Technology Integration and Critical Thinking

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Introduction

Today, it is almost impossible to find a school that does not have technology resources available to teachers and students. Having technology, however, is not enough to ensure rigorous instruction that provides students with multiple opportunities to develop critical thinking skills, the ability to analyze own thinking with the intention of improving it (McColister & Sayler, 2010). With introduction of the Common Core State Standards (CCSS), elementary school students are expected to analyze own thoughts and explain them in written and/or oral forms, based on the evidence they obtain in the process of learning the content. Even though the CCSS do not specifically define rigor or explain what critical thinking looks like in an elementary school, it is evident that educators are responsible for teaching high-order thinking skills as a part of the English Language Arts and Math curriculums. The CCSS call for robust and relevant applications of basic knowledge, and integration of technology is recognized as a tool for developing such learning environment (CCSS, 2010).

Schools in the United Stated invest thousands of dollars into different technologies and gadgets to support student learning. However, we do not have enough specific evidence in today's educational research to show that any one type of technology has a bigger effect on critical thinking than another. How technologies are integrated into teaching and learning determines academic outcomes. Focus on strategies for implementation seems to be the most prominent trend in recent educational studies (Armstrong, 2004). With this qualitative study, I would like to investigate the role of technology integration in teaching critical thinking skills at Shiloh Point Elementary School. In order to develop understanding of this central question, teaching experiences of one teacher in the school will be explored to develop an understanding the following issues:

- What strategies of technology integration are used to teach critical thinking?

- How do teachers choose which technology integration strategy to use when planning lessons focused on development of critical thinking?
- How do student critical thinking skills change when technology integration strategies are implemented?
- How do teachers know if technology integration strategies have positive and/or negative effect on critical thinking?
- How does the process of planning and implementing instructional strategies change with technology integration when developing critical thinking skills in elementary students?

The purpose of this narrative study proposal is to explore and describe technology integration strategies used by an elementary school teacher to develop critical thinking skills in students at Shiloh Point Elementary School.

Definition of Terms

Critical thinking is an ability to analyze the ways one thinks with the purpose of improving such ability. Critical thinking skills depend on formal learning and can be dramatically improved with integration of effective strategies for teaching critical thinking (Linn & Shore, 2008).

Literature Review

Today, many classrooms in elementary schools lack rigor. Students are not challenged to think critically and have limited opportunities to learn in a collaborative, technology-enriched environment. A wide variety of Web 2.0 and computer-based tools and the introduction of the Bring Your Own Device initiative have brought up a question of their impact on critical thinking of students. Educators want to know if it is necessary to implement technology in order to raise rigor of instruction and how it can be measured.

Many studies have been conducted to help teachers understand what critical thinking is and

how different pedagogical strategies may impact students learning of such thinking. Many studies were focused on teaching critical thinking to gifted students. McCollister and Sayler (2010) encouraged educators to "life the ceiling" and infuse instruction for gifted students with critical thinking and academic rigor. They argued that both are necessary to ensure academic growth of gifted students. Four ways to implement teaching critical thinking skills in everyday lessons were described: problem solving, questioning, evaluation of sources, and decision making. The authors illustrated specific lesson activities and strategies to demonstrate what each of the ways look like in an elementary classroom. They also argued that gifted students are able to think critically and on much deeper levels than teachers normally think. Thus, teachers need to assess students' readiness levels, their interests, and styles of learning in order to successfully carry out each of the described strategies.

To assist teachers in evaluating instructional plans in regard to rigor and critical thinking Hargett, Matusevich, and O'Connor (2009), authors from the North Carolina Department for Public Instruction, developed a rubric for measuring levels of rigor in development of curriculum, instruction, and assessment was developed and tested. Initially, this tool was created for Gifted teachers, but later it became popular with general education teachers across North Carolina and was adopted by East Carolina University in a course for preparation of Gifted Education teachers. As a result, additional resources for measuring and evaluating rigor in curriculum, instruction, and assessment were developed: a special set of questions with specific examples for each was developed to help teachers evaluate their instructional planning and design. This study provided educators with a developed rubric to measure rigor and demonstrated evident of this tool being successfully utilized in creation of rigorous curriculum, instruction, and assessment. Such tool should be introduced in professional learning sessions of all schools and utilized by teachers

during instructional planning and professional collaboration.

