

Creative Synthesis and TPACK: Supporting Teachers through a Technology and Inquiry- Rich Graduate Degree Program

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This study offers a new way to assess TPACK within the context of a graduate program revitalized to focus on new literacies. Whereas previous studies have focused on teacher lesson planning or modeling best practices, our research examines TPACK by exploring the Creative Synthesis Projects of graduates from our program. These projects reveal the manner in which the teachers synthesized personal and professional insights gained over the course of graduate study. Portraits of four teachers provide a holistic understanding of the evolving nature of teacher professional knowledge, especially within the context of prolonged, authentic inquiry and reflection.

The Problem

Chris Dede (2008) traced a “seismic shift in how students learn and what they know” (p. 81). This seismic shift is due in large part to the advent of Web 2.0 technologies and the evolution away from classical models of knowledge creation and dissemination. Students today must develop new literacies to comprehend and communicate information quickly and accurately using a variety of computer-based technologies. Teachers can support the development of these new literacies by providing authentic learning opportunities (Leu, Kinzer, Coiro, & Cammack, 2004).

Teachers with a strong level of technological pedagogical content knowledge (Mishra & Koehler, 2006; more recently referred to as technology, pedagogy, and content knowledge, or TPACK) can effectively respond to the new learning and literacy demands placed on students and schools as technologies are integrated into instruction (Spires, Hervey, & Watson, 2013). Supporting teacher development of TPACK is a complicated endeavor that focuses on “teachers’ concurrent and interdependent content, general pedagogy, and technology understanding” (Harris & Hofer, 2009, p. 100).

This study explored the experiences of in-service teachers enrolled in a graduate program revitalized to focus on new literacies and TPACK. The paper describes the professional inquiry of recent graduates in our New Literacies and Global Learning (NLGL) master’s of education (M.Ed.) degree program and examines the extent to which course work impacted their TPACK specifically related to new literacies. Whereas previous studies have focused on teacher lesson planning (Harris & Hofer, 2009) or modeling best practices (Niess, 2005), our research examined TPACK by exploring teacher synthesis of personal and professional insights gained over the course of their graduate studies. The NLGL program is described, along with qualitative data that supports a better understanding of the experiences of recent program graduates. The portraits of four teachers are presented for a holistic understanding of teacher professional knowledge and its relationship to authentic inquiry and reflection.

Improving Graduate Study for Experienced Teachers

Current research in teacher education emphasizes that effective professional development must be prolonged and sustained (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). It must also connect to the daily work of teachers and their subject matter (Darling-Hammond & Bransford, 2005) as well as focus on improving student learning (Guskey, 2000).

Graduate study can be a powerful mode of professional development for teachers (Tom 1997, 1999). M.Ed. degree programs for experienced teachers provide the structure and sustained involvement necessary to support teacher growth. This is especially true when graduate study focuses on goals relevant to improving teacher effectiveness, including

“ongoing self-improvement, a commitment to working together collegially, and a focus on student learning” (Tom, 1999, p. 247).

Through graduate work, teachers engage in learning experiences that “support the risk taking and struggle entailed in transforming practice” (McLaughlin & Talbert, 1993, p. 15). At the same time, teachers have the opportunity to participate in communities of learning that overcome the isolation many teachers experience (Harrison & Killion, 2007).

Collegiality is an important component of teacher professional development and graduate study. According to Wenzlaff and Wieseman (2004), teachers should have opportunities to work collaboratively and to learn from and support each other. Similarly, Putnam and Borko (2000) and Regan-Smith (1994) emphasized the importance of supporting teacher interactions in a discourse community. According to Weise (1992), collaborative, cohort-based groups of teachers have the potential to improve K-12 student performance.

The course programming and content of effective graduate programs focus on student learning (Tom, 1997, 1999). Specifically, project-based or inquiry-oriented learning provides opportunities for teachers to reflect on authentic issues they face in the classroom and to learn how to respond to student learning needs (Hawkes & Romiszowski, 2001; Knapczyk, Hew, Frey, & Wall-Marencik, 2005). By becoming students of their students, teachers enrolled in graduate programs become more responsive to their student learning needs and develop strategies to support students in the classroom.

Graduate programs that utilize distance education technologies and programming respond to the needs of teachers as working professionals (Muchmore, Marx, & Crowell, 2002). They can leverage instructional technologies to support collegiality and focus on improving student learning. Graduate programs that incorporate technology also may model best practices for the integration of instructional technologies, thereby explicitly supporting the development of TPACK.

The NLGL M.Ed. program was designed with these reform-based characteristics in mind. It focuses on providing prolonged and relevant professional development for working teachers. The programming and course content emphasize collegiality, strategies for improving student learning outcomes, and the integration of technology. Two theoretical

perspectives provide the foundation for the NLGL program: new literacies and TPACK.

New Literacies

With technological advances driving much of the change in information and communication, many researchers and other educators are using the framework of new literacies (Lankshear & Knobel, 2003; Leu et al., 2004) to explain the changing nature of literacy. The demands and opportunities associated with literacy in the 21st century extend beyond the traditional practices of reading, writing, and speaking to incorporate facility with new genres of media and information technologies. Students currently use a variety of tools, including threaded discussions, online journals, games, chat rooms, instant messaging, e-mail, virtual worlds, wikis, and blogs to discuss issues and problems, to seek ideas and answers, and to entertain themselves.

Linguists use the term *deixis* for words whose meanings change quickly depending upon the time or space in which they are used. Accordingly, Leu (2000) argued that literacy is a deictic term since the forms and functions of literacy rapidly change as technologies for information and communication change. Emerging technologies require new skills and strategies on the part of the user. For example, searching for information online requires new kinds of reading skills. A learner may be skilled with using search engines but lack the critical expertise for selecting reliable information from the vast number of links that are available (Coiro, 2011; Spires & Estes, 2002).

