In Search of Technological Pedagogical Content Knowledge: Teachers' Initial Foray into Podcasting in Economics

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Abstract

In this paper, we report on work with eight practicing ninth grade social studies teachers to determine how they chose to integrate podcasting to help their students build on their economic literacy, which includes building both economic concepts and skills. The study is rooted in an interpretivist research paradigm, using the Council for Economic Education's National Voluntary Content Standards in Economics (1997) and Mishra and Koehler's (2006) theory of Technological Pedagogical Content Knowledge (TPACK) to frame data generation, analysis, and the reporting of results. We found that teachers demonstrated strong technological pedagogical knowledge (TPK) but a lack of technological content knowledge (TCK) in the design and implementation of the podcasting projects. We argue that the lack of teachers' content-based rationale for podcasting is a function of the universal nature of some digital tools, such as podcasting, in contrast to more specialized tools, such as computer simulations. (Keywords: Economics, podcasting, technology integration, technological pedagogical content knowledge, TPACK)

In recent years, educators have touted the benefits of audio recording and podcasting as a way to disseminate lecture-based curriculum to create pedagogical efficiency (Copley, 2007; Meuppala & Kong, 2007), provide supplementary course material (Baker, Harrison, Thorton, & Yates, 2008; Edirisingha, 2006; Lee & Chan, 2007), and enhance the clarity and meaning of direct instruction (Anazi, 2007; Lane, 2006). In addition to instructor-created podcasts, a number of educators have begun to study the use of learner-generated podcasts as a means of assessing students' understanding in higher education coursework (Armstrong, Tucker, & Massad, 2009; Dale & Povey, 2009; Lee, McLoughlin, & Chan, 2008; Vess, 2006). In the K–12 classroom context, we found only eight journal articles that document the use of podcasts as a tool for learning in science (Bedrossian, 2010; Plankis & Weatherly, 2008; Putman & Kingsley, 2009; Schaffhauser, 2009), music (Coutinho & Mota, 2011),

English language arts (Goodson & Skillen, 2010; Saine & Kara-Soteriou, 2010), and elementary social studies (Dlott, 2007).

Two of the articles report on teacher-created podcast efforts. Putnam and Kingsley (2009) report on the efforts of a fifth grade science teacher to create supplemental podcasts to support student vocabulary acquisition. In a quasi-experimental, pre/posttest design (n = 58), they conclude that the students in the treatment group scored significantly higher than the students in the control group on the posttest. Additionally, 86% of the students in the treatment group indicated that the podcasts helped them to learn better, and 76% agreed that the podcasts helped to make learning vocabulary more interesting. Shaffhauser (2009) reflects on his efforts to use podcasting in a variety of ways in a high school science class. He began by creating recordings of his class lectures as a way to help students who are absent to access course material. Over time, he began to create a series of brief podcasts to introduce new course material along with accompanying instructional modules that students could work through independently. He concludes that podcasts assist student learning by providing them opportunities to learn outside the class and to pace their own learning.

The majority of the student-generated podcasting articles emphasized the motivating nature of creating podcasts (Coutinho & Mota, 2011; Goodson & Skillen, 2010; Dlott, 2007). Plankis and Weatherly (2008) conclude that student-generated report podcasts connected with and supported the inquiry process of student research projects in a high school aquatic science class. The remaining K–12 articles (Bedrossian, 2010; Saine & Kara-Soteriou, 2010) were descriptive in nature and did not discuss student impressions or learning.

Although the use of podcasting in both higher education and K–12 has increased over the last 5 years, in an exhaustive search of the literature, Hew (2009) found that "studies that employ the use of student-created podcasts are hitherto lacking" (p. 344) with the vast majority of the literature chronicling the use of audio podcasts "implemented in higher education and traditional course settings" (p. 348). Hew (2009) concluded his review urging researchers "to focus on K–12 settings which, hitherto have not been as frequently examined" (p. 350).

To explore the efficacy of podcasting in the K–12 classroom, we began our study of the use of podcasting in economics, a content area within social studies that has garnered little attention in the study of educational technology research (Swan & Hofer, 2008). Further, in the state in which this study took place, economics, although required in high school, has been shrinking within the social studies curriculum, as the number of questions on the end-of-year tests has gone from 18% in 2006 to 15% in 2010 (Kentucky Department of Education, 2010). The teaching of economics in this context is problematic in that economics is often confined to 8–9 weeks within a ninth grade integrated social studies (ISS) class that focuses on geography and

civics as well as economics. Additionally, the emphasis on both concepts and skills that the Council for Economic Education (2010) outlined is challenging for many teachers, especially in high-stakes testing environments, where concepts are often emphasized over skills.

This challenge is compounded by the fact that many social studies teachers have less formal training in economics than any other social studies discipline (Dumas, Evans, & Weible, 1997; Eisenhauer & Zaporowski, 1994; Lynch, 1994; Walstad & Kourilsky, 1999). Unfortunately, the research literature in economics education provides little guidance on the effectiveness of particular instructional strategies in teaching economics (Miller & VanFossen, 2008; Schug & Walstad, 1991). Miller and VanFossen (2008) have consequently issued a call for more studies of classroom interventions, particularly those that leverage educational technologies in the learning experience.

