Teachers' Technology Integration Decision-Making in Co-Taught Classrooms: Two Cases

Debbie Grosser, M.Ed.

Diana Theisinger, M.Ed.

The College of William & Mary

Teachers' Technology Integration Decision-Making in Co-Taught Classrooms: Two Cases

In this study, we investigated how teachers make decisions about what and how to use technologies in two public middle school classrooms. For the purposes of this study, technology is defined as any digital tool used to enhance, supplement, or assist with student learning (Hew & Brush, 2007). Specifically, we focused on the context of collaboratively-taught classrooms, where two teachers—one general education teacher and one special education teacher—work together to make decisions. We selected two classrooms for participation: one in which the co-teachers had made the decision to implement technological tools independently of principal or district influence and one in which the principal or district had mandated the use of certain technological tools. Results of this study provide (a) deeper understanding about how technology-integration decisions were made in these co-taught settings, and (b) the elements that influenced these co-teachers' technology integration decision-making.

Research Framework

Our study is situated in the interpretivism/social constructivism (Rossman & Rallis, 2003) research paradigm. Within this paradigm, researchers attempt to understand the world as it is by uncovering participants' experiences and perceptions of events or situations through interactions or observations (Rossman & Rallis, 2003; Schwandt, 2007). The focus is on participants' descriptions of experiences within their own unique context. This framework is appropriate for our study because our focus is the experiences and perceptions of our participants. Our intent was to better understand the decisions that these teachers made related to technology integration and the conditions resulting from these decisions.

Setting

We studied two public middle school classrooms, both taught by a team of co-teachers. We recruited co-teaching pairs who fully share classroom responsibilities, lesson planning and instructional delivery, and who have been working well together for a number of years. This allowed our focus to remain on our central interests of technology integration and the effects of different technology entry points (teacher-driven vs. principal/district-driven), rather than being concerned with any challenges that might have been created by an unsound co-teaching partnership.

Co-teaching is a special education service delivery model whereby students with disabilities receive the specially designed instruction needed to address specific skill deficits. Co-teaching involves the partnership of two licensed educators, usually a general education teacher and a special education teacher, sharing one classroom of diverse students. These professionals share the planning and delivery of instruction as well as the accountability for student learning. This partnership between professionals with different areas of expertise is necessary to support students with disabilities in accessing and making progress in the general education setting (Friend, 2014).

Co-teaching is often incorrectly conflated with the term inclusion (Friend, Cook, Hurley-Chamberlain, & Shamberger, 2010). Inclusion refers to the belief system that students with disabilities should be integrated into the general education classroom. Inclusive classrooms are not necessarily those that require both a general and a special education teacher; rather, they are classrooms in which students with disabilities receive instruction alongside students without disabilities. This is an important clarification, as much of the existing research related to technology integration in special education settings has taken place in inclusive settings, not in co-taught classrooms. Co-teaching, as noted above, involves the shared responsibility of the

general education and special education teacher in instructional planning and delivery (Friend, 2014).

In order to make the best use of each co-teacher's areas of expertise, teachers must learn to work collaboratively and share goals for student learning and classroom practices. Co-teaching partners must believe that each has a shared and equal role in the education of all children in the co-taught classroom (Murawski, 2012). It is important for co-teachers to plan instruction as a team. The act of co-planning lessons supports teachers' perceptions of shared responsibility for instruction and student learning (Cviko, McKenney, & Voogt, 2014). Specifically, Cviko and colleagues found that teachers' involvement in the design and delivery of technology-enhanced instruction influences the way they perceive their roles in the classroom as well as their approach to and the effectiveness of technology integration.

Co-teaching partnerships are important relationships that must be developed and fostered. The interaction between a special educator and a general educator involves an unwritten contract, shared responsibilities and differing roles (Friend et al., 2010). Often it is an assigned partnership rather than a relationship that develops through choice or mutual agreement. Successful co-teachers communicate regularly and effectively, collaboratively plan and deliver instruction and assessment, and value the expertise each brings to the relationship (Friend, 2014).

