TPCK for Impact: Classroom Teaching Practices that promote Social Justice and narrow the Digital Divide in an Urban Middle School

Savilla I Banister, Bowling Green State University
Rachel A Reinhart, Bowling Green State University - Main Campus
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By

Savilla Banister, PhD
Bowling Green State University
sbanist@bgsu.edu

Rachel Vannatta Reinhart, PhD
Bowling Green State University
rvanna@bgsu.edu

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Dr. Savilla Banister is Associate Professor of Classroom Technology for the School of Teaching and Learning at Bowling Green State University. Dr. Banister’s research focuses on the impact of multimedia technologies for teaching and learning at the P-16 level.

Dr. Rachel Vannatta Reinhart is Professor for the School of Educational Foundations and Leadership Studies at Bowling Green State University. She serves as the Coordinator for Educational Foundations and Inquiry and her research focuses on P-16 technology integration, and teacher qualities that promote effective technology integration.
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Abstract:
US schools have long struggled with what has recently been identified as the “achievement gap.” While the debate ensues in regards to an explicit definition for this phenomenon, research overwhelmingly demonstrates that students of marginalized populations remain on the lower end of most measures of school success. Accordingly, advocates of social justice point to the disparities of resources, including quality teachers, experienced by students in poverty. As a part of this movement, access to appropriate technological resources in schools has become an issue, commonly labeled the “digital divide.” This study reviews evidence of teaching for social justice and impacting the digital divide through the analysis of classroom observations in one year at an urban middle school participating in school reform efforts.

Key Words: TPCK, digital divide, social justice, school reform

Introduction

US schools have long struggled with what has recently been identified as the “achievement gap.” This gap, measured primarily through scores on standardized tests, is most apparent when affluent versus non-affluent school populations are compared (Lee, 2008). Typically, the schools in rural and urban poverty-stricken areas also demonstrate lower attendance and graduation rates (Marley, 2008). Furthermore, these schools suffer from inadequate funding, lack of resources, and a teaching staff that is often inexperienced or unqualified. In an effort to address these issues, multiple school reform efforts have been introduced to combat the inequities experienced in these lower-achieving schools (Linda Darling-Hammond, 2009; Whittington, 2004; B. Williams, 2003).

One such reform effort, project GEARUP (Gaining Early Awareness and Readiness for Undergraduate Programs), is designed to increase the number of students prepared for college by improving instruction, and increasing and intensifying after-school tutorials, mentorships and other enrichment programs. GEAR-UP is a major federal initiative focused on populations underrepresented currently in post-secondary education. This article documents teaching
practices in an urban middle school following five years of collaborative restructuring as a part of the GEARUP initiative (Fischer & Hamer, 2004). Collaborative restructuring evolved democratically, as teachers, parents, administrators, community members and university faculty dialogued and strategized to effect growth in student learning and preparation for post-secondary education.

The reforms at Ravine Middle School,* the site for this study, have all been based on what teachers and administrators have identified as student needs. These needs have been documented through ongoing and completed action research projects and literature reviews (Bernauer, 2002; Fullan, Bennett, & Rolheiser-Bennett, 1990). The reform work at Ravine is based on the belief that school change and restructuring can be process-oriented. Researchers have worked to identify the key aspects of process-oriented change. Their analysis positions the work that the Ravine Middle School GEAR-UP team has engaged in as part of the range of “new” forms of work emerging: professional networks and school university collaborations which create job-embedded professional development opportunities (S. G. Grant, 1997; Guskey, 1998). Teachers at Ravine elected to participate in various types of job-embedded professional development (JPD) as they worked to reach their students more effectively.

As a part of the restructuring efforts of the GEAR-UP team, issues of equity were explored, to determine the most acute student needs, related to supporting students in continuing their education. Teachers realized that Ravine students lacked many resources available to their middle-class peers; because of this, students did not feel empowered to pursue post-secondary goals, or even to attempt high-school graduation. From this analysis, the team began offering JPD

* A pseudonym
to support teachers in crafting strategies to empower students to learn and to build democratic classroom environments. Teachers also targeted student access and use of computer technologies as an area of need. The majority of Ravine students are part of low SES and minority populations; research has shown that most of these students do not have home access to up-to-date computers or Internet services (Bull, 2003; Gorski, 2002; Moghaddam, 2004; Morse, 2004). Ravine teachers, then, created JPD opportunities focused on classroom technology integration as a component of their work to improve instruction and combat the “digital divide.”

