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Visual Thinking Tools To Enhance Nonfiction Reading Comprehension In The Middle School

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VISUAL THINKING TOOLS TO ENHANCE NONFICTION READING COMPREHENSION IN THE MIDDLE SCHOOL

By

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To all of those who have supported me through my graduate school journey and a special thank you to John Weissert.

“The eye sees only what the mind is prepared to comprehend.”

Henri Bergson, French Philosopher and Educator

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CHAPTER ONE

Introduction

Background

When a middle schooler is excited, they want to the world to know it. The craftsmanship of good teaching is channeling the excitement of a middle schooler to learn by planning engaging instruction. In a middle school classroom, often the excitement happens between peers socializing, but also when students can make connections and dig into their content. It can feel like a magical process, when a class is humming with synergetic flow. Teachers strive for that kind of classroom environment on a consistent basis. Within this space of synergy, many good things can happen: content engagement, depth of understanding, critical thinking, connection making, idea sharing, cooperative group work. I started this journey, towards a masters in literacy education, asking myself, how can I best engage students to reach this consistent state of flow.

Engagement and classroom flow are achievable. Most teachers experience it, albeit some more than others. It is something that we, teachers, bring home at night, excited to think about and share. In my experience, there are so many possible avenues to this state, indeed, they even happen spontaneously sometimes – from factors seemingly, perhaps truly, out of my control. But in looking for a way to inspire this in my classroom with consistency, relying on external spontaneous factors is not a great option. Instructional techniques must be translatable, something that can be applicable within any curricula. For literacy it should work for anything that can be read, which is to say nearly

every genre and text structure. It should be transferable, something that students can apply to their own experience before the moment in the classroom, and students can also transfer to new challenges after the class ends. Instructional techniques should also be easy. It has to be a technique that doesn't take weeks or months to master. It should be accessible to students from the first time they use it. To do so, it must tap into skills that already are native to middle school students. And, since middle school students have such varied academic and experiential background, the technique should be flexible enough to scaffold between learners of different levels and grow with the students as they develop greater and more complex understanding, even within the same classroom.

Of the handful of instructional techniques that fit these criteria, I looked for one that could maximize access for all students. So, when I was posed the question, "What are some ways your learners make their thinking visible during literacy instruction?" it struck me as an immediate hit. Students are constantly drawing, doodling, much like many adults are. Thinking visibly, is natural and native. Moreover, the advantages are becoming more widely regarded and accepted in the academic and business worlds through mind mapping and built journaling. At the time the question was asked, I was attending the EARCOS (East Asia Regional Council of Schools) Conference in Kota Kinabalu, Malaysia March 2015. It gave me pause to reflect, how are my students able to show their thinking? As a middle school teacher of 6th and 7th grade students in English Language Arts and Social Studies- Ancient History and Geography; I know that I must teach my students to channel their energy, enthusiasm, and ideas in a way that that is most powerful for them. Where unruly debates are demanded, but controlled professionalism is unknown- I must work towards providing my middle school students

with frameworks to structure their thinking, opportunities to expand and heighten their critical thinking and ultimately, communicate these ideas to others.

In my classroom, students respond to what they are reading by jotting thoughts on post-it notes, annotating articles in the margins, preparing discussion questions and reflecting in preparation for literature circle meetings. I do strive to put the ownership on my students to recognize their own thinking, but what more can be done? What if there is a way to teach students cognitive strategies to improve their awareness of their thinking? What if students used visual tools to be able to see their thoughts in order to drive their thinking deeper or use visual tools to strengthen reading comprehension?

The concept of connecting visual tools and reading comprehension fascinates me because in order to understand how this process works, one has to first understand how learning happens. If teachers can get to the root of where learning occurs, we can understand when student's learning shuts down and become better at teaching students who have hit the learning roadblock. We must also have a comprehensive understanding of visual tools, what they are and how they work, as well as an understanding of good reading comprehension strategies in order to then put these concepts together.

I believe that the underlying purpose for literacy is to really teach students to be critical thinkers; how to spark, communicate and revise thinking after reflection and gaining new insights. If reading is thinking, how can we see this? Ritchhart and Perkins (2008) discuss how invisible the process of thinking really is, that in order to become more effective thinkers, we have to learn how to make our thinking visible. We must externalize thinking through speaking, writing, drawing. Once these thoughts are made visible, the student is then able to work with them much more easily.

Having been a teacher of both language arts and social studies in a middle school setting, I am interested in helping my students read and critically analyze nonfiction texts. I believe that through the teaching of visual thinking tools, we can teach students strategies to visualize their thinking while they are reading to help them construct and comprehend the meaning while also thinking more critically about it. I believe that visual thinking tools can lay the foundation for these externalized thoughts, which can then be better analyzed, manipulated and discussed critically. Therefore, I am on a quest to uncover effective strategies to help my student visualize their thinking and answer my question: *How can visual thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?*

Personal and Professional Connection

In my first six years of teaching, I taught in high English Language Learner (ELL) population. Through that experience I received extensive professional training and support with ELL co-teachers. Two of the major takeaways I learned for supporting ELLs are explicit instruction through the use of visuals and vocabulary development. I know that these same best practices for teaching ELL students, benefit all of my students. The more I have learned about using visual tools in the classroom the more I am able to recognize their wonderful universal design to support all learners. When students use visual tools, they are challenged to become constructivists of their own thinking and learning.

Through this research, I hope to gain practical methodologies to increase student learning and comprehension in all areas of my teaching.

As a teacher I believe it is my job to guide my students to acquire knowledge by emphasizing to my students that is their responsibility to discover their own learning. I want my students to gain independence and pursue their own interests to become their own experts. I strive to be an expert in facilitating these strategies for learning and critical thinking. I am not an expert in all of my content areas, as I have taught a variety of social studies courses over the years from American History to Geography, to Minnesota Studies to Ancient History. Although I taught Ancient History for two years, I did not know more about the Spartan military than my 6th grade warfare fanatic students, nor did my depth of knowledge regarding Greek mythology compare to that of some of my passionate and enthusiastic students. As a content area teacher, like in social studies, where you can never know it all of the content, it is essential to provide students with the tools and strategies for acquiring their own knowledge. I am also able to share my expertise with students to construct deeper understandings of the content through making connections, providing frameworks and routines for thinking more deeply.

When students are equipped with electronic devices in the 21st century to answer all of their questions at their fingertips, what is the role of teachers? I think that the heart of this research will help to illustrate what the future educators purpose is in the classroom- to help students think in new and different ways and to express those ideas clearly and in a multitude of ways. I do not believe that I am, nor need to be the all-knowing gatekeeper of information in my classroom- I want my students to learn how to investigate and find the information they need to answer the questions that they have lingering. It will become important for our students to become both independent and cooperative thinkers, speakers, writers and readers.

Through this research, I have begun to explore more deeply about how the brain works and how this must relate to the way we teach. What I thought was a great reading comprehension strategy for my students is much more than that. Visual tools should be taught because, "Students enjoy the process of opening their minds and showing not only *what* they are thinking (content) but also *how* they are working through complex questions (process)," (Hyerle, 1996, p. 3). Visual thinking tools are a way for students to unlock both their thoughts and their process of thinking.

Visual thinking tools are called as such because like any tool you might find in your toolbox, there is one right for every job. The process of selecting the right tool will take some training but will ultimately lead to higher level thinking and comprehension; students will have to slow down and become more aware of their thinking process. Teaching these visual tools will involve a systematic progression of introducing a tool within its own lesson and logically rolling out more tools for students to add to their repertoire.

On a basic level I have started to use visual tools in my own classroom but hope to take them even farther through this research. I think that the best way to teach them is to select the ones I want to use; a combination of Singer's Brain Frames (2015) for reading and note- taking strategies and Hyerle's Thinking Maps for broader concept thinking strategies. I can see how these can be taught systematically at the beginning of the year with large example chart papers hung around the classroom to be used as a point of reference throughout the year. In a concrete way, visual tools can be used to enhance reading comprehension by encouraging students to interact with text.

