes standing behind a table with presents in several stages of gift-wrapping who seems to be rushing.

Ms. Penelope: What is this cartoon that looks like Ms. Penelope? What is she doing?
Raise your hand.–*Students respond and then Ms. Penelope points to the next student and listens to the response.*
What day do you think this is?
She places her hand over the center of the image and listens to the students' response.
Christmas Eve. Ok

Once she allowed a few moments for the students to look at the image and make initial connections, Ms. Penelope began her line of inquiry with a "what" question. She invited students to verbalize what they saw, encouraging them to voice their observations and initial assumptions. What are they seeing? What is happening in the picture? In the process of activating prior knowledge, she also aided students in creating meaning from the image by asking them to find commonalities between the image and their teacher. The woman in the picture looks like Ms. Penelope. What is Ms.

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Penelope doing? By making the image more relevant, she is perhaps fostering more relational connections. For example, instead of wondering what that woman is doing, students could begin to wonder why Ms. Penelope relates herself with the woman in the picture. What is it that these women have in common?

Through inquiry, students are encouraged to think of what Ms. Penelope is doing wrapping presents in the image and why she is rushing. Initial, factual lines of inquiry help establish connections to the visual, while visual cues, such as the teacher running her hand over the center of the image where the presents and the woman's frantic working hands are located, also push the students to reach for answers from their own experiences. The teacher further pushes students' thinking by asking them to take all of the information they gleaned to figure out something that is not explicitly stated in the slide: *"What day do you think it is?"* With this question, students are tasked with gathering all of the information they gleaned from the visual to make an educated guess based on what they know (background knowledge), what they know about Ms. Penelope and the information she has given (relational), and what is present in the visual itself (content). Once that initial line of inquiry was exhausted, Ms. Penelope provided an explanation of the vocabulary word and moved on to asking questions that encouraged students to reflect on the knowledge they acquired by using it to think about themselves.

Ms. Penelope: I am quickly doing it because Christmas is in just a few hours and I am excitedly doing it because I love Christmas and I love to give gifts to people, ok? Use that word "feverishly" in a sentence for me. What would you do feverishly? Raise your hand and tell me.

By asking the question "What would you do feverishly?" Ms. Penelope asked students to consolidate and apply what they discussed and begin internalizing that

information by creating new connections to the content. Visuals in this part of the

process of visual contextualization served as an activating mechanism and entry-point

into the concept being taught in order to enhance comprehension. In similar ways, all

teachers followed this line of inquiry that lead to using different strategies to enhance

comprehension beyond the initial activation of background knowledge (Table 4.5).

Table 4-5. Questions asked to activate students' background knowledge

Content questions	Inference questions	Reflection questions
Ms. Maria: Are we seeing some extremes in the temperatures?	Why is there such a big difference?	Is that right?
Mr. Rudy: What does the large intestine do?	What do you think is different?	Do we agree with that?
Ms. Ladasha: How many pages shorter is this book?	How would I find that out?	How do we know it's 52?
Ms. Lana: What is a level?	If this is level what will my pen do?	Okay is it level? How do you know?

2.2 Ways to enhance comprehension

To enhance comprehension of content, teachers used basic visual components

(e.g., color, lines, and shapes) to isolate content, direct students' gaze (by demanding

their attention), and encourage a deeper exploration of the ideas behind the visuals

used. By first isolating content, teachers suggest that using basic visual components to

identify key information is one way to facilitate learning. In addition, in directing students'

gaze to parts of the information, teachers foster deductive reasoning, which in this case

involves gleaning a general idea of the visual before exploring its parts. Such

exploration can lead to deeper analysis of visual data than with simple information

capture.

For example, teachers used colors to emphasize particular pieces of information. During a math class, Mr. George kept switching between green and black when working out the problems. In addition, he was explicit when using the colors and he made sure that students noticed a color difference.

Mr. George: So I'm going to work backwards with these words. I have all the factors. Now I want the common factors–

Field notes: *He points to the words on the board.* –The problems are in green and his process is in black.

It is interesting to note that while Mr. George wrote the problem in green and the process in black, he did not explain why this was important to consider. During the interview with Mr. George, when asked about his use of color, his expectation of the students was to have them differentiate ideas and chunk the information using color.

Mr. George: I think I was changing colors to differentiate ideas. Like, I was talking about chunking before, or maybe different ideas are different steps to how to solve a math problem--that's probably why I do it.

While the expectation here is for students to discriminate both pieces of information, students have not previously been explicitly taught how to use color for their learning. Mr. George, then, is using color to implicitly encourage students to separate these ideas in their minds (internally), by associating problems with the color green and the process with black. It is an invitation to construct meaning using color and his explanation.

Ms. Penelope used color in a similar way when teaching her students about prefixes. During one class, she identified prefixes by separating them from the base word and assigning the prefix a color (orange). She then wrote down the meaning of the prefix in another color (pink). When asked about her reasons for using color in her lessons, she emphasized the need to gain and maintain her students' attention.

Ms. Penelope: I try to get them the funniest or the most entertaining picture--a colorful picture. I did not want to stick with the black and white. I always look for the cutest or the coolest looking, something that was appealing to their eyes that they wanted to look at, did not mind looking at.

Ms. Poppy also emphasized the use of colors to isolate and/or highlight specific information. In this case, Ms. Poppy was teaching a lesson on how to write an expository essay. She placed two cardboard signs with information on how to write an expository essay on the whiteboard. The process had been sectioned off by the colors red, blue, and green, respectively. Ms. Poppy also included explanations on how students could present their ideas by using dialogue and similes. These were color coded in purple and orange, implying they are also of importance, but not necessarily primary importance. When asked about why she uses color for teaching writing, like the others, she emphasized difference. She mentions that by using various colors, students will implicitly be focused on the difference between different aspects of writing, such as a main idea vs. details.

Ms. Poppy: They don't have much writing background and to help them to distinguish, like, if I wrote an introduction in green and then I went to the main idea paragraph in purple, it helps them understand that these are two different paragraphs. The introduction has its own purpose and then the main idea has its own purpose. Then the rest of the paragraph in black and then I underline the details that support the main idea, and it just helps them distinguish and understand that those paragraphs are different. They all were related but they had different purposes.

2.3 Ways to connect with the content

In another aspect of providing visual contextualization, teachers constantly encouraged students to connect with the visuals and content they provided in different ways. They fostered three kinds of connections: text to self, text to others, and text to text (including visuals). Drawing from a previous example, Ms. Penelope used language

to make connections of her own to a visual she presented during a vocabulary lesson for the word "feverishly".

Ms. Penelope: I am quickly doing it because Christmas is in just a few hours, and I am excitedly doing it because I love Christmas and I love to give gifts to people, ok? Use that word feverishly in a sentence for me. What would you do feverishly? Raise your hand and tell me.

Ms. Penelope used language to provide a possible interpretation as to why the woman in the picture feverishly (i.e., quickly and excitedly) wraps presents. She made a connection to the image, stating that she looked like the blond woman in the picture. She completely assumed the role and used the word and its definition in her explanation. She used language to reconstruct the meaning of the visual, thus inviting students to do the same. She invited them to establish a personal connection to the concepts discussed and provide alternate interpretations of the image, as well as take ownership of the word and use it in various contexts. Some teachers directly asked their students to make these kinds of connections and explained how doing so can be useful. For example, Ms. Lana talked about symbols that can help remind us of people:

Ms. Lana: Do we have other symbols to remind us of people? Do we use other symbols to remind us of people? Maybe pictures can help remind us of people.

Ms. Lana emphasized how pictures and symbols can help trigger internal responses and internalization of information. She encouraged students to make a personal connection, and to perhaps think of pictures they have in their homes and how that helps them remember people or experiences. By relating in this way to the visuals presented, students are impressed with the importance of tapping into their background knowledge combined with the visuals they may have available. Relational connections with visuals are made important and are one way to explore content.

Teachers also encouraged students to connect to others' experiences and to think about those experiences vicariously. For example, during a discussion of suffixes, Ms. Lana asked students to recall a previous lesson and a news article relating to one of the words they had discussed.

Ms. Lana: Some of you laughed when we came up with that word a couple of days ago and I was thinking about it. Did you--did any of you all see on the news where a woman had been attacked by a chimpanzee? He literally had pulled her face off and she was basically "faceless". And then these surgeons had rebuilt--*she spread her hands in front of her face, putting on a pained look*--put a partial face back on her but she was actually faceless for a while. What is it, student?
Student response.
Yes it was horrible. But yes some of you all were like, I've never heard of faceless--*she matches her expression and voice, mimicking how the students had reacted*--and I said but what if they had? And I was thinking about that story.

Ms. Lana tasked students with several actions. First, she asked them to recall a previous lesson and their reaction to the word "faceless". She then contextualized the word in a scenario some of them had recently seen on the news, thus attaching a different set of thoughts and emotions behind the word. Ms. Lana then put on an exaggerated, pained expression to explain how the woman was "faceless" after the attack, emphasizing the severity of the word. The students were encouraged to imagine and sympathize with the faceless woman's plight, thus establishing a connection with that woman's experience and the word. With the new parameters provided for the word, students were coaxed to imagine how "horrible" (as one student put it) it would be to be faceless.

Finally, teachers asked students to make connections to various texts. In the following example, Ms. Ladasha was in the middle of a science lesson where the students were reading about and discussing rocks. After they looked at, read, and

talked about the properties of a rock, she asked about their importance. Her question

was met with silence, interrupted by the occasional whisper and turning of pages in a

textbook. She tried again:

Ms. Ladasha: *She puts on a confused facial expression and a finger against her temple. As she talks she shakes her head as if she has forgotten something important.* –Why are rocks important? Why do we care about rocks?

The teacher is asking students to synthesize and make connections between the

question and the information they have just finished discussing from the text. The

expression could encourage students to draw from the text, the class discussion, and

their opinions in order to answer the question. The question "why" asks for more than

details that can be found in a book; it asks for students to provide a rationale for their

answer. The question "Why do we care?" establishes the need to connect with the

information.

Theme 3: Internalizing information

Internalization of information is an intricate process that is not separate from any

process in teaching and learning. By internalization, I am referring to a construction of

meaning that occurs in the mind of an individual via an organization of information that

can encourage understanding. As Vygotsky mentions, it is the "internal reconstruction of

an external operation" (1978, p. 56). This is not something that can be seen, but it is

something that is encouraged through external processes to aid meaningful

engagement with content, which increases the probability of deep understanding.

Encouraging internalization can happen at any and every point in the teaching and

learning process. I have separated the concept here to emphasize teachers' attempts at

encouraging this process through the use of visuals. In multiple attempts to encourage

internal reconstruction of external processes, teachers asked students to copy, identify, analyze, or repeat the information from the visuals presented.