Dutchess Maye (2013) went even further with her study. She examined the readiness of teachers to prepare students to be college- and career-ready. She defined the characteristics of rigorous instruction in relation to Common Core Standards and explained the role of Bloom's Taxonomy in the process of aligning instruction, learning, and assessment. The data collected during this study showed that instruction in most observed classrooms lacked rigor and was concentrated in the Acquisition quadrant - "recall of disciplinary knowledge that is gained for its own sake" (Maye, 2013, p. 30). To address this issue, Maye hypothesized and described specific strategies to increase rigor in a classroom. She listed them as professional learning tasks for teachers to implement in daily instruction to improve student critical thinking skills. To improve this tendency, the author suggested Strategic Planning as a method to improve the quality of teaching. The plan was described as a combination of three components: alignment, questioning, and automaticity. Just like the authors of the studies described above, Maye called educators to realize the necessity of job-embedded and relevant professional learning.

It is evident that one of the key issues in effective technology integration is misconceptions or myths about technology integration, often believed by teachers and parents. Such misinterpretation may lead to resistance and unwillingness to try new strategies and integrate technologies into daily teaching and learning activities. For example, Okojie, Olilnzock, and Okojie-Boulder (2006) investigated the false perception of technology integration by many veteran and in-service teachers. The authors portrayed the causes as (1) inability of teachers to plan technology integration during the planning stage of instructional design and not as a stand-alone tool and (2) ineffectiveness of professional technology trainings that are focused around technological skills instead of instructional strategies for its integration. The authors developed a

"blueprint" for technology integration, suggesting to connect technology for instruction to all stages of pedagogical planning and execution of instruction: identifying learning objectives, choosing methods and technology relevant to the objectives and learning activities, evaluating technology integration techniques, designing follow-up and enrichment materials and activities relevant to the instruction, locating and making available additional instructional materials, and designing a vibrant learning experiences for students that support students in discovering knowledge for themselves.

The position that technology should be viewed as a stand-alone tool was also supported by Armstrong (2004): "There is a tendency to think that ICT is so "new" that its use will be accompanied by new pedagogies that will somehow transform teaching and learning" (Armstrong, 2004, p.413). ICT itself does not cause learning, but how it's used plays a significant role in it. Their work described and evaluated ways of integrating information and communications technology (ICT) in different subjects. This project study examined and described five strands: teaching and learning, policy and management, subject cultures, professional development, and learners' our-of-school uses of ICT. The study showed that 79 % of teachers (n=229) underestimated the skills and knowledge of their students in computer ownership and skills. In the world of rapidly changing technology, teachers need to learn how to lean on expertise of students to create a community of common knowledge and improve learning.

Professional development is the process that can help teacher clear out some misconceptions about technology integration and learn how to improve pedagogical skills in this area. A two-dimensional model called Pedagogy*Technology for monitoring teachers' progression in technology integration and pedagogy was developed and tested by Lin, J., Wang, and Lin, I. (2012). The authors argued that it did not matter how technologically savvy teacher were and

what technical skills they wanted and were able to obtain. What mattered was the pedagogy with which they were integrating it into teaching and learning. Participating teachers showed the progress on the two-dimensional grid, but the ways the progress went were very different: while two teachers decided to improve their technical skill, another teacher did not learn any technical skill but changed her pedagogical approach from direct teaching to social learning. Despite the fact that a further investigation is needed to determine which professional learning approach has a bigger impact on student learning, it is evident that both strategies improve student engagement.

Parents play an enormous role in student learning. Their buy-in may be a tipping point in a school plan on technology implementation, especially with introduction of the Bring Your Own Device initiative. Grunwals Associates LLC (2013) examined how parents perceive the role of different technology devices in education. The study involved a diverse group of families, with children from Pre-K through high school. The findings showed that parents of younger students have the most positive position towards mobile learning and its influence on student achievement and the role of educators in influencing parents' opinion is huge. Interestingly, parents of K-2 students had the most support of such learning. Overall, the study exhibited that most parents completely or somewhat agreed that mobile devices support their children's learning and offer many different opportunities for engagement in a classroom. Educators need to continue building communities of learners in which parents play a fair part. Communications about technology integration and its effects on student learning and engagement should be consistent help improve student academic performance.

Even if educators develop lessons that help students improve critical thinking skills and they view technology as an important key of such lessons, they need to know which implementation strategies work better and how much they impact students learning. The work of

Lee, Lin, Michko, Waxman, and Wu (2011) reviewed research on the effect of teaching and learning with technology. The goal of this study was to identify effective practices of technology integration. One of the findings was that students working in small groups with computers perform better than individual student working with computers (mean of 0.4 compared to mean of 1.08) and groups of three to five students are more effective than groups of two. Interestingly, the lowest effect of technology on cognitive skills of students was found in grades 9- 12 (0.22), while students in grades K-3 showed much greater results (0.5). According to this study, the most effectives use of technology was noticed in remediation skills, finding out about ideas and information, inquiry/investigation, project-based learning, and expressing thoughts in writing. The cognitive outcome had an effect size 0.43 that was larger than many of the past meta-analytic studies. The following effective strategies for technology integration were suggested: collaborate in small or paired groups with computers, develop instruction that is relevant and sense-making in context, and build student basic skills and help them understand interconnections in a project-based setting.