Purpose

As co-teachers collaborate to design lessons, they must consider the ways that technologies may enhance student learning (Cviko et al., 2014). However, effective integration of technology into classroom instruction goes beyond simply adding technological tools and experiences to instruction. It includes identification of students' individual learning needs and application of technologies that match diverse student needs in the classroom (Harris, Mishra, &

Koehler, 2009). Effective technology integration involves activities that require students to construct new knowledge, solve real-world problems, and make meaning from their learning. Teachers therefore need to understand how technology can support the delivery of content in the most meaningful way: "Based on their knowledge of both their learners and the subject, teachers need to be able to select the most appropriate [technological] resources to enable their students to meet the required learning goals" (Ertmer & Ottenbreit-Leftwich, 2010, p. 260). When considering the diversity of students in the co-taught classroom, the interplay of content, pedagogy, and student characteristics makes instructional decisions related to technology integration even more challenging (Ertmer & Ottenbreit-Leftwich, 2010).

Much of the existing research about technology integration has been done with K-12 educators in general education classrooms or in pre-service programs for general education teachers. Technology has been found to support students with disabilities in these settings by providing them access to and progress in the general education curriculum (Jackson, 2004). The challenge of increasing diversity within today's classrooms (Leyser, Zeiger, & Romi, 2011) makes it vital to have technologies that may be used to meet the needs of all learners. Technology offers an avenue by which teachers can personalize instruction: modifying to meet the needs of struggling learners and enhancing or extending for those students who are ready to learn more about a topic (Pellerin, 2013).

Many factors play into teachers' decisions to integrate technology into the classroom and their effectiveness in doing so. However, it is unclear which factors may influence co-teachers' technology integration decision-making and practices within their shared classrooms. Further research in these areas may assist educators in identifying the most effective approaches to technology decision-making and integration in the co-taught classroom.

Theoretical Framework

Our study was supported by a framework first developed by Doyle and Ponder (1977) called the "practicality ethic" (p. 7). Doyle and Ponder (1977) suggested that when teachers consider whether and to what extent they will adopt a proposed innovation in the classroom, they first consider the ease of learning the new procedure (*instrumentality*), the extent to which the new procedure aligns with their existing practices and beliefs (*congruence*), and the payoff—in the form of student enthusiasm or professional recognition—for implementing the procedure (*cost*). In short, teachers make decisions about adopting change based on what is practical. Subsequent research using the practicality ethic framework has reinforced the idea that teachers are the ultimate decision-makers in terms of implementing proposed changes (e.g., Richardson, 1990). Despite what district- or building-level change agents might propose or mandate, the teacher directs what actually happens at the classroom level.

Although Doyle and Ponder (1977) looked at educational change in general, rather than technology integration in particular, more recently, researchers have used the practicality ethic framework to examine teachers' technology integration decision-making. McGrail (2005) interviewed middle and high school English teachers about their use of technology and found that teachers implemented new technologies in the classroom only if those technologies supported improvements in their teaching methods and academic gains for their students. Further, teachers in this study were averse to implementing new technologies if practical challenges—like lack of computer lab time—got in the way. Cviko et al. (2014) applied the practicality ethic to teachers' use of technology in teaching early literacy. In their cross-case analysis, they found that "considerations about the practicality of an innovation can affect how

teachers implement technology" (p. 69). Whether technological innovations are implemented successfully seems to depend heavily on teachers' perceptions of the innovation's practicality.

The practicality ethic guided our development of interview questions and observation protocols. It was also the lens through which we examined and analyzed the generated data.

Literature Review

Teacher Decision-Making

The instructional decision-making process is complex and involves the consideration of both internal and external factors (Boschman, McKenney, & Voogt, 2014; Webster & Son, 2014). Internal factors are those within the control of the teacher, such as the teacher's past experience, knowledge, and beliefs (Webster & Son, 2014). External factors are more varied and may include student characteristics, classroom context, curriculum, and available resources (Perfecto, 2012). The balance of these (at times) conflicting factors is the foundation upon which teachers make decisions about how to integrate technology into their instruction (Webster & Son, 2014).

In a case study of secondary English teachers' instructional decision-making, Perfecto (2012) found that teachers' instructional planning decisions were most influenced by the required curriculum and student characteristics. Although the teachers were cognizant of learning goals, context greatly impacted their lesson plans and the adaptation of these plans during instruction. Perfecto (2012) noted: "At every stage of the decision-making process [teachers] tried to balance the demands of the prescribed curriculum and the realities of the classroom" (p. 480-481). Griffith, Massey, and Atkinson (2013) echoed these findings almost exactly, reporting that teachers worked to find a middle ground between what students needed and what outside forces

required of the teachers. Griffith et al. (2013) also found that context was a great influence in teacher decision-making.