3.1 Visuals as mnemonic devices

Teachers used a lot of visuals they created themselves, using components such as lines, color, and shape, all of which are basic elements of visual learning. They used these visuals as mnemonic devices. A mnemonic device serves as a memory aide. For example, pairing a person's name with a descriptive adjective can serve to help the person remember a name (e.g., Sad Brad). Likewise, teachers used many visuals to encourage students to remember concepts. The most frequent visuals included colors, lines, and circles, wrapped concepts in animal and other figures, and the use of students' bodies to create mnemonic devices.

For example, in one of her language arts classes, Ms. Penelope encouraged her students to create mnemonic devices for new vocabulary using body movements. For "submarine" she would pinch her nose and pretend to dive under water. She encouraged students to come up with their own movements, but would supply them if needed and she would encourage them to copy the movements. When some of the students seemed distracted while discussing the meaning of the word "gigantic", she emphasized the importance of the movements to help trigger recall by opening her arms wide:

Ms. Penelope: I need to see everybody doing this to help you remember–*she models opening her arms again.*

Visuals, then, help learners internalize information by helping to scaffold processes through visual stimulus and recall. Other mnemonic devices were created using basic visual elements (e.g., line and color). In math class, for example, Mr. Jesse

encouraged students to copy his strategy of wrapping concepts in animal and other figures, the most prominent being a turtle head. He used different color markers, such as red and green, to draw an outline of a turtle around numbers in a numerical equation to help students complete the multiplication process with two numbers. The turtle head served to help students recall the order of the process needed in order to effectively solve the equation.

In another math class, Mr. George used a rainbow to aid students in organizing numbers to factor. The rainbow blocked in the numbers students were working with, limiting the range of numbers they used to solve the factoring problem. The basic shapes used by these teachers provided structure and repetition, which served as mnemonic devices to help in students' recall of the material.

3.2 Asking questions to analyze visuals

In previous sections I have emphasized how teachers asked different kinds of questions throughout their lessons. I emphasize inquiry within the internalization process to highlight how teachers encouraged students to ask questions that fostered analysis of visuals and the content. Analysis aids in the internalization process, as it represents an external operation that draws on the knowledge and sheds some light on the thinking of the learner. Teachers used inquiry to continuously draw out more information from the students.

In a science lesson, Mr. Rudy provided students with planet cards. Each contained a picture of a planet and text. Through inquiry, Mr. Rudy asked the students to identify what they saw on their cards and began a brief analysis to help them determine how they would group the cards together. He limited the possible ways students could group the cards, encouraging thinking beyond basic information (such as

grouping them by size alone). Once students had completed their groupings, he then

again tasked students with analyzing their groupings.

Mr. Rudy: This is the correct order--*he glides his hand along the line of planets*--laid out
by distance from the sun. The distances are not real accurate but the
order is correct. *–He pauses to correct behavior–*Based on your
groupings, do you notice anything in particular about the planets? What
did you notice, student?
Student response.
What did you notice? Did you see any comparisons that related to each
other?
Student response.
For example, how many of you looked at the number of moons and the
distance? Did the number of moons have anything to do with the
distance?
Student response.
Well look at this. *–He points to parts of the image–*How many moons does
Mercury have?
Student response.
None. How about Venus?
Student response.
Earth?
Student response.

Mr. Rudy: So--*He glides his hand along the planets–*in these first four planets the farther
away they get, they get more moons, right? Did you notice anything from
Jupiter to Neptune? How many moons does Jupiter have?
Student response.

Field notes: *He continues to point to each planet as students respond.*

Mr. Rudy: So--*He points to a section of the image–*from here to here they get bigger.
From here to here they get smaller. That is a pattern isn't it?
Student response.
Did you know that our solar system has what is called an inner set of
planets and an outer set of planets? Based on the moons, could you
decide which are the inner and which are the outer?

Through several interactions with the visuals, the students were asked to use the

cards to construct meaning based on their previous discussions of the material and

what they knew of the planets. They were asked to identify different components,

question their groupings, and to look closely at details in each card, emphasizing the

information to be gathered from a closer inspection. For instance, Mr. Rudy asked them what they noticed about the planets as they were grouping their cards. Had they noticed anything in particular? Asking this question facilitated an understanding of students' thinking processes and helped Mr. Rudy determine how to structure the questioning from there, to fill in any information the students may have missed.

The teacher was constantly going back and forth with the information, each time helping students uncover more information from an analysis of the visuals. After asking what they noticed, Mr. Rudy chose a more specific line of questioning to guide students' thinking, which involved the identification of information and repeated analysis:

Mr. Rudy: Did you see any comparisons that related to each other? For example, how many of you looked at the number of moons and the distance? Did the number of moons have anything to do with the distance? How many moons does Mercury have?

Through this inquiry, Mr. Rudy tasked students with several challenges. First, to access what they know about making comparisons. Second, to think about how making comparisons can help them make inferences and reach conclusions using the data they have. Third, they needed to look at their groupings again and make comparisons to satisfy the earlier question of "What did you notice"? By asking different questions about the material students had already engaged with, the teacher guided students to process the information several times in order to pick up on details and nuances that are usually grasped after repeated interaction with the visuals.

Theme 4: Externalizing information

Like internalization, externalizing information can be encouraged at any and every point in the teaching process. Externalization in this context refers to using information gleaned from visuals in a social setting to construct or reconstruct

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knowledge using learned/internalized information by creating new material and presenting the material learned by using visuals and other modes. In other words, it is showing external applications of internal processes. Visual learning and communicating suggests a constant process of external (social) and internal (in the head) negotiation (Genishi & Dyson, 2009). While these processes of internalization and externalization may happen constantly and simultaneously, I have separated them to facilitate discussion of the findings. In multiple attempts to encourage students to demonstrate their grasp of concepts taught through visuals, teachers asked students to explain, create visuals, and present information using multiple modes.

4.1 Summarizing content

Teachers constantly encouraged a construction and reconstruction of content. In some cases, teachers asked students to summarize their learning using manipulatives, text, and/or images. By having students summarize what they know, teachers were able to tell if students could discriminate key ideas as opposed to focusing overmuch on details. In other words, teachers asked students to use various visuals to help them glean student understanding by observing external applications of expected internal processes.

Nearing the end of a unit, for example, Mr. Rudy asked students to summarize their learning of how solar systems form through text and pictures.

Mr. Rudy: Your assignment today is to draw a series of pictures showing how solar systems form. I want to see in your labels the words supernova, nebula, planetesimals, star, and planet. I want to see those words, okay. Write a description of what's happening in your picture. It doesn't have to be a long description--just a few words.

The teacher is reinforcing the concept of only highlighting key information. In this case, the visuals will help highlight the written information and provide a few more

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important details that are helpful when synthesizing and summarizing information. In another example, Ms. Penelope asked students to demonstrate their knowledge of prefixes using PlayDoh®.

Ms. Penelope: We are putting PlayDoh® on your napkin, okay. Now if you can, show me a sub word. You can explain it to me and justify your answer with your sculpture--*she holds up the tub of dough in her hands*–that's fine.

I am going to check your sculpture and you are going to have to explain it to me. Just be real brief. Tell me what it means and how it deals with sub--*she points to the word on the board*–meaning below or under.

Similar to what Mr. Rudy asked her students to do, Ms. Penelope asked students to apply their learned knowledge by creating a visual and then explaining the visual they created. However, they were not only tasked with demonstrating learned knowledge, but also had to provide explanation and justification. This served to deepen the teachers' understanding of how students were internalizing the content.

4.2 Teaching others

Teachers also asked students to present their information to others in a way that would reinforce the content they learned in class. Students were tasked with re-teaching the content to their peers. In doing so, teachers were asking students to determine the most important aspects of the content and figure out how best to present it to their peers. These presentations happened informally and at times were impromptu throughout the lessons. Students usually presented small parts of the lesson at a time.

During a mathematics lesson, for example, Ms. Ladasha reviewed ways to multiply two-digit numbers. The class was using small dry-erase boards to work through the problems. One student wanted to share what he remembered from the previous lesson, which Ms. Ladasha encouraged.

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Ms. Ladasha: Student is showing us what we learned yesterday. I love it. Student, can you remind us--can I show everybody? Student is reminding us what we learned yesterday. We learned a lot about zeroes, didn't we? Let's look at Student's problem: 90x20, prove it. *–She's holding up a white board showing the problem 90x20.*

Students talk.

Prove it. Prove it to me. You can't tell that he's got a comma. *–She points to the whiteboard. –That is actually a comma. –She hands back the whiteboard.*

Prove it. Student said you're supposed to multiply it. Hold on, hold it up as soon as you prove that. I want to see some people proving it. No we're not yelling out. We are not yelling out.*–A student asks a question. – 90x20. Students hold the whiteboard to show their answers.*

Okay here we go, going to prove it.*–Ms. Ladasha grabs the whiteboard and says*: all right we're going to prove it. *–She called on a student and said*: all right we're going to prove it. Can you talk us through how to prove it please?

Ms. Ladasha stressed the importance of not just showing processes, but explaining and helping others walk through them. She modeled these processes. First she reinforced the importance of revisiting what was learned by showing others ("I love it."). Then she asked the student to take another step in the process, where he had to prove what he did is correct. This emphasized the idea that being able to complete a process is not sufficient. Students were asked to reflect on the processes and encouraged to self-monitor and self-correct. By using the white board to create their own visuals to explain the process, Ms. Ladasha and the other teachers encouraged the students to access their understandings and organize them in a way that others might use to comprehend the material.

Analytical insights from interviews

Insights from the observations helped me understand the thoughts driving the processes teachers followed when using visuals in a technology-enhanced

environment. These processes, which I have called the Visual Spiral Framework (VSF), include how teachers invited students to engage with visuals, while they—the teachers--provided contextualization for those visuals, facilitated internalization of content, and encouraged externalization of the material learned. In the next sections, I provide the analytical insights gained from the interviews with the teachers. The interviews helped me explore the reasoning and purpose behind these processes, as well as the beliefs that drove teachers to use visuals and technology for instruction. Findings are organized by themes from the analysis of the data.

Findings from the interviews illuminate teachers' perception of visuals and reasons for using visuals and technology in their teaching. One reason teachers used technology, for example, was to facilitate student access to visuals. The use of visuals was driven by a belief that visuals facilitate initial learning processes, engage students, foster connections to information, facilitate recall, increase confidence, and facilitate a spiral of learning that potentially leads to an increase in critical thinking. Finally, teachers ascribed importance to visuals inasmuch as they facilitated students' relational connections to content. The next sections provide further detail and insight into the findings.