The popularity of podcasting in economic news outlets (e.g., American Public Media's *Marketplace*, *The Economist*) led us to consider the potential and viability of this tool in the economics classroom. Economics has an inherently symbiotic relationship with the news. For example, the President of the United States has to consider the political and economic fallout from his official statements on current or past events. In a recent interview, President Obama reflected on this fragile link, "Well, I think what is true is that, when you're in this job, everything you say could affect markets…" (*International Business Times*, 2011). On the other hand, economic reports are newsworthy in and of themselves. Leading stories on news outlets are often the quarterly reports on Gross Domestic Product, inflation, housing starts, and, most recently, unemployment. The lead stories on CNN as we wrote this paper read, "Gas prices up 6 cents" and "GDP growth revised lower" (CNN, February 24, 2011). As news sources try to appeal to digital generation consumers, many traditional sources (e.g., magazines, newspapers, radio shows) have turned to podcasting because of its accessibility both in form (e.g., subscription and listening on the go) and function (e.g., engaging format). For example, although the *Economist* may not be considered a "must read" for many Americans, the *Economist* podcast is one of the most popular podcasts in the iTunes store. For many, the conversational and engaging discussion format of the podcast is more palatable than long-form essays in a magazine or on the Web. Given the emphasis on connections to the real world and the fact that many economic concepts occur dynamically in real time, economics offers many opportunities for implementing instructional podcasting in engaging and effective ways (Van Fossen, 2008).

In this study, we sought to explore the instructional affordances and constraints of podcasting in the high school classroom. For this study, we worked with 8 ninth grade economics teachers in a south central state to determine how they integrated podcasting technology into the curriculum to help their students build on their economic literacy and/or reasoning. We

were particularly interested in whether the teachers perceived that podcasting provided a relative advantage in teaching economics and the extent to which the teachers demonstrated Technological Pedagogical Content Knowledge (TPACK) in their podcasting projects. We found that podcasting was a nimble technology that allowed the teachers to pedagogically adapt to their individual teaching contexts with very little technological "overhead." In this way, they demonstrated strong technological pedagogical knowledge (TPK). None of the participants, however, articulated a strong vision of how podcasting contributed to content learning in economics. We argue that when using some universal technologies, such as podcasting, teachers may not demonstrate strong technological content knowledge (TCK) because it simply does not exist for these types of generalized digital tools in the same way as more specialized, discipline-based tools.

Theoretical Framework

In designing instruction for economics, teachers are challenged to help their students build both conceptual and process-oriented knowledge. Instead of solely focusing on key terms and ideas, teachers are additionally tasked with helping students to develop their economic reasoning (National Council for Economic Education [NCEE], 2010). Moving students from an emphasis on concepts to the application of their knowledge in the form of skills and reasoning is a daunting challenge (Miller & VanFossen, 1994; VanFossen, 1995; VanSickle 1992), particularly when many economics teachers lack the requisite background knowledge related to economics content (Eisenhauer & Zaprowski, 1994; Lynch 1994; Walstad & Kourilsky, 1999).

Educational technology may be one vehicle for helping students move beyond conceptual understanding. In fact, Miller and VanFossen (2008) suggested the need for more technology integration opportunities for economics teachers. Many effective, Web-based economics simulations and interactive activities are available to help students apply and test their knowledge of economic principles, most notably EconEdLink, offered by the Council for Economic Education. The recent rise in popularity of economics-related podcasts in popular news media may provide a new avenue for technology integration in the economics classroom. Podcasts including American Public Media's *Marketplace*, *The Economist* podcast, and the *New York Times' Freakonomics* are all engaging podcasts that offer insight, analysis, and applications of economic concepts and reasoning in our global economy. What is unknown is whether this podcasting technology has any application or potential within the economics classroom.

Effective, authentic technology integration is predicated upon the teacher's ability to bring content, pedagogy, and technology together in a way that is greater than the sum of the parts. We base this interpretation on the following literature. Shulman (1987) stressed the importance of a teacher's understanding of the discipline as well as the most effective

strategies to facilitate discipline-based learning. He referred to this knowledge as pedagogical content knowledge (PCK). In the mid-1980s, educational technology was limited primarily to nondigital tools (e.g., chalkboards, overhead projects, video cassette recorders), and it was assumed these technologies required little additional training (although the operation of the Dusquesne projector and 16 mm films may suggest otherwise). Therefore, technology was subsumed in pedagogical knowledge in Shulman's model. With the advent of more complex digital tools, the knowledge required for using technology in teaching has increased. Acknowledging this new complexity, Mishra and Koehler (2006) expand on Shulman's framework to include technological knowledge as a new domain similar to content and pedagogical knowledge. Their Technological Pedagogical Content Knowledge (TPCK or TPACK) framework helps researchers and teacher educators better understand the complexity of the knowledge required for effective technology integration. Essentially, they argue that knowledge in each of the three domains (content, pedagogy, and technology) is a necessary but insufficient condition for effective digital technology integration.

TPACK also provides a framework through which to view instructional planning and implementation in order to better understand the successes and challenges teachers encounter in integrating technology into their teaching. In this study, we were particularly interested in how the teachers matched the affordances of the technology with their instruction (technological pedagogical knowledge, or TPK) and how they connected the use of technology with the content of their curricula (technological content knowledge, or TCK) as we explored the participants' efforts to integrate podcasting technology in the economics classroom.

The following research questions guided the study:

- How do teachers integrate podcasting technology to (a) address economics concepts (NCEE, 1997) and (b) engage their students in economic literacy skills (NCEE, 2010)?
- What evidence of TPK and TCK is in the teachers' instructional decisions related to their podcasting projects?
- What value, if any, do the teachers perceive in using podcasting to teach economics skills and concepts?

Methodology

Participants

Study participants consisted of eight practicing social studies teachers who taught in seven schools across five counties in a south central state. A recruitment e-mail went out to all economics teachers in five counties. We selected eight teachers who expressed interest in the project for participation based on their interest in implementing a podcasting project in their economics curriculum.