In the same way that readers must acquire skills in navigating textual and graphic features of the traditional informational textbook, readers must acquire sophisticated reading skills with online environments in order to be academically and professionally competitive—not to mention civically engaged. As technology alters the literacy experience, the task of literacy learners increasingly will become to learn *how* to learn and learn effectively while adapting to rapid changes, not simply to master a fixed set of skills that remain static.

Many dimensions of online reading may require new comprehension skills and strategies over and above those required when reading printed books (e.g., Coiro, 2011). The latest statistics claim that one sixth of the world's population, 2.4 billion individuals, now use the Internet to read,

write, communicate, learn, and solve important problems online (Internet World Stats, 2012). By all indications, these numbers will continue to rise.

Since the capacity to communicate and work globally now exists, the demand for global knowledge and understandings is steadily increasing in both professional and personal contexts. The world's knowledge-and-innovation environment favors those who have global awareness and competence, strong communication capacity, the ability to collaborate to solve unfamiliar problems, and the ability and flexibility to adapt well to new challenges.

In addition to understanding and having mastery of American history and culture, educators should make global connections so they can engage themselves and their students in considering multiple perspectives while functioning as both American citizens and citizens of the world (Merryfield, 2007). An important prerequisite for interaction in a global context, whether as a citizen or professional, is focused reflection on cultural assumptions and the various frameworks in which people make sense of the world. In light of the changing nature of communication and increasing global interdependence, the current generation of educators, researchers, and policy makers must provide leadership to help define what it means to be literate within a hyperconnected world.

TPACK

In order for teachers to support student development of new literacies, they must draw on a combination of technological, pedagogical, and content knowledge. Building on Shulman's (1986, 1987) model of pedagogical content knowledge, Mishra and Koehler (2006), among others, have created a framework to describe the vast changes in teaching and learning that are occurring as a result of computer-based technologies. Central to the TPACK framework is the notion that teachers must develop capacities for continually evolving pedagogical skills adapted within the context of content area knowledge and relevant technology.

TPACK captures the intersections of the variety of knowledge domains teachers must possess to integrate technology effectively for student learning, which include pedagogical knowledge, content knowledge,

technological knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and ultimately, technological pedagogical content knowledge.

Figure 1 provides examples from the NLGL program to illustrate the manner in which technological knowledge, pedagogical knowledge, and content knowledge are synthesized in the NLGL program to support the development of new literacies TPACK (Mishra & Koehler, 2006).

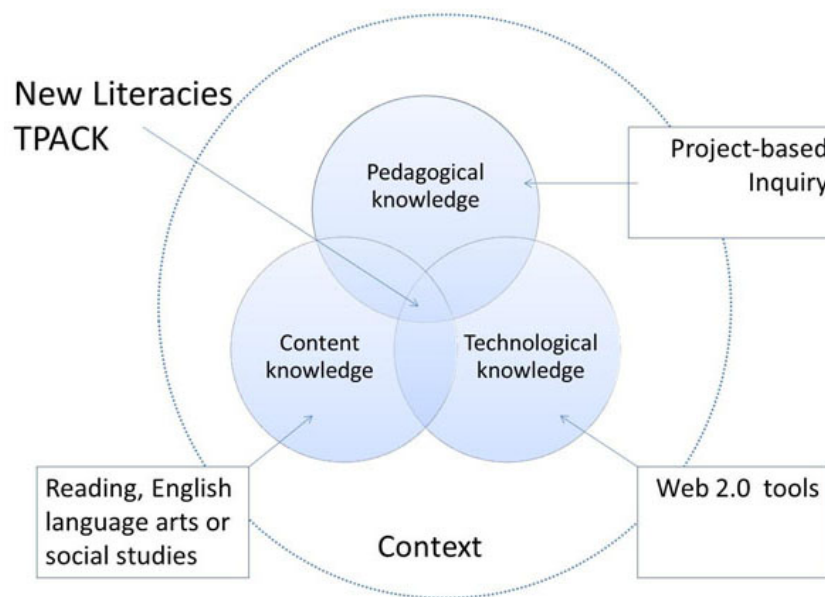


Figure 1. New literacies TPACK

Studying TPACK in the past has been so difficult because “teachers’ knowledge is situated, event-structured, and episodic” (Harris & Hofer, 2009). Thus, a single lesson plan or survey may provide an incomplete understanding of TPACK. For instance, Abbitt (2011) argued in his review of research on TPACK in preservice teacher education that

longitudinal studies and more nuanced measures are necessary to understand connections between perceived and demonstrated knowledge: “Currently, however, the degree to which the perceived TPACK contributes to the demonstrated ability of a preservice teacher to effectively plan for instructional uses of technology is largely unclear” (p. 297).

In this study we focused on the Creative Synthesis Projects the teachers submitted prior to graduation. Creative synthesis has been defined as an iterative design and development process that results in (a) creating new knowledge from inquiry and (b) representing inquiry results in original ways through media (Spires, Hervey, Morris, & Stelpflug, 2012). Creative synthesis, which has an emphasis on generativity, has been differentiated from synthesis, which historically refers to combining different elements to form a whole (DeSchryber, 2012).

We treated these projects as narratives that could be analyzed to disclose the voices, biases, processes, and understandings of the teachers (as in Grumet, 1981). They revealed more to us about the professional and personal insights of the teachers we work with than did the lessons they planned. For instance, each teacher had to make a decision about what to include (and exclude) in designing the Creative Synthesis Project, and these choices provided insights about what mattered most to the teachers.

In order to complete the projects the teachers had to synthesize all the work they did over the course of the program and make sense of it as a creative narrative. At the same time, since the teachers all used Web 2.0 technology tools to represent their projects visually as the final showcase (a pedagogical act), these projects provide a glimpse of TPACK in action. We have evidence of the teachers’ use of technology to inform and to teach.

These teachers designed their projects with an audience in mind and with the aim of explaining what they learned in their graduate work. The Creative Synthesis Project captured the manner in which they reconceptualized their professional knowledge to make room for the new knowledge they gained in their graduate work and make it their own. From this reconceptualization came knowledge creation.