After five years of reform efforts, researchers wanted to determine if, in fact, JPD and other initiatives were significantly impacting student experiences in the classroom. They asked the question, “What evidence existed to demonstrate that GEARUP JPD had effected change for students?” Survey data collected from teachers, students and parents over the years indicated that they believed GEARUP was impacting Ravine Middle School in positive ways. State standardized tests and attendance measures provided some confirmation that the school was raising student achievement and participation. Various case studies had provided glimpses into teachers’ classroom strategies (Banister & Fischer, 2006; Banister & Steingraber, 2006; Michalski, Banister, & Hodges, 2005). But substantive, comprehensive data on what was occurring, day by day, in Ravine classrooms was lacking. Were teachers delivering academic content in a way that demonstrated pedagogical expertise, with the potential to impact student learning? Had the emphasis on collaborative reform strategies translated to democratic classrooms that promoted social justice? Did these strategies include technology integration experiences that expanded student access and use of digital technologies? The purpose of this study was to examine the relationship between classroom practices related to teachers’ expertise in conveying academic content, creating democratic classroom environments and effectively integrating technology.
Framing the Study

Before rigorous data collection in Ravine classrooms could begin, it was imperative that the researchers agreed upon what elements of classroom instruction were being targeted for study. Pedagogical Content Knowledge (PCK), practices promoting social justice, and technology integration strategies (ultimately Technological, Pedagogical, and Content Knowledge-TPCK) were central in this undertaking. Researchers believed that these constructs would provide a solid foundation for describing and examining classroom practices, while acknowledging the complexities therein. Because the JPD opportunities chosen by the teachers had focused on pedagogy, social justice, and classroom technology integration, observing their classrooms with these elements in mind seemed prudent. Since technology integration practices provided these urban students with more equitable access and use of digital technologies, the concept of the digital divide was noted as an underlying theme in the social justice framework. The following paragraphs explore the theories of PCK, TPCK, social justice and the digital divide in more detail.

Pedagogical Content Knowledge (PCK)

In order for students to learn academic content effectively, teachers must know their subject matter. This fact is undisputed, for how could anyone teach something that they do not know themselves? However, recent research has moved the assumption of what a teacher knows to another level. Not only do teachers need to be masters of their content (subject matter), but they must also be masters in how to effectively convey that content to their students. This level of expertise is currently defined as Pedagogical Content Knowledge (PCK) (Beattie, 1995; Dawkins, Dickerson, McKinney, & Butler, 2008; Piccolo, 2008; Shulman, 1986, 1987).
PCK is more than a “bag of tricks,” various teaching methods, that a teacher pulls from, as they peruse through their course content, week by week. Rather, PCK entails a scope of expertise that allows educators to critically review what their students need to learn, understand their students’ learning styles, and effectively select and carry out teaching strategies that powerfully convey content to learners (Chauvot, 2008; Dawkins, et al., 2008; Piccolo, 2008). The result of excellent PCK, it is theorized, should be successful student learning. While teacher education experts have continued to focus on PCK as a primary goal of their initiatives, comprehensive research support for student achievement with PCK is inconclusive (Abell, Park, Hanuscin, Lee, & Gagnon, 2009). This is, in part, due to the complexities of schooling and the difficulties in collecting day-to-day descriptive data of teaching practices. Smaller case studies do demonstrate the importance of PCK for effective teaching and learning, but more substantive work is needed to tie student achievement and PCK on a broader scale (Fitzharris, Jones, & Crawford, 2008; VanDijk, 2009). This study seeks to document teacher’s PCK as evidenced through observations of classroom teaching practices. In addition, technology integration practices were studied. If teachers demonstrated PCK within their digital technology use, then researchers determined that Technological Pedagogical Content Knowledge was evident. The following paragraphs further explain this concept.

Technological Pedagogical Content Knowledge (TPCK)

As if PCK were not a complex enough construct, researchers interested in the effects of classroom technologies on teaching and learning have added this component to the mix. Identified as Technological, Pedagogical, and Content Knowledge (TPCK), this entity is described as teacher understanding, not only of subject matter and expertly-selected methods of teaching
that subject matter to students, but the knowledge of the various digital technologies available to teach the content and how to best select and integrate these technological resources to impact student learning (Mishra & Koehler, 2006).