Table 1. Participant Demographics

Name	Years Teaching/ Years Teaching Economics	Undergraduate Major /Minor	Number of Economics Classes	Professional Development in Economics	Confidence in Teaching Economics	Confidence in Teaching with Technology
Carrie	3/3	history/ political science	1	None	4	3
Jamie	1/1	political science/ history	2	None	3	5
Allison	5/5	history/ sociology	1	None	4	3
John	17/13	history/ political science	1	Extensive	5	4
Christine	2/2	economics/ history	15+	1 online NCEE	5	3
Abby	4/4	history/ sociology	1	None	4	3
Caroline	1/1	anthropology/ history	2	None	4	3
Jason	3/3	political science/ history	2	2 district workshops	4	4

An initial demographics survey revealed that seven of the eight teachers were in the first 5 years of their teaching experience, and only one of the teachers had greater than 15 years of experience, 13 of which were spent teaching economics. All of the teachers had completed a master's degree in education with initial certification in social studies as part of their programs, and all attended the same university (and program) for this degree. See Table 1 for a summary of participants.

Not surprisingly, only two of the teachers had a strong preparation in economics, either through undergraduate preparation or extensive professional development (Dumas, Evans, & Weible, 1997; Eisenhauer & Zaporowski, 1994; Lynch, 1994; Walstad & Kourilsky, 1999). Despite a lack of formal preparation, participants described their comfort level with economics material from "moderately comfortable" to "very comfortable" and rated themselves either 3, 4, or 5 on a scale of 1–5. Although Lynch (1994) found that teachers needed a minimum of four courses in economics to make an impact on student learning, the participants who lacked formal training viewed the economic material required in their schools' standards-based curriculum map as fairly basic and, therefore, easier to grasp for teachers without extensive coursework in the field. Carrie explained:

> In the 3 years that I have taught economics, my confidence in teaching the subject has increased. Part of this is due to the reality that the curriculum map for teaching economics in this county is broad in scope. Both macro and micro economic concepts are included, however these are done at an introductory level.

Carrie's confidence was reflective of the other participants' responses regardless of their formal training in economics. Although the participants felt generally confident about their knowledge of economics, many expressed concerns about making the content relevant or accessible to students. Christine, who had the most extensive undergraduate preparation, noted:

> My undergraduate work gives me a comfortable understanding of the subject, but it is still difficult for me to translate economic concepts into 9th grade level understanding.

When asked about any conceptual struggles in economics, John said, "No real conceptual struggles, just interest struggles … just keeping the kids engaged in the dismal science."

The participants in this study also reported confidence in using technology in their teaching, rating themselves 3, 4, or 5 on a scale of 1–5 (e.g., 1 = learning phase, 2 = achieving proficiency, 3 = basic proficiency, 4 = good proficiency, 5 = highest proficiency). Although all of the participants integrate some form of student-created technology project at least once during the year (e.g., moviemaking, PowerPoint presentations, or podcasting), access to computer labs for all but one of the teachers was difficult. All of the participants, however, had at least one computer and projector in their classrooms, and many had up to three additional computers for student use.

Instructional Context

In this south central state, secondary social studies departments determine the scope and sequence of curriculum by the state-mandated curriculum standards in social studies. The state social studies standards for grades PK–12 represent the minimum required content students should be taught to meet the high school graduation requirements. Because economics questions on the statewide assessment make up only 15% of the high school social studies exam (Kentucky Department of Education, 2010), often economics is taught as part of an interdisciplinary class called integrated social studies (ISS) rather than as a separate course. ISS is primarily taught in the ninth grade and is designed to give students exposure to various disciplinary lenses in social studies, particularly geography, economics, and civics. All eight of the participants taught ninth grade ISS classes. Only one of the teachers taught honors sections of this course; the other participants taught general sections of the course.

Given the fact that the study of economics in many ISS classrooms is confined to 8–9 weeks, the emphasis both on concepts and skills outlined by the Council for Economic Education (2010) is challenging for many teachers, especially in high-stakes testing environments, where concepts are often emphasized over skills. Although schools in this state have been making progress on meeting performance benchmarks, there is still much ground to cover. The disparity between the performance of students in this state's

multiple-choice items (correct response rate of 65%), which tend to focus on concepts, and the open-response items (23% of students scored at or above the proficiency level), which focus on skills, reflect the national trend (Kentucky Department of Education, 2009).

To support the teachers in this effort, both researchers provided a one-day intensive professional development experience (one via Skype) in which we introduced the teachers to podcasting technology, examples of teacher and student-created podcasts in the social studies (primarily history), and different pedagogical approaches they might use with podcasting (see agenda online at http://www.econocast.org/workshop). Teachers received a small honorarium ($300) for participating in this project. We also discussed the affordances of podcasting in schools, including the anytime/anywhere access for increasingly connected students, the creative ways podcasts might be used to teach or review content, and the relative ease of user-friendly software for podcasting (e.g., Audacity, Garage Band). The participants then completed a guided exploration of existing teacher- and student-created podcasts in history classrooms in which they closely examined how the podcasts connected with the instructional strategies of the lessons. We also introduced the participants to the taxonomy of Learning Activity Types (LATs) in the social studies (Hofer & Harris, 2011) and how they might select and combine these activity types in relation to their content foci (see Appendix A for summary of LATs). We concluded by introducing and practicing the requisite technology skills needed to record, edit, and post their podcasting projects using Audacity, a free cross-platform audio recording and editing software application. Following this workshop, the participants independently designed and implemented a podcasting project for their economics classes in the spring of 2010.