Theme 1: Navigating technology

Throughout the processes observed in the classrooms, teachers used technology in several ways for instruction to facilitate access to visuals and increase student engagement. For instance, when teachers encouraged quick information capture, most of the time they used the computer, document camera, and projector to show students different resources. I thought about the guiding questions for this study, which ask what teachers are doing with technology and what they are trying to

accomplish when using it. It was important to learn teachers' preferences and reasons

behind the use of technology in the classroom in order to answer these questions.

Looking more closely at what they used and why, I was able to determine several

things.

First, the term "technology-savvy" may mean different things in different contexts.

When teachers in this study described themselves as "technology-savvy", they initially

mentioned the technology they used in the classroom, how many years they had been

using technology, and their willingness to try new technology. Further exploration of

their thoughts on what it means to be technology-savvy revealed preferences and other

practices they considered important. I found that teachers emphasized show-and-tell

technologies and encouraged students' independent exploration of technology as part

of reaching mastery. Second, the teachers' use of hardware mostly depended on their

professional development experiences, as well as past experiences. Third, when

choosing technology for instruction, teachers considered the format and content of the

resources to determine their usefulness for instruction, e.g. increasing students'

motivation to engage with the content. Finally, they cited several reasons behind their

use of technology, including ease of access and increased synchronicity. The next

sections further discuss these findings and provide examples.

1.1 Technology used for teaching

Despite the availability of different kinds of technology at their school, teachers in

this study purported a preference for show-and-tell types of technology. This is

consistent with what I observed in the classrooms. I asked teachers what was the type

of technology they liked to use in the classroom, and for the most part, teachers used a

combination of computer/laptop, overhead projector, and document camera.

Mr. Jesse: Definitely the overhead projector and the document camera.

Mr. Rudy: I am constantly using PowerPoint® and things like that, and I would have something up on the screen so there's usually something every day from me for the kids depending on the availability of the computers.

Ms. Penelope: I like to use a lot of technology primarily during teaching time: my computer, the document camera, projector screens. After you left me, we actually did research projects and Prezi® presentations on iPads®.

Ms. Maria: Now that I have my document reader and they can see it, and everybody can see it at one time--where 13 years ago or 18 years ago all I had was an overhead projector, unless the paper was see through there was nothing to see.

Ms. Poppy: I use the document camera, the projector, and my laptop.

Ms. Lana: I use my document camera all the time along with my computer. I will, like, create sentences on the computer in Word and then use the document camera with the projector to put it up there. That's how we do a lot of our grammar skills.

Teachers' responses were mostly limited to technology they were currently using, with the rare mention of other or similar technology they had used in the past or expected to use in the future, such as iPads®. Possibly, teachers may have been influenced by the technology that was touted during their professional development experiences or, perhaps, they readily took up only technology that was in school. However, the use of this technology also suggests that traditional teaching mores might also have influenced their technology preferences and uses.

For example, when teachers spoke about technology that facilitates show-and-tell strategies (e.g., the document camera), they purported their ease of use and of the possibility for increasing students' access to information via this technology (I further explore their reasons for using technology in the next sections). Technology, then, presents another way to facilitate increasing students' access to information where a lecture is accompanied by a visual. As teachers explained or lectured, the technology

was used to project the content, thus helping to occasionally draw students' attention away from the teacher and to the visual. Using technology that allows for show-and-tell strategies potentially facilitates the same processes we have known to be part of traditional classrooms. However, because the visual becomes a focal point (instead of just the teacher), students are given the opportunity to engage in other cognitive processes to help them tackle the content by multitasking (Hicks, 2011).

1.2 Ways to engage with technology

Teachers encouraged the use of show and tell technologies and shared the ways in which they engage with technology to become technology-savvy or technology experts. In order to become technology-savvy, they played around with technology, attempted to master one delivery system at a time, and modeled technology for other teachers. They emphasized teachers seeing themselves as learners and pacing themselves before using any technology in the classroom. Importance was given to teachers feeling comfortable enough with using the resources in the classroom and accepting that, at times, students would be the experts instead of the teachers.

Mr. Jesse: I think just start slow, pick one way you want to use technology to help your instruction and try it, and get really good at that before you try something different. I think you do not get overwhelmed that way. I think that from a management standpoint if you are trying to take on too much and you don't know what you are doing you will probably lose the class and therefore you will lose any benefit that you would have had by using it.

Part of becoming comfortable with technology included "playing" with it. Teachers encouraged ignoring any set of instructions a computer, for example, may bring, and to instead leap into the technology. Mr. Rudy explained his choice to obviate instructions:

Mr. Rudy: I can't think of any other way of saying it than that if you are not playing with it, with the technology, you're not ever going to learn. If you sit down and you are thinking that you have to write down all of the steps and then you expect your kids to sit down and write step one to step three, that's just not

going to work. That's just not the way that computers are built today. You know I don't think I've opened the manual for a computer in 20 years. I don't read, I do not get out a book and read about how to do it. I think about what I need to do and I go searching for the menu to help me do that and I just try stuff and play with it.

What Mr. Rudy said speaks to the changes in our lives as technology has grown ever present. While there are different kinds of new electronics and technology devices springing up on an almost weekly basis, certain aspects of technology are well ingrained in the minds of those who have experienced it for years. The expectation is that the technology itself will help the user learn, at minimum, the basics of its function and operation. This renders outside explanations (i.e.an instruction manual) superfluous. The assumption is that the children also know this, and that their motivation and engagement with technology is dependent on their ability to play around with it as soon as they are presented with it.

In addition to playing around with technology, teachers highlighted their preference to see technology being modeled by other teachers. They showed an interest in knowing what others are doing in the classrooms with technology and how they are doing it so they could then use it in their own classrooms. Ms. Maria expressed her frustration at having to participate in professional development where the presenter would only talk to them about the technology they could use in the classroom.

Ms. Maria: I can think of twenty things that I'd much rather be doing than listening to someone talk to me. I would much rather go in and watch somebody. How are they doing it? And then I want to go back and try it.

Seeing and modeling the use of technology was highly important for all teachers. For some of them, modeling has become a way they both learn about technology and teach others. It is a cycle of shared learning among peers. Much like the intuitive, hands-on, playing with technology processes Mr. Rudy and others held in such high

regard, teachers preferred to learn how to integrate technology in the classroom in much the same way. Ms. Poppy shared one experience where she modelled for a new peer.

Ms. Poppy: We have a new teacher on board with us right now and she's hesitant. I modeled how to use it. The students were sitting in front of the computer facing me and my back was to the board and I could see every kid. I could see if they were getting it or not getting it. She liked it and she wanted to set up her classroom just like mine so that she could do it. I told her, well you can also do the clickers, where you have everything set up in the morning. The kids can come in and put their answers just for review. I would tell her she could take the kids anywhere without leaving the room by using technology like that with a document camera and projector, it's so convenient. There is student engagement, that's the key, and they love technology. You can use it to reinforce things that you've already taught. You can use it to teach new skills. You can use it to give them homework assignments: go home, watch this video. Tomorrow come in and we will do hands-on and we will learn.

1.3 What to look for when choosing technology for instruction

When asked how they chose technology for instruction, teachers did not explicitly speak of hardware or software. Instead, they prioritized the presentation of the content. This suggests that technology, which was present and used on an almost daily basis in all of the classrooms of this study, was not assigned as much importance as the format and structure of the information presented. In other words, teachers looked for sufficient coverage and relevance to the material in the lesson, not for what they could do with the technology or how they could creatively use it to enhance the lesson.

For example, teachers emphasized the need for certain features that they incorporated in their processes during instruction. This includes resources where the information is chunked (which was very present during internalization processes) and ensuring an immediate, obvious, and explicit connection between the resource and the content being taught. For instance, Mr. Jesse looked for resources made available

through technology where content was parsed into age-appropriate, manageable pieces

of information.

Mr. Jesse: I want to make sure that, well, first of all that the content is covered well. This is one that… yes definitely that the concept is covered well and that it's broken up into little--I guess chunks--where you are learning one part at a time. And they are learning a specific--I mean, I want to make sure that at the very end of it they are learning only one thing and so yes I want to make sure that's there.

Mr. Rudy added the need for resources to be connected to the teaching

standards all teachers must adhere to. For him, that served as a starting point that

steered him towards technology resources that were relevant and provided sufficient

coverage of the material to be taught. Both he and Ms. Lana specifically touted the

usefulness of short videos to help meet the standards and provide something that is

relevant to the material.

Mr. Rudy: I search for what we are doing it is skill-based or standards-based. Yes that's the way we are teaching right now, so that's when I am starting a lesson based on a particular standard. So that's where I start to use anything from Discovery Education™ videos to YouTube™ videos to Schooltube™ to anywhere I can find it--as long as it's a video that is appropriate and I try to avoid longer videos unless I'm going to be absent. If I am teaching the class I want one or two short videos.

Ms. Lana: I use my document camera all the time along with my computer. I will, like, create sentences on the computer in Word and then use the document camera with the projector to put it up there. That's how we do a lot of our grammar skills, you show like little short YouTube™. It's amazing the YouTube™ I have found that have thirty seconds or less and they are so powerful to show the kids.

1.4 Reasons for using technology

As mentioned before, teachers' use of technology in the classroom may have

been influenced by their participation in technology initiatives, the availability of

technology in their schools, and the ways technology may perpetuate traditional

teaching mores. Thinking about those influences, I asked teachers to share their

reasons for using technology in the classroom. I found that teachers assign importance to how technology resources potentially increase students' background knowledge through vicarious experiences, help increase synchronicity between teachers and students, and help increase motivation to engage with the content.

In the following example, Ms. Lana emphasized the importance of providing students with vicarious experiences and gave examples of how technology helped facilitate including such experiences in her lesson. By providing these experiences through technology, she was able to fill in any gaps in students' background knowledge and enhance lessons. Technology resources represented one way to explore the world without leaving the classroom.

Ms. Lana: I have found so many things. I can show a thirty-second clip and it does exactly what I want like, for example, we did a big story on sea creatures of the shore up in Maine and it talked about all these creatures in the story and my kids had no concept of what it was that we were talking about even though there was a picture in the book they were like, what is that? And I'm like, how many of you have ever been to the beach? I had several kids that had never even been to a beach before so this is extremely foreign to them. So I went home and I found thirty second clips of all of these different sea creatures that have been filmed in, like, aquariums in the seashore and I showed it to the kids and you should've heard all of the ooohs and ahhs, this is so cool. And you know it just gave them a little bit more of a frame of reference because you know they were totally lost.

For this teacher, seeing is one way for students to have a meaningful experience from which they can draw from. Other potential benefits of using technology include increased synchronicity and flexibility that technology such as the projector and document reader afforded. Teachers expressed being able to constantly face their students allowed them to address concerns immediately, as it encouraged them to reflect more closely on what was happening in the classroom at any given moment.