Project-Based Inquiry Process

The Creative Synthesis Project was the culminating product of a long-term inquiry process that spanned the entire NLGL program. Teachers enrolled in this program pursued individual lines of inquiry and became members of a discourse community focused on the common goals of improving teacher practice and student learning while responding to the demands of education in the 21st century. Figure 2 depicts the project-based inquiry process that teachers followed.

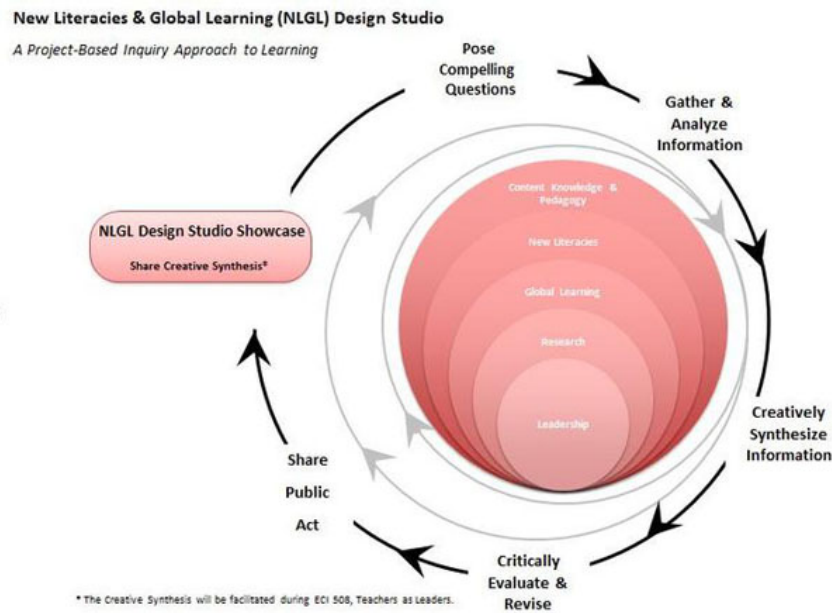


Figure 2. Project-based inquiry and the NLGL Creative Synthesis Project. Diagram adapted from the New Literacies Teacher Leader Institute (Spires et al., 2009).

The first phase of the project-based inquiry process involved having teachers pose a compelling question, which was revised and answered over the course of study. Coursework provided a structure for the

following phases of the process, in which teachers proceeded to gather, analyze, creatively synthesize, evaluate, and review new understandings. Teachers presented their new understandings in their final Creative Synthesis Projects. Teachers shared their projects with fellow teachers, professors, and other colleagues during a Design Studio Showcase event at the end of their program, prior to graduation. The four core courses—New Literacies & Media, Teacher as Researcher, Global Learning, and Teachers as Leaders—along with the specialty area courses in the program (all represented in the concentric circles of Figure 2) were designed to scaffold the creative synthesis process for the teachers.

These design elements were included in our graduate program to support teacher professional development in the skills necessary to understand new literacies and teach within this context. For instance, a major goal for teachers in our program was to develop the skills necessary to support students' effective use of technology to locate information and communicate conceptual understandings. In the NLGL program TPACK included an understanding of the new literacies framework and the ability to enact curriculum that supports the development of student literacies.

Methods

Rather than focusing only on teacher lesson planning or surveys of TPACK, we implemented an authentic project-based inquiry, the Creative Synthesis Project, to holistically support and assess the TPACK of our students. This capstone project modeled the pedagogy we hoped teachers would adapt, even as it helped us learn about their professional knowledge and understanding.

Our qualitative case study focused on the experiences of four recent graduates of the NLGL program. Our study was framed by two research questions:

- What did the Creative Synthesis Project reveal about teacher professional knowledge growth (TPACK)?
- Specifically, how did these teachers make sense of the new literacies framework in the context of their own practice?

We used portraiture (Lawrence-Lightfoot, 1983) to provide rich, detailed portraits of the teachers' experiences and their insider knowledge.

Portraiture blends ethnographic techniques with phenomenology to present an “aesthetic whole” (p. 243)—an authentic representation of the individuals and their stories. Key components of portraiture include “identifying emergent themes as listening for repetitive refrains and resonant metaphors, exploring and discovering cultural and institutional rituals, triangulating data from a variety of sources, and attending to dissonant threads” (Lawrence-Lightfoot & Davis, 1997, p. 216). To demonstrate the complexity of the teachers’ experiences in the NLGL program and to understand the manner in which they made sense of their experiences, we created portraits based on archival and interview data.

Data Collection and Analysis

We began our study by administering an exit survey to all of the 2011 graduates of the NLGL program. Based on responses to the survey, we studied the experiences of four teachers in more depth. These teachers were among the first cohort of graduates from the NLGL program and were chosen for the range of their experiences, the unique manner in which they approached their Creative Synthesis Projects, and their willingness to participate in this study (all projects can be viewed at <http://cednlg.wikispaces.com/NLGL+Student+Creative+Synthesis+Products>).

In order to create portraits of the four teachers, we began by independently coding their Creative Synthesis projects. Based on this analysis we identified emergent themes in the Creative Synthesis projects of the four participants. These themes included the following:

- The integration of technology for teaching.
- The importance of relevancy.
- Developing relationships with colleagues/members of the cohort.
- Making sense of course work and new pedagogies.
- Emergent understandings of TPACK framework.
- A new focus on literacy.

At this point we merged our analyses and jointly conducted an additional round of coding to refine the initial codes and themes. We developed coding categories (as in Bogdan & Biklen, 1992), such as: “teaching context,” “disciplinary knowledge,” “TPACK,” “new literacies,” “teacher

outcomes,” “student outcomes,” “NLGL program courses,” “creative synthesis,” and “limitations or hindrances.” We compared these categories across the case using a constant comparative method (Glaser & Strauss, 1967).

Based on our initial analysis we developed an active interview protocol (Holstein & Gubrium, 1997) that allowed for open-ended responses from the teachers (see [Appendix A](#)). We engaged the teachers in interviews to learn how they viewed their experiences in the NLGL program and what, if any, connections they made between the program and their professional development.