Data Sources

Data for the study included introductory and pre-implementation surveys of the teachers, project plans (including lesson plans and ancillary materials), post-implementation interview transcripts, and observation notes from the implementation. The surveys focused on the teachers' background and knowledge relative to teaching economics as well as the specifics of their project, how they selected the curriculum focus for the project, and how they designed the project (see Appendixes B and C, pp. 95–96). The teachers constructed their project plans using the state's curriculum plan model (see Appendix D, p. 97). The project plans indicated the teacher's content objectives, formative and summative assessments, and procedures and resources used during the podcasting project. We interviewed each teacher after completing implementation of the projects, focusing primarily on how they used the technology and their rationale for doing so. We used four questions to structure the interviews (see Appendix E, p. 98), with data from the pre-survey and project plans serving as the basis for elaboration specific to each

participant. The observations served primarily to assess implementation fidelity, or the degree to which their actual teaching reflected the design of the project. We used the teachers' project plans to note any significant changes or alterations to the lesson(s).

Data Analysis

The overarching analytical framework for this study is analytic induction. Although there are many permutations of this particular approach across time (Erikson, 1986; Robinson, 1951; Znaniecki, 1934), the common thread is that inductive, rather than deductive, reasoning is used to shape understanding of a phenomenon and relationships between concepts. Findings are not meant to be "final" because they are formed in a context of a specific setting but are meant to serve as a continual stepping stone to achieving more accurate definitions and representations of phenomenon. The core analytical task involves using empirical evidence (qualitative or quantitative) to interrogate hypotheses so that they are redefined to try and establish a universal relationship.

We broke down the analysis process into four "tasks." The first three involved summarizing the data according to the research questions. After completing the initial tasks, we undertook the task of synthesizing the summaries around working hypotheses to generate the findings reported in the following sections.

In the first task, we described what the participants did in their projects. We analyzed the teachers' project plans holistically and independently in order to identify the economic concepts and skills that the teacher built the plans upon as well as the pedagogical approaches the teachers used in the podcasting projects (e.g., student-created podcasts, teacher-created podcasts, purpose of the podcast, etc.). The economics curriculum standards for the Integrated Social Studies (ISS) course were derived from the Council of Economic Education's National Standards. These standards consist of 22 economic concepts (NCEE, 1997) and the five skills necessary for economic reasoning (NCEE, 2010). To help us understand the content focus for the podcasting projects, we compared the objectives in the lesson plans against these concepts and skill standards to determine the complexity of content covered. Student products were used to triangulate the content covered in the various classes. Additionally, we identified the number and types of Learning Activity Types (LAT) present in the lesson procedures as a way of summarizing the teacher's pedagogical approach.

In the second task, we attempted to understand how the teachers drew on their TPK and TCK in designing their projects. To accomplish this, we analyzed the surveys and interview transcripts independently, seeking and recording instances of TCK and TPK. For instances of TPK, we searched for examples where teachers discussed how the technologies supported the learning activities they selected as well as when they referred to podcasting

facilitating or hindering a learning process. An example statement might be: "The tool really seemed to interfere with kids' discussion…" or "This really helped with formative assessment because I could …." For a statement to be considered evidence of TCK, we looked for teachers to make connections between the tool and content, such as: "This will really help students understand how an economic indicator helps determine the direction of the economy…." Teachers' perceptions of the value-added from the technology were also recorded during this process to address the third research question. We then met repeatedly to discuss our analyses until we reached consensus for each survey/transcript. We noted and recorded within-participant and across-participant patterns for each of the four types of professional knowledge. We constructed summaries for each participant from this analysis process, and these served as cases in the reporting of results. These cases are descriptive, rather than evaluative, in their conceptualizations.

We began the last task with the initial assumption that teachers would demonstrate the ability to rationalize connections between the content and technology and their pedagogy and the technology. These assumptions served as our initial hypothesis in the assertion generation process. Following the analytic induction approach, we refined the assertions that consisted of a systematic search "of the entire data corpus, looking for disconfirming and confirming evidence, keeping in mind the need to reframe the assertions as the analysis proceeds" (Erickson, 1986, p. 149).

Findings

Although all the teachers in the study successfully integrated their podcasting projects within the constraints of their classrooms and curricula, their ability to connect the content, pedagogy, and technology was mixed. All the teachers were able to provide a substantive pedagogical rationale for integrating podcasting in the classroom. None of the teachers, however, articulated specific, content-based rationales for addressing particular curriculum with their podcasting projects.

Although TCK was not evident in the instructional design and implementation, there was meaningful engagement with the content.

Curriculum-based technology integration in a K–12 classroom assumes a connection or synergy between the use of the technology and the curriculum content. In the current era of high-stakes testing, this connection is critical for teachers, particularly beginning teachers, as they often feel pressure to efficiently cover their content (van Hover, 2006). The participants in this study were successful in designing and implementing their podcasting projects to address their curricula in this challenging context.

Description of the projects. The eight teachers varied in their approaches to addressing economic concepts and/or skills in their podcasting projects. Three of the teachers focused solely on concepts (e.g., economic systems, monetary

policy, supply and demand), and four teachers focused on both concepts and skills (e.g., collecting and organizing research related to issues of a global economy). For example, Abby's students addressed economic concepts by defining important economic terms (e.g., demand) within their podcasts and using a relevant example to explain the concept (e.g., increasing consumer demand for iPods and decreasing demand for music CDs). Carrie asked her students to develop economic reports on developing nations using online data sources. In these projects, students addressed economic concepts (e.g., inflation) and identified problems the country faced as a result (e.g., devaluation of the currency). Interestingly, one focused on financial literacy ("importance of achieving short- and long-term financial goals"), which is outside the scope of the NCEE standards (Miller & VanFossen, 2008) and not included within the state's standards-based curriculum for economics.