Ms. Poppy: I like to use my document camera because I can face my students and they are looking at the board and I am writing instead of turning my back

towards them. They can see what I am writing and it is projected to the screen behind me. Also, magazine articles that we'll read for literature--it's right there under the document camera. I can just put it under there and I can view whatever I am using. We can read along together with the laptop. I can plug my document camera into my laptop and play Jeopardy style games that I have created or we can do different types of games.

To this teacher, facing her students during class time was important. Her response invites us to assume that turning one's back to the students can have negative or ineffective results. The technology allowed her to continuously check for understanding and maintain the momentum of the lesson. In addition, technology facilitated group learning experiences when reading together or playing educational games. Orienting student attention during every teachable moment is important and technology serves as a conduit that provides ease of access and flexibility.

Finally, increasing student motivation was important for the teachers in this study. They agreed that technology presents one way to potentially increase student engagement with content. Mr. Rudy, for example, highlighted how students felt included and thus more motivated when he used the document reader and projector to share text with his students.

Mr. Rudy: They just get a better grasp of it. I mean, even when I was doing reading, one of the things that I started doing was buying e-books and projecting them. Or we would read a class book instead of me just sitting in front of the class reading from a book. I started projecting the book on the projector and what I noticed was a lot more engagement from the students than when I was reading the text and they can read along with me if I only have one copy of the book. I noticed a lot more engagement in the text rather than them just sitting at their desks because when they are just sitting in their desks and listening to me read. Sometimes the kids get off track and draw pictures or they are otherwise engaged and not listening to the story. They were more engaged when they were looking at the screen with me.

Theme 2: Visual literacy definitions

Knowing how teachers construe visuals and visual literacy was relevant to answering what teachers are trying to accomplish when using visuals in the classroom. In other words, I wanted to learn the ways teachers understood visuals can aid in thinking, learning, and communicating. I found that teachers had a challenging time defining visual literacy, maintaining their focus instead on visuals as resources. Teachers agreed visuals are obvious, concrete and easily done, but slippery--that they facilitate internalization and externalization processes.

2.1 Characteristics of a visually literate teacher

Visual literacy here was explored only as it related to the teachers. Teachers reflected on their own practices and how visuals promote visual thinking, learning, and communicating. They mentioned different ways to use visuals and, similar to their preference when learning technology, to communicate with other teachers to learn new ways to integrate visuals into their teaching. When describing a visually literate teacher, teachers said they should know what students are doing with visuals in their daily lives, and they should be fearless in their use of visuals and focus on connections between the visuals and the content, as well as focus on the visual's potential to motivate and engage students in the lesson. They emphasized the use of visuals without hesitation and the need for teachers to integrate different kinds of visuals in their instruction.

Mr. Rudy: There is no hesitation for me to pop up images on a projector or to search on the computer to look for interesting visuals to use in the classroom. You know, there are some people and some teachers that just put something that's animated that has nothing to do with the content. I avoid that stuff like the plague and I don't really animate my power points to make things look flashy or fun. Occasionally it's more productive because I want this or that to show better. Teachers need to keep up with that. We don't have to play video games all day long like the kids but we ought to be familiar with what they are doing and that's one of the ways that they learn.

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Mr. Rudy highlighted the importance of visual communication. He provided an example of an ineffective communication when the focus is more on aesthetics and gimmicks than on the content of the visual itself. Visual communication should include a visual with a clear connection to the content, limited, planned, and purposeful animations, and knowledge of the different ways students learn. In addition to using visuals that have a direct connection with the content being taught, teachers also stated that educators need to have a balance between images and text to increase student thinking and investment in the lesson. Ms. Penelope emphasized visuals as one possible entry point into students' learning.

Ms. Penelope: Visuals should not be used just as visuals--they need to be used alongside with text or the concept that you're teaching in order for at least to jumpstart their thinking on a concept–some sort of visual hook even if it's just the hook that you use that's visual. It's going to make them connect with it maybe personally on a personal level, which is going to make them interested and engaged once you get them hooked, interested, and engaged, personally connecting the likelihood of them buying into what you're teaching. It's going to be way more than if you just said okay now learn about this [and] lecture on it all day.

The idea here is that when visuals are paired with text and the content being taught, the visual serves as a hook that fosters higher cognitive processes that lead to visualization and possible internalization of information. Teachers should know how to create that balance to foster initial thinking processes that may lead to higher order cognitive processes. Student investment in the lesson is important for visual thinking and learning to take place. A visual hook is one way to foster those processes. Once students are invested and have begun the thinking process, then deeper meaning can take place. In order for deeper meaning (i.e. visual learning) to take place, teachers should be able to glean meaning from visuals. They should be able to show their

students that meaning can be extracted from multiple sources, including image-centric

resources. As Ms. Poppy stated:

Ms. Poppy: A teacher should be able to take the meaning of an image and interpret it and make meaning out of it. That's what she's going to try to do for her students, whether in math, science, reading, or whatever the subject area. I think it's very important for a teacher to be able to do that.

2.2 Visuals are concrete and "easily done"

All teachers agreed that using visuals for instruction present critical and powerful

ways of teaching and learning. However, they also stated that visuals are easy. They

are easily seen: when they are first captured by our senses, they immediately impart

information without necessarily always having to transform symbols into meaning, as we

do when we read print information. Overall, teachers considered visuals to be "obvious".

Ms. Poppy: Something the kids can view and they can see.

Ms. Penelope: Something concrete that can be seen--obviously, it's a visual.

Mr. Jesse: Anything that the student can see. Not always touch, but at least always be able to see that relates to whatever the content is or whatever the focus is for the day.

Ms. Lana: It's there and I can look at it and go back to it refer to it.

Ms. Maria: Pictures, videos, examples that I provide for them on the whiteboard.

Mr. Rudy: Anything that has a picture, anything the kids look at.

When asked to define visuals, all teachers included in their definitions the need

to have "it"--"something," "anything" material that can be seen. Like Ms. Lana mentions,

"it's there." Physical interaction need not be part of engaging with a visual, as long as

there is visual stimulation. Mr. Jesse expanded on this idea explaining that, lacking

physical interaction, the visual needs to be something that relates to class content,

which helps maintain focus on the day's goal. While definitions of visuals began with

what might be thought of as the "obvious" definition of "visuals are something that can

be seen," the further teachers tried to explain the concept, the more they seemed to struggle with their explication. One teacher, for example, commented on both the explicit and implicit nature of visuals:

Ms. Penelope: I would define it as a concrete object. I guess that's vague enough that it's not necessarily one but something concrete that can be seen--obviously it's a visual--that helps a student connect the concept with the real world application part so that they can, you know, make it applicable and real in their life.

The teacher's language alludes to the slippery nature of visuals as a concept. At first glance, it appears to be an "obvious" answer, but it also encompasses many things so that it is not limited to "one", but to a plethora of possibilities. It almost seems as if an effective way to define visuals is to leave it in general terms (i.e. vague terms). It is a definition that we seem to grasp even as it slips away. When thinking about visuals as a noun provides too blurry a direction, the definition turns towards possibilities achievable with visuals in the classroom (i.e., visuals as verbs). In the previous example, the teacher emphasizes visuals' potential to help students make connections among themselves, the content, and the real world. Visuals become not just a tool, but a conduit to self-empowerment and meaningful participation in the world. They have the potential to be a slippery yet powerful ally in literacy learning.

2.3 Text as a visual

During the teaching processes in the classrooms, teachers used many print-centric resources. However, they made little distinction between these resources and the visuals they used for instruction. The boundaries between text and visuals were blurred and print was often used as part of teachers' visual repertoire for instruction. The idea of text as an image or a visual permeated the discourse of all of the teachers.

Ms. Penelope: They also take notes too, so that's part of their visual, you know, seeing it. I know I do a lot of anchor charts so that they, you know, see it written as far as, like, when they're taking notes.

Mr. Rudy: In some contexts, text is a visual--I guess in all contexts…some are more text-based.

Ms. Lana: I thought of my visual writing aids that we have: the models, the writing models, Venn diagrams, our T charts that we use, sequencing charts-- different aids like that.

The assumption among teachers is that text is not always a visual, but can become one or be part of a visual. Some students were encouraged to add their own notes as part of a visual. Others were given visual writing aids, such as a T chart, where text is arranged visually. Teachers made a clear distinction when referring to texts as visuals and when they were not.

Ms. Lana: I think in reading it's different because in reading your visual will be the illustration and the written language will be just the text, so two different-- …I would call the writing the paragraphs and the writing model a visual for just me teaching writing in the language arts. Within reading it's not really a visual. I think the illustration would be more the visual to relate it to the reading context.

The teacher emphasized a difference between the use of text for writing and for teaching writing and the use of text for reading. For writing, she sees text as a visual guide and a way to structure content towards the purpose of communication. The focus seems to be on paragraphs and writing models as particular forms that shape content delivery, thus transforming them into visuals. Text then, is perceived as a visual when the purpose of the text is communication and where there is focus on form (i.e., learning to write paragraphs that start with a 'hook', followed by the main idea, and then supporting details).

To further explore this idea and determine its feasibility and robustness, I turned to teachers' explanations of their use of text as visuals. Some of the examples teachers

provided for text-based resources they considered to be visuals included anchor charts, writing models, word walls, note taking, pocket charts, and sticky notes. One teacher commented on her use of anchor charts:

Ms. Penelope: Anchor charts--that's another thing I know I do a lot of…so that they, you know, see it written as far as, like, when they're taking notes--they also take notes, too, so that's part of their visual.

This example made me think again of the vagueness in teachers' initial definition of visuals, where visuals are "something" that can be seen. Likewise, the information written in the anchor charts is "something" that can be easily seen by the students. In this case, written information is shaped to help students visualize the content. The text they see anchors their learning to "something" that is "concrete", which fits with teachers' definition of visuals. The purpose of the writing here was to communicate content to the students. It is important to note, however, that the students were helping to create the writing visuals themselves. The focus was on the form (notes) to help students recollect and make connections to content. The process was not passive and receptive, as it could be if they were reading information from a book; instead it was active and creative.

As I explored teachers' responses, I found several more examples where text was construed as a visual, matching the notion of an active, creative process that involves both teacher and students creating and interacting with the text. Students were encouraged to make connections with the text as a visual, thus fostering increased comprehension of the material.

Ms. Lana: My writing frames, my models--I like to use those because it helps students visualize the introduction of an expository essay where the main idea is and why they have to give support for that main idea. I also like to use sequencing maps when we're doing sequential steps to something with

science or social studies like the timeline with their science projects-- we use those [because] it just helps organize their thoughts better.