TPCK adds yet another dimension to identifying effective classroom instruction, arguing that 21st century teaching and learning must reflect compelling uses of digital technologies. In order for teachers to be prepared with TPCK, they must spend time in both learning the “mechanics” of various technologies, as well as studying how to match specific technology tools to specific learning needs. Such knowledge would include how to use various software packages, peripheral devices and websites, expanding, then, to effectively selecting those resources that would most powerfully support the learning goals of the classroom (Angeli & Valanides, 2009). Such expertise necessarily builds upon a foundation of adequate PCK and requires the additional technological capabilities to be nurtured in teachers. Advocates of TPCK do not imply that for every learning goal there exists only one technology integration strategy that will support that goal, (anymore than PCK proponents would argue that only on pedagogical strategy would support a certain learning goal) but rather that teachers with TPCK have the ability to keenly identify multiple technological strategies for a given situation and then implement a strategy that meets the needs.

Part of TPCK also includes the ability to understand the technological constraints within a certain teaching scenario, and adjust accordingly. For example, a teacher determines that students should construct digital concept maps and share these with peers for review and editing, in order to critically evaluate a specific classroom topic. TPCK would be demonstrated, not only in this determination, but as the teacher selects content-mapping resources (purchased
software, open source application, or web-based?) and chooses an environment for peer editing (shared files on the server, wikis, or inserting digital comments on actual concept map files?). In addition, the ability to transfer from one option to another, based on the availability and functionality of the digital resources would further exemplify the TPCK of a teacher.

Documenting TPCK in classrooms has followed the trajectory of the studies of PCK, in that the scope needs to be expanded to make stronger claims about the impact on teaching and learning (Hofer & Owings, 2008). The relationship of PCK to TPCK in classroom teaching is also an area where further research is needed (Greenhow, 2009). For the purposes of this study, researchers sought to document evidence of PCK and TPCK in classrooms, in order to determine best practices for teaching in urban settings. Strong pedagogy, coupled with powerful technology integration experiences, might provide more equitable learning opportunities for students. In so doing, issues of social justice would be addressed, including more access and use of digital technologies. The concept of teaching for social justice, including impacting the digital divide, is presented below.

Teaching for Social Justice

In addition to the importance of PCK and TPCK to support teaching and learning, this study chose to also focus on the classroom evidence of teaching for social justice. Because of the GEARUP focus on preparing students to move on to post-secondary educational opportunities, the need to develop students’ self-efficacy attributes was paramount. Accepting and valuing students’ voices in the constructivist classroom, with the goal of encouraging critical thought, could yield those who believed in themselves enough to graduate and build a strong future. While some have criticized the practice of preparing teachers to impact social justice (C. Grant &
Agosto, 2007), proposing that the construct is nebulous and, therefore, impossible to nurture, a strong contingent of teacher educators have embraced the challenge (Adams, Bell, & Griffin, 1997; Ayers, Hunt, & Quinn, 1998; L. Darling-Hammond, French, & Garcia-Lopez, 2002; El-Haj, 2003; Michelli & Keiser, 2005; C. Swain & Edyburn, 2007).

These advocates have articulately outlined the need for empowering students of marginalized populations through creating democratic classroom environments where these students are respected and valued for their unique perspectives and intelligences. Strategies have been developed and practiced within communities of teacher educators, but, as in the case of PCK and TPCK, studies have not moved beyond small, single-classroom research to demonstrate the wider impact that teaching for social justice might be generating (Sleeter, 2001). This longitudinal, multi-classroom study focuses on social justice elements found in classroom experiences, and their relationship to PCK and TPCK. Specifically, the researchers posit that appropriate technology integration experiences promote social justice by providing students access and use of digital technologies that are often absent from urban environments. An additional explanation of addressing the digital divide as a subset of urban school social justice issues is provided in the following paragraphs.

The Digital Divide: An Outgrowth of the Social Justice Imperative

Finally, this study sought to understand the classroom teacher’s impact on the digital divide, a construct that can be characterized as an outgrowth of the social justice agenda. While the exact origin of the term digital divide cannot be determined ("Digital divide," 2005; Foster & Borkowski, 2004), it has been in use for over a decade. Politicians, scholars, educational leaders, policy makers and activists frequently employ this phrase when addressing issues of
empowerment and democracy (K. Williams & Alkalimat, 2002). These discussions have proliferated various determinants in identifying the digital divide phenomenon, including types of Internet or computer access (both quality and quantity), and available and/or actual uses of these technologies (Angus, Snyder, & Sutherland-Smith, 2003; Attewell, 2001; Moghaddam, 2004; Morse, 2004; Solomon, 2002).