In my 6th and 7th grade social studies classes I have taught Singer's (2015) sequence walk as a strategy to preview sections of their textbooks. After leading the students through a fifteen-minute mini-lesson, 100% of the students were able to continue independently and are able to preview a section of their textbook with accuracy. To do this work, students bubbled the headings, drew lines off of the heading to write connecting prior knowledge, drew an arrow to the next bubble with the next heading, and again, wrote connecting information and continue on through the sequence of the whole section. The students were then ready to read the section of text. As the students read, they added new information and crossed off mis-information, enabling students to connect their prior knowledge with newly acquired understandings. As the students became more familiar with this Brain Frame (Singer, 2015), they can make it their own by adding thought bubbles to share their personal reflections. This visual thinking tool allowed students to both activating prior knowledge of the content from the reading, as well as also previewing the text structures. One of my 7th graders said, "Ms. Lund, this is pretty cool, are we going to keep taking notes like this?" Before using a Brain Frame for note-taking, none of my students ever commented on particularly enjoying any note-taking strategy.

Next Steps

Knowing that visual tools are already connecting with my students reassures me that this work is valuable. This also suggests long-lasting benefits for my students as they find this work relevant to them. I want my students to feel a strong sense of awareness of their learning and knowledge they gain, as well as awareness of the process that they go through while doing so. I do not want the learning process to be a secret; where some

students succeed, and others do not because they lack thinking strategies. I want all of my students to be equipped with the tools necessary to succeed. I believe that all of my students are capable and desire to thinking critically and feel smart. I want to provide these keys for my students to help them in unlocking the door to learning. I look forward to continuing my research with visual tools to enhance student thinking in my classroom and beyond.

Teaching visible thinking is so vast in scope. For the purpose of my research, I had to narrow it down to focus on the use of visual thinking tools as laying the foundation for critical thinking of nonfiction texts and content specific reading. However, there are many more kinds of ways to apply visible thinking routines into the classroom. I am curious to explore other uses of visual tools from Harvard's Project Zero such as Edward De Bono's Six Thinking Hats (1985, 1999) to develop empathy. The Six Hats are thinking tools to better understand multiple perspectives for reasoning and problem solving.

I envision my students acquiring all of these tools to enhance their critical thinking, adding them one by one into their toolbox, and using them in and beyond my classroom. It is important for all teachers to become aware of this research and to begin developing the thinking curriculum that is right for their classrooms, divisions, schools and districts. Through my research I will answer: *How can visible thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?*

Conclusion

Through this research I hope to further define what visual thinking tools are, how they can be used within a content area middle school classroom to lay the foundation for critical thinking and deepening reading comprehension. I will explore their range of application and focus on ways that visual thinking tools can be used to increase student learning and thinking before, during and after reading nonfiction texts. I hope to uncover how visual tools help students to self-regulate, take ownership, develop their critical thinking and enhance reading comprehension. This research will teach us how to enhance learning, thinking and reading comprehension using a tangible and flexible visible thinking strategies. The aim of this capstone to ultimately design visual thinking tools implementation curriculum to answer the question: *How can visible thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?*

In my chapter one, I have introduced myself as an educator and provided a rationale for my purpose, problem and research question. Chapter two will contain a literature review that will lay the groundwork for understanding the concepts and theories behind my project. Chapter three will describe the project. Lastly, chapter four will be a critical reflection on the project.

CHAPTER TWO

Literature Review

Introduction

Cultivating critical literacy in our students requires teachers to foster deep and complex thinking and reading strategies. In order to help our students meet these high reading demands, it is our job as educators to supply our students with opportunities to develop their skills, and strategies to meet the threshold of critical literacy. Through this literature review, I seek to further understand how visual thinking tools provide our students with a means of achieving these goals. This literature review will cover five themes; 1) 21st century literacy demands, 2) the young adolescent learner, 3) reading: comprehension, theorists and strategies instruction, 4) making thinking visible through visual thinking tools, 5) teaching with visual tool for transforming information into knowledge.

As a teacher of the 21st century world, it is essential to recognize the unique and specific needs of a modern reality. How will our teaching practices incorporate tools to guide our 21st century learners to meet the demands of our modern world? I believe that this can be achieved when students are able to critically analyze and express their ideas in response to a text. When comprehending nonfiction texts, students must gather data and draw inferences to express meaningful understandings. Students must be critical of these texts to take their comprehension beyond fact collecting. Indeed, post-secondary education is increasingly the status quo and a requirement for gainful employment. In

2002, the US census found that 26.9% of adults over 25 years of age had a bachelor's degree or greater. Just 15 years later, in 2017, the US census found that 34.6% of adults over 25 years old had completed a bachelor's degree or greater (US Census, 2018). Concurrently, in the US wages over this same 15-year period for employed adults had remained statistically unchanged when adjusted for inflation (Wilmers, 2018). This would suggest that the 21st century economic environment has increasing education demands in order for adults to achieve a level of employment that would achieve a similar wage. Indeed, Levy & Murnane (2005) noted this trend over a decade ago that demonstrated the fastest growing professors have the highest literacy demands, while professions with lower demands are actually shrinking.

Furthermore, past policy studies suggest the changing economic landscape is increasing demand for adolescent learners to read and write at a higher level than their predecessors (Carnegie Council on Advancing Adolescent Literacy, 2010, Jacobs, 2008). Perhaps not surprisingly, but certainly distressingly, adolescent classrooms have been slower to adjust to the changing demands. In a 2010 survey, only one third of post-secondary professors found only 1/3 of their students arrive with the necessary literacy skills for their discipline (ACT, 2010).

Yet, consensus regarding what the explicit 21st century literacy demands are for adolescent learners has been slow to develop. Therefore, the first section will explore 21st century literacy demands, which include critical literacy, visual literacy, and the increasing demand of nonfiction digital texts. 21st century literacy moves the classroom and student expectations beyond simple decoding, but true comprehension means high levels of analysis and dynamic thinking are involved while interacting with text.

Importantly, it moves beyond the paper text to digital formats. Digital content already predominates the reading content for most students, and their adult counterparts for that matter. Explicitly teaching students to navigate digital content in the classroom improves comprehension and deep thinking. At the highest-level 21st century literacy doesn't do away with paper content but shares classroom time with digital content and balances the analytic and visual thinking techniques between digital and non-digital content.

Secondly, the literature review will cover the young adolescent learner. The middle school student possesses unique characteristics. Teaching middle school students how to use visual thinking tools as a strategy for non-fiction reading comprehension provides academic skills necessary for these students to be successful independent learners throughout their secondary and post-secondary educations. Furthermore, middle school students often have wide ranges of content specific experience and education, making them an ideal student population to practice transferable literacy skills and a generalizable visual thinking toolkit.

The third section includes fundamentals of reading comprehension and a strategies approach for instructional practices. For visual tools to strengthen nonfiction reading comprehension, they must coincide and enhance the good reading comprehension strategies that we know and teach our students. In the same way that reading strategies must be systematically taught to our readers, so do visual thinking tools, as these are also used to enhance comprehension of reading.

The literature review will next explore what visible thinking is and what is meant by "making thinking visible". We must understand the purpose and importance of visible thinking and what it entails. This section will also draw connections between visual

thinking tools and visual literacy. The process of visually representing thinking is obtainable, beneficial and engaging to all learners.

The literature review will conclude by exploring how to teach and use visual thinking tools for transforming information into knowledge. This section will clearly define and explain different kinds of visual tools and how they can be used uniquely to benefit learning. This section will lay the foundation for the visual thinking strategies toolkit I will be designing to introduce and implement visual tools in the content area classroom.

The Common Core and 21st Century Literacy Demands

Nonfiction and the common core state standards for middle school students.

State leaders including governors and state education leaders of 44 states developed the Common Core State Standards (CCSS) in 2009. The goal of the CCSS is to help simplify and homogenize the definitions of proficiency that had been developed ad hoc by each individual state. They were developed from a collection of thought leaders, government officials and the public to ensure students have well established educational goals to prepare all students to enter the workforce or postsecondary education. They were implemented starting in 2009 as states voluntarily adopting the standards by school boards, state legislation or state superintendent. There remain several states, including Minnesota, that have not adopted the CCSS statewide. (NGA, 2008)

Specifically, the CCSS place a strong emphasis on nonfiction and text complexity for readers across all grade levels. To address the CCSS, librarian Robyn Young (2013) writes, “students need sustained exposure to expository text to develop important reading strategies, and the expository text makes up the vast majority of the required reading in

college and the workplace." She acknowledges the reasonable emphasis on such required reading in the CCSS to reflect these literacy demands of the real world. In specific content areas, students need to be exposed to high quality informational texts more. The expectations are clear to emphasize nonfiction texts and we must provide the support that our students need to be successful nonfiction readers and critical thinkers.