After interviewing our 4 participants we coded the transcriptions and attempted to be more attentive to “the experiences and perspectives that do not fit the convergent patterns” (Lawrence-Lightfoot, 1983, pp. 192-193). Using a constant-comparative method, we again refined coding categories and themes from our previous analysis. Throughout the process, we returned to the Creative Synthesis Projects and other archival data. The portraiture methodology allowed us to be open to the emerging patterns and to unexpected discoveries (as defined by Lawrence-Lightfoot & Davis, 1997, p. 225).

According to Harding (2005), “The standard for portraiture is more accurately reflected in authenticity than validity” (p. 54). In order to ensure these portraits were authentic, several efforts were made: triangulation (Merriam, 1988), member checks (Lincoln & Guba, 1985), and openness about the researchers’ subjectivity (Glesne, 1999).

We used two types of data—archival and interview—from multiple sources. Our use of interview data helped to confirm (or disconfirm) our initial interpretations of archival data. After our interviews with the 4 participants we emailed them copies of the transcripts to edit as needed. Based on our data analysis we drafted portraits of 4 teachers who recently graduated from the program: Ethan, Janine, Chuck, and Erin (pseudonyms).

Results

Using the portraiture methodology we created portraits of the 4 teacher participants, which are intended to provide a more nuanced understanding of their experiences. Table 1 provides an overview of these portraits.

Collectively, we can draw lessons from these teacher portraits about the development of TPACK and the potential of graduate study to impact teacher professional development positively.

Table 1
Teacher Portraits

Pseudonym	Demographics	Teaching Experience (Years/ Subject)	Compelling Question Posed in the Creative Synthesis Project
Ethan	White, Male	14 / English Language Arts	“What are professional development modules which offer 21st-century pedagogy ideas to continue to meet the needs of 21st-century students?”
Janine	White, Female	5 / English Language Arts	“What strategies best promote engagement and increase student achievement among at-risk youth?”
Chuck	White, Male	3 (second career) / Social Studies	“How can global technologies be utilized to effectively engage at-risk [high school] students in history?”
Erin	White, Female	7/ 2nd grade elementary	“How can student reflection enhance literacy?”

Ethan: Old School to New Tech

Ethan, a self-proclaimed “old school” teacher, reported that the NLGL program provided the “philosophical as well as practical strategies and tools to make creativity an integral part” of his pedagogy. He had taught

high school English, creative writing, and journalism for 14 years. He received his National Board Certification in 2003. Reflecting on his experience in the NLGL program he reported in an interview, “Now that I have completed it if I would have known the growth I would have [pause] it has definitely impacted the way I have taught simply because of the structure of it.”

For his final Creative Synthesis Project, Ethan focused on strategies for sharing his new knowledge with his colleagues. He posed the following inquiry question: “What are professional development modules which offer 21st-century pedagogy ideas to continue to meet the needs of 21st-century students?” His inquiry resulted in the creation of a series of professional development modules posted on a wiki site and based on content Ethan learned in the four core classes of the NLGL program.

The wiki Ethan developed has a simple look with none of the creative flourishes other teachers incorporated into their project designs. Instead, his project followed a linear course beginning with “Staff Development for Web 2.0 tools,” then referencing NLGL core courses: Staff Development for Teacher as Leader, Staff Development for Global Learners, and Staff Development for Teacher as Researcher.

Each module included agendas that Ethan created for several days’ worth of professional development seminars related to each topic. For example, on Day 1 of his Global Learners staff development, he identified a research article, discussion questions, and a Web tool for teachers to consider. He ended the module with the prompt, “Brainstorm some ways you can incorporate one or two ideas into your curriculum.”

Ethan followed a similar format to outline the professional development activities associated with each of his modules. He also provided a rationale or overall reflection that included the TPACK diagram and a “list of what I learned makes effective staff development.” This list included, providing staff development that is “useful,” “interactive,” “ongoing,” “teacher driven,” “site-based,” “student learning,” “theory-based,” and “[extended] time.”

Next to a TPACK Venn diagram, Ethan wrote,

Veteran teachers have extensive content knowledge. Effective staff development pushes them to increase their pedagogical knowledge—to use technology, creativity, student-centered classrooms to make learning more relevant for their students. A

careful reading of the four different modules will show I have encouraged teachers to implement a new philosophy into their teaching: making reflective decisions on increasing student learning.

According to Ethan, he developed the knowledge, skills, and confidence in the NLGL program to enable him to lead professional development sessions in the high school where he taught. Prior to the program, he had never led professional development sessions. After graduating from the NLGL program he said, "I've presented to my teachers in my department and in my school at mini staff development on some of those early release Fridays."

Ethan made direct connections between his use of technology in the classroom and his experiences in the NLGL program. Reportedly, he began to integrate Web 2.0 tools into his freshman English classes, and he took on more of a role as a facilitator in the classroom. For example, in the NLGL program, he learned to create a wiki about young adult literature "that really transformed the way I taught and interacted with my students." He continued to use the wiki to share information with his students and to guide his lessons.

According to Ethan, "[The NLGL program] changed my approaches. It opened my eyes. Being 10-12 years in [the profession] I knew that I was effective, but there was a missing component and it was student creation—it was student ownership."

He integrated blogs into his instruction to be more than a journal for students, but a site from which they could share information with each other and critically discuss topics. He wrote, "My students definitely benefitted from creating the blog, reading blogs and thinking about their topic. They have ownership about their topics and a better understanding of how to discuss the topic."

Ethan reported that a driving question, one he wished he could explore with the other teachers in his department, was "How is it that we integrate more technology so that students are critically thinking more and creating better and deeper products that correspond with the content knowledge?" He related this essential question about the appropriate use of technology to the TPACK framework: "That's [TPACK] the way I conceptualize my class."