Boschman et al. (2014) conducted a case study of kindergarten and early literacy instructional design teams. These teams considered technology integration in terms of its affordances to student learning. All three teams considered pedagogical issues when designing technology-enhanced lessons. Additionally, practical issues such as available resources, student characteristics, and ease of instructional delivery heavily influenced instructional decision-making. One finding in this case study was that teachers' choices were often limited by external mandates stemming from various stakeholders, including school boards, central office administration, and principals. This finding was supported by Hew and Brush (2007) in their meta-analysis of K-12 technology integration studies; they found that school leaders sometimes impeded teachers' technology integration with mandated initiatives and overly restrictive policies.

It may be the case that decisions that are made for teachers, rather than by teachers, tend to restrict teacher autonomy. A recurring theme emerged in our research that teachers' decision-making is often an attempt to find balance between internal, classroom forces (e.g., student engagement) and external, building or district forces (e.g., policy and mandates). It is unclear, however, to what extent this balancing act extends to teachers' decision-making around technology integration.

Technology Integration in General Education Settings

There is surprisingly little recent, scholarly research about the broader issue of how general education teachers are actually using technology in the classroom. In their meta-analysis, Hew and Brush (2007) found a gap in the empirical research around observations of teachers'

technology integration—most researchers had relied on self-reported data from the teachers. A further gap was found with respect to the ways in which external stakeholders, like principals and district leaders, affected teachers' technology integration. One study, conducted by digedu—an educational technology consulting firm—comes the closest to shedding light on how the "average" teacher in the United States is using technology in the classroom (digedu, 2014). After surveying 620 K-12 teachers from across the country, researchers concluded that, although nearly all of the teachers surveyed were using technology in the classroom and thought positively about it, most also wanted to use it more frequently. Most teachers reported using digital technologies to replace non-digital technologies, rather than to enhance instruction. This may be a manifestation of what Doyle and Ponder (1977) called congruence. These same teachers expressed frustration with losing instructional time to technological challenges and with the lack of instructional support for using technology effectively (digedu, 2014).

Some researchers have suggested that teachers' integration of technology into their daily classroom practice evolves in "stages: from being aware and informed about the possibilities of [technology] in education, to a more routine utilization of [technology] in classroom practice, and finally to creative uses of technology for teaching and learning" (Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2013, p. 4). This idea of technology integration happening in stages mirrors Puentedura's (2013) SAMR model; he has written that teachers use technology in ways that substitute, augment, modify, or redefine existing classroom practice. This suggests that technology integration is an ongoing process, rather than a quick solution.

There is some evidence that teachers who have positive attitudes about technology, administrator support for technology integration, and time to experiment with and learn to use new technologies are more likely to integrate technology in classroom practice (Webb, 2011).

Yet it is interesting to note that there does appear to be a connection between the decisions teachers make about incorporating technology in the classroom and "teachers' beliefs of the value or perceived usefulness" (p. 71) of the technology (Hodges & Prater, 2014). This conclusion is supported by Hew and Brush (2007), who found that the major barriers to teachers' technology integration in the classroom included teachers' attitudes, beliefs, knowledge, and skills related to technology. Teachers who did not see a clear connection between their specific content area and the technology being used were less likely to integrate it; likewise, teachers who perceived that a particular technological tool was too difficult or time-consuming to learn were less likely to use the tool. It seems that teachers' attitudes about particular technologies magnify the effects of external influences on teachers' decision-making around technology integration (Hodges & Prater, 2014). This suggests that teachers who are already integrating technology in the classroom may be encouraged to do so even more often with the encouragement of school or division leaders. Likewise, teachers who are already reluctant to incorporate technology may resist the "district mandate" approach. Therefore, because of its emphasis on teachers' perceptions about the instrumentality, congruence, and cost of learning a given technology, the practicality ethic (Doyle & Ponder, 1977) may be a useful lens through which to examine teachers' decisions about technology integration in the classroom.