21st century literacy demands. The common assumption through all definitions of "21st century demands" revolve around the shifting technological and economic norms from paper content that is selectively controlled through publishing houses to digital platforms that are comparatively more accessible, tremendously more voluminous less curated, yet more detailed in content specific areas. Although an author of digital content may have the power to create and present the message, readers have the unique power to criticize, question and analyze the author's message (McLaughlin & DeVoogd, 2004). These are higher level thinking skills take the reader's thinking beyond the text and must be taught and rehearsed for readers to be able to do this work successfully. 21st century demands, in essence, try to generalize what skills regarding literacy will be necessary for success in the ever-evolving global economy, and what generalizable strategies teachers can employ to help students reach those demands.

In contrast, it has been contested that the high levels of educational attainment necessary within each discipline is such that each discipline demands its own content specific background knowledge and text Lee and Spratley (2010). Additionally, Drapier, Broomhead, Jensen, and Siebert (2010) argue, without explicitly using the term "21st century literacy demands", but nevertheless conveying a similar gestalt, that (21st century) literacy must be addressed within the context of the content-area classroom and

the unique the characteristics of each discipline would require a distinct instruction. They argued literacy generalists do not have the understanding of the content to address the nuances of the literacies required in a particular discipline.

However, this may mistake the forest for the trees. As, despite their being content specific demands at the highest level, adolescent learners and their teachers could benefit from literacy learning strategies that can be generalized between content areas.

In 2013, Meyer in conducted a survey of 161 middle and high school teachers to gauge how these teachers describe the 21st century literacy demands in their classrooms. The results of the survey indicated that content-area teachers have limited declarative knowledge of adolescent literacy. Moreover, Meyer used a similar conceptual framework, which I outline in chapter 3 research paradigm/framework/theories that I adopted to address my research question: *How can visual thinking tools be used as a foundation for a middle school students critical approach to understanding nonfiction texts?*

Howard Gardner (2009) outlined five key minds we must cultivate for the future including disciplined, synthesizing, creating, respectful and ethical. Gardner (2009) elaborates on synthesizing by describing how the most valuable people of the 21st century and who will rise to success will be those who can gather a variety of sources, make decisions about what is of most importance and then synthesize this information to make sense of it for themselves and others.

To be prepared for the demands of the 21st century, Shmoker (2011) suggests students need adequate amounts of subject-area content, concepts and topics, intellectual and thinking skills (such as argument, problem solving and drawing conclusions), and

lastly, authentic literacy including reading, writing and discussion. He also suggests the need for "generous amounts of good content and critical thinking skills, and sufficient opportunities to learn to read, write, speak and listen effectively" (p. 27-28). Shmoker suggests it is important for teachers to stay focused on what is essential and ask themselves, what are my students reading, writing, speaking and listening to today in my classroom? Shmoker suggests that we, as middle school teachers, must meet students' heterogeneous abilities where they are upon arrival to the classroom and provide them the skills to churn through vast amounts of content, consistent with the increasing volume of digital and non-digital content.

21st century literacy in the adolescent classroom, therefore, includes a heterogeneous mix of digital and non-digital content. Digital non-fiction content has specific characteristics versus non-digital formats, yet students' analytic and critical thinking strategies should be developed in the classroom to meet the literacy demands for both formats, digital and non-digital. Additionally, the overall literacy expectations are greater for all levels of learners. Adolescents are no exception and adolescent learners are under increased literacy demands to be prepared for post-secondary education. Although some authors suggest focusing efforts on content specific literacy strategies, middle and high-school teachers in content specific areas lack an understanding of literacy learning strategies and are poorly positioned to support middle-school students who lack a content depth in many subjects. It is therefore essential that middle school teachers have generalizable literacy toolkits that can be transferred by teachers and students between content specific areas.

The Young Adolescent Learner

Middle school students are uniquely positioned between childhood and adolescents. These students between the ages of 10-15 are a diverse group physically, psychologically and cognitively (Manning & Bucher, 2009). As noted by Manning (1995), there are five characteristics of the young adolescents' cognitive development: they develop from Piaget's concrete operations stage to formal operations; they develop the ability to think hypothetically, reflectively, and abstractly; they develop the ability to make reasoned moral and ethical choices; they develop personal attitudes and perspectives toward other people and institutions; lastly, they develop cognitive skills which allow them to solve real-life problems.

Adolescent learners are an exceptionally heterogeneous group in terms of cognitive development. Normal pubescent neurological development can occur within the full range of 10-15 years, with girls tending more towards earlier development and boys frequent developing towards 14-15 years old, or even later. (Case, 1985)

Within the middle school classroom, teachers must have a repertoire of strategies for quickly differentiating instruction to both scaffold for the concrete operations student, as well as the formal operations students, simultaneously challenging all students to develop the ability to think hypothetically, reflectively, and abstractly. These concrete operations learners learn most effectively with concrete objects and have difficulty dealing consistently and effectively with abstractions and generalizations, whereas the formal operations learners can participate in educational experiences requiring the conceptualization of abstract relationships, employ inductive thinking, and expand the logical thinking processes (Manning, 1995).

Middle school educators must take developmentally responsive curriculum and

instruction into consideration. According to Tomlinson, Moon & Callahan (1998), to effectively serve academically diverse young adolescents, then, middle schools would seem to require a) a view of middle level learners as desirous of and able to respond to authentic challenge, b) complex, idea and concept-based curricula, and c) skill, will, and resources necessary to ensure flexible exploration and study so that the full range of readiness levels, interests, and learning profiles is actively planned for in instruction.

During this unique developmental stage we must provide the support that our students need to be successful nonfiction readers and critical thinkers. Teaching middle school students how to use visual thinking tools as a strategy for non-fiction reading comprehension provides academic skills necessary for these students to be successful independent learners. Visual thinking tools also engage students in their learning process and allow them to take ownership in the creation and design of the tools. Visual thinking tools are also easily differentiated based on the specific needs of the learners.

Reading: Comprehension, Theorists and Strategies Instruction

Introduction. This section aims to highlight the essentials in reading instruction, which will provide a focus for the use of visual thinking tools. Using visual tools is a strategy for reading comprehension that this capstone aims to illuminate. 21st century learners must be literate with a critical approach towards texts. Students apply critical thinking in selecting the visual tool they use, this will then lay the foundations for students to externalize their thinking, an essential step to critical thinking. This section will explore the underpinnings of reading comprehension, critical literacy, constructivist theory, reading is thinking and strategies instruction and lastly explicit instruction.

Reading Comprehension. There has been a shift in the understanding of the

complexity of reading comprehension to becoming a much more complex process involving knowledge, experience and thinking (Fielding and Pearson, 1994). Beyond literal understanding, true comprehension involves the reader's interaction with the text. According to Stephanie Harvey and Anne Goudvis (2007) in Strategies That Work the construction of meaning is the goal of comprehension. As readers are reading there are two major processes happening, they are not only thinking about what they are reading, but also what they are learning. Reading is a continuous knowledge building routine. As students learn they are constructing knowledge in their own way. John Hattie (2009) explains how constructivism a process through which learning and acquiring knowledge occurs, not how we teach, but how our students learn:

> Students often come to lessons with already constructed realities, which, if we as teachers do not understand them before we start to teach, can become the stumbling blocks for future learning. If we are successful, the students' constructed realities (based on their surface and deep knowing) and keenness to explore these worlds are the major legacy of teaching. (p. 26)

As teachers, if we have a solid understanding of where are students are at, and are able to see their thinking, we are better able to ensure that they will be able to construct knowledge without misunderstandings.

Critical Literacy. An influential theory underpinning critical literacy is Louise Rosenblatt's Transactional Theory (1978, 1980, 1994, 2002). Her theory suggests that meaning is made from reading when readers transact with the text from their personal

experiences. It is in this exchange and close interaction is where comprehension occurs. As all students think uniquely and have different experiences, this means that reading is a very individual experience, unique to each reader, and therefore meaning from a text is constructed differently from reader to reader. Rosenblatt's Aesthetic Efferent Continuum (1994) illustrates her idea that reading involved either taking an aesthetic (emotional) stance or an efferent (factual) stance. No reading is entirely one or the other but falls somewhere in between and changes at each reading task or experience.