Janine – The Importance of Relevancy

Janine was a high school English teacher in her late 20s. She completed her fifth year of teaching when she graduated from the NLGL program. She taught in a large urban high school where she also completed her student teaching internship. She taught a combination of classes, including senior English (academic level), Advanced Placement (AP) English, and Teacher Cadets. The year following her graduation from the NLGL program Janine was admitted into a Ph.D. program in education at a nearby university.

Janine titled her Creative Synthesis Project “A Modest Proposal: NLGL Synthesis” and used a Prezi electronic presentation. The connection between relevance, motivation, and success echoed repeatedly in Janine’s Creative Synthesis project. Her overarching question was “What strategies best promote engagement and increase student achievement among at-risk youth?”

She focused on the following main themes in her synthesis: “humor,” “positive student-teacher relationships,” “pop culture-infused lessons,” and “21st century media.” She followed each by referencing relevant research literature and describing student projects that captured her attempts to integrate these themes into practice.

For example, related to the theme of humor she provided three example teaching strategies, including having students read Swift’s *A Modest Proposal* and then writing their own satires. She wrote, “In this way, an English teacher may slyly encourage the marriage of literature, writing, and humor.”

She also included a YouTube video of students performing their satires in class. Related to 21st-century media, she listed five example Web 2.0 technologies (i.e., Weebly, Glogster, Twitter, Trailfire, and YouTube) and associated teaching activities. Janine highlighted a class assignment in which students created movie trailers for the novel *1984* and posted them on YouTube.

Over the course of her inquiry into engaging students, she referred to the work of Nel Noddings (1995) and focused on integrating technology to teach her most “challenging English III In-Class Resource (ICR) class.” She offered the following conclusion: “When humor, positive student-teacher relationships, lesson infused with popular culture, and

21st-century tools are all present in a classroom setting, student engagement—as well as achievement—soars.”

Janine described her teaching style as centered on “pop culture-infused lessons.” For Janine this meant including popular music, current events, and a variety of emerging technologies into lessons. For example, she used her Twitter account to facilitate communication about assignments and to extend student understanding. She frequently asked students to post short responses to assigned works of literature and to link these responses to other web-based media. Her Twitter feed also revealed the friendly, humorous relationship she created with her students. She frequently Tweeted praise for student work and joked with students about events from class.

It is important to note that the majority of Janine’s reported use of technology focused on teacher-centered uses. For instance, she described frequent use of an LCD projector to display PowerPoint presentations and the document reader to display graphic organizers, such as “a chart asking students to compare *1984* to modern society.”

According to Janine, the student-centered activities appeared more frequently in her Teacher Cadet (elective) class, where students created “Facebook pages to represent a particular student issue” and completed “a multimedia debate that asked them to use three different forms of media to show evidence to validate both the affirmative and negative position on a current educational issue.”

Janine explained that the differences in her integration of technology were mainly due to access to technology resources. Janine had six desktop computers in her classroom, two of which were not operational. She also complained that her printer had been broken for almost a year. Therefore, she relied on resources from other classrooms or the media center.

For instance, referring back to the *1984* assignment, she explained that she had sent small groups of students to the broadcasting room, and some students brought their own computers from home. In an interview, she reported, “It was a small enough group that I got to farm them out to various places and I trusted them.” However, this experience was not uniform across her classes.

Chuck – Digital Technologies for At-Risk Students

Similar to Janine, Chuck, a high school social studies teacher, adapted his new technological knowledge to improve his teaching of at-risk students. Chuck is a friendly and affable teacher. In an interview, he reported that his students think he looks like Harry Truman. He described all of his students as at-risk and reluctant learners and reported that many of them lacked basic reading skills. After completing college he started teaching in a small parochial school, but ended up leaving teaching for jobs in textiles, hotel management, private business, industrial engineering—“usually with a focus on customer service,” he said. Just prior to returning to the classroom Chuck worked for SAS Curriculum Pathways, an interactive, standards-based curriculum, designed for middle and high school students. After he reentered teaching, he decided to pursue his M.Ed.

Chuck’s Creative Synthesis Project was presented via a blog hosted on Weebly.com, which he still maintained and updated at the time of this writing. Weebly is a free platform for website design. According to the site it is “the easiest you’ll ever experience,” and “there are absolutely no technical skills required.”

Chuck’s Weebly page featured a black and white picture of his hands pressed into soil with a small tree, in vivid green, growing between them. He explained the image on his site: “New leaf, new learning, new life’... just whatever might be needed to help people accept change and move on to become a positive contributor to their future.”

Under the tab “New Literacies and Global Learning” Chuck included a Voki avatar and text describing the NLGL as focused on “digital technologies for the classrooms, research-based teaching and learning, global collaboration, and teacher leadership.”

Chuck’s compelling question in the Creative Synthesis Project was “How can global technologies be utilized to effectively engage at-risk HS students in history?” To answer his question, Chuck included “Highlights from the Past Three Years,” which focused on examples from each of the following courses:

- ECI 509, 515, and 546 – Cool Tools Locally and Globally
- ECI 501 and 526 – Curriculum and Research
- ECI 524, 525, and 727 – The Global, Digital, and Historical

- ED 508 and ECI 508 – Diversity and Teacher Leadership.

For each course his highlight included either an example of a project he completed or an insight he gained; for example, “ED 508 helped me to realize that ‘those’ and ‘them’ really are mine, helped me to see that kids are kids: no matter what, they are all very much alike, and at the same time, each one is unique.”

Importantly, Chuck included a navigation tab labeled “Today: The NLGL Synthesis,” in which he presented a teaching project that he viewed as a synthesis of what he had learned in the NLGL program. This project was titled “Local Digital Ephemera ‘From my Peep.’” He set the context for the project by describing his students’ lack of engagement in academic history. He reported, “Derek said, ‘All that ---- happened so long ago, who’s gonna believe that happened anyway?’”

The local digital ephemera project was Chuck’s response to Derek’s questions. His students were assigned to “(a) Photograph what’s important to us; (b) Write about why it’s important; (c) Publish our pictures and our writing; and (d) Connect with other students around the world and share products [using e-pals].”