Access has been traditionally defined as the right or ability to log on to a computer system or use a computer program. When focusing on access, data is often collected regarding the number of computers present in a certain geographic space (school, library, home, community), the ratio of people to computers, or the number of computers equipped with Internet connections. While the United States, as a whole, statistically surpasses most other nations in these measures, stark inequities have been documented within its borders. Minority and low SES populations have consistently been shown to have less access to technological resources (Gorski, 2002; Hayden, 2003; Norris, 2004). These inequities are present, regardless of the unit analyzed. Be it home, school, or community, the wealthy and powerful, without fail, enjoy the benefits of more computer resources.

Beyond access, however, lies the reality of opportunity for use in the digital divide debate. Those who collect statistical data on the number of computers and Internet connections oftentimes interpret this information as reflecting progress in narrowing the divide. However, just because computers are present, one cannot immediately assume that they are functional and put to use. Especially in school settings, studies have shown that marginalized student populations receive little or no opportunities to use computer technologies in productive and creative modes (Bull, 2003; Milone & Salpeter, 1996; C. P. Swain, Tamara., 2001). As these
practices persist, students are being denied experiences that have been shown to increase their chances for meaningful employment and educational opportunities.


The constructs of Pedagogical Content Knowledge (PCK), Technological and Pedagogical Content Knowledge (TPCK), Teaching for Social Justice, and Impacting the Digital Divide combined to form the framework of this inquiry. Because of extensive Job-Embedded Professional Development (JPD) experienced by much of the faculty at Ravine Middle School throughout five years of GEARUP school reform initiatives, researchers hypothesized that teachers would demonstrate expertise in these areas. Furthermore, relationships between these constructs would be examined to determine possible connections between reformed teaching practices (PCK and TPCK) and the impact on social justice in these classrooms. Specifically, was the issue of the digital divide being impacted in these classrooms? Because each of these propositions suffers from a lack of substantive research based on detailed, repeated classroom observations, this study provided a unique and valuable dataset. Two primary questions guided the study:

1) Does the level of the implementation of reformed teaching practices significantly relate to the technology use of urban middle school teachers?

2) Does the level of implementation of reformed teaching practices and technology use significantly differ by social justice indicators (high/low)?

Contextual Landscape and Methods

Ravine Middle School in the Midwest had many characteristics that made it a unique site
for study. Seventy-five percent of the 850-member student body was categorized as “at risk”, living on poverty level family incomes. The minority population of the school was less than fifteen percent, almost equally divided between African-American and Hispanic groups. However, a significant number of poor Appalachian families also attend the school. The school received substantial Title One funding, because of such a high poverty rate, and these funds were used to provide a variety of initiatives aimed at facilitating student success in school.

Since this study sought to capture the complexities of classroom teachers’ expertise in PCK, TPCK, teaching for social justice, and impacting the digital divide a mixed-methods triangulation design was utilized. Researchers conducted multiple classroom observations over an eight month period using two types of instruments that we identified as the “Longstop Protocol” (LSP) and the “Quickstop Protocol” (QSP). Observation data was then converted into quantitative data for statistical analysis. The following sections describe how data was converted. In addition, over 500 classroom artifacts (lesson plans, classroom handouts, student work samples, etc.) were collected and coded relating to these observation protocols.

Longstop Protocol (LSP)

In order to capture detailed data from daily class sessions throughout Ravine Middle School, a team of researchers randomly⁠¹ visited full class sessions (43-minute periods) of 23 teachers, completing three to four observation protocols for each teacher. Eighty-nine observations were attempted during the months of January through April 2008, with 82 LSP completed. Seven observation sessions were not completed due to classroom constraints (substitute teacher, exam being given, etc.).