Technology Integration in Inclusive Settings

Technology has been found to support access to and progress in the general education curriculum for students with disabilities (Jackson, 2004). Increasing numbers of students with disabilities and other diverse types of learners are included in general education classrooms (Angus & Oliveira, 2012; Huberman, Navo, & Parrish, 2012; Leyser et al., 2011). This challenge of greater diversity within today's classrooms makes it vital to have technologies that, when

integrated into curriculum, may meet the needs of all learners. Recall from our earlier discussion that inclusive settings are not necessarily co-taught settings. However, much of the research related to technology integration in classrooms that include students with disabilities has been done in inclusive classrooms as described in the examples below, not classrooms in which co-teaching is the delivery model for special education services.

Beacham and McIntosh (2014), studying pre-service teachers' attitudes and beliefs about the use of technology in inclusive settings, determined that the teachers integrated technology into instruction when they had knowledge of the particular technology and when they saw value in its use in terms of student learning. Although pre-service teachers had generally positive attitudes toward use of technology for instructional purposes and towards inclusion of students with disabilities in the general education setting, their attitudes were not as positive toward technology integration in inclusive classrooms. As such, technology was considered for accessibility, but not necessarily for instructional purposes.

Pellerin (2013) found a broader view of enhancing instruction using digital tools and resources whereby teachers considered technology that supports the needs of all students, rather than only those students with disabilities. Data obtained during a two-year action research project indicated that embedded professional development influenced teachers to incorporate technology into their instruction in inclusive settings. Pellerin's (2013) research addressed the shared learning of teachers in relation to their decisions to integrate technology into their classrooms. Teachers who were given the opportunity to discuss their experiences with technology integration with other teachers in similar inclusive settings were more open to adopting instructional practices that incorporated the use of technology. This suggests that the unique context of a co-taught classroom may encourage teachers' technology integration. The

instrumentality that Doyle and Ponder (1977) identify as a consideration for teacher decision-making may have some influence here. There is a need to understand more about the decisions co-teachers make about integrating technology in the classroom.

Method

We employed a multiple case study approach to compare and contrast the experiences of teachers in two separate cases: one in which the co-teachers had made the decision to implement technological tools independently of principal or district influence and one in which the principal or district had mandated the use of certain technological tools. Yin (2014) has identified the multiple case study design as a means of comparing and contrasting two or more cases, thus providing the opportunity for more robust analysis than a single case study might allow. We viewed each case as an individual unit, using a holistic case study approach. Yin has further recommended a holistic approach for researchers who wish to look at "the global nature of an organization or of a program" (p. 55). Given the limited extant literature related to technology integration in the context of a co-taught classroom, a case study approach provided the opportunity for rich description of our participants' experiences. Our review of the literature revealed several gaps that were best filled by an exploratory approach that allowed us to gather rich information about the many unanswered questions surrounding teachers' technology integration decision-making in co-taught settings.

Participants

We opted to use purposive criterion sampling (Patton, 2002) for our study because we had a specified focus and context within which to answer our research questions. Purposive sampling methods involve identifying participants who provide perspectives and experiences relevant to a particular research focus (Bazeley, 2013; Schwandt, 2007). Additionally, because

this was a case study, our case had to be bound. Yin (2014) has described a bounded case as one in which the researcher specifies the unit of study and the context within which that unit is viewed. The case may be also constrained or bound within a timeframe or place (Creswell, 2013).

We looked at two public middle school classrooms, both taught by co-teachers, who were integrating technology into instruction; in both cases, we recruited strong co-teaching pairs who worked well together and had been working well together for a number of years. Our first case, in the Eastern County school division, included Gayle, the general educator, and Gina, the special educator. At the time of our study, the pair had been co-teaching together for six years. Our second case, in the Central County school division, included Carmen, the general educator, and Carla, the special educator. They had been teaching together for only two years, but both reported a strong co-teaching relationship. Both co-teaching pairs met our desired qualifications in that they were veteran teachers (who had greater than five years' teaching experience), in established partnerships, who reported working well together. Our observations and interviews with each pair confirmed that they frequently engaged in co-planning and decision-making.

Data Generation and Collection

We employed the trustworthiness criteria developed by Lincoln and Guba (as cited in Seale, 2002). Trustworthiness is the extent to which the methods and findings of a study are of sufficient quality to ensure credible, confirmable, dependable, and transferable results. These quality criteria were appropriate for our naturalistic study. We hoped to uncover the experiences and meanings within teachers' experiences through in-depth exploration of our cases.