Chuck’s hope was to challenge his students to consider historical ephemera in the everyday and to connect it to their study of the past through the integration of technology. He reported that this teaching activity was inspired by his NLGL coursework.

After graduation Chuck continued to blog despite being a self-proclaimed “digital dinosaur.” According to Chuck, blogging provides an opportunity to serve as a teacher leader for his colleagues, and the blog had created an outlet for him to share his newfound insights about history and historiography. In fact, he coined his new idea “leader teachership” after being inspired by the NLGL core course on teacher leadership.

He wrote in his project, “We teacher leaders now have the torch, and it is our responsibility to seek out and encourage others to become teacher leaders too.” As an example, Chuck’s blog focused on revitalizing history instruction by focusing on digital history and the democratization of history through access to digital archives. His blog posts have focused on state history, and he has reviewed nonfiction texts in an effort to share his insights with fellow teachers.

Erin – Literacy Improvement Through Reflection

Erin is a second grade teacher who completed her seventh year in the classroom at the time she graduated from the NLGL program. Her own experiences struggling with literacy, including “poor reading habits developed in grade school and low ‘academic’ self-esteem,” led her to pursue her M.Ed. in literacy. “I want to stop the cycle and do everything in my power to help low readers feel success and value in schools,” she reported.

Her work in the NLGL program was dominated by her interest in helping struggling readers through student reflection and goal setting. She was also inspired to complete her master’s degree by her mentor teacher, who was also pursuing a master’s degree in reading education.

Erin used Prezi to present her creative synthesis. In her project she focused on new literacy strategies that would help her students be successful in class. She posed the overarching compelling question: “How can student reflection enhance literacy?” To answer this question she referenced Vygotsky, Bruner, and Piaget (which she had studied in the program) and argued that classroom activities must connect to student prior knowledge.

As examples, she highlighted several of the technology-rich projects that she created in the NLGL program. For instance, in the Creative Synthesis Project, she included a YouTube video that answered the question, “How can flip cameras help students reflect on their writing?” She followed her teaching examples with several bullet points describing her insight and reflection about her professional development over the course of the program. Erin concluded, “My students have gained a higher sense of their writing ability due to using writing rubrics and conferencing with peers.”

Erin also reported that she transformed her teaching by reconceiving play as a critical aspect of literacy instruction. She came to value her students’ engagement in critical thinking and problem solving as they were confronted with the need to “problem solve with a computer game, Smart Board, or an iPad Touch in order to proceed and continue to play.”

Erin said it was important that her NLGL course instructors provided “lots of demonstrations and discussions” to help her feel more confident integrating technology. She specifically mentioned a project from the New Literacies and Media class that she adapted for her students: “The

PBI project...was awesome, because I got to put everything together that I was learning and actually do it in my class.” In her interview, she also referred to TPACK as a “theory [that] could help us design our lessons with technology.”

Despite her interest in integrating emerging technologies into her instruction, Erin reported uneven success, and she expressed some hesitation about her ability to lead a technology rich classroom successfully. For instance, she mentioned using Prezi as a teaching tool, but she did not feel comfortable allowing her students to create their own.

Alluding to the tentative nature of her adaptation of the NLGL inquiry framework she said, “I have not used the inquiry process. It has stuck with me a little. I definitely have grown to the idea of exploring and creating a project.” Erin cited several reasons for her relative lack of implementation, including that the tools are “always changing,” “people just get busy,” and that some of the strategies she learned in the NLGL program were geared toward older students.

Perhaps as evidence of these hindering factors, Erin created a PB Works (pbworks.com) class wiki for her second graders, which included a brief teacher introduction, weekly homework assignments, and class photos (posted to Shutterfly, www.shutterfly.com). The front page included a Voki avatar (www.voki.com) with which Erin welcomed students to the site. Beyond this content, the site did not appear to have been updated frequently or used as a forum for substantive student work. The same was true of her Blogspot page, which focused on student goal setting but had not been updated since she graduated.

Erin cited the cohort model as one of the most positive features of the NLGL program. In an interview, she explained that the “Connection between other students was great. [We] see the same cohort over and over again. To be partnered with people from other schools [and] see what resources they have [is useful].” As an example she mentioned a classmate and “her excitement for everything she did.” Erin reported trying to emulate her style, saying, “I feel the master’s degree propels you.”

Discussion

Findings from our study varied across the four teachers. We found evidence that the NLGL program impacted the manner in which they reflected on their professional work and the use of technology with varying degrees of success. The strongest evidence of programmatic impacts occurred when the teachers could make direct connections between course work and the daily needs of their classrooms. All four teachers reported some difficulty synthesizing their course work to address overarching questions in the Creative Synthesis Projects, yet they did provide evidence of their integration of technology to support student development of new literacies. Overall, the creative synthesis process appears to have been successful at prompting the development of TPACK, and the final projects provided data for assessing this development.

Relevancy and Connection

According to Darling-Hammond and Bransford (2005) professional development must connect to the daily work of teachers and their subject matter if it is to be effective. The teachers in our study echoed this concern as they described their experiences. They were much more likely to integrate teaching strategies learned in the program if they could identify a direct connection to their practice. For instance, Ethan mentioned incorporating resources and teaching strategies from NLGL classes directly into his daily lessons.

In an interview he said, "Because I have 12 years of experience I could sift through and take and apply literally the next day what you guys [program faculty] were talking about and what I was learning in class." Similarly Janine mentioned the core course, New Literacies and Media, and reflected, "I definitely felt like I could learn something and apply it or I could alter it and apply it to my own classroom." She referred to the "cool [technology] tools" she was introduced to in the class and the manner in which she adapted them into her practice.

We actually made projects and we crafted things that I could seriously take and use that with my kids. Or I could ask my kids if that was something they would like to use. I felt like in that aspect I got to be on the same team with my students.