This continuous read and response transaction is what I hope to assist my students with while reading informational texts by using visual thinking tools. Although providing our students with independent reading time has aesthetic benefits, we must help to balance this experience with an efferent stance as well. When we teach our students to become better readers, we must teach them strategies or different ways of thinking about text, as well as opportunities to actively engage with text both independently and socially with others. As teachers, we are disrupting the norm to challenge our students thinking. We cannot leave our students alone and isolated in their reading process.

Constructivist Theory. Within constructivism, meaning is made while reading. Readers must be actively making connections between their prior knowledge and with what they are learning to bridge new understandings from text. Brian Cambourne's (2002) assumptions of constructivism is that "(1) Learning cannot be separated from context; (2) The learner's goals are central to what is learned; and (3) Knowledge and meaning are socially constructed through negotiation, evaluation and transformation" (McLaughlin & DeVoogd, 2004, p. 21). Knowledge being socially constructed; thinking and learning is a contextualized social practice, is further supported by Lev Vygotsky

(1978). Our role as the teacher is to help facilitate this social aspect of learning in a way that benefits our students and allows them to extend their learning with their peers. Using visual tools is a further extension of this constructivist approach to literacy and provides a concrete way for readers to interact and construct meaning from texts.

Reading is thinking and reading is strategic. Reading is a thinking process, and as such, we must teach our students how to navigate this process. Readers cannot only be proficient decoders but also need to be meaning makers. Durkin (1978-79) suggests that comprehension is a strategic process, "strategic reading refers to thinking about reading in ways that enhance learning and understanding (Harvey & Goudvis, 2007, p. 23). We can think of strategic readers as those who are proficient readers who have an action plan to move them closer to their goal or purpose for reading. Strategic readers are purposeful decision makers. In order to help our students become strategic, we must explicitly teach them how to do this.

To fully comprehend text students need to monitor their understanding, enhance their understanding, acquire and actively use knowledge and develop insight to think more deeply and critically (Harvey and Goudvis, 2007). With all of these complex components to reading comprehension, readers must be systematically taught strategies in order to be able to successfully implement and use them independently. Harvey and Goudvis (2007) have narrowed down the work of Pearson, Dole, Duffy and Roehler (1992), Pressley (1976), and Keene and Zimmermann (1997) to focus on the reading strategies that are the most effective for proficiency in reading comprehension. These strategies include activating background knowledge and making connections, questioning, inferring, visualizing, determining importance and lastly, summarizing and

synthesizing information (Harvey and Goudvis, 2007).

Explicit instruction. Successfully teaching reading strategies involves clear, explicit and systematic instruction. Strategies should be taught this way so that students are able to understand the way that each of the strategies work, the purpose for each one and how to implement the strategy independently. The act of reading is not visible, as a reading teacher, we must work to make this a visible process for students to better understand what to do and how to do it better. We must make the implicit, explicit. Reading comprehension strategies should be taught one by one, taking time to introduce them individually and spotlighting how each of them work. This instruction should follow Pearson and Gallagher's (1983) Gradual Release of Responsibility framework; strategies should be introduced and modeled for the class, followed by guided practice and independent practice.

Making Thinking Visible Through Visual Thinking Tools

Introduction. In order to deepen student critical thinking, we must help students do so by providing them with the necessary tools. By teaching students to become more critically and visually literate we can push them to be more analytical by providing them with strategies for externalizing their thoughts. Once thoughts are made visible, they are able to be better understood, shared and evaluated. This research will explore how we can help students visualize their thinking to intentionally communicate it with others.

Making thinking visible. To illuminate the mystery behind thinking and learning, as teachers we need to teach our students strategies for making their thinking visible. Just as much as we want to shed light on this process for our students, we must also do the same for our instruction to make it explicit. To make instruction more

explicit, students know what their objectives are for learning each day, teachers are clear, they scaffold, model and guide practice. In order for students to really know the purpose of their learning each lesson, we have to tell them; our teaching must be visible. We need our students to show us their thinking; we must check for understanding in order to monitor and adjust, it must become visible. Emphasizing visible learning is John Hattie (2009) who say,

> It is critical that the teaching and the learning are visible...in the classrooms of the successful teachers and students, ... in the passion displayed by the teacher and learner when successful learning and teaching occurs, and ... requires much skill and knowledge by both the teacher and students. The teacher must know when learning is correct or incorrect; learn when to experiment and learn from the experience; learn to monitor, seek and give feedback; and know to try alternative learning strategies when others do not work. What is most important is that teaching is visible to the students and that the learning is visible to the teacher. (p. 25)

Ensuring visible teaching and learning, readjusts the teacher's role as "activators, as deliberate change agents, and as directors of learning" (Hattie, 2009, p. 25). This instruction is both teacher and student-centered, "this does not mean that they [teachers] are didactic, spend 80 percent or more of the day talking, and aim to get through the curriculum or lesson come what may. Effective teaching is not the drilling and trilling to the less than willing" (Hattie, 2009, p. 25). This teaching and learning needs to give

students time to think and process their learning for themselves, without a teacher guiding them the entire way. According to Perkins (2011) the mission is to teach our students not only how to learn to think but how to think to learn as well.

Visual literacy. Visual literacy is a concept and term that has been evolving and inconsistently defined since its introduction in 1969 by John Debes, when he tentatively defined the concept (Avgerinou & Ericson, 1997). The definition that I would like to use in this research is from Ausburn & Ausburn (1979b), "Visual literacy can be defined as a group of skills which enable an individual to understand and use visuals for intentionally communicating with others" (p. 291). As educators we must teach our students how to be visually literate by reading and writing visuals. We must learn how to read or comprehend visuals by decoding and meaning-making, while also writing or creating visuals to communicate ideas visually.

Literacy in the 21st century is much more than reading printed text and handwriting on paper. With all of the technologies… multimedia, websites, social media platforms, television, videos and advertisements…. It is no longer sufficient to solely read and write texts, students must learn how to process both words and visuals. Students must be instructed to be visually literate; to "read" (consume/interpret) images and "write" (produce/use) visually rich communications to move between text and images; between literal and figurative world's (Burmark, 2002).

To assist our students in becoming visually literate, I aim to teach my students visual strategies to synthesize the information they learn and share their thinking with others. These can come in many different formats, but eventually, I would like for my students to become aware of their options and make decisions on their own about how

they will synthesize the information based on a combination of preference and text structure. I think this will truly indicate visually literature students, those who can synthesize nonfiction information and create a visual tool that displays this thinking and is able to speak for itself.

Visual tools defined. The heart of the research on visual tools is surrounded by the work of David Hyerle and his development of Thinking Maps in the late 1980s. His work stems from the constructivist theorists and the "thinking skills" movement from Harvard University's Project Zero including Howard Gardner and Steve Seidel's project entitled "Making Learning Visible". Hyerle (2009) defines visual tools as, "nonlinguistic symbol systems used by learners, teachers, and leaders for graphically linking mental and emotional associations to create and communicate rich patterns of thinking," (p. xix). Visual thinking tools assist in the transformation of static information into active knowledge. Hyerle (2009) expands by saying that these visual forms also act as metacognitive tools for self-assessment.

The term visual tools might be more commonly understood in connection to graphic organizers and semantic maps. Graphic organizers, as the name suggests are a visual organization of words on paper that eliminate the linear writing format in exchange for the structure and format of the tool to make meaningful relationships among the words and ideas on the page (Clarke, 1991). Graphic organizers are limiting to our greater understanding of visual tools, as graphic organizers, simply organize information. Hyerle (2009) suggests that, "other visual tools have been designed for moving well beyond brainstorming and organizing ideas to specifically facilitate dialogue, perspective taking, mediation of students' thinking, metacognition, theory development, and self-

assessment." Visual tools are a means to heighten complexity of thought, not simply to gather and record information. Semantic maps, on the other hand are also limiting and does not fully elicit the dynamic usage and all-encompassing qualities as the term visual tools does.

The term tool is purposeful and essential to our understanding of what visual tools are and how they function. Tools, like a hammer, are stored in a toolbox and taken out as it is needed for a specific job. If you have a something to nail together, you can take your hammer and it will help you get the job done. As a simple machine, it is not too complicated to use, but with a little practice, you are able to use it comfortably. This is exactly what visual tools are like. Once they are collected and added to a "toolbox", they are then able to pull out and used when it is necessary.