Our primary focus in data generation was interview data. Yin (2014) has suggested that a focus on in-depth interviews offers the best way to gather rich data within case studies. We used

both semi- and unstructured interviews, letting our research focus and theoretical framework guide our questioning of teachers. Semi-structured interviews were those in which we asked initial guiding questions specific to our research topic. Follow-up questions emerged based upon how participants responded to the initial guiding questions and provided for the generation of richer information. We conducted two semi-structured interviews with each of the four participants (two co-teachers per case)—one interview took place at the beginning of the study and the other took place at the end. In the semi-structured interviews, we relied on the following questions, guided by the strands of our research focus and theoretical framework:

- What technologies do you use in the classroom?
- How do you make decisions about integrating technology?
- How much does the amount of learning you would need to implement the technology play a role in your decision-making, if at all?
- How much does the alignment of the technology with your practices and beliefs play a role in your decision-making, if at all?
- To what extent does student enthusiasm play a role in your decision-making, if at all?
- To what extent does professional recognition play a role in your decision-making, if at all?

We the conducted member checks, whereby participants reviewed each aspect of the data generation and analysis process, to ensure accuracy of results. Member checks were conducted both during the interview process and after interview recordings and transcripts were summarized to build credibility in the study (Creswell, 2013). Credibility refers to how closely a researcher's results reflect the participants' meaning of the experiences shared (as cited in Seale, 2002).

In order to build a context for our case studies and background knowledge for asking interview questions, we also conducted classroom observations twice over the course of our study. The same strands of the research focus and theoretical framework that guided the interview questions also guided our observations: we were looking for evidence of teachers' practicality ethic (Doyle & Ponder, 1977) in their technology decision-making. Classroom observations allowed us to generate rich descriptions of the contexts of the cases (Creswell, 2013), supporting the transferability of our results. Transferability refers to a reader's ability to evaluate whether a study's results would apply to a new or different context (as cited in Seale, 2002). We allotted time for unstructured interviews immediately following each observation of teachers' classrooms. These unstructured interviews included questions directly related to our observations and provided opportunity for confirmation, elaboration, and clarification of our interpretations.

Finally, we collected data in the form of teachers' lesson plans and any school policy documents related to teachers' technology integration decisions (e.g., memos, professional development handouts, emails, etc.). These layers of data supported our impressions and ensured that our data were derived from participants' experiences and perceptions, rather than from our perceptions and expectations of results, contributing to the credibility of these results (as cited in Seale, 2002). We viewed data from "different vantage points" (Schwandt, 2007, p. 298), thus uncovering more of the complexity of the participants' experiences, enriching the data. Our findings were validated by triangulating multiple, different types and sources of data (Bazeley, 2013).

Bazeley (2013) recommends that researchers write their ideas, considerations, perceptions, and other relevant experiences in a journal—often called a reflexive journal—that is

maintained throughout the research study. Reflexivity is a process through which an individual identifies thoughts, feelings, and biases associated with the research topic (Schwandt, 2007). We each maintained reflexive journals, which contributed to the dependability of our study by providing an ongoing record of our research questions, ideas, plans, decisions, actions, and reactions and our reasons for these decisions and actions. Dependability is a commitment to mindful research methods, whereby the research process is transparent, organized, and well-documented (as cited in Seale, 2002).

Lincoln and Guba's (as cited in Lincoln, 1995) authenticity criteria for non-positivistic research include fairness (researchers' efforts to represent all relevant perspectives in their research), ontological authenticity (participants' understanding of their own perceptions and experiences as a result of participation in the study), educative authenticity (participants' understating about others' experiences and perceptions as a result of participating in a study), catalytic authenticity (participants' desire to change something about themselves as a result of participating in a study), and tactical authenticity (the extent to which participants are empowered to actually change something about themselves as a result of participating in a study). Although no researcher can guarantee meeting these criteria in a particular study—with the exception of fairness—we attempted to create conditions that were favorable to meeting Lincoln and Guba's authenticity criteria. For example, the use of member checks allowed our participants to reflect on their decision-making related to technology, laying the groundwork for ontological, educative, and catalytic authenticity.