Chuck reported a similar experience as he explored new technologies with his students. His Creative Synthesis Project focused almost entirely on his historical ephemera project, which he first learned about in a digital history course. Similarly, Erin reported integrating a project-based inquiry model she had learned into her instruction after experiencing success with this model in her course work.

The teachers had less tolerance for the more theoretical courses and concepts presented in the program. For example, Erin felt that the notion of “global learning” was ambiguous. In her interview, she explained, “You just knew we are going to figure out how to mesh this whole global learning together thing with literacy. But beyond that, how does that happen, how do I do it in the classroom?”

Similarly, Janine was critical of course work in the NLGL program that did not have an obvious connection to her classroom practice. “I felt like I needed something after 5 and half months [in the course]—a product versus just sitting around in a circle and talking.”

The emphasis on products, direct application, and relevancy by the teachers seemed to point to a fairly literal or routine adaptation of ideas they were exposed to in the program. They were worried about wasting time in courses that did not have an obvious connection to their teaching. It appears that the NLGL courses that had the most obvious and direct connections to their professional work focused on developing teaching activities that could be used the next day in their teaching.

Importantly, when the teachers made connections between course work and their practice it was often mediated through their opportunities to interact with other teachers in the program. In an interview, Janine reported, “I definitely felt like I was around some strong teachers—members of the program.” She said she appreciated being about to “talk to people and bounce some ideas back and forth.”

According to Tom (1999), the cohort model is an important feature of high-quality graduate education for teachers, since it allows them to enter a community of practice. All 4 teachers in our study cited the cohort model as a positive feature of the NLGL program. According to Harrison and Killion (2007), when teachers work in cohorts, “Their professional learning becomes more relevant, focused on teachers' classroom work, and aligned to fill gaps in student learning. Such

communities of learning can break the norms of isolation present in many schools” (p. 77).

Creative Synthesis

The teachers all expressed difficulty reconceptualizing their course experiences to design the final Creative Synthesis Projects. They referred to their confusion and anxiety about the project and its ambiguous nature. Erin, for instance, described “feeling at a loss” in the process. As such, it appeared that the Creative Synthesis Project provided a considerable degree of cognitive disequilibrium. Confronted with the challenge to synthesize across their course work and answer an overarching research question, the teachers defaulted to a fairly linear process of providing evidence course by course.

Chuck specifically mentioned ED 508 Diversity in the Classroom and Community and its impact on his teaching. He wrote about this course in his Creative Synthesis Project. In addition, he grouped his classes: ECI 501 and ECI 526 as “curriculum and research,” ECI 524, 525, and 727 as “the global, digital, and historical,” and ECI 509, 515, and 546 as “cool tools.”

Perhaps it is not a surprise that the teachers focused on individual courses since semester-long courses remain a major organizing element of our program. Nonetheless, in the creative synthesis process, we hoped to prompt students to consider their new knowledge, not as defined by discrete courses, but as responding to a compelling educational need or question. By providing more scaffolds and supports for the teachers in the process, perhaps program faculty can better leverage the project to help move teachers from more routine to more innovative presentations of their new understandings.

In retrospect, the teachers were able to reflect on their experiences and what they might have done differently on the Creative Synthesis Project. For instance Erin reported, “If I were to do it all over again and knowing what I know and having all the resources all the masters student have now, I would be better prepared.” Similarly, Ethan reported that after viewing his classmates’ projects and reflecting back on his experiences in the program, he could have done a better job of synthesizing across his work in the NLGL program by applying what he learned to a new situation—the preparation of lateral entry teachers.

These findings emphasized the value of a “metacognitive’ approach to instruction [that] can help teachers learn to take control of their own learning by providing tools for analysis of events and situations that enable them to understand and handle the complexities of life in classrooms” (Hammerness et al., 2005, p. 366).

New Literacies TPACK

Despite the fairly routine nature of the creative synthesis projects, there were some significant examples of innovation. Both in their Creative Synthesis Projects and in the interviews, the teachers demonstrated facility using 21st-century technologies. All of the teachers in our study described new Web 2.0 and other computer-based tools that they had been exposed to and used throughout the NLGL program. These included wikis, website design applications, blogs, and a variety of other Web 2.0 tools.

In describing their rationale for integrating these technologies into instruction, they all referred to TPACK. For example, in her interview, Erin acknowledged, “We learned how TPACK theory could help us design our lessons with technology.” It appears that the NLGL program helped these teachers to articulate the manner in which they conceptualized their teaching, by providing a working knowledge of the new literacies and TPACK frameworks.

Notable across the portraits were instances when the teachers used technology to support students as they developed new literacy skills. For instance, Ethan described his use of wikis to teach writing and literary analysis as “transformative.” According to Ethan, his teaching shifted to focus more on “student creation” and “student ownership” and “opened my eyes” to new possibilities in the classroom. This pedagogical shift, in turn, appeared to lead his students to deeper conceptual understandings. Similarly, Chuck encouraged his students to interrogate their own epistemologies by examining mass media, including sports mascots and apparel labels, to eventually come to a deeper understanding of historical significance.

In this regard the NLGL program’s consistent focus on new literacies appears to have engaged the teachers in reconceptualizing their role to become facilitators of student learning (Greenhow, Robelia, & Hughes, 2009). This, in turn, seems to have impacted teacher TPACK—the

teachers integrated their technological knowledge with their professional content knowledge.

Importantly, these teachers went beyond feeling more comfortable with new technology to merge their technological knowledge and professional content knowledge to create new forms of pedagogy. For example, Chuck's portrait illustrated the personal rewards he gained from using technology regularly. Using his blog he was able to take up technological tools to help make sense of the historical past and to present new ideas for a wider audience. He, in turn, passed on his new disciplinary understanding of history to his students through his integration of the historical ephemera project in the classroom. By allowing his students to create their own digital history, he began to flex some of his TPACK skills. This merging of technology and content knowledge demonstrated his fairly sophisticated understanding of both the discipline of history and the skills needed to communicate his understandings to students.

Chuck's experience was reiterated across the portraits. Ethan, Janine, and Erin all described how they became more personally comfortable with the technology and, in turn, used the technology to help carry out new pedagogical approaches to their content instruction.