Seven of the teachers in this study challenged the students to create their own podcasts and, according to their lesson plans and observations, gave a performance assessment of the podcasts as part of the student's quarterly grade for the ISS course. These projects varied in scope, length, and degree of production value (e.g., music, sound effects). Podcasts from Abby's class were 45–75 seconds long and were focused on having students produce concise vignettes on economic concepts covered within the unit. The students in Jason's class produced similar podcasts with a goal of convincing the audience that certain types of economic systems were more advantageous than others (e.g., command versus market systems). Although the podcasts from John's class were more elaborate with sound effects and music, each of John's students chose a billionaire and reported on the ways he or she acquired his/her fortune. Outside the scope of the standards-based economics curriculum and the NCEE standards or skills, John's projects were mapped to the Practical Living standards of this state, which included financial literacy strands. John's students had completed this project over the past several years using Microsoft PowerPoint for the final student product, and as a result, podcasting did not cause this misalignment of pedagogy and content. These three projects (Abby, Jason, and John's) went beyond basic recall of information and asked students to explain, describe, or compare economic concepts.

Four of the podcasting projects (Carrie, Jamie, Allison, and Christine) were more elaborate in terms of content scope and production value. Because these four projects included not just economic concepts but economic skills as well, the questions students investigated within their projects were more cognitively complex. Additionally, these projects asked students to explore expressive aspects of the medium, including sound effects, music, or elaborate script premises for the podcast (e.g., imitating a newscast or late-night talk-show format). These projects exemplify Miller and VanFossen's (2008) assertion that a concept approach versus a skill approach creates a "false dualism" and that, for authentic economic thinking to occur, "one is impossible without the other" (p. 300). For example, the

students in Carrie's class created a radio talk show in which they compared the economic issues of three countries within a geographic region. Although the students certainly explained the economic issues the countries were facing, Carrie challenged them to discuss possible solutions and the advantages and disadvantages of these approaches. Similarly, the other three projects emphasized economic reasoning, asking students to use evidence to evaluate, analyze, or explain the economic impact of an economic policy or condition. In Jamie's project, students watched the *Story of Stuff* (2010) and were placed into eight groups to examine various questions raised in the video. Students in Christine's class became "investigative journalists" asking, "Is the U.S. still in a recession?" The students used online sources (e.g., newspapers, databases, etc.) to examine economic indicators of unemployment, stock market prices, housing starts and sales, and a "wild card" indicator of the group's choosing (e.g., Consumer Price Index, retail sales, Gross Domestic Product) to answer the question. Allison's students focused on the country of India and asked students to investigate an economic issue (e.g., outsourcing, poverty, technology growth) and determine the consequences of these issues. Not surprisingly, the projects that were designed around economic concepts and skills were the most ambitious of the podcasting projects.

In only one of the podcasting projects did the teacher create the podcast for the students. Caroline created a 45-minute podcast reviewing important economic concepts covered within the 8-week unit. She made the podcast available on the school website for students to download and made copies of the podcasts on CDs for students without Internet access at their homes. Throughout the podcast, Caroline defines the economic terms for the students and provides relevant examples so that students can understand how these terms are applied in the economy. It is worth noting that Caroline was in her first year teaching during the study and interestingly was apologetic in both the pre-survey and post-interview about the design of her project. She asserts that, in future iterations, she would challenge her students to create the review and that "it would be more student-centered … and just a little more variety, I think. More hands on for them." See Appendix F for a summary of the teachers' podcasting projects.

Technological content knowledge (TCK). Although the teachers were able to connect the use of podcasting with their curricula, it could be argued that these connections did not demonstrate strong TCK. In defining TCK, Koehler and Mishra (2009) suggest that "teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa" (p. 65). By participating in the study of podcasting in the economics classroom, the technology selection was predetermined for the teachers. The curriculum focus, however, was up to the teachers, within the constraints of their district curriculum maps or pacing guides that provide a mandated scope and sequence for the ISS curriculum.

Although the study took place in the spring semester, all the teachers had ample choices for the content focus, as most were just beginning the economics component of the ISS course immediately following the professional development session. It is interesting to note that, despite this relative flexibility, none of the teachers provided a clear, content-based connection with podcasting. In other words, the teachers did not articulate why podcasting was a particularly good fit with the concept or skill they selected from their curricula. For example, the interview transcripts and pre-surveys did not include any statements that indicated the podcasting process would help students understand the business cycle, Gross Domestic Product, or any other economic concept or skill.

Moreover, none of the participants seemed to have any pattern of content focus selection. The podcasting projects varied considerably in focus, from projects that reviewed macro- and micro-economic concepts to projects that examined a macro-economic concept or skill (e.g., economic systems and economic growth) and projects that investigated global economic issues, problems, and solutions. Jamie's response to how she selected the content focus for her project was similar to how the other participants explained their approaches:

> The topic, materials/global economy, was chosen as it was relevant to the timing of the unit. This unit began with the study of North American geography (human, physical, etc.) and transitioned to how the United States is connected to other countries.

This emphasis on the timing of the curriculum sequence seemed to be the primary determinant of content focus for the teachers.

This logistical selection process seems to demonstrate low TCK (the ability to match the technology tool or resource with a particular content focus). However, podcasting is more of a universal tool rather than a discipline-specific tool. So, although on the surface it may seem that the teachers demonstrated low TCK, this may more accurately be explained by the general nature of podcasting as a means of communication rather than as a tool for building understanding. The teachers may have been able to provide a more strategic connection between the content and the technology had they been able to select from a range of tools or if the technology focus had been more discipline specific (e.g., online simulation or data modeling software).