Data Analysis

We employed a cross-case analysis approach (Bazeley, 2013; Yin, 2014) for data analysis. In looking at similarities and differences across the two cases, we focused on teachers'

technology use and decision-making, as well as evidence of the practicality ethic (Doyle & Ponder, 1977) in teachers' decision-making.

We relied on both categorical and holistic approaches (Creswell, 2013) in the process of data analysis. Creswell notes that holistic data analysis involves reviewing the data as a complete piece and then identifying themes within the data, whereas categorical data analysis involves the identification and sorting of data into relevant categories. The categories for our initial coding of data were guided by the practicality ethic: instrumentality, congruence, and cost (Doyle & Ponder, 1977). Other categories emerged as we interpreted our data. As noted above, our study involved semi-structured interviews, classroom observations, and a review of extant documents. We opted to use a holistic approach to analyzing the classroom observations and extant documents and a categorical approach to analyzing interview data. Our aim was to form a broad impression of what was happening in each classroom. Analyzing observation and document data holistically allowed us to do that and encouraged insights that a more detailed, categorical examination might miss (i.e., missing the forest for the trees). This combined approach allowed us to identify broad themes in classroom observations in order to refine our interview questions. Then, because of the more targeted interview questions, our categorical analysis of interview responses helped us develop a more detailed understanding of teachers' decision making, digging in to the richly detailed responses our teachers provided.

Results

As we will describe, contextual elements played a significant role in the decision-making process for the teachers in both of our cases. Doyle and Ponder (1977) referred to these contextual factors as "ecological variables" (p. 5) that influenced teachers' adoption of new practices in the classroom. They noted that environmental demands, the culture of the classroom,

and the isolation of teachers within those classrooms encompass ecological variables. Ecological effects, then, are the interactions between environmental demands in the classroom and the behavior of teachers.

Teachers must make decisions about how particular innovations will impact their unique classrooms. This is where the three critical components of the practicality ethic come into play: instrumentality, congruence, and cost (Doyle & Ponder, 1977). The consideration of all three of these elements will determine if teachers deem a new practice or technology practical for implementation.

The results of our study supported the notion that an innovation must be practical in order for teachers to incorporate it into the unique context of their own classrooms. However, our results went beyond this notion to include not only the practicality of a particular innovation, but also the role of relative advantage in teachers' decision to adopt an innovation as standard classroom practice.

Contextual Elements

Context is a complex concept that encompasses a variety of components. Porras-Hernández and Salinas-Amescua (2013) posited that context includes both the scope of the environmental influences as well as the actors involved. They referred to the scope of context at three definitive levels: *macro* (global influences), *meso* (local influences), and *micro* (classroom influences). We found that both the general contextual elements associated with a typical classroom (e.g., time constraints, access to technology, district influence, etc.) as well as contextual elements unique to the co-taught setting (e.g., the relationship between co-teachers) influenced teachers' technology decision-making. In other words, we found that context played a major role in teachers' technology decision-making, similar to other studies of technology

integration (e.g., Badia, Meneses, & Sigalés, 2013; Boschman et al., 2014; Griffith et al., 2013; Perfecto, 2012).

We considered general contextual elements to be those elements that would be part of any typical school setting. These, combined with the unique characteristics of the co-taught classroom, can either constrain or encourage teachers' technology decision-making. For example, in our case from Eastern County, teachers had access to a limited number of iPads. However, because the two teachers worked collaboratively, they were able to facilitate students' group work with these devices more effectively. Gina noted that co-teaching was particularly helpful for station teaching. The unique co-teaching context made it more practical to integrate the limited number of devices effectively.

Time constraints were a frequent pattern across both of our cases. We considered this to be a contextual element as well, in that the effects of time constraints may be mitigated by the presence of a second teacher, as in the case of a co-taught classroom. As Carla from Central County stated, "I wish we had more time for decision-making. You know at this point decision-making is done after hours and sometimes it's done very quickly, on-the-fly." Time constraints may impact the decision to integrate technology even with two teachers to support the effort. For example, Gayle noted,

> If it is going to take me 10 to 20 hours to learn how to do something…? It is going to take me *another* 10 to 20 hours to teach the kids how to understand it. And our time is—with the content that we teach—our time is too valuable to be wasteful with our time. So, it has to be something that is very user friendly that is readily available and easily understood.