Findings from our study point to a new perspective on TPACK. In their Venn diagram Mishra and Koehler (2006) presented equal-sized spheres of knowledge—technology, pedagogy, and content—with all three playing equally important roles in “good teaching.” When viewed from the experiences of the teachers we worked with however, it appears that the TPACK model fails to account for the importance of pedagogical content knowledge. Mishra and Koehler's predecessors (i.e., Shulman, 1987; Thornton, 2001a,b) placed the teacher, and specifically the teacher's role as a curricular-instructional gatekeeper (Thornton, 2001a, 2001b) and “manage[r] of *ideas*” (Shulman, p. 1), as the center of teaching reform. An alternative to the TPACK model might indicate this by presenting the oval representing pedagogy as considerably larger than the ovals representing content and technology (see Figure 3; see also Pierson, 2001).

As we observed in this present study, the creative synthesis process shifted fundamental pedagogical beliefs about the role of the teacher and students in the classroom. We found evidence to illustrate a close connection between changes in teacher pedagogical content knowledge,

for instance, creating new opportunities for students as content creators and technology being integrated in more innovative ways.

At the same time the portraits point to the difficulty of precisely pinpointing or measuring TPACK. According to Mishra and Koehler (2006), “The basis of [the] framework is the understanding that teaching is a highly complex activity that draws on many kinds of knowledge...[and] is a complex cognitive skill occurring in an ill-structured, dynamic environment” (p. 1020). Ultimately, these portraits acknowledge the importance of teaching context for understanding TPACK.

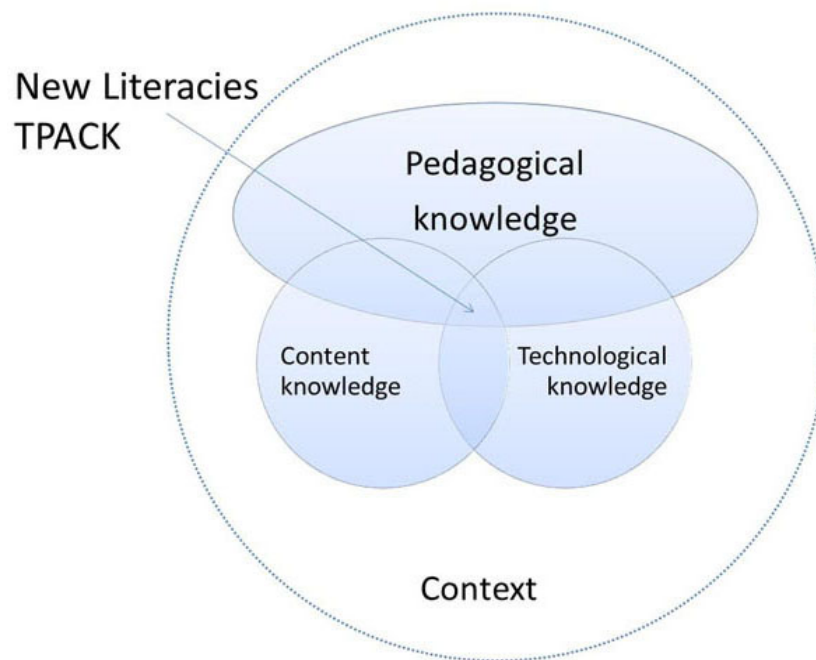


Figure 3. Revised New Literacies TPACK Diagram

(In their original model Mishra and Koehler did not include context; however, noting the importance of the teaching and learning context, a dotted line was added to the TPACK figure.)

The development of teacher TPACK appeared to be constrained not only by teacher willingness to take risks and be innovative, but also by more concrete or fixed factors. All of the teachers pointed to hindrances to their ability to enact their new TPACK in the classroom. These included a lack of access to technology (Janine), lack of administrative support (Ethan), teaching situation (Chuck), and the sociopolitical environment of the school (Erin).

Conclusion

In this study, we treated the Creative Synthesis Projects as narratives that revealed the teachers' processes and understandings; the projects summarized their knowledge reorganization and knowledge creation. Analyzing the Creative Synthesis Projects from the frameworks of new literacies and TPACK, we were able to get a better sense of the extent to which the teachers adapted these frameworks to their own needs. The projects modeled what we hoped the students would internalize (a creative and iterative process of problem posing and reconceptualizing) and served as an effective tool to assess teacher TPACK, especially regarding the integration of new literacies. Although this study confirms the difficulty of precisely measuring TPACK, we found that pedagogical knowledge appeared to be crucial to understanding the development of new literacies TPACK.

Overall, the portraits of the teachers presented here provide a starting point for understanding the impact of graduate study on experienced teachers and were intended to "inform and inspire" (as in Harding, 2005). The individual portraits along with cross-portrait analysis reveal the varied nature of professional knowledge development and indicated that teachers need ongoing support to integrate professional development experiences into practice. According to Tom (1999), effective graduate study must meet a series of "markers," including "teaching as on-going self improvement," "teaching as collegial work," and "a focus on student learning."

Our study describes one model for engaging teachers in graduate work that meets these three markers, transcending typical coursework to

challenge teachers to synthesize creatively and represent their understandings. As observed, the creative synthesis process contributed to a shift in fundamental pedagogical beliefs about the role of the teacher and technology in the classroom.

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Appendix A NLGL Interview Protocol

1. Background information
 - a. Educational background (e.g. degrees, institutions, licensure)
 - b. Educational experience
 - c. Current teaching situation
 - d. Future endeavors
2. Why did you want to pursue graduate study?
3. Did the NLGL program meet your expectations? Perceived strengths and weaknesses of the program?
4. How did the NLGL program compare to other professional development experiences you've had?
5. Can you share a story/anecdote to describe the NLGL experience and its effect on your teaching?
6. Can you describe your current/planned use of technology?
7. What did you take from the program that you plan to use in your teaching?

How would you describe your educational philosophy/
outlook?