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¹ Randomization was determined by assigning each teacher a number and then using a digital spreadsheet to generate a list of random numbers within this range. Teachers were then observed in this order. Researchers were able to complete six to eight observations each week, and continued through the random order until it was finished. Once this occurred, another list of the numbers in a random order was generated.
The data collection instrument used during these LSP observations was the well-established Reformed Teaching Observation Protocol\(^2\) with Social Justice supplement (RTOP+). The original RTOP was an instrument designed by the Evaluation Facilitation Group of the Arizona Collaborative for Excellence in the Preparation of Teachers (ACEPT) in 1999. The adapted instrument was tested by the Teaching for a New Era (TNE) project in 2007 (Pedulla, Salomon-Fernandez, Miteseu, Jong, & Cochran-Smith, 2007), and contained the items from the RTOP instrument with the addition of six items specifically related to teaching for social justice. The TNE project researchers report “The RTOP is an established standardized instrument with sound psychometric properties. The instrument developers report the rater reliability to be 0.95, indicating a very high level of consistency of ratings across raters. The RTOP also gives norm-referenced information about the extent of reformed teaching practice.” (Pedulla, et al., 2007) Ravine researchers were trained to use the instrument by observing the same class session and discussing their results during the month of December, 2008. After four to eight observation and critical analysis sessions, researchers achieved an inter-rater reliability of .70 to .85 and began conducting observation sessions in January for the study.

The RTOP+ yields scale scores in six areas: 1) Lesson Design and Implementation, 2) Content: Propositional Knowledge, 3) Content: Procedural Knowledge, 4) Classroom Culture: Communicative Interactions, 5) Classroom Culture: Student/Teacher Relationships, 6) Teaching for Social Justice. Data on technology use and integration within these observed sessions was also captured with the RTOP+ through the descriptive and demographic information retrieved. The RTOP+ contains the directive: *Please describe any technology visible in the room (e.g.*

overhead projector, TV/VCR, computers). Please describe the type and number of computers, if these machines are turned on, if they are being used and in what manner. Also note teacher use and student use of digital technologies throughout the lesson observation. With this information, combined with the data collected through the QSP observations, each session was assigned a technology integration rating. The following paragraphs explain this work in more detail.

Quickstop Protocol (QSP)

In addition to observing 82 full class sessions at Ravine Middle School, researchers also completed five-minute “quickstops” in 58 out of 66 Ravine teachers’ classrooms on a weekly to biweekly basis. All in all, 871 QSP were tallied, with an average of 16 stops per classroom from December 2007 to April 2008. Researchers unobtrusively slipped quickly into classrooms, indicated the technologies in use, the user and the type of use. The QSP identified various digital technology resources in the classroom, including teacher workstation/projection systems, student computer workstations, digital cameras and microscopes, and graphing calculators (See Appendix B). If these resources were in use, researchers also noticed who was using them (teacher, individual students, student groups) and what software applications were being utilized (presentation, spreadsheet, word-processing, concept-mapping, Internet browser, etc.). The QSP data was then entered into an electronic database for analysis.

Calculating the Technology Quotient (TQ)

Since each teacher was observed using LSP and QSP numerous times, the researchers sought to generate a value that represented the overall level of technology use. To do so the researchers, generated a technology quotient (TQ) for each LSP using two values—a technology integration level from the LSP and an average technology indicator from the QSP. The first value,
the LongStop Protocol Technology Integration Level (LSP-TIL), was determined for each LSP session and represents the level of technology integration. Essentially, each LSP session was rated based on the level of technology integration observed. Three levels, ranging from 2 to 4, were used. Level 2 represents teachers using digital technologies in instructional methods. Level 3 indicates students using digital technologies during the class session. Level 4 represents students working on a project using digital technologies. For example, if during a LSP a teacher was observed using the projection system for instruction (2) and students were observed individually using computers or other digital devices to complete learning tasks (3), then the class session would receive a level of 5 (2 + 3). If students were observed participating in project work that integrated digital technologies a level of 4 would be indicated. If all three types of technology integration scenarios were observed in one LSP observation (highly unlikely) it would be possible for a session to receive a level of 9 (2 + 3 + 4). Other instruments have utilized a similar leveling system to describe and differentiate the quality of technology integration (Hastings, 2009; Washington.....)