Visual tools lend themselves to the natural way that our brains work, which are predominantly visual. Hyerle (2009) suggests that researchers believe that we receive about 70% of information from our surroundings through our eyes as well as we make and store images and pictures of incoming information in our brain. This shows just how important is is for us to capitalize and develop strategies for processing and making meaning of our visual world. It is further suggested that, "neuroscientists tell us that the brain organizes information in networks and maps" (Wolf, 2004), indicating that our brains are pattern detectors and are constantly seeking ways to make sense of the world around us. Visual tools provide a spatial means for really capturing those patterns and engaging students at the most fundamental levels of cognition.

In Arthur Costa's prologue in David Hyerle's book, Visual Tools (2009), he explains that Hyerle's visual tools are "a set of tools for exploring, enhancing, and

refining those unique qualities of humanness" (p. ix). Costa explores nine human qualities that make humans human, and offers insight into how, through the use of visual tools each of these qualities can be enhanced including:

1. Metacognition: Humans can think about their thinking, a process that can be enhanced by students visualizing that thinking. In order for our students to become independent we need to teach them how to slow down and monitor their own thinking process with metacognitive strategies taught explicitly to students. These strategies help students to recognize their thought process and monitor their comprehension. "Students' ineffective learning strategies are linked to poor metacognition, revealing that struggling learners have not developed the practical figure it out skills to succeed in academic challenges," (Joseph, 2010). If they are able to do this, they are able to better to self-regulate and be successful learners.
2. Constructing Abstractions: Visual tools assist in organizing and finding patterns among the overwhelming amount of information that is available. Humans synthesize this information by recognizing patterns and compartmentalizing. Visual tools will assist in both recognizing patterns within texts and organize this information (Costa, 2009).
3. Storing Information Outside the Body: Our brains have a limited capacity for storing information. It is therefore to our advantage to learn strategies for note taking that can help us organize information, "high-quality visual tools are basically used for surfacing dynamic schemas, graphic representations that externalize in blueprint form the conceptual knowledge structures bound within

the architecture of the brain" (Hyerle, 2004, p. 2).

4. Systems Thinking: Humans have an innate need for making sense of parts of the total system, by graphically depicting these relationships, we can better make sense of how information is organized and related.

5. Problem Finding: Humans are uniquely wired to detect problems and seek solutions, which we do naturally. Students trained in using visual tools will seek problems and use visual tools to help solve them.

6. Reciprocal Learning: Humans are social beings and crave collaboration and cooperative learning, Vygotsky would suggest that learning is socially constructed, a cornerstone for using visual tools.

7. Inventing: Hyerle disparages giving students ready-made maps to follow and fill in. He emphasized the need for students to invent their own tools and to hone and refine them as they generate and gather information, process or elaborate that information into conceptual relationships, and then apply and evaluate those generalizations (Costa, 1996).

8. Deriving Meaning from Experiences: If information has been organized graphically, it is much easier to return to the information, reflect on it and derive deeper meaning.

9. Altering Response Patterns: Humans are capable of recognizing patterns within information and also choosing to select alternative patterns to respond to. Visual tools encourage this consciousness and flexibility of responses (Costa, 1996)

As you can see, visual tools enhance and develop these humanly qualities, putting all of the pieces together. We are able to better understand how "the traditional linear strings of words students see in textbooks and hear from teachers in dominantly linear-auditory classrooms do not even come close to approximating the complex visual-verbal-spatial patterning of what is going on in their heads. Thus, there is cognitive dissonance..." By training students to visualize their thinking using visual tools, we are not only developing our students as learners but also as human beings and embracing the strengths and natural workings of the brain.

Visual tools in content areas. Visual tools are being used across disciplines in content-specific ways, however there is a disconnect between the bigger picture and how visual tools can be used in different way. Hyerle states, "there is rarely a coordinated effort to help students make sense of all of them (2009)." Teachers should provide students with a holistic understanding of visual tools and how they can be used across content areas, grade levels, and purposes. Although it may be difficult to teach students all of the visual tools out there, or rather impossible, we can break visual tools down into different categories- if students know what those main focuses are, they are better able know what they should use. Throughout a student's career, they can build to their repertoire of strategies within those umbrella topics of specific strategies.

Some content areas lend themselves more naturally to particular visual tools than others. Science lends itself to the use of conceptual mapping for hierarchical information, these can be used to better gauge the students' development of concepts and misconceptions. Math teachers are constantly pushing students to 'show their work'. The use of flowcharts and diagrams lend themselves to problem solving in a mathematics

classroom. Story maps are an example of visual scaffold used in a language arts classroom, enabling them to synthesize meaningful patterns. Brainstorming webs or mind maps are commonly used as scaffolds for writing prompts (Hyerle, 2009). The objective of my research is to bridge the isolationist tendencies of visual tools to provide my students a wide understanding of a multiple types of visual tools and an even greater repertoire from those.

Reading comprehension and visual tools. Writing composes our thoughts on paper, reading composes meaning in our minds (Harvey and Goudvis, 2007), so imagine combining these two actions to strengthen both the composition of ideas and increasing meaning. That is the essence of what using visual tools does during reading comprehension. Bonnie Singer Ph.D. is a researcher in the field of visual tools, but has taken her work a step further, specifying visual tools that can be used for the enhancement of reading comprehension. Singer has devoted her career to the study the relationship between language and cognition and is the founder of Architects for Learning, focusing on providing teacher training based on research findings. Singer presented at the East Asia Regional Council of Schools conference I attended in Kota Kinabalu, Mayalsia, in March 2015.

Singer defines reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (2015). Therefore, in order to comprehend text, we must become involved as readers to extract and construct meaning. The visual tools that Singer has developed are called Brain Frames, they help to visualize this process of comprehension. Singer makes the connection in her research that we need to take what we know to be best practices for

reading comprehension and combine them with visual tools to enhance reading comprehension, which are especially helpful in the development of spatial processing. Singer elaborates on Michael Pressley (1976)'s work with reading comprehension strategies and provided examples of how visual tools can be used for different strategies, for example, activating background knowledge should involve previewing text structures to help determine the visual tools that can be used or locating important information can involve putting these visual tools to use with graphic organizers or concept maps.

Teaching Visual Tools for Transforming Information into Knowledge

If we want our students to be critical thinkers, how can we assess this? How do we know what and how students are thinking? Visual tools provide a means for which to see this complex process unfold. In this section we will explore how visual tools can be categorized for different purposes, how they work and when to use them to answer the question: How can visible thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?

Visual tools may look familiar, however the way that these tools are used and taught to students is incredibly important in how powerful they can be for learning. Hyerle's (2009) work has helped to further develop, categorize and name these different visual tools, these are the three broad categories of visual tools, "brainstorming webs- for fostering creativity and open mindedness; graphic organizers- for fostering analytical content and process specific learning; conceptual mapping- for fostering cognitive development and critical thinking" (p. xix). These distinctions help us to understand the unique purposes for different kinds of tools. This literal "drawing out" of ideas can be

done across all ages from young children to adults, can be used individually or collaboratively, and constructed using multi-media platforms, websites, apps, paper, white boards. Visual tools are able to communicate thinking across cultures and languages. These are concrete tools that are dynamic and adaptable; they can be beneficial within all discipline areas for all students.

Brainstorming webs for creative thinking. Through the creative and visual representation of ideas, our brains are better able to make connections. "Brainstorming webs are natural bridges between the neutral networking of the brain and the conscious mapping of the mind." (Hyerle, 2009, p. 52). Tony Bunza's (1979, 1996) work in the use of both sides of the brain led to the specific design of Mind Maps, a commonly used and trademarked brainstorming web visual tool structure. Although we receive knowledge in predominantly linear ways in the classroom, we do not necessarily understand information con by using brainstorming webs, we are able to help our students to make sense of this information with the more sporadic interpretation needed in our minds. Hyerle (2009) criticizes our standard notebooks with solely horizontal lines and how stifling this is for the creativity and flexible thinking of our students to sketch and open their thinking.

Essentially brainstorming webs and mind maps involve the clustering of ideas from the center of the page where the process begins with the main idea and expands outward as idea expands. Brainstorming webs are readily used during the prewriting process, but often are not revisited and used organically throughout the writing process to continue to develop ideas and writing, as they could be.