This is another example that alludes to text as a visual to help students "visualize" a particular written structure (in this case, an expository essay). The assumption here is that students follow the same steps or structure in order to communicate ideas in an expository form. For the sequencing maps, the text can be encased in squares or circles--something that separates or chunks the information--to highlight the form and structure of the writing. Again, the idea of creation closely ties to the notion of text as a visual. Following these examples and analysis, it seems that for a text to be considered a visual, the focus of text as a visual is on its form and structure in order to effectively create a completed, written piece.

2.4 What to look for when choosing visuals for instruction

It was important to learn how teachers designed or chose visuals for instruction. I wanted to know if they had a particular preference and if they felt visuals had to be designed in a particular way. I found that aesthetic is a very important consideration of the visuals used in the classroom, emphasizing the need for increased student motivation and engagement in the lesson. In addition, when teachers looked for visually rich, technology-enhanced resources to use in the classroom, visuals needed to be developmentally appropriate and interesting to the intended audience. One teacher stated that visuals should be:

Ms. Penelope: School appropriate…and relevant to their age because that's the whole focus. We got to make it to where they understand where they are and make it applicable in their lives all the time. So I try to…get them the funniest or the most entertaining picture or colorful picture. I do not want to stick with the black and white. Always look for the cutest or coolest looking, for the biggest and baddest. Something that was appealing to their eyes that they wanted to look at and did not mind looking at.

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Relevance to content and students' lives continues to be highly important in teachers' discourse. In addition, visuals have to be interesting in order to catch students' attention. Possibly, motivating students this way encourages them to pay attention and become invested in the lesson. Visuals can be funny, entertaining, colorful, cute, and bold in order to attract their audience. Teachers also assigned importance and relevance to visuals that helped provide in-depth access to content and that could help differentiate instruction. For example:

Mr. Jesse: I'll try to find certain videos that maybe are lower-level in that I know that the kids will enjoy watching it and keep their interest in and maybe explains it differently or explains it better than me.

In teaching reading, a common recommendation to motivate struggling readers is to obtain texts of low readability and high interest. Similarly, this teacher recommends the use of "lower-level" visuals--in this case, videos--to maintain high interest in the subject and to motivate students to make connections. It does not mean that visuals should not be challenging, but to provide another avenue for student comprehension. Like the teacher said, they can be used to explain things "differently" or "better."

Theme 3: Visuals as powerful and necessary ways to learn

What are teachers doing with visuals in the classroom and what are they trying to accomplish? I found there was a striking contrast between what teachers thought of technology and what they thought of visuals for education. While technology was deemed important and perceived as helpful when facilitating access, motivating students, increasing synchronicity during a lesson, and increasing background knowledge, teachers contextualized the use of visuals as critical to teaching and learning literacy. I found that teachers saw visuals as powerful ways to facilitate content comprehension, help students establish several connections to the material, analyze

and review information, and demonstrate understanding. The use of visuals for teaching and learning seemed to be so embedded in their psyche that it was hard for teachers to fathom any lesson without using some sort of visual.

3.1 Visuals are critical to learning

I found that all teachers assigned importance to visuals for instruction. It was not unusual to hear the words "critical" and "powerful" when teachers talked about visuals. For example:

Mr. Jesse: I think [visuals] are critical. I think without the visual you're getting way less learning than you probably could or should.

By using the word "critical", this teacher assigned visuals significant power in the classroom. Visuals here could be construed as an invaluable aid: a bridge to literacy learning that is immediate and relevant. Teachers mentioned that visuals afford a way for students to understand content because "it's easily done." They also encouraged the use of visuals to help students internalize processes and understand concepts.

Mr. Rudy: One my favorite things to do is have every kid be on the computer and let them do research and produce some kind of product. When they create something like PowerPoint® and they have to present the information--like we did a project on the planet Jupiter earlier this year. They had to do research on the planet, they had to find images for the end of the presentation--you know I think it was just five or six lines and we just spent a couple of days on it but they created the visuals to go along with the text so they understood a whole lot better what they were doing. You know when they get to choose which visuals they are going to use to go along with what they are presenting to me that's more powerful learning.

Part of the processes observed in the classrooms included fostering students' internalization and externalization of content through visualization and the creation and presentation of visuals that served to show their understanding. Mr. Rudy reinforced that notion and explained what all teachers expressed: that visuals are used to facilitate student comprehension by establishing connections between the visuals and learning

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and by providing students with opportunities to create and use their own meaningful visuals. However, teachers also presented other important considerations for visuals in literacy learning.

According to teachers, visuals facilitate initial learning processes by engaging students aesthetically (visuals are fun), which increases student interest and engagement. This potentially leads to students beginning to make connections to content, other visuals, and their experiences. Visuals become cues students can fall back on to facilitate recall, increase confidence in learning (visuals provide a safety net), and provide a "spiraling review", not just for students, but for teachers as well. One teacher specifically mentioned how visuals can foster a "spiraling" of "things" studied in the classroom:

Ms. Lana: Repetition and being comfortable with things and it's that spiraling, you know, so many times we teach things and then we go on but we should not do that. We need to go back and go back and a lot of the things that I'm using in my classroom I'm building upon. Like I start, let's say, a chart day one with irregular verbs. Well that chart is going until the last day of school because we're building on that chart constantly and it may be a while before we use that particular irregular verb again, but it's up there. …I noticed when they are writing they're looking at it like, 'oh I can use that, I need to use that word'.

Ms. Lana commented on how visuals facilitate quick repetition and revisiting of content, which represents a spiral of learning. Within this spiral, learning via visuals is ongoing and recursive. This concept of "spiraling" suggests that visuals, at minimum, help us remember information. Continued use of visuals, however, fosters a way of learning that is spiraling because we go back to previous information through visual cues, reinforcing what is already known and adding to or applying the information in different contexts. Visuals, then, help learners internalize information by helping to scaffold processes through visual stimulus and recall. Teachers keep going back to

seemingly simple processes that aid in bridging self to the content and establishing

multiple connections to literacy, including visualization of the material.

3.2 Students as visual learners

Teachers encouraged a lot of "in the head" visualization of content throughout

the lessons. They used language, mnemonic devices, body movements, and other

resources to encourage students to form a mental picture of the material. I found that

this encouragement by teachers came from a deep-rooted belief that all of their

students were visual learners. While teachers acknowledged the existence and

importance of multiple ways students learn, and that there are other types of learners in

their classrooms, they touted image-centric visuals as being more relevant to the ways

students learn. Ms. Penelope emphasized that visuals help provide relevance and

connections to the real world by helping the students visualize and concretize abstract

concepts.

Ms. Penelope: I think it is important. It's not the most important because there are kids who can learn kinesthetically, auditory, all those nice learning styles, but I do think it is in order to make that I'm all about like real world, real life, why the heck am I learning this, what good is it for me kind of thing. So I think it is important. It's definitely important because I think that visuals give that concrete aspect of the concept that you're teaching. It makes it real for them. You need to be able to visualize it. It makes it that much easier when we are instructing. But those visuals are there because that's where it kind of hits home kind of thing. It makes them realize all this is important and this is why; here is how it shows me why and how it connects those concepts and makes it more real to them--that concrete part of it.

In addition to visualizing and concretizing abstract concepts, teachers

emphasized the need for the visual learners in their classrooms to manipulate

information by way of visuals. By doing so, teachers argued that it helped students

increase their understanding of the material. Ms. Poppy, for instance, emphasized the

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use of graphic organizers to help students chunk information and organize it visually in order to increase comprehension.

Ms. Poppy: More students I find are more visual learners. It helps, instead of just telling them something, for them to look at it as you're instructing them. When we are doing the writing process, if I just tell you how to do the writing process it just–*she waves in the air*–but if we sit there and write as we're doing it they can visualize it, they can look at it using the computer. With the visuals of a diagram, just to use a Venn diagram and say how two books are different, they can visualize them how the two books are different, using that Venn diagram they can actually see it. I think more kids are visual learners and it helps.

While teachers' focus remained on visuals as a resource to help students learn, some teachers also gave examples of how visuals help their visual learners to communicate their understanding. This externalization of their internalization processes helped teachers determine how much students understood the material. Sometimes the visuals students used were far more effective in showing their understanding than what their written work showed. Mr. Rudy gave an example of a child who struggled with print literacy.

Mr. Rudy: A lot of our kids are visual learners. There was one kid--he was probably the lowest reader in fifth grade. We're talking about a second grade level-- maybe first grade level--he ended up with one of the best pictures in the whole room and the best one sentence descriptions to go along with the pictures. He understood the process. Now, when he wrote the paragraph, the paragraph was atrocious, but the pictures were really good so he understood the concept. And that's what we were after.

Finally, teachers emphasized that their visual learners depended on the visuals in the classroom throughout the year. Visual cues on the walls, for example, helped activate students' recall of previously learned information, facilitating scaffolding of new and relevant information. Something that teachers constantly alluded to was how visuals helped conduct a spiraling review of the content.

Ms. Lana: A lot of times the visuals can be brought back up or placed in the classroom or saved to bring back up so that helps kids constant reminder of, you know, what they learned. It's easier to go back and look instead of me just telling them again--if it's on anchor charts somewhere they can refer back to it.

The role of visuals is not just important, but of utmost importance, according to the teachers in this study. They believe that most of their students lean more towards visual learning, while all of their students benefit in one way or another from the use of visuals for instruction. One implication is that visuals are critical to making connections to the "real world." They facilitate connection and understanding, making literacy relevant and useful.

3.3 Teachers as visual learners

When asked to share their beliefs about visuals and their reasons for using visuals, teachers voiced their own meaningful connections with visuals. Most of the teachers claimed that, much like their students, they were visual learners.

Ms. Penelope: I really don't begin to teach without visuals.

This is a prevailing statement that summarizes the undercurrent present in all of the interviews. All teachers claimed to use visuals on a daily or near-daily basis for the benefit of their students. However, five out of the six collaborators (everyone except Ms. Poppy) also stated that they considered themselves to be visual learners, especially growing up. These teachers assigned value and significance to visuals by establishing a life-long personal connection and, in turn, forging connections to the perceived learning preferences of their students. When I asked how often she used visuals for instruction, Ms. Penelope answered:

Ms. Penelope: Every time I teach. –*Pause*–. Because I HAVE to. Because that's how I learned and I feel that the best way to describe it is to include visuals. I mean, we do a hands-on something. I don't necessarily do hands-on every

single time because it's not always conducive, but I always, you know, talk, have that auditory part, but I always use writing something or drawing something or showing a video or using a picture all of it every time I teach. I have to.

For most of the teachers, personal experiences heavily informed current practices. In this example, the teacher felt that including visuals is compulsory. Without visuals, her class might be incomplete and, therefore, not beneficial for her students. The language used denoted a yearning for the past and a desire to maintain personal connections, thus forging new connections with the class. There was also an urgency inherent that could be explained by teachers' reminiscing of their experiences with, or without, visuals. Mr. Jesse alluded to the possibility. He claimed that visuals stave off boredom, which he remembered as a staple of his childhood student experience, where "there were no visuals."