TPK was evident within the instructional design and implementation. Teachers may match a particular technology tool or resource to a teaching approach based on a variety of factors, including encouraging interactivity, maximizing efficiency, facilitating collaboration, and increasing student engagement in the learning process. The teachers in this study were able to clearly identify a variety of pedagogical affordances of podcasting in relation to their selected teaching approach, and in doing so they demonstrated

TPK. In order of perceived importance, we found that the teachers saw value in their projects related to (a) increasing student drive and intensity in the learning process, (b) leveraging podcasting as a vehicle for alternative assessment, and (c) providing enhanced opportunities for student expression.

Increased motivation. The most significant value addition in the eyes of our participants focused on the increased motivation and drive they saw in their students during the projects. These findings mirror the literature base of podcasting in K–12 classrooms (Dumas, Evans, & Weible, 1997; Eisenhauer & Zaporowski, 1994; Lynch, 1994; Walstad & Kourilsky, 1999). In their interview transcripts, the teachers expressed difficulty motivating and engaging their students in the study of economics, which often resulted in lower student achievement. This reflects a larger trend in the literature showing that economic attitudes and student achievement are related (Schug & Walstad, 1991; Walstad & Van Soyc, 1990). The teachers suggested that their students worked harder, refined their work more frequently, and attended more fully to the learning experience than is typical. Even in the teacher- and student-led review podcasts, the teachers comment on students' high level of engagement in listening to the podcasts.

In the projects that gave students the opportunity to create their own podcasts, the level of engagement was even higher. Some students were so engaged in the projects that they worked beyond class times and project requirements. Jason noted, "What was interesting was that some of the kids worked on this at home and did work on it over the week of testing, so it was nice to see that the kids really wanted to put some effort into this." The public nature of the podcasts also seemed to motivate the students. Christine noted that "knowing that they would be online, or available to the public, just kind of forced them to put a little more into it than maybe they would have if they were just for a paper or just a project that they were turning into me." Jen agreed, noting, "It can be a good way to encourage students to explore more about the topic so they feel as if they have a more 'polished' podcast." It seems that for her students, the "public" product led them to take more care and increased their ownership of the work.

Interestingly, the increased level of motivation seemed to hold true for those participants teaching either high- or low-achieving students. For example, Carrie explained it this way: "Due to a large number of students with 504s and IEPs, using hands-on or 'active' types of activities lend themselves well to meeting the students' accommodations." She suggested that the student-centered nature of her podcasting project engaged her students more than traditional activities and that this was particularly important in economics, which covers abstract concepts that students sometimes struggle with.

Meaningful alternative assessment. Three of the teachers suggested that podcasts could serve as meaningful alternative assessments of students' understanding of economics concepts and skills. Two of the teachers noted that the added richness of the podcasting medium enabled them to better assess

their students' learning compared with a traditional test. For example, Abby noted, "There was definitely value-added with the kids individually doing it [contributing to a podcast review activity], I think, because it was a good way for me to tell, OK, well this group really understands the content, which was nice." Two teachers indicated the potential they saw for the podcasts to enable students to demonstrate their understanding of concepts and how they may be applied in "the real world." Abby suggested that the students demonstrated that they were able to "make those real life connections to it, to be able to explain it to other students. That shows me that they know the material and that they have mastered the material." Although these benefits may also be derived from different types of assessments, these teachers suggested that there was a unique benefit in hearing how their students articulated their understanding.

Enhanced student expression. Five of the eight participants asserted that the podcasting medium provided students interesting opportunities to express themselves and noted that this mode of expression empowered some students to more clearly and creatively demonstrate their understanding. Two of the teachers noted that the ability to record their podcasts in private decreased some of the apprehension that some students had in speaking "live" in front of the group. John commented, "One student who is reluctant to speak up in class said, 'You mean I don't have to talk in front of the class!' … so that was a very positive thing."

Several of the teachers appreciated the opportunity for student creativity afforded by the podcasts. In many of the projects, students had at least some latitude in both the selection and presentation of the content. Many of the teachers encouraged the students to be creative in their expression, format, and approach. Jason explained:

> I don't know that it was a more effective way to convey information, but what I saw was a lot more of the kids were able to be creative with this and so I think that was the biggest advantage to this.

Although the teachers tended to focus on the creative element of podcasting, none compared or contrasted this affordance with other student-centered projects that might also encourage creativity.

Technological pedagogical knowledge (TPK). Any instructional activity, whether teacher- or student-centered, that utilizes technology to any substantial degree often requires more time and logistical planning and provides more possible points of failure than an activity that does not include technology. It stands to reason, then, that in choosing to integrate technology in the classroom, teachers should see some value added by the technology. We see this holistic "value-added" component as a function of the degree of "fit" between the content, the pedagogy, and the technology. If this is the case, it can be argued that additional value in proportion to the extra time and effort should be evident in a lesson to justify its inclusion (Harris, 2008). In

this study, although the teachers did not clearly articulate a strong content-based rationale for taking on these additional challenges in their classrooms, they did provide a clear pedagogical rationale for doing so and thus demonstrated strong TPK.

Discussion

Classroom teachers have appropriated a variety of digital tools and resources for instructional use in the classroom that were either designed for, or have clear connections to, various disciplinary processes. We refer to these as specialized tools. For example, the National Library of Virtual Manipulatives hosts a large number of Web-based, interactive, online mathematics applications created specifically for and aligned with K–12 mathematics curricula. Though not designed for the K–12 classroom, Web-based digital archives of historical documents, the Web-based *CIA World Factbook*, and virtual trips in Google Earth clearly map to the disciplinary approaches within social studies curriculum.