The second value used to generate the Technology Quotient was the QuickStop Protocol Indicator of Technology Integration (QSP-ITI) and represents the average amount of technology used per observation. To calculate this value, QSP data were first sorted using individual teacher identifiers. Various types of digital technology uses (e.g., SmartBoard, video camera, projector) in a particular teacher’s classroom were tallied and divided by the number of visits per teacher. In theory, it would be possible for a teacher to have up to 10 checkmarks on the QSP (again, highly unlikely), indicating that the teacher was using the projection system, a SmartBoard, digital cameras, and all students were using computer workstations, cameras and other digital peripherals.
The Technology Quotient then combined the LSP-TIL and the QSP-ITI by multiplying these two values (QSP-ITI * LSP-LIT = TQ) such that the TQ is a function of quality of technology integration and variety of technology used. The TQ’s for each LSP instance were rounded to the nearest whole number, with those numbers over 4 being indicated as a “4” for the purpose of analyzing the TQ score with the RTOPS+ data, which was gathered on a 4-point scale. Fifteen, out of the 89 LSP sets, initially had a TQ raw score over four.

For example, if a teacher’s classroom was observed 16 times during the study using the QSP and 32 items indicating digital technology use were documented during those visits, then the teacher would be given the technology QSP indicator of 2.0 (32/16). If the LSP-TIL for a particular observation was 2, then the TQ for that class session would be 4.0 (2.0 * 2). Of course, with this system, a class session could, theoretically receive numerical identifiers ranging from 0 to 90 but the realities of classroom life prove this to be highly unlikely. Rather, researchers found that using this quietly construed process actually succeeded in providing comparative data that could reasonably be integrated with the RTOP+ scale for analysis.

These methods yielded a complex and relatively large data set. Considering that each Ravine Middle School teacher taught six class periods a day and engaged in teaching lessons an estimated 170 days that year (additional days spent on testing, convocations, etc.) for a total of 1020 possible lessons, researchers were able to document three to four complete class sessions (LSP) and sixteen quick visits for each teacher. Mathematically, the data was only a fractional representation of classroom teaching during that school year, but the collection comprised a rigorous sampling of teacher work, in any case.

Results
In analyzing the data, subscale scores for each reformed teaching practice were created by calculating the mean of respective subscale items: Lesson Design, Propositional Knowledge (PpK), Procedural Knowledge (PcK), Content (PpK + PcK), Communicative Interactions (CI), Student/Teacher Relationships (S/TR), Culture (CI + S/TR), Social Justice, and Technology Quotient. Table 1 presents the items that correspond to each subscale, frequencies and percents for subscale intervals, and means and standard deviations for subscales. The subscale of Content combines the subscales of Propositional Knowledge and Procedural Knowledge; this scale is representative of PCK. The subscale of Culture combines the subscales of Communicative Interactions and Student/Teacher Relationships. While the majority of participants fell in the “descriptive” interval (3.00-3.99) for each subscale, most subscale means ranged from 2.50 to 3.00. The subscales of Student/Teacher Relationships ($M=3.22$), Social Justice ($M=3.11$), and Propositional Knowledge ($M=3.02$) showed the highest means. The subscale with the lowest mean was Communicative Interactions. The Technology Quotient was very low ($M=1.8$) with the majority of teachers using digital technologies in their teaching, but not demonstrating student use of technologies for learning.

A correlation matrix (see Table 2) was constructed to examine the relationships among the subscales and Technology Quotient. All correlation coefficients were statistically significant at $p<.01$. Subscales were strongly correlated with one another with most coefficients ranging from .60 to .95 with the exception of correlations with Technology Quotient. Social Justice was most related to Student/Teacher Relationships ($r=.730$) and Content ($r=.701$). Interestingly, the Technology Quotient generated fairly weak to moderate correlations ranging from .23 to 42.
These low correlation coefficients may be due to the Technology Quotient with respect to what it measures and how it is calculated. Although the Technology Quotient attempts to capture one’s level of technology integration, it does only represent technology use at a few points in time, during which the instructor may have implemented an excellent lesson that does not utilize technology. The Technology Quotient was most related to the subscales of Communicative Interactions ($r = .417$), Culture ($r = .392$), and Procedural Knowledge ($r = .380$). Overall these correlations do support the interrelations between PCK, Social Justice, and TPCK.