In addition, the teachers related to visuals even as adults, a fact they used to further concretize the idea that visuals are important and necessary for learning:

Ms. Maria: I can think of twenty things that I'd much rather be doing than listening to someone talk to me…

Mr. Rudy: When I'm trying to put something together, I can't read the instructions. I have to see it, you know, I have to see the diagram and I think kids are that way too, especially the young kids.

Ms. Maria would rather see processes instead of hearing about them, suggesting that interaction and possibly creativity play important roles in learning. Mr. Rudy stated that he "can't read the instructions", which is not a commentary on any inability to do so, but a preference, which he ascribed to his youngest students. This points to the idea of spiraling review and learning. The seemingly back-to-basics approach has resulted in a preference as an adult but, at the same time, it is perceived as necessary in early learning experiences in order to facilitate the resolution of future problems.

In this study, the majority of teachers expressed being visual learners. Some of the teachers claimed it was more natural to gravitate towards visuals. The assumption here is that learning through visuals is one way of learning that is more easily facilitated, as something that is perceived as being "natural" might be more easily accomplished. One teacher explained:

Ms. Lana: I know myself--and it's proven--that teachers teach the way they learn the best and I'm a very visual person. I just know that and so I look around the classroom and I'm like, oh my gosh, my classroom is overwhelming sometimes with all of the things on the walls because, again, I'm very visual. So I make a lot of anchor charts and again even with technology I think that's probably why I do a lot of keynotes or PowerPoint® because it's the visual. And the kids can see it and to me visual is--I think of the word almost like concrete. It's something you can grab onto, it is something that it's not just floating in your brain…it's there and I can look at it and go back to it and refer to it.

One of the claims this teacher is making is that learning and teaching via visuals is natural--that if it has formed part of the teacher's previous experience, then it will inevitably influence ways of teaching. But also, significance is assigned to visuals as pathways or bridges and as anchors to help think about the real world and make it tangible. By "the real world" I mean possibly outside of school or the community in which the students live. In addition, this suggests that, without a visual, people may not necessarily form a connection to material so it does not feel real.

Ms. Penelope: That's where it kind of hits home kind of thing. It makes them realize all this is important.

3.4 Ways visuals facilitate internalization and externalization processes

As I mentioned in previous sections, internalization and externalization processes happened throughout the lessons. They include ways teachers encourage students to process and share information to demonstrate their grasp of the material presented. Teachers stated that one way to encourage students to engage with these processes

was to create their own visual. Teachers had different ways in which they did this. One teacher had students perform math word problems:

Mr. Jesse: They will actually perform [a] word problem. You can use that to discuss, you know, why did you [do that]? If they acted this thing out then I am thinking specifically for what operation you used. Why are we going to use multiplication, for instance? That's one way.

Acting out a word problem helps students visualize the problem itself, which can help make connections that lead to solving that particular problem. In this case, the teacher encouraged the creation of a visual representation of a math problem to aid with the internalization of processes. However, not all teachers requested the creation of external, concrete representations. Teachers also asked students to create a visual inside their own heads:

Ms. Penelope: Sometimes it will start off with my own visual…to get that jumpstart, for instance. I will have them, if we are reading, or I'm describing something, I will have them close their eyes and think about what I'm reading to them in their minds and visualize that and get that mental picture. We did this with when we were reading *Island of the Blue Dolphins*. I read a scene, I read it and I reread it and I reread it again and I made them make a mental movie. After I read that part to them, I made them create the scene on the long paper and later we read it and read it and read it and visualized that mental movie.

The process of visualization is complex. The teacher began by modeling visualization through the creation of a visual. This was followed by encouraging the conscious process of visualizing, in which students closed their eyes, blocking out all visual stimuli to depend solely on what they heard and what they saw in their minds. The repetition of the reading material by the teacher possibly encouraged students to process information a few times to pick up on details and nuances that are usually grasped after repeated readings. They were then asked to externalize that mental

"movie"; to communicate it with others and demonstrate their understanding of the reading material.

This reinforces the idea of a learning spiral where visuals are at the heart of grasping understanding and processing information. Students are encouraged constantly to create and communicate. This teacher went on to state that this process of creating these mental movies provides practice so that when the students continue to read, they will default to this same process of visualization, so that students can "…think more critically and visualize at a more critical level." In short, visuals present a spiral of concrete vs. abstract knowledge and processes that allow for synthesis of the abstract, the concrete, and the unseen (i.e. external to the classroom) concepts to encourage internalization of information.

Summary

In this Chapter, I presented data that suggests that when teachers are using visuals for instruction, they are used as tools to mediate the process of guiding students' meaning-making, where text is still a big resource for instruction. In their lectures, teachers used various strategies as part of the visual spiral framework (VSF). These included using basic visual elements, non-verbal cues, inquiry, activating background knowledge, and encouraging students to create visuals. First, teachers would encourage quick information capture, where they had information available in different modes for students to see. Second, teachers provided students with visual contextualization, where they included a series of visual cues and verbal explanation of the visual. Third, teachers encouraged the internalizing of information, where they asked students to identify, analyze, copy, or repeat different aspects of information within the visuals employed. Finally, teachers encouraged the externalization of the

information presented. Students were expected to use the information gleaned from the visuals to construct and reconstruct knowledge, create new material, and/or present material learned by using visuals and other modes.

I found that technology plays an important role in facilitating access to visuals and potentially increases student engagement, motivation, and enthusiasm. In addition, technology can offer access to the immediacy of visuals, which in turn afford opportunities where students can vicariously experience the world outside of the classroom walls. I also found there is a blurred line between visuals and text where some text is considered a visual when the purpose is creation or communication of information. Visuals play an important role in learning, primarily to establish connections to the content, which are revisited in future learning processes, creating a spiral of learning. In addition, teachers voiced their preference as visual learners and the need to offer similar experiences to their students. When teachers looked for visually rich, technology-enhanced resources to use in the classroom, visuals needed to be developmentally appropriate and interesting to the intended audience. In addition, I determined that, while teachers consciously used visuals for instruction, visual literacy tenets remain as elusive as a clear definition of 'visuals'. However, while they may not be explicitly talked about, several visual literacy tenets were found implemented throughout the study. In the next chapter, I will discuss how findings relate to theory, practice, and future research.

CHAPTER 5
DISCUSSION AND IMPLICATIONS

Overview of the Study

The rise and momentum of image-centric technologies in contemporary life emphasizes the need to learn to "read" (understand) and "write" (communicate with) visuals (Avgerinou, 2007). Visuals, while image-centric, are multimodal and can be found in confluence with other communicative modes such as sound, text, and video (Duncum, 2004). Within current conversations of what counts as necessary and important literacy, visual literacy has been emphasized (Sosa, 2009; Wilhelm, 2005) as another way of learning, thinking, and communicating in the 21st century. Furthermore, within contemporary, digitally connected environments, many scholars suggest the conscious integration of visuals in education to offer additional opportunities to facilitate learning (Avgerinou, 2001; Debes, 1969; Fleckenstein, 2003; Fransecky & Debes, 1972; Grant, Hutchinson, Hornsby & Brooke, 2008; Portewig, 2004; Segovia Aguilar, 2010; Sosa, 2009). Image-centric resources in the classroom are important for, and influence, literacy acquisition (Dyson, 1999; Johnson, 1990), not just in traditional learning settings, but within increasingly technology-saturated, visually-rich environments.

There are several challenges to the integration of visual literacy in education. One challenge is that there are different understandings of what visuals are, how they may be used, and how they impact thinking, learning, and communicating, which has fostered some confusion as to how they may be used in instructional settings. In addition, research has been limited to a few studies dealing with limited graphical representations, where the focus was on particular types of graphics, such as maps (Coleman, 2010). Much focus has instead been given to the design of visual materials

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for the classroom, where an understanding of visuals is assumed (Omar, 2000; Portewig, 2004). Because of these and other challenges, research on what is happening with visuals in the classrooms has been lacking. There is a need to ascertain teachers' instructional strategies, methods, and resources currently used to integrate visuals in technology-enhanced literacy instruction (Mayall & Robinson, 2009). Such knowledge can serve to enhance our understanding of teachers' integration of visual literacy tenets, inform future literacy considerations, inform practices, raise new questions, and foster reflection of current practices.

This study, using an inductive approach, addresses this need and adds to the literature on visual literacy in the area of teacher practice. I asked the research question: How do fourth and fifth grade teachers who self-identify as technology-savvy educators describe their use of visuals during teacher-directed, technology-enhanced, literacy instruction? To better understand their responses, I asked two more guiding questions: What are teachers doing with visuals and technology in the classroom? What are teachers trying to accomplish when they use different strategies, methods, and/or resources? I wanted to see how teachers used visuals as another way to encourage learning, thinking, and communicating in the increasingly heavily technological and visual contexts of the 21st century. Through videotaped observations and interviews I was able to explore teachers' practices and beliefs about using visuals in technology-enhanced classes, and how these beliefs relate to the ways teachers provide literacy instruction.

To answer the research questions, I gathered data in two phases. First I conducted observations in the classrooms, followed by semi-structured interviews with

the collaborators. I used inductive domain analysis to explore the data, as detailed in Chapter 3. Findings from the observations highlighted four processes teachers used when including visuals in their instruction, which I call the Visual Spiral Framework. Teachers used this framework to encourage students to use the information gleaned from the visuals to construct and reconstruct knowledge, create new material, and/or present material learned by using visuals and other modes. Analytical insights from the interviews revealed that teachers believe technology facilitates access to visuals and helps increase students' motivation and engagement. However, they assigned more significance to using visuals as one way to think, learn, and communicate. Teachers' views complemented their teaching practices, as they used the VSF to aid students' internalization and externalization of learning.

The purpose of this chapter is to further discuss the conclusions of the study. It begins with the most significant findings and their relationship to conclusions of visual literacy literature. In the next sections, I discuss the links of findings to theory and practice, and the implications for future research.

Summary of the Findings

This study explored the practices of teachers in technology-enhanced environments who employed four processes to encourage visual thinking, learning, and communicating. Within the VSF, teachers first encouraged quick information capture, where they had the material available in different modes for students to see, engage with, and reflect on. Second, teachers provided students with visual contextualization, where they included a series of visual cues and verbal explanation of the visual, inviting students to make several kinds of connections to the information presented. Third, teachers encouraged the internalizing of information, which demanded closer

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engagement with the content, where they asked students to identify, copy, analyze, or repeat different aspects of information within the visuals employed. Finally, teachers encouraged the externalization of the information presented. Students were expected to use the information gleaned from the visuals to construct and reconstruct knowledge, create new material, and/or present material learned by using visuals and other modes.