Other digital tools are more general in nature and do not interact directly with a particular discipline (e.g., history, geography, or economics). We refer to these as universal tools. For example, multimedia presentation and word processing software, document cameras, interactive whiteboards, and Web-based streaming video can be used effectively in a variety of content areas and disciplines. Podcasting is clearly a universal tool that supports the communication of content, either by the teacher or by the students, but does not directly connect with the curriculum content in the same way that digital archives connect with historical thinking.

Every technology offers certain affordances and introduces specific constraints (Ryder & Wilson, 1996) in classroom application. We conducted this study to understand how teachers would use podcasting in economics to help us better understand the inherent affordances and constraints of the tool in classroom practice. We found that podcasting allowed teachers to engage and motivate their students in the study of economics. They found the technology to be feasible within a standards-based environment and were able to navigate the logistical challenges with the technology they encountered. However, there were not clear connections between the tool and the discipline of economics. Given that podcasting may be characterized as a universal tool, this is not surprising. However, the increased complexity of planning for and implementing a technology-enhanced learning activity such as podcasting may not yield increased student understanding of economics concepts and skills. Essentially, students can express their thinking through podcasting, but it won't help them think like an economist.

Specialized tools and resources (e.g., data modeling and online simulations in economics) offer opportunities to engage students in discipline-based thinking. For example, although students communicated their understanding of human capital through podcasting, they may better understand

the concept by engaging in a Web-based Human Capital interactive activity from the Council for Economic Education's EconEdLink site (http://www.econedlink.org/interactives/index.php?iid=1&type=student). These kinds of exercises engage students in economic reasoning in ways that universal tools do not.

Despite these affordances, specialized technology tools and resources are limited by their associated constraints. These kinds of tools tend to be more complex and require more nuanced TPACK to be effective teaching tools. For example, data modeling software offers opportunities for teachers to challenge their students to manipulate and analyze economic data to answer questions and draw conclusions. However, in addition to knowing how to facilitate this kind of learning experience (TPK), the teacher must also know where to find economic data, understand the appropriate questions to ask, and effectively use the tools to produce meaningful analysis (TCK). The teachers in this study, with their limited training in economics and relatively superficial curricula, most likely would have found this process quite challenging. In other words, specialized technology tools and resources require substantially more content knowledge than universal tools to use in the classroom.

There are some social studies educators that might argue that we should focus our efforts on researching the efficacy of specialized tools that are unique to the various strands or disciplines within the social studies (Doolittle & Hicks, 2003; Miller & VanFossen, 2008). We don't disagree. We believe that the use of digital primary sources, geographic information system (GIS) software, and computer simulations, for example, may provide powerful affordances for inquiry-based, student-centered, project-based learning in social studies. However, others argue that the use of universal tools (e.g., podcasting, moviemaking, document cameras, interactive whiteboards) provides opportunities for affective engagement as well the development of 21st century skills (Partnership for 21st Century Skills, 2009). We don't disagree with this either. Lee (2008) takes a more inclusive stance highlighting a range of ways that technology can support or augment teacher's "pedagogical actions" (pp. 130–131) in the social studies classroom. We believe that understanding the affordances as well as the unique challenges and opportunities of both universal and specialized digital tools helps to inform teachers' strategic decision making regarding technology integration.

Conclusion

We began this study attempting to understand how teachers would best implement podcasting within multiple high school economics classrooms. In this study, teachers were able to connect the use of podcasting to economic concepts and skills within their curriculum. The teachers also found podcasting to add value to the learning experience in terms of increased student motivation and offering opportunities for meaningful alternative assessment and student expression. These findings support prior research on

podcasting in K–12 classrooms in terms of improving student motivation (Coutinho & Mota, 2011; Dlott, 2007; Goodson & Skillen, 2010) as well as connecting with curriculum-based learning (Plankis & Weatherly, 2008). Further research could explore the potential for students to individualize their own learning and provide multiple avenues for self-expression, both key principles in Universal Design for Learning (Rose & Meyer, 2002). Additionally, efforts to explore how students perceive the use of podcasting in their learning and the impact of this kind of work on their achievement levels are also important. Finally, more studies of TPACK-in-practice will help teacher educators understand how teachers plan for and implement technology integration in the classroom.

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Appendix A

Sample Social Studies Learning Activity Types

Activity Type	Brief Description	Possible Technologies
Read text	Students extract information from extbooks, historical documents, census data, etc.; both print-based and digital formats	Websites, electronic books
View presentation	Students gain information from teachers, guest speakers, and peers; synchronous/asynchronous, oral or multimedia	PowerPoint, Photostory, iMovie, MovieMaker, Inspiration, videoconferencing
View images	Students examine both still and moving (video, animations) images; print-based or digital format	PowerPoint, Word, Photostory, Bubbleshare, Tabblo, Flickr
Listen to audio	Students listen to recordings of speeches, music, radio broadcasts, oral histories, and lectures; digital or nondigital	Podcasts ("Great Speeches in History," etc.), Audacity, Garageband, Odeo, Evoca, Podcast People

Note. The complete taxonomy of 42 Social Studies Learning Activity Types can be found on the Activity Types Wiki (http://activitytypes.wmwikis.net).

Appendix B

Introductory Demographic Survey for Participants

General Background

- How many years have you been teaching? Describe your educational background (degrees, rank, additional trainings).
- What subjects/grade levels do you teach each year?
- How would you characterize your typical approach to planning a unit or project?