Organizing thinking using graphic organizers. Although brainstorming webs

and graphic organizers are both visual, help organize ideas and help to generate ideas, these visual tools also have some significant differences. While brainstorming webs are open-ended with no specific design, start with a blank page and are idiosyncratic; graphic organizers are pre-created, are the same visual for all users and focus on specific content or process (Hyerle, 2009). Graphic organizers are great tools to help students to comprehend information and can become more valuable if the process of creating and evaluating of the organizers themselves is discussed.

Conceptual mapping for integrating creative and analytical thinking. In 1972, Joseph Novak was researching children's knowledge growth within science. He found it difficult to measure the growth of the students' knowledge through the interviews conducted and began to find a better way to represent children's cognitive structure and conceptual understanding, from here the concept map was designed (Novak & Canas, 20087). Joseph Novak and Alberto Canas, define concept maps in their technical report "The Theory Underlying Concept Maps and How to Construct and Use Them" (2008), Concept maps are graphical tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts indicated by a connecting link linking two concepts. Words on the line, referred to as linking words or linking phrases, specify the relationship between the two concepts.

Conceptual maps may look like graphic organizers, but the key difference and significance of conceptual maps is in the purpose, introduction, application and outcomes (Hyerle, 2009). Unlike brainstorming webs and graphic organizers, Conceptual mapping differs from brainstorming webs or graphic organizers in that conceptual mapping has

greater emphasis on defining, expanding, building, evaluating and reflecting. This has important impacts in the cognitive process of the student in that it requires metacognition, questioning, and reflection. This has been evaluated through a study by Sabbah et. al. (2015) who found that students who created self-generated computerized mind maps significantly improved their reading comprehension. The students who participated in this study were female English language learning college students in a level three. Although these students are older than the students that will be in this research, this does indicate the potential for positive outcomes for the implementation of self-generated visual tools on middle school student reading achievement of nonfiction texts.

Thinking Maps. In efforts to make sense of the full range visual tools, David Hyerle devised his own trademarked set of visual tools called Thinking Maps while creating a student workbook to develop thinking skills at the middle school level called Expand Your Thinking (1988, 1993). From brainstorming webs to foster creative thinking, graphic organizers to organize content and concept mapping to focus on deeper conceptual understanding- Thinking Maps provide a common language and a means for implementing in a student-centered way. Hyerly discusses his challenges with using Tony Buzan's Ming Mapping techniques, "every web started in the center and branched out. The repetitive visual pattern being developed did not reflect a rich range of thinking patterns in the content areas; too much irrelevant information was scattered across a page" (2009, p. 117). The eight thinking-process maps are graphically consistent and flexible, they include: a context frame, describing attributes, comparing and contrasting, classification, part-whole spatial reasoning, sequencing, cause-and-effect reasoning, and reasoning by analogy.

Choosing appropriate visual tools and student ownership. An essential way to measure the successful implementation and instruction of visual tools is when students begin to independently choose the appropriate visual tools for their tasks and show ownership of the tools. Teachers must teach visual thinking skills explicitly to minimize confusion, coach students to mediate their thinking and "ask reflective questions of students so they would become metacognitive, self-assessing, independent learners" (Hyerle, 2009, p. 117). This is a similar process of teaching reading strategies to students; they must become independent and show ownership over the usage of these tools to help them think, read and process information. Over time, students will develop a fluency in using visual tools to be able to use them dynamically, even combining multiple tools at a time to fit their context.

Conclusion

Based on the literature reviewed in this chapter, high quality nonfiction texts are in higher demand for our readers in the 21st century. Our student's ability to think with more depth and complexity are essential to be critically literate. In order to help our students, meet these high reading demands, it is our job as educators to supply our students with opportunities to develop their skills and strategies to meet these expectations. As the research suggests, visual thinking tools provide our students with a means of achieving these goals.

Through the findings and best practices, I will design a visual thinking toolkit to embed and systematically teach visual tools alongside the reading of nonfiction texts to improve comprehension. It is my hope that my findings will answer: *How can visible thinking tools be used as a foundation for middle school student's critical approach to*

understanding nonfiction texts? The following chapter, will provide a discussion of the design of this visual thinking through visual tools nonfiction reading unit.

Chapter Three will also provide an explanation of the context and participants, procedural information essential to the understanding and development of the unit. Chapter Four will be a critical reflection on the project, limitations and implications for the future

CHAPTER THREE

Methods

Introduction

My personal and professional journey has led me to explore the use of visual thinking tools in my classroom to facilitate increased student learning. While in the audience of East Asia Regional Council of Schools conference, we were collectively asked; "what do you all do in the classroom to make thinking visible". Honestly, I wasn't quite sure. It seemed like a simple question that I wanted to have great answers to. Watching the presenter outline the various and sundry visual thinking teaching strategies was a light bulb moment. I wanted to help my students make the mysterious process of learning into something clear and shareable.

By the end of the hours long presentation, I was certain this was a winning teaching strategy for literacy in my middle school classroom. I opened the conference booklet of forthcoming presentations and highlighted all the talks involving visible thinking strategies. By the end of the conference, I knew this would be a way to engage all of my students and to get all of them thinking critically about specific content while going one step further to meta-cognate on their own analytic strategies. There are so many interesting aspects about visible thinking and visual thinking tools. Ultimately, I wanted to focus on using visual thinking tools to improve my student's comprehension of nonfiction, content specific texts. Through this, I have posed the question: *How can*

visual thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?

This chapter will provide a project overview, the conceptual rationale, and some vignettes of project implementation in my own classroom. My intention through this project, is that any middle school teacher, of any content specific area, could digest the project materials presented here, and have some answers the question first posed to me during the Asia Regional Council of Schools conference; what can you do in a middle school classroom to make thinking visible? It is my sincere hope that middle school teachers can find a visual thinking toolkit supportive and helpful in support the CCSS and helping their students reach and exceed the 21st century literacy demands.

Overview of the Project

This project addresses how to incorporate a holistic concept of adolescent literacy and contextualize visible thinking strategies in the classroom. Ultimately, I hope that my students will learn how to use visual tools to help them interact with their thoughts and ideas as they respond to text and their learnings. This chapter will also provide a context for this work with a look at my school and classroom. I will also be explaining how this context impacted the considerations I made for the toolkit. I will describe how this project was designed to embed visual thinking tools in the middle school classroom to support nonfiction reading. I will also explain why I created the visual thinking toolkit as well as the process behind their design.

Research Paradigm

More broad conceptualizations of literacy, and, by derivative the tools both visual thinking or otherwise, helped to create a holistic understanding of adolescent literacy

learners and the strategies that can be used in the classroom to achieve literacy competency. The RAND Reading Study Group's (RRSG, 2004) describes reading comprehension and Purcell-Gates (2004) and Jacobsen (2004) conceptualization of print literacy development. RRSG (2002) suggests students' reading comprehension is an interaction between the reader, the text and the activities. Through the interplay of the reader, text and activities surround the text, a student can extract and construct meaning from the text. The study group also contended that these interactions do not happen in a vacuum but are situated in the sociocultural context (i.e., social structures, languages, conventions, history, and goals) associated with the learners. Additionally, Purcell-Gates (2004) argue that literacy development involves cognitive processes that are nested in sociocultural contexts. I am therefore looking to establish tools and/or techniques that allow students and teachers with a flexible activity to illuminate the students' sociocultural context to themselves, thereby facilitating the meta-cognitive processes necessary for high order critical thinking. Furthermore, such tools and/or techniques should be transferable and sufficiently rich to provide content depth in numerous subject matters, helping students delve into voluminous digital and non-digital content. This paradigm is inherently student centered.

Choice of Method

When I was first introduced to the paradigm of visual thinking tools, I found them easy to implement, conceptually concrete and visual instinctive. I was particularly drawn towards the work of David Hyrley's (2006). Through this project I hope to make more visual thinking tools freely available to all middle school teachers in an open source environment that was widely accessible. Visual thinking is an organized note taking

strategy that mirrors the text structure and fits neatly into cognitive strategies of adolescent learners. These methods are widely available but were siloed in content specific paradigms. Or, there were only available in graphic organizers that did not match a more holistic and student-centered approach. Furthermore, this toolkit walks through how I introduced these visible toolkits in my classroom through mini-lessons. The architecture of the mini-lessons in this toolkit are drawn from the work of Lucy Calkins (Calkins, 1986). Such that the mini-lessons replicate the form and structure of the readers-writers workshop. By doing so, the student becomes the center of the mini-lessons, meeting the students where they are in content understanding and embeds it, the mini-lesson, in the students' personal socio-cultural context.