Both teams of teachers experienced some degree of district-level influence related to technology initiatives. Yet, within those parameters, teachers continued to make decisions about how to best implement these initiatives in the unique contexts of their own classrooms. For example, in Central County, the unique co-teaching context provided insight for us as researchers that we would not have been able to glean in a traditionally taught classroom. In this classroom, the district had a strong influence over technology integration, with a 1:1 laptop initiative and district-mandated testing software. In the beginning of our study, Carmen, the general education teacher, often deferred credit to the district with regard to her technology decision-making; however, her co-teaching partner, Carla, repeatedly gave the credit to Carmen's personal decisions. Carla had the unique perspective of working with other classroom teachers and seeing how they were navigating the same district mandates; she realized that in this partnership, Carmen was in fact making many personal decisions about technology within the boundaries of the many technology-related district initiatives.

Interpersonal elements. We identified several patterns that we categorized as *student elements*: students' acceptance of technology, students' behavior, students' best interests, student engagement, and cost (in terms of student enthusiasm). The unique context of the co-taught classroom combined with these student elements to form what we refer to as interpersonal elements. Having two teachers in a collaborative relationship changes not only the way teachers interact with one another, but also the way the teachers interact with students (Friend et al., 2010). The tasks of managing students' behavior around technology and addressing student learning with technology were both influenced by the team dynamic of the co-teaching partnership. Additionally, each teacher made decisions based not only on the presence of another teacher in the room, but also based on elements related to students.

We found that these interpersonal elements influenced teachers' technology decision-making. In other words, teachers' decisions were influenced by the interactions between co-teachers as well as by each teacher's (and the teachers as a pair) interactions with students (Badia et al., 2013). For example, Gina noted on several occasions that she learned from her co-teaching partner, who had more previous experience with technology integration than she had. Similarly, Carla referenced being influenced by Carmen in her statement:

> I have other classes where they're using very little to no technology at all. Some of the uses in the other classroom had filtered over from [Carmen's] classroom. They'll learn how to make a commercial in [Carmen's] classroom and then want to do that in another class.

The co-teaching partnership also provided opportunities for teachers to brainstorm ideas about how best to integrate technology into the classroom. Gayle noted:

> We share a classroom so we constantly talk about stuff and bounce ideas off each other. Once a good idea starts, we kind of just make it happen, and where we can include technology we do…it usually will be like something along the lines of, "Oh! I saw this really cool thing! Maybe we can do this!"

Co-teachers in Central County were able to work collaboratively to establish heterogeneous groups for students, to differentiate lessons based upon students' strengths, and to plan for the best access to instruction. Co-teachers in Eastern County made use of varying approaches to co-teaching to support student learning, incorporating technologies into these approaches. These teachers noted that the technologies supported different co-teaching approaches as much as the approaches made integration of technology more effective. In other

words, there was a reciprocal relationship between pedagogy and technology in the co-teaching context.

Teachers from both cases also referred to the influence of students on their decision-making. Gayle noted that student behavior was often a consideration in whether to integrate technology into a lesson. Both Gayle and Carla expressed concern about students' off-task behavior while using technologies. Other student elements included students' acceptance of using new technologies, students' prior knowledge in using technologies, and student engagement as a reason to adopt new technologies. For example, Gayle stated, "If the kids are not engaged and excited about it, they are not going to use it to their fullest."

Referring to cost, Doyle and Ponder (1977) suggested that student enthusiasm might play a role in teacher decision-making in adopting new innovations. They characterized student enthusiasm as students' excitement about a classroom innovation. In other words, student enthusiasm corresponds to students' interest in the novelty of a new technology. Although student enthusiasm was sometimes a factor for the four teachers in our study, student engagement appeared to be of greater concern. For our participants, engagement had more to do with technology enabling or encouraging students' prolonged interest in and attention to a content-related task. Where enthusiasm over novel tools was fleeting, engagement was sustained and the same tool might continue to foster this engagement even after the novelty faded. When referring to engagement, teachers indicated that students actively interacted with the instructional content in some capacity. For example, Carla noted about technology:

It catches several students and almost tricks them into performing, if that makes any

sense. When we take a student who normally has his head down and is asleep and we give him the