Teachers' instructional strategies within the VSF emphasized the importance of using visuals to think, learn, and communicate. Teachers encouraged reflection, relational connections, constructing and reconstructing meaning, and internalizing information and externalizing information. They employed several strategies to achieve their goals including using basic visual elements, orienting students' gaze through non-verbal cues, using/creating visuals as mnemonic devices, asking questions to analyze visuals, asking students to copy, identify, analyze, or repeat visual information, and having students summarize content and teach others using visuals.

Using basic visual elements fostered opportunities for students to discriminate important information. Using non-verbal cues helped emphasize the importance of certain information, as well as directed students' attention to details. Creating and using visuals as mnemonic devices provided opportunities for students to engage with vocabulary. Asking different kinds of questions and copying, identifying, or repeating visual information afforded meaningful exploration of material. Using these strategies, teachers pushed their students to engage meaningfully with visuals and to use them to visualize (think), learn, and communicate.

Teachers in this study believe that visuals facilitate initial learning processes, engage students, foster connections to information, facilitate recall, increase

confidence, and facilitate a spiral of learning that potentially leads to an increase in critical thinking. In order to provide authentic and meaningful interactions with visuals in education, teachers used technology to facilitate access to visuals and to potentially increase engagement, motivation, and enthusiasm for the lesson. They chose or designed visuals they felt were aesthetically pleasing, age-appropriate, and offered students multimodal ways to access content. Finally, print-centric resources formed part of how teachers taught with visuals, as text was perceived as a visual when the focus was on form and not so much on content. The findings are linked to existing literature and illustrate different strategies, methods, and resources teachers may use to integrate the use of visuals for instruction.

Discussion of the Findings

This study reinforced the use of visuals as an important way to encourage thinking, learning, and communicating in technology-enhanced environments. In addition, this study adds to the body of visual literacy literature on three fronts. First, it highlights teacher's choices and the beliefs that drive these choices when using technology and visuals for instruction. Second, by positing the ways in which these teachers integrated visuals, this study helps highlight some existing teaching practices used to foster visual thinking, learning, and communicating. Finally, it supports the VSF as a basic framework that can provide a starting point for visual literacy integration and reflection in technology-enhanced classrooms.

Teachers' choices

Many of the studies extant explore teaching practices concerning certain types of graphic representations, such as graphic organizers (Coleman, 2010). There have been scant studies that have looked beyond particular visuals used in the classroom. In

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England, for example, Omar's (2000) study explored the skills teachers demonstrated, the purposes of materials used, and their expectations of what children are supposed to know when using visual materials, in hopes of establishing preliminary guidelines to using visuals in the classroom. Omar found that realistic, ready-made print materials and textbooks were the dominant form used by teachers. In addition, it proved difficult to establish a guideline for classroom use, as no clear link appeared between design and purpose.

The parameters of my study allowed me to more specifically focus on teachers' choices in terms of what resources and methods they employed. As technology facilitates access to a wealth of materials and programs that allow teachers to create their own, looking into these choices provided more information on design and purpose. Having so many choices meant teachers were restricted to neither the traditional nor the innovative, which fostered a deeper reflection of what they felt they needed to include in their lesson to more effectively teach their students. For example, the technology used influenced which types of visuals teachers included (e.g., the document camera facilitated the sharing of traditional print resources), how teachers approached the content (e.g., pointing, using visual elements, and creating visuals, for example), and the demands on students to participate, question, and connect with the material (e.g., creating mnemonic devices, including their own visuals, and using visuals to present information).

Teachers made several conscious choices when deciding to use technology and visuals for instruction. When choosing technology for instruction, they emphasized show-and-tell technologies and encouraged students' independent exploration of

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resources as opposed to being passive receptors of a lecture. They considered the format and content of the resources to determine their usefulness for instruction, so as to increase students' motivation to engage with the content. Many times, they used print-centric resources.

When choosing visuals for instruction, teachers looked for multimodal resources, such as manipulatives, interactive videos, graphs, and clipart. Students were encouraged to "read" the visuals in order to construct meaning from them. Teachers considered the colors, formatting, and relationship to the content of the lesson.

Teachers' beliefs about visuals and technology were an important influence on how and why they incorporated the above-mentioned visuals and technology for teaching. For example, design decisions were deeply connected with teachers' perceptions of themselves and their students as visual learners. They expressed a need to include visuals in their pedagogy because that is how they learned. They believed visuals facilitate initial learning processes, engage students, foster connections to information, facilitate recall, increase confidence, and facilitate a spiral of learning that potentially leads to an increase in critical thinking.

In addition to teachers connecting previous experiences with how they integrated visuals, their expressed beliefs on what constitute visuals further inform how they designed instruction. One of these beliefs is that text can be a visual if the focus is on form. For example, a hamburger is a popular metaphor for writing a structured essay. The buns represent the introduction and conclusion, while the meat and other additions represent detail. The formatted writing itself speaks to this metaphor, facilitating

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visualization of where the different parts are located. Students can identify the introduction, for example, without knowing or having to read the content.

While this study helped illuminate some links between design and purpose, as with previous studies, this remains a challenge (Omar, 2000). Part of the reason for this was teachers' varying definitions of visuals, as well as a disconnect between what they stated were their beliefs and what I observed in their practice. Where some teachers remarked how visuals fostered higher order thinking skills, for example, there were very few instances where this was encouraged in the classroom. The potential for deep analysis, however, was present in the line of inquiry whenever there was a discussion of visuals.

These findings reinforce what many proponents of visual literacy have called for: a need to establish commonalities of visual literacy across the disciplines (Avgerinou, 2001; Brill, Kim, & Branch, 2007; Clark-Baca, 1990; Messaris, 1994; Moriarty, 1997; Seels, 1994). Understanding of visual literacy would depend on the discipline and context. In the case of education, this could mean establishing a framework for an educational visual literacy that includes a definition, emphasizes a process for teaching, and fosters visual thinking, learning, and communicating. In the following sections I further discuss these ideas and present the VSF as a basic framework for educational visual literacy.

Teachers and the Visual Spiral Framework (VSF)

Coleman's (2010) study in the United States examined K-5 teachers' instructional practices and strategies involving visuals. Coleman conducted a survey where she asked about the use of graphic representations, their frequency of use, and what were teachers' instructional practices involving these representations. She found that the

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most frequently reported practices included pointing to visual representation in texts such as books, using graphical representations to organize text, and having students use Venn and web diagrams to organize, plan, and compare and contrast ideas. She found there is a lack of direct instruction when it comes to the uses and purposes for graphics. Coleman also highlighted the importance of image-centric delivery systems in metacognition in learning, as well as the need for teachers to explicitly remark on how to read such visuals.

While my study led to similar findings, it also found similarities among teachers in how they taught using different visuals. Teachers' beliefs, experiences, and conscious use of visuals in the classroom challenge the existing notion that visual literacy is not being taught. While it remains true that visual literacy is not explicitly talked about or explained to students, it is being used implicitly as one way to teach thinking, learning, and communicating. Teachers do have an understanding that their students need to know their way around technology for future jobs and that visuals have always been-- and continue to be--an important way to learn. However, there needs to be a shift from implicit knowledge and teaching to a more purposeful, explicit way of engaging with visual literacy in the classroom. It is important, then, to begin with what is already happening in the classrooms and build from there.

The findings from this study highlight the processes teachers used to provide students with opportunities to engage with technology and visuals as part of their learning, which I have dubbed the Visual Spiral Framework. The Visual Spiral Framework encases methods, strategies, and resources that are consistent with many of the tenets of visual literacy as operationalized by Seels (1994) and Avgerinou (2001).

Image-centric resources were used to encourage students to interpret visual information. Visuals were deemed critical to learning as one important way to be able to judge information for credibility, evaluate meaning, and identify and appreciate the techniques used to convey information. Visuals were used, created, and modeled to help others establish meaning and internalize learning.

The VSF highlights the importance of visuals as a motivating, powerful, and meaningful way to provide students with an entry into a lesson. It promotes enhanced comprehension through visualization, analysis through inquiry of different components, and helps establish relational connections to the information. The VSF is a process for teachers that encompasses the creation, expression, teaching, and revisiting (reflection) of visual information.

While teachers did not explicitly voice knowledge of visual literacy tenets, many were present in their instruction as part of the VSF and in their remarks. For example, they readily agreed that a visual may be seen with the eyes or in the mind and may include other modes such as text. It may also include various concrete objects such as pictures and manipulatives, and it may be used for thinking, communicating, and learning. (Avgerinou, 2001; Seels, 1994). The teachers used basic components of visual language, such as colors and shapes, to encourage discrimination of important information and orient students' attention. Teachers encouraged students to independently construct meaning from visuals and to turn information into pictures, such as mental movies or graphic organizers. They also encouraged an analysis of visuals through inquiry to aid in meaning-making. Finally, they encouraged students to make

relational connections between images and text, which provided opportunities for students to tap their background knowledge, feelings, and ideas.

Implications

This study presents several implications for teachers, teacher educators, and researchers. I begin by drawing strategies from what I gleaned from the data. Then I explore implications for future teacher educators. Finally, I detail several limitations to this study and how this might influence future research.

Implications for educators

Teaching with visuals in technology-enhanced environments can be challenging and rewarding. Traditionally, teachers have taught content mostly through lecture using print-centric resources. Now technology affords other possibilities, where knowing and teaching visual literacy is of increased importance; where technology has inspired changes even in the ways teachers and students interact (Dwyer, 1994).

The current study adds to the body of literature that addresses ways teachers can integrate visual literacy tenets in their instruction to foster visual thinking, learning, and communicating. The findings of this study indicate that teachers' understanding of visuals and technology for instruction, their design or choices of materials for instruction, their beliefs concerning visuals and technology, and their approach when using these resources in the classroom play key roles in fostering thinking, learning, and communicating with visuals. A willingness to make mistakes and use these resources in the classroom potentially increases meaningful opportunities for teaching and learning. Teachers' practices gathered from this study highlight how they operated within the Visual Spiral Framework to foster immediate connections to content, provided visual contextualization, and encouraged internalization and externalization of information.

They used strategies such as basic visual elements and activated students' background knowledge, inquiry, and summarizing to increase opportunities to meaningfully engage with visuals to construct meaning.

However, teachers' use and description of visual literacy emphasized visuals as subordinate to linguistic text instead of as an addition to the types of literacy students may need. No teacher used visuals as stand-alone texts. Visuals were always referred to in tandem with other modes. The focus when encouraging engagement with visuals was mostly on the basic syntax of visuals, i.e., that is, the elements of visuals (colors, lines, and shapes). Other elements—such as manipulation, editing, and foreground-- were not explored. Similarly, the semantics of visuals (i.e., how is this image related or not related to our culture?) were barely addressed. Findings from this study reinforce the idea that higher order visual literacy skills should be taught explicitly, as they are not developed solely by looking with our eyes (Ausburn & Ausburn, 1978).