Social Justice group differences were also examined with respect to the subscale scores. Participants were categorized as low social justice with subscale scores ranging from 0 to 2.99, while participants with subscale scores of 3.00 and greater were identified with high social justice. T tests of independent samples were conducted to compare high and low social justice groups. Table 3 presents group means and standard deviations along with $t$-test results. All subscales revealed significant group differences, indicating that participants with high social justice had significantly higher means in all subscales scores when compared to those with low social justice. Cohen’s D was also calculated to evaluate the size of effect for each subscale. All subscales generated extremely large effects as a result of social justice groupings indicating that teachers in high social justice classrooms implemented higher levels of reformed teaching practices. The subscales of Lesson Design and Content (PCK) showed the greatest effect from Social Justice. The Technology Quotient also showed significant differences between Social Justice groups, again indicating that teachers with high Social Justice were observed to have a higher levels of technology use.
Discussion

This extensive documentation and analysis of teaching practices in an urban middle school yields powerful evidence of how exemplary teachers impact social justice and the digital divide. While teachers were observed to use technology at fairly low levels, technology use showed significantly moderate correlations with several reformed teaching practices supporting the theoretical framework of TPCK and the strong link between pedagogy and quality technology use (Mishra & Koehler, 2006). Several studies support the relationship between a constructivist environment and quality technology use (Moersch, 2001; Wenglingsky, 1998).

A teacher’s commitment to social justice was another factor related to reformed teaching practices, supporting a strong relationship of social justice with PCK and TPCK. As a result, teachers who are committed to empowering students of marginalized populations through creating democratic classroom environments may be more knowledgeable and/or committed to implementing innovative teaching practices. Ravine Middle School classrooms that demonstrated SJ/TPCK were interactive and honored student voices. Teachers and students were respectful of one another. Many lessons were inquiry-based, with students participating in activities and conversations about the lesson at hand with interest. Students were not passive observers in the TPCK/SJ classrooms, but were active seekers of knowledge. Further studies of high TPCK/SJ classrooms and student achievement on state standardized tests will be forthcoming, but research to date indicates that active learning environments like TPCK/SJ classrooms promote academic achievement. Since students in the high social justice classrooms were also getting
experiences in integrating technologies for learning, digital divide issues of access and use were being addressed.

This study focused on classroom data related to teachers’ expertise in conveying academic content, creating a democratic classroom environment and effectively integrating technology. The findings demonstrate that these three components of teacher expertise are correlated closely with one another. Because of the complexity of the classroom environment, it is difficult to conclude exactly how a teacher manages to craft daily lessons that effectively reach students with content knowledge, while enacting a democratic experience. Why technology-integration is often a part of this process is also unclear, but some glimpses into the documented teacher practices found in this study may offer some insights. Following are examples of classroom practices that ranked high in TPCK using the Technology Quotient (TQ) previously described.

Examples of Classroom Practice

A few of the classrooms observed necessarily demonstrated strong evidence of student engagement, dialogue and technology use. Among these were the Industrial Technology classes and the classes held in the Media Center. These venues, coupled with teachers that expected students to be “intrepid explorers,” (Vannatta, 2007) consistently evidenced students working on group or individual projects that required research, debate, and media creation. Students in these classrooms were using computers to locate and analyze information, discussing their findings, and creating projects and presentations, shared with the class. Beyond these courses, however, science, language arts, social studies and math classes were also found to include examples of strong TPCK, identified by a high TQ.
A science class was observed during a unit on sound and frequency. Collaborative student groups were using five classroom computers to research presentations on sound, including locating actual sound files to be analyzed and discussed. The teacher, using another computer connected to a projection system, provided direction on research practices and examples of resources. During this observation session, a research assistant noted “connections were made between sound and music” in response to LSP item 10, “Connections with other content disciplines and/or real world phenomena.”

In language arts classes focusing on the topic of “Poetry,” two teachers were observed presenting poetry vocabulary using their teacher workstation and a projection system. Students were then given direction on an assignment to write their own “real life” poetry. Students then worked in groups, brainstorming ideas related to real world situations, specifically related to success in high school and the current job market. With these ideas in mind, students moved to computer workstations to begin to write rough drafts of poems.

A social studies classroom studying “The Crusades” included students creating multimedia slides containing key facts about this event in history. In addition, the teacher, again using a projection system, provided an outline of elements to be included in students’ final presentations. Students worked in cooperative groups during this time, and then presented their slides to the rest of their classmates. The teacher’s lesson objectives included, “Students will be able to explain how the participation of citizens differs under monarchy, direct democracy and representative democracy. (Ohio Academic Content Standards, Citizenship Rights and Responsibilities 7.1).”