Therefore, the purpose of this capstone project was to create a bridging toolkit that connects the Reader's and Writer's workshop (Calkins, 1986) modalities with all content areas. It does so with a series of mini-lessons for a middle school teacher to select and teach visual thinking tools to enhance student learning in any content area. Through this resource, my goal is to explicitly introduce a variety of visual thinking tools that are applicable to any nonfiction lesson. These tools are interchangeable to any and all curricular units. With continued practice and routine use of visual thinking tools across content areas, the goal is for students and teachers to independently incorporate visual thinking tools as they see fit to engage with nonfiction text before, during or after reading.

Setting/Audience

Nonfiction literacy demands in a content area classroom may be challenging for many of my students, it is therefore our responsibility as teachers to differentiate my

instruction so that all of my students have access to the information that they need to learn in the course. Because I designed the mini-lessons as bridges between language arts and any content area, the audience could and indeed should be any adolescent instructor. Below, I describe the three distinct educational and socio-cultural settings where I tried several of my mini lessons as well as a timeline for doing so.

As a social studies teacher, we want our students to go beyond the facts, we want our students to be critically thinking; posing their own questions, predicting future outcomes and interpreting the deeper meaning of information. With a wide range of different levels of students in a classroom, I want to be able to get all of those students on the same page. It is also essential to teach my students strategies to engage with texts at high levels of understanding to then be able to get into critical discussions, I believe that visual thinking tools lay the foundation for students to be able to do this work. To best understand how this capstone was designed, it is important to recognize the context and participants for which this project was created and the three educational environments I began implementing them as a social studies teacher, 1) South Korean private international school, 2) Minneapolis public school 3) small private Montessori school in Minneapolis.

1. I began developing my ideas and research for this capstone during my first teaching placement a small private American international school in Busan, South Korea during my third and fourth years of teaching. I was teaching 6th grade language arts, and 6th and 7th grade social studies. The school had roughly 245 students enrolled. The school had high academic expectations and worked specifically to meet the needs of its diverse

student population of Americans, Koreans, Russians, Canadians and others, with an estimate of about 50% English language learners.

2. I returned to the Twin Cities in 2016, and worked for two school years in a urban middle school. The school K-8, has roughly 630 students. The student population is about 80% Black or African-American, most of which are Somali, 5% Latino, 5% American Indian, 5% White. 95% of students are free-reduced lunch qualified with poverty and homelessness concerns. Due to these high needs, the school has a strong focus on academic achievement through the use of English Language strategies, culturally responsive strategies and socio-emotional strategies takes to increase student learning.
3. The most recent setting has been the small private Montessori school where I teach mixed grade-level classes including 4th/5th grade Language Arts and Social Studies and 6-8th grade Language Arts. I have 14 students in each of my five sections that I teach on a daily basis. I see my students for 60 minutes, three days a week. In my classroom I have a wide range of student abilities and interests. Through my social studies course, I strongly focus on strengthening nonfiction literacy skills, communication and critical thinking through the vehicle of Social Studies content.

This is my seventh-year teaching in an upper elementary/ middle school setting, serving students grades fourth through eighth. Within both of my contexts, I have been faced with the challenges of a wide range of diversity within my classrooms. This is why I have come to focus on teaching visual thinking tools to help support the learning and

achievement of all of my students, a beneficial practice for ELL students, Special Education students, high need students and general education students. These visual thinking tools have the ability to engage all students where they are and help take them to the next level with their learning.

Visual thinking tools are a powerful way to organize ideas and they provide clarity. With this clear visualization of thinking, we are better able to enhance student's perspective taking. Students are becoming equipped with the tools necessary to communicate their thinking with others and serve as a way to mediate discussions. To prepare for the demands of the 21st century, Shmoker (2011) suggests students need: adequate amounts of subject-area content, concepts and topics; intellectual and thinking skills (such as argument, problem solving and drawing conclusions); and lastly authentic literacy including reading, writing and discussion. As the demands are high, these visual thinking tools will enhance comprehension and critical thinking for students to be successful. In a concrete way, visual tools can be used to enhance reading comprehension by encouraging students to interact with text.

Project Description: Toolkit Development and Design

This handbook is a collection of visual thinking tools and mini-lessons for their implementation.

The introduction mini lesson of six visual thinking tools, based on common text structure and demands in nonfiction texts: sequencing, cause and effect, main idea and supporting details, categorizing, telling, compare and contrast. The mini lessons will describe each of the visual tools as well as how these tools can be used before, during or after each lesson or within the unit as a whole. The learning targets in this handbook

reflect that. As the students become more comfortable and familiar with the visual thinking tools, the learning targets will evolve and develop in complexity throughout their usage.

Each of these tools should be selected purposefully based on the text structure. These visual tools are all student created within their own notebooks or on larger chart paper of their choice. This is an essential difference between visual thinking tools and graphic organizers. These are not predetermined structures with a specific number of connections, boxes or bubbles. Students are not limited to what is provided for them, rather they are responsible for generating the structures themselves, in a way that responds fluidly to the text.

Ultimately, the best use of these visual thinking tools is as often as possible for students to be able to adapt and modify them to fit their needs and enhance their critical comprehension of texts. The *Power and Purpose* description of each tool will describe how each visual thinking tool will be used to promote critical literacy practices and better prepare students for the demands of the 21st century.

Timeline

Throughout the fall semester 2018, I created a toolkit of minilessons that provide examples of visual thinking tools, looking through the lens of my research question.

Evaluating Toolkit Effectiveness

To determine the effectiveness of the toolkit that I design I will reflect on the focus questions 1) *Does this toolkit, and these minilessons adhere to the Understanding by Design framework for curriculum mapping?* 2) *Does each lesson introduce or reinforce the use of a visual tool?* 3) *Does each lesson provide modeling, guided practice*

and independent practice to allow students to implement visual tools into their learning? I will use these questions to evaluate and reflect on the effectiveness of the toolkit that I design. With these in mind, I will keep a clear focus on the priorities for each of the toolkit and the minilessons that are included.

Conclusion

In this chapter I have outlined the rationale, context, methodologies, curriculum design and evaluation. As a middle school social studies teacher, it is essential that my instructional practice reflects the nonfiction literacy demands of the 21st century. It is my responsibility to instruct students within my content area to read, write, speak, listen and think with a critical lens. Through the creation of a toolkit of visual thinking tools for the use in my middle school social studies classroom, I will answer my essential question for this project: *How can visual thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?*

In chapter four, I will reflect upon the results of the toolkit design, include a critical reflection on the project and discuss the limitations and implications for the future

CHAPTER FOUR

Critical Reflection

Introduction

This project has incorporated several of the key themes that have resonated with me throughout my career as a language arts and social studies educator, targeting middle school students, literacy and critical thinking. When I began my working on my capstone project, I was eager to bridge nonfiction literacy strategies between both classrooms. This led me to inquire and develop my research question, *how can visible thinking tools be used as a foundation for middle school student's critical approach to understanding nonfiction texts?* The purpose of my project is to provide middle school teachers with a toolkit for teaching and using visual thinking tools in their classrooms. Through the work I have done in this project, I have strengthened my knowledge of the nonfiction literacy demands of the 21st century, and how visual thinking tools can be taught and used by students to meet these rigorous expectations. This research has taught me the importance of using visual thinking strategies to support student learning.

Within this chapter, I will provide a description of the project I created to answer my research question. I will also provide my final thoughts and reflections on my capstone journey. I will highlight several key understandings from the literature review. I will address some of the implications, as well as some of the limitations of my project. Lastly, I will discuss the trajectory this work will take me through my next steps in my teaching career.

Connection to Research

The research paradigms I applied to this project are clearly conceived and have demonstrated use within the educational research community. I also found ample justification for implementing such research paradigms and visual thinking tools to align classroom practices and strategies with the 21st century literacy demands of adolescent learners. Additionally, I found the research on visual thinking tools well developed and explicit.