Not taking opportunities to examine visuals in depth potentially ignores or undermines the power of visual literacy for interpreting content, examining ideological implications, making judgments of worth, evaluating, and appreciating image-centric visuals (Bamford, 2003). It is important to understand that visual literacy may foster analysis of syntax and semantics, analysis of production techniques, evaluation of aesthetic, evaluation of purpose and audience, and apprehension of the affective impact of images (Bamford, 2003).

In addition, technology in the 21st century has emphasized the need for visual literacy. Contemporary technology is heavily visual, delivering information ranging from the simple to the increasingly complex. This necessitates not just a willingness to use

technology in the classroom, but adapting and adopting technology as one way to access and process different knowledge. Mishra and Koehler (2009) presented a framework for teaching that includes technology. It emphasizes the interplay of three forms of knowledge: content, pedagogy, and technology. Technological Pedagogical Content Knowledge (TPACK) identifies the complex nature of teacher knowledge, compounded with contemporary technology. According to this framework, it is important for teachers to understand the impact of technology, develop technological tools for educational purposes, understand how technology and content influence each other, understand how teaching and learning change when using technology, and flexibly integrate technology, pedagogy, and content (Mishra & Koehler, 2009). The findings from this research, however, suggest this reflection and flexibility are not taking place. They reinforce what Hooper and Rieber (1995) have noted: that it is rare to find teachers who move beyond the utilization stage of technology integration. Findings from this study emphasize the need to move beyond treating technology as an extra tool in the classroom in orderto break away from the familiar and explore the connections extant among technology, content, and pedagogy that include visuals as another level of complexity of meaning.

Teachers need to take advantage of current technologies to promote visual literacy skills and competencies in the classroom. Shifting the implementation of the VSF from implicit to explicit visual literacy instruction can provide students with opportunities to enhance their learning, work collaboratively, help them understand themselves and others, and solve problems creatively. Focusing on visuals as stand-alone texts invites students to make connections between images and ideologies,

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analyze and evaluate them, work collaboratively, and manipulate and recreate visual

information. The following are strategies gleaned from this study's findings and

suggestions as to how they may be taught explicitly and in a more in-depth way within

the VSF in a technology-enhanced environment.

- Use visuals to help students make personal connections to the content--teachers can ask questions such as: what does this remind you of? Is this something that has happened to you or you know has happened to someone else? How does this image make you feel? What is the message in the image?

- Use technology and visuals as a way to increase student interest and engagement--teachers can begin conversations about choices made when taking a picture or including a drawing in a book, for example. When watching a video, teachers can ask explicit questions about the use of color, sound, movement, expressions, voice, and other specific elements such as foreground and background (e.g., Why were these elements shown over others? What is the difference between the foreground and the background and why is this significant?)

- Create and use visuals as mnemonic devices to facilitate recall--teachers can ask students to come up with key words, movements, or drawings to help remember key concepts.

- Create visually rich learning spaces so that students are constantly engaged and connecting previously learned information with new content--examples of this include student-created anchor charts, word walls, a "graffiti" wall where students can jot down their ideas, comments, or questions, posters, etc.

- Play around with technology and allow students to experiment as well--teachers can take this as an opportunity to ask students why they think technology is important. They can also encourage students to think creatively by using the technology to do things other than what it was specifically designed for.

- Master one delivery system before experimenting with more--at times technology can be overwhelming to learn. It is important to take it one step at a time. Explore what is available, make a list of what could be most beneficial for instruction and learning and then use and feel comfortable with one system before tackling the next.

- Use technology as much as you can--using technology emphasizes its importance in the world.

- Learn what other teachers are doing with visuals in the classroom and model the use of technology for other teachers--modeling for others can also be beneficial in encouraging experimentation with technology.

- Choose colors as a voice--consider creating and explaining the links between the use of color and the teacher's intention (when writing on the board, for example). This emphasizes the intentionality behind using color and teaches students to think about color choices and how such choices may impart meaning.

- Use visuals to jumpstart students' thinking on a subject--let students know that one purpose is for them to read the visual. This is a good opportunity to teach basic visual elements such as line, color, shape, size, etc.

- Model for students how to create a visual that will help them increase their understanding--explain each aspect of the visual and emphasize how it may be helpful when studying.

- Use a lot of graphic representations, such as diagrams--image-centric resources offer "sensual immediacy" (Callow, 2005, p.9) which may help students organize and process information to enhance understanding.

- Encourage creativity by having students create visuals to go along with their writing--explore with students the different purposes for including drawings with their writing. For example, to facilitate visualization, to foreshadow events, to heighten an emotion in the writing, to explain a concept, etc.

- Verbally establish a direct and explicit relationship between visuals and the content being taught--explain, for example, how the visual enhances the content or encourages the viewer to ask questions.

- Ask questions of visuals that have to do with issues (What could this image mean to the viewer?), information (What new information is in the picture that may not be in the text?), who (Who is the audience for this visual?), persuasion (Why was this image chosen to convey a particular message?), and assumptions (What experiences are assumed in this image?) (Bamford, 2003).

Implications for teacher educators

As technologies and contexts change, so does literacy (National Council of

Teachers of English, 2008). As views of literacy and what counts as literacy continue to

broaden and shift, educators must recognize the increasing diversity, complexity, and

demands of our global economy. To be able to compete in such an environment, not

one, but many literacies are needed. While we have many types of learners, working

with visuals is something they will have to practice if they are to compete in technical and visually-rich environments. It is necessary for teacher educators to explicitly include technology and visual literacy standards, resources, and strategies in their instruction so that future teachers learn the importance of doing so.

In this study, the literature on visual literacy and The Visual Spiral Framework both emphasize visual literacy tenets that can aid in student internalization and externalization of content. The processes and strategies employed by the teachers in this study can serve as a framework for future teachers. They can reflect on these processes, discuss them within other contexts, and benefit from the input of others. In addition, future teachers should be given ample opportunities to use technology and visuals in meaningful ways. Direct instruction alone may not effectively address the complexities of both technology and visual literacies. Through experience, future teachers have opportunities to think about visuals and technology not just as tools, but as other ways to foster thinking, learning, and communicating. For example, in a lesson on how to give an oral presentation, visuals can be touted as one way to help an audience understand a concept. A lot of thinking goes into making this visual, as everything from colors and lines to shape and movement are ways to communicate information.

Implications for future research

Similar to past research (i.e., Omar, 2000), observations, interviews, and field notes seemed to be adequate for data collection on instructional practices and beliefs. The observations were helpful in examining multiple instances of different use of visuals and technology, while the interviews made it possible to consider and explore teachers' beliefs and purpose for using multimodal representations in the classroom. In addition,

videotaping these processes helped capture and explore linguistic, contextual, and procedural details that may have otherwise been overlooked. Inductive domain analysis proved revealing and allowed an exploration of ideologies that heavily influenced teacher practices. These data collection and analysis methods may prove useful for future research in this area.

The results of the analysis for this study, however, are encumbered by limitations that are important considerations for future research. First, this study involved a limited number of collaborators from one school. While there may be similarities, the findings from this study may not be repeated for other research on the subject. It is important, then, for the reader to carefully consider the framework, methodology, and context in which this study took place before deciding if findings may apply in some way to other contexts.

Second, this study did not include the effectiveness of teachers' use of visuals or technology in supporting literacy instruction. The study focused on their practice and beliefs, which were connected to the use of visuals and technology. The Visual Spiral Framework only reflects teachers' processes when using visuals for instruction. As such, the VSF is not construed as an evaluative tool, or the only correct way to implement visuals in technology enhanced classrooms. Future research could study other contexts where features of the VSF are present and add, revise, and/or challenge what is there.

In addition, future research can investigate how teachers' beliefs are connected with teachers' effective visual literacy instruction. This could lead to a richer understanding of contextual influences in the use of visuals and technology.

Furthermore, this study did not include data on student achievement, reception of materials used for instruction delivery, and use and beliefs about visuals and technology. Future research might include students' perspectives and experiences to reach a better understanding of how visuals and technology may influence their academic experiences.

A finding of this study suggested that teachers still heavily use print-centric resources for literacy instruction. Since the initiative for integrating technology in the classroom has been carried out with gradual implementation, the use of primarily print-based materials could be ascribed to what has been historically used in the classroom. Perhaps teachers are simply used to these materials. With the continued integration of technology, there could be a gradual balancing out of the use of print and visuals for instruction, or it could lead in another direction entirely. That remains to be explored, elsewhere, in the years to come. Perhaps future research could focus on the transition from print-centric to technology-enhanced classrooms and note trends, changes, adaptations, practices, beliefs, and other considerations. For the moment, findings from this study suggest print remains dominant by design, while the use of visuals potentially increases with the use of technology.

The collaborators in this study left me with new knowledge, impressions, thoughts, and wonderings. They helped me shape the idea of a visually and technology-enhanced classroom. What does it look like? What could it look like? These questions, and others, remain open for further consideration. Those in the field of visual literacy need to come to an agreement about the definition of visual literacy and its basic tenets as it relates to the field of education. In addition, more research needs to be conducted

to begin to glean an understanding of how explicit visual literacy instruction may

influence instructional design and student learning.

APPENDIX: INTERVIEW GUIDE SAMPLE

Thank you very much for agreeing to participate in this research. I want to talk to you about visuals you use in the classroom during instruction, as well as the technology you use that may include use of visuals. I would like to know how you understand how visuals impact students' learning in a technology-enhanced curriculum. I would like to ask you few questions.

1. How would you define the term "visuals" for use in the classroom? In other words, what counts as a visual for classroom use?

2. How often do you use visuals for teaching?

3. What are your favorite visuals to use for instruction and why?

4. How important do you believe visuals are within a technology-enhanced curriculum?

5. What kinds of skills do you believe students need to effectively engage in a technology-enhanced curriculum?

6. I would like you to expand on the characteristics of what you believe to be an effective use of visuals in the classroom.

7. Describe the characteristics or qualities of what you believe teachers need to know or have in order to be effectively use visuals for instruction.

8. During one of the observations, you told students to: "Make yourself a visual for #5." What do you expect students to do when you say this and why do you want them to be able to do? For what purpose?

9. During many of the lessons you used electronic slides to present information. What is your process for finding/creating these resources and what do you take into consideration when thinking about using them for direct instruction?

10. How do you feel technology has impacted your instruction in how you use print information to teach?

11. How do you feel technology has impacted your instruction in how you use visuals to teach?

12. Is there anything else you would like to add? Thank you for your time.

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BIOGRAPHICAL SKETCH

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