As a final example, a math class working on the concept of slope, using graphing calculators. The teacher first used the projection system to project a grid on the whiteboard.
Students used erasable markers to draw graph equations and calculate slope. The teacher also used the projection system to provide brief tutorial on the use of graphing calculators. Students then worked in groups, using the graphing calculators, to complete equations and slope calculations. When asked if she sometimes made changes to the curriculum, the teacher responded, “Yes! I might break this down into more manageable steps. Next I would go deeper into the concept versus the broader...to develop more conceptual versus procedural knowledge.”

In summary, the class sessions that received a high TQ rating were classes in which 1) The teacher demonstrated a keen focus on key concepts of the lesson and kept the students on task. 2) Students were working in groups and actively engaged in dialogue about the lesson concepts. And 3) Digital technologies were being utilized to support the key concepts identified by the teacher. Certainly other consistencies could be noted, but these observations support the premise that PCK, democratic classroom development, and TPDK are identified in classes noted to have a high TQ rating.

Limitations

While this study utilized rigorous data collection methods and a large data set, there are still limitations that should be noted. No pretest measure was present in this design. While the GEARUP school reform initiative was in place for five years, no observational data was available for the beginning of this endeavor. Therefore, it might be argued that these teachers have been demonstrating TPCK and socially-just classroom practices for years. If that is the case, and the reform efforts, including the JPD activities, had no impact on classroom practice, this study still provides a glimpse into what a TPCK classroom looks like and how such classrooms impact the Digital Divide and social justice issues. Examining other limiting factors, the complexities of school life place many obstacles in the way of researchers. Certainly the instruments used and
the artifacts collected represent only a fraction of what occurs throughout a year of schooling. Researchers certainly did not see a large portion of the classroom experiences, but analyzed a powerful sample, nonetheless. The LSP required researchers to make judgments in each classroom, and these judgments could be skewed. Even with training, it is possible that some researchers scored various classrooms differently based on their own personal bias, or other invading factors at the time of data collection. With these limitations in mind, this study still provides details and substantive data to support the relationship of TPCK and teaching for social justice.

Conclusion

Teaching is a complex activity, and, while good teachers seem to be easily identified by students, parents, and administrators, establishing a “formula” for nurturing a good teacher sometimes seems out of reach. Our best practices must continue to be pointing to good models, analyzing those models and sharing those models with future teachers. Five years of JPD related to the school reform efforts of project GEARUP were examined through critical observations of classroom practices. Teachers found engaging students in collaborative, interactive, dynamic environments were those who demonstrated solid content knowledge and PCK (Beattie, 1995). In addition, they utilized digital technologies to support teaching and learning in their classrooms (TPCK), they promoted social justice and, researchers argue, began to address Digital Divide issues. These results are compelling and provide a basis for continued research and professional development. They certainly arise from a larger data set than has been collected for most studies of TPCK and social justice/digital divide focused studies. Perhaps TPCK, as a subset of PCK, must
be modeled in teacher education programs in order for students to be more prepared to enter their professions in a position to attack the Digital Divide.
Appendix A: Quickstop Data Collection Instrument

Classroom Tech Inquiry Quick-Stop Protocols

Room (#/teacher)______________________Date:_________
Content Area:__________________________Time:________

Current Activity:
☐ Teacher-Centric (one-way lecture)
☐ Interactive (teacher/student exchange)
☐ Group (student small group work)
☐ Individual

Technology in Use (check all that apply):
☐ Classroom projection system
  ☐ PowerPoint
  ☐ Website
  ☐ Word
  ☐ Excel
  ☐ Inspiration
  ☐ Video (US? Other?)

☐ SmartBoard      list content area ____________________________

☐ Student Computers
  ☐ Turned on
  ☐ Students using workstations number of students _________
  ☐ individually ☐ in groups

☐ Laptop Cart number of students _________
  ☐ individually ☐ in groups

Applications/activities at student computers
☐ PowerPoint
☐ Website
☐ Word
☐ Excel
☐ Inspiration
☐ Other __________________________

☐ Digital Tech Peripherals
  ☐ Digital Cameras
  ☐ Graphing Calculators
  ☐ Classroom Response (clickers)
  ☐ Other __________________________

Additional Notes: _______________________________
________________________________________________________________________

Documenter: ___________________________________
References


Table 1 Descriptive Statistics RTOP+SJ Subscales and Technology Quotient

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Table 2. Correlation Matrix of Subscales

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<th>LD</th>
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<th>S/TR</th>
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Table 3. Social Justice Group Differences (High/Low) in Subscale Scores and Technology Quotient
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