At the core of my research, I want to better prepare my students for the 21st century, which are placing ever greater literacy demands on adolescent students (Carnegie Council on Advancing Adolescent Literacy, 2010). Howard Gardner (2009) outlined five key minds we must cultivate for the future including disciplined, synthesizing, creating, respectful and ethical thinking. Gardner (2009) elaborates on synthesizing by describing how the most valuable people of the 21st century and who will rise to success will be those who can gather a variety of sources, make decisions about what is of most importance and then synthesize this information to make sense of it for themselves and others. To be prepared for the demands of the 21st century, Shmoker (2011) suggests students need: adequate amounts of subject-area content, concepts and topics; intellectual and thinking skills (such as argument, problem solving and drawing conclusions); and lastly authentic literacy including reading, writing and discussion. He also suggests the need for "generous amounts of good content and critical thinking skills, and sufficient opportunities to learn to read, write, speak and listen effectively" (p. 27-28). Thus, 21st century literacy demands for adolescents are tautologically, economically and pragmatically defined in literature. Nevertheless, it seems there is a great deal of

evolution necessary in classrooms across the country in order to meet 21st century literacy demands. Generally, students are currently ill prepared for the literacy rigors of postsecondary education, or even the necessary admission tests (ACT, 2010). Therefore, changes to predominate literacy strategies in classrooms are necessary to support adolescent learners prepare for their futures.

Visible thinking tools to support 21st century literacy demands. In searching for concrete tools for to support such evolution, I found the research surrounding visual thinking tools explicit and intuitive. The research specific to visual thinking tools is surrounded by the work of David Hyerle and his development of Thinking Maps in the late 1980s. His work stems from the constructivist theorists and the "thinking skills" movement from Harvard University's Project Zero (1967) including Howard Gardner and Steve Seidel's project entitled "Making Learning Visible". Hyerle (2009) defines visual tools as, "nonlinguistic symbol systems used by learners, teachers, and leaders for graphically linking mental and emotional associations to create and communicate rich patterns of thinking," (p. xix). Visual thinking tools assist in the transformation of static information into active knowledge. Hyere (2009) expands by saying that these visual forms also act as metacognitive tools for self-assessment.

The term visual tools might be more commonly understood in connection to graphic organizers and semantic maps. Graphic organizers, as the name suggests are a visual organization of words on paper that eliminate the linear writing format in exchange for the structure and format of the tool to make meaningful relationships among the words and ideas on the page (Clarke, 1991). Graphic organizers are limiting to our greater understanding of visual tools, as graphic organizers, simply organize information.

Hyerle (2009) suggests that, "other visual tools have been designed for moving well beyond brainstorming and organizing ideas to specifically facilitate dialogue, perspective taking, mediation of students' thinking, metacognition, theory development, and self-assessment." Visual tools are a means to heighten complexity of thought, not simply to gather and record information. Semantic maps, on the other hand are also limiting and does not fully elicit the dynamic usage and all-encompassing qualities as the term visual tools does.

Tools, like a hammer, are stored in a toolbox and taken out as it is needed for a specific job. Similarly, with a series of strategies for making thinking visible collected in a "toolbox", they are then able to be pulled out and used when it is necessary. Visual tools lend themselves to the natural way that our brains work, which are predominantly visual. Hyerle (2009) suggests that researchers believe that we receive about 70% of information from our surroundings through our eyes as well as we make and store images and pictures of incoming information in our brain. It is further suggested that, "neuroscientists tell us that the brain organizes information in networks and maps" (Wolf, 2004), indicating that our brains are pattern detectors and are constantly seeking ways to make sense of the world around us. Visual tools provide a spatial means for really capturing those patterns and engaging students at the most fundamental levels of cognition.

Nevertheless, in my anecdotal experience, both content specific middle-school teachers and general language arts middle school teachers fail to widely implement visible teaching strategies. Similarly, there is little collaboration around visible thinking tools to form generalizable and transferable visible learning strategies for students that if

consistently and continuously implemented across all subjects could support student literacy.

Indeed, my experience has been recently supported by a recently published survey of middle and high school teachers in content specific areas that demonstrated a majority of content specific teachers have little understanding of literacy learning tools (Meyer, 2013). It is apparent that although the research on literacy is well defined, tangible assets to support the evolving and increasing literacy demand are lacking. Additionally, these tools are not yet widely implemented across subjects within middle schools and we are therefore not providing a majority of students with the necessary literacy skills to meet the 21st century demands.

Project Description

In order to answer my research question, I designed a toolkit of visual thinking tool mini-lessons. These will allow teachers to use this resource quickly. They can identify the Visual Thinking Tool based on the text structure of the nonfiction text. The mini-lesson will provide a framework for the teacher to easily understand the power and purpose for the particular tool. The language suggested in teaching the visual thinking tool is broad enough to be implemented across several content areas. These minilessons are designed to be selected at random, and do not need to be taught in any particular order. Each of the mini-lessons provides a framework for introducing the Visual Thinking Tool. As teachers and students become more familiar with the Visual Thinking Tool, adding each one to their repertoire at a time, they can work together to modify the tools to meet their needs.

By increasing the translatability to all content areas, I hope that the tools can be easily implemented by teachers of multiple content areas and in student populations with heterogeneous socio-cultural backgrounds and varying abilities. Ideally, the student can learn one visible thinking strategy in science one week and apply that same strategy to understand a series of non-fiction texts for some social studies project the following week. In doing so, the student can become the center of the literacy strategy.

Limitations of project

As this tool is currently in a handbook format, the ability to share this easily with other teachers is limited. If I were to create a website for this handbook, this resource would have the potential to reach many more teachers and consequently, have the ability to enhance student learning on a much larger scale. The mini-lessons that I have written in the handbook, do include an appendix with anchor chart examples for the classroom. However, I did not create a digital template for duplication, as these visual thinking tools are not intended to be literally applied.

When I began this project, I was teaching middle school social studies with both 6th and 7th graders. I am now teaching in a mixed grade level classroom of 4th and 5th graders. I am left wondering how impactful these visual thinking tools would be in the K-5 elementary classroom. In what ways can these visual thinking tools be adapted to meet the needs of younger learners? Do these also lend themselves to other content areas, outside of social studies? How does this work different within different disciplines?

Lastly, this project does not provide an experimental element to determine the effectiveness of my visible thinking toolkit.

Next steps

There are several additional "next steps" to experimentally evaluate the toolkit described in this project. First, I would I would need to cultivate an experimental setting, either in the school that I currently teach or in another appropriate setting where I could get administrative and teacher buy-in on the study design. All teachers within the study would be included in this Case-Control study, where the control is the baseline assessment of participating teachers. I would assess baseline literacy strategies and their implementation in middle school classrooms in content specific areas similarly described to Meyer (2013). Once baseline assessment was complete I would conduct a training seminar for all teaching participants regarding the toolkit based on the mini-lessons described herein.

Teachers will then be surveyed again to reflect on these focus questions, 1) Does the planning toolkit ingrate the instruction of science, academic language and writing? 2) Does the planning toolkit incorporate meaningful learning opportunities for all students? 3) Are academic language forms and function needed for the academic success in science explicitly identified within my planning tool?

Challenges to conduct such a study include Institutional Review Board approval and institutional and administrative buy-in. Furthermore, such a study would be the first pilot study of a prospective, longitudinal and randomized study to assess student outcomes among diverse classroom settings.

Implications

When used frequently and correctly, this toolkit has the capacity to engage students and challenges them to truly make these tools their own. I hope that it can lead to inquiry based, meaningful and authentic instruction, and as a result, this toolkit has the

power to cultivate a passion for lifelong learning. I intend on using and adapting this toolkit myself for the planning and preparation for my current 4th/5th grade students. I also intend on sharing my capstone project with my colleagues to support their broader use across our small school. By creating a professional development workshop for my colleagues, our school would benefit from professional conversations related to the implementation and adaptability of teaching strategies across grade levels and content areas.

This planning tool will serve as an interactive and inspiring toolkit for classroom teachers on the integrating science and writing instruction and the importance of academic language development for young learners. This toolkit will embed best practices in writing academic language instruction, and meaningful science experiences. The teachers at my school will benefit from this planning tool by having access to a quick reference for instructional planning. Part of my role is to serve as a resource for mainstream classroom teachers, my goal is to support the interrogating of writing and academic language in content areas and this planning tool will allow be to reach more teachers than I could have previously.

Conclusion

Throughout this chapter, I reflected on the capstone process, revisited the literature review and discussed how my research is connected to the project. I determined limitations of the project and possible implications. I have described my growth as a teacher and reflected on my learning during the experience. This process has fundamentally changed me as an educator and I am grateful for the experience and understanding that I have gained.

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