In higher education, Wang, Woo, and Zhao (2009) investigated how interactive online environment effects critical thinking. Specifically, the authors analyzed to what extend writing personal reflections on own learning and online collaboration tasks impact critical thinking. The findings of the study showed that about thirty percent of college students participated in the experiment thought critically while writings personal reflections on what was learned in class. The authors observed that online collaboration is more effective when happens between larger groups (3-5 people). Educators need to understand that it is not always necessary to conduct collaboration online if participants often see and interact with each other in real life.

Campbell (2012) investigates the impact of technology on writing and critical thinking

skills development. In this study, the researchers followed 21 fifth and sixth graders in their learning for two years. The main focus of this study was on digital storytelling in elementary schools and how it enhances student engagement and ability to create higher quality writing. The study showed that the time students spent on task and completion of the project (indicators of engagement used in this study) improved with the implementation of digital storytelling approach in writing instruction (increase from 70% to 96% in time spent on task and from 79% to 100% in task completion) and 92 % of students participating in the study improved their writing skills. The state standardized test results indicated the improvement of writing skills as well. Choosing effective pedagogical strategies in a combination with technology tools used for digital storytelling increased student engagement and overall writing performances.

In contrast to the studies described above, Casto, Taylor, & Walls (2004) investigated the effects of technology on learning with a different approach. They wanted to find out if teaching the same objectives with technology integration would have different outcomes than teaching them without technology integration. The findings of this study proved that the integration of technologies increases the learning. Students in elementary and secondary schools showed greater gains from pretest to posttest the lessons with integrated technologies than students who learned the same units without technology integration.

It appears that more and more educational researchers investigate different strategies for technology integration. Nevertheless, the spectrum of this issue has multiple areas that have limited data available to us. Specifically, necessary research needs to be conducted on the elementary school level to identify how early introduction to technologies and their implementation in teaching and learning may impact student performance and development of critical thinking skills.

Methodology

Setting and Participants

This qualitative narrative study will take place in Shiloh Point Elementary, a suburb public elementary school in Forsyth County of Georgia. The majority of students in this school are white (65.1%) with the largest minority group being Asian (16.4%). Approximately 14 % of students are enrolled in the free or reduced-cost lunch program. Nineteen percent of students are identified as gifted and receive services provided by a team of qualified teachers.

A teacher from a fourth grade classroom in this school will participate in the study, sharing her stories of personal professional experiences with technology integration in development of critical thinking skills in elementary students. This teacher was chosen based on her consistent technology integration in daily instruction and high academic student performance data in comprehension and problem solving skills, the two main areas that require proficient critical thinking skills. This participant has a Master's degree in Curriculum and Instruction and holds endorsements in English Second Language, Gifted Education, and Reading Recovery. This teacher speaks three languages and recognizes the importance of diversity and culturally responsive teaching techniques. She has been an educator for fourteen years and taught second, third, and fourth grades in public schools. This teacher was one of the first people who adopted the Bring Your Own Technology (BYOT) initiative in our building two years ago. Since then, she continuously looks for new, innovative ways and strategies to meet needs of all learners in her classroom. In addition, the teacher is recognized as an educational leader in the building for her pedagogical knowledge, rigorous instructional planning, and continuous professional growth by the administrators and staff.

Data Collection and Analysis

For the purpose of this study, the participant will be asked to tell her story of individual professional experiences with technology in a classroom for the past three years. The study will describe the chronological perspective of her experiences from being a technology-resistant educator to a facilitator of critical thinking learning with technology integration on a daily basis. Multiple interviews will be conducted to collect field texts: narratives from the participant about personal experiences and descriptions of observed strategies in the classroom by the researcher. Each interview will allow the researcher to collect raw data. In addition to listening to the natural flow of teacher's stories, the researcher may have specific questions to develop a deeper understanding of technology integration strategies for teaching critical thinking to students and describe the chronological progress of pedagogical skills for doing so.

After collecting raw data from the interviews and observations, the researcher will analyze and interpret it by retelling the story in own words, identifying themes and/or categories of information, coding them, tracing chronological information, and developing additional questions to farther investigate the topic. During collection of data, the researcher will constantly collaborate with the participant to ensure the information is presented objectively and interpreted correctly by the researcher. The narrative will be written in a storytelling mode. However, the researcher will evaluate field texts based on their depth, accuracy, and realism of account. Collected data will allow the researcher to look for and evaluate possible common trends and categories and develop a list of common strategies for technology integration in teaching critical thinking skills.