Economics Approach and Background

- How long have you been teaching ninth grade economics?
- What background do you have for teaching economics specifically (e.g., undergraduate/graduate course work, professional development, etc.)?
- How comfortable do you feel teaching economics? Are there particular concepts that you struggle with?

- How would you describe the students in your economics courses?
- Describe your favorite lesson/unit in economics. Why is it your favorite?
- Experiences with Technology
- How would you rate your proficiency for integrating technology into your teaching (1 being not proficient; 5 being highly proficient)? Give a rationale for your rating.
- We would like to understand your use of technology by looking at a specific tool. We assume that PowerPoint is a pretty ubiquitous tool, and the following questions are built around that assumption. If you have another tool that you use more pervasively, please substitute that for PowerPoint.
  - Please describe the frequency that you use PowerPoint.
  - Please describe the ways in which you use the tool in class (present information, have students create presentations, create note templates, etc.). If you can send us a few sample presentations, that would be great.
- What are some examples of how you've integrated technology in your teaching in general? In economics?
- How would you describe your access to technology tools, resources, and support for using technology in your teaching? For example, what do you have access to in your classroom? In your school?
- Describe any technological issues you have at your school that make technology use difficult (firewalls, outdated software, etc.). If there are none, talk about why technology use is so easy at your school.

Appendix C

Pre-Implementation Survey Instrument

In this survey, we hope to understand how you went about planning your project. Please describe how you went out about planning the project, including these specifics:

- How did you select the content focus for your project (e.g., demand and supply, global economy, economic literacy, review of economics concepts)?
- How did you select particular learning activity(ies) you used in the project (e.g., lecture, interview, research, data-based inquiry, etc.)?
- What contextual factors did you consider in developing your project (e.g., time, access to technology, comfort with technology, student characteristics/preferences, curriculum maps, departments/colleagues)?
- What value, if any, do you see in using the podcasting technology in economics?

Appendix D

State Curriculum Plan Model

Task A-2
Lesson Plan

Intern Name:		Date:	Cycle:
# of Students:	# of IEP Students:	# of GSSP Students:	# of LEP Students:
Age/Grade Level:	Subject:		Major Content:
Unit Title:		Lesson Title:	

Context

- Identify the unit topic and the unit objective(s) addressed by this lesson:
- Describe the students' prior knowledge or the focus of the previous lesson:
- Describe generally any critical student characteristics or attributes that will affect student learning:

Lesson Objective(s)

State what students will demonstrate as a result of this lesson. Objective(s) must be student-centered, observable and measurable.

Connections

Connect your goals and lesson objective(s) to appropriate Kentucky Core Content and/or Program of Studies. Use no more than two or three connections, and if not obvious, explain how each objective is related to the Program of Studies and/or Core Content.

Assessment Plan

Using the tabular format below, describe how each lesson objective will be assessed formatively to determine student progress and modify instruction if needed. Describe any summative assessment to be used if it is a part of this lesson. Include copies of any assessment instruments and scoring criteria or rubrics if applicable to the lesson.

Objective/Assessment Plan Organizer

Objective Number	Type of Assessment	Description of Assessment	Depth of Knowledge Level	Adaptations and/or Accommodations

Resources, media and technology

List the specific materials and equipment needed for the lesson. Attach copies of printed materials to be used with the students.
If appropriate, list technology resources for the lesson including hardware, software and Internet URLs, and be sure to cite the sources used to develop this lesson. (If your committee thinks the technology observed in the lessons does not fairly represent your use of technology, provide additional documentation in your Component 1 exhibits. See Standard 6.)

Procedures

Describe the strategies and activities you will use to involve students and accomplish your objectives including how you will trigger prior knowledge and how you will adapt strategies to meet individual student needs and the diversity in your classroom.

Appendix E

Structured Interview Questions

- What was your reaction to the implementation of your podcasting project? What surprised you (either positively or negatively)?
- How, if at all, did your alter your plan as you taught the project? Why did you make these changes?
- After implementing the project, how would you characterize the added value of the technology in this project?
- If you were to replicate the project with another class, how might you alter it? Why would you change it in this way?

Appendix F

Summary of Teachers' Approach to Podcasting Exercise

Names	Project Description	Concepts and/or Skills	Technology Used	Learning Activity Types Present in the Lessons
Carrie	Student-created research report on the global economy	Concepts and skills	Audacity	1. View presentation 2. Complete charts 3. Create presentation 4. Listen to audio
Jamie	Student investigations into the various economic dimensions outlined in the Story of Stuff	Concepts and skills	Garage Band	1. View video 2. Group discussion 3. View presentation 4. Write report 5. Role playing 6. Complete chart 7. Short essay
Allison	Student-created research report on India's economy	Skills	Garage Band	1. Answer questions 2. Group discussion 3. Research 4. Report 5. Create presentation 6. Listen to audio
Gerry	Student-created reports on billionaires	Personal Finance (practical living)	Garage Band	1. Group discussion 2. Listen to audio 3. Answer questions 4. Research 5. Create presentations 6. Read text 7. Create a model
Christine	Student-created (a) field report on local economy or (b) database inquiry research report on global economics	Concepts and skills	Garage Band	1. Research 2. Complete charts 3. Database inquiry 4. Report
Abby	Student-created "Vocab-Casts" as a review for economics summative test	Concepts	Audacity	1. Create presentation 2. Listen to audio 3. Answer questions/review
Caroline	Teacher-created unit review for summative test on economics	Concepts	Garage Band	1. Listening to audio
Jason	Student-created persuasive essay on market and command economies	Concepts	Audacity	1. Research 2. Create presentation