References

Armstrong, V., Barnes, S., Brawn, R., Breeze, N., Gall, M., John, P., & Sutherland, R. (2004). Transforming teaching and learning: Embedding ICT into everyday classroom practices. *Journal of Computer Assisted Learning, 20*(6), 413-425

Campbell, T. (2012). Digital storytelling in an elementary classroom: Going beyond entertainment. *Procedia - Social and Behavioral Sciences, 69,* 385-393. doi:10.1016/j.sbspro.2012.11.424

Casto, D., Taylor, L., & Walls, R. (2004). Learning with versus without technology in elementary and secondary school. *Computers in Human Behavior, 23*, 798-811. doi:10.1016/j.chb.2004.11.010

Grunwald Associates LLC. (2013). *Living and learning with mobile devices: What parents think about mobile devices for early childhood and K-12 learning*. Retrieved from http://www.grunwald.com/pdfs/Grunwald%20LandL%20public%20report.pdf

Hargett, M., Matusevich, M., & O'Connor, K. (2009). The nonnegotiables of academic rigor. *Gifted Child Today, 32*(4), 45-52.

Lee, Y., Lin, G., Michko, G., Waxman, H., & Wu, J. (2011). Revisit the effect of teaching and learning with technology. *Journal of Educational Technology & Society, 16*(1), 133-146.

Lin, J., Lin, I., & Wang, P. (2012). Pedagogy * technology: A two-dimensional model for teachers' ICT integration. *British Journal of Educational Technology, 43*(1), 97-108. doi:10.1111/j.1467-8535.2010.01159.

Linn, B., & Shore, B. (2008). Critical thinking. In J.A. Plucker & C.M. Callahan (Eds.), *Critical issues and practices in gifted education*. (pp.57-84). Waco, TX: Prufrock Press.

Maye, D. (2013). Hitting the mark: Strategic planning for academic rigor. *Delta Kappa Gamma Bulletin, 79*(4), 29-36.

McCollister, K., & Sayler, M. (2010). Lift the ceiling: Increase rigor with critical thinking skills. *Gifted Child Today, 33*(1), 41-47.

National Governors Association Center for Best Practices and Council of Chief State School Officers. (2010). *Common core state standards initiative. Preparing America's students for college and career*. Washington, Dc.

Okojie, M. O., Olinzock, A. A., & Okojie-Boulder, T. C. (2006). The pedagogy of technology integration. *Journal of Technology Studies, 32*(2), 66-71.

Wang, Q., Woo, H., & Zhao, J. (2009). Investigating critical thinking and knowledge construction in an interactive learning environment. *Interactive Learning Environments, 17(*1), 95-104.

Appendix

Interview Protocol

Institution: _____Date: _____

Interviewee (Title and Name): _____

Interviewer: _____

Introduction:

You have been selected to speak with me because you have been identified as a teacher who is consistent with technology integration in daily instruction and has high academic student performance data in comprehension and problem solving skills, the two main areas that require proficient critical thinking skills. My research project focuses on exploration of technology integration strategies used by an elementary school teacher to develop critical thinking skills in students at Shiloh Point Elementary School. This study is not to evaluate your teaching techniques and experiences, but to tell a narrative story of your practices in technology integration and how it affects teaching and learning critical thinking skills of elementary students.

I have planned to interview you for an hour. Later, we will spend more time discussing this study. I will provide you with a written narrative of your experiences and ask you to ensure I represent your beliefs and experiences objectively, clearly, and correctly.

During this time, I would like you to cover several questions. I will be taking notes as you answer the questions. You need to understand that it may be necessary for me to interrupt your narrative in order to complete all questions and/or clarify your responses. All information your share will be confidential, your name and the names of your students included. Your participation in this study is absolutely voluntary and you may stop at any time if you feel uncomfortable. Thank you for your agreement to participate in this study.

Interviewee Background:

- How long have you been teaching?
- What teaching experiences do you have?
- How long have you been teaching at Shiloh Point Elementary?
- What certifications do your hold? What is your highest degree?
- Briefly describe the students with whom you work.

Technology Integration and Critical Thinking

- Throughout your teaching career, have you always integrated technology in your classroom? If not, please describe what made you change your mind?
- Describe what teaching and learning critical thinking skills look like in your classroom.
- Do you observe any changes in student academic performance, specifically in critical thinking skills, when you/they utilize technology?
- How do you choose technology tools and strategies with which they are integrated into your lessons?
- What resources help know what technology tools and how to integrate them to teach students critical thinking skills?

Other Topics Discussed: _____

Post Interview Comments or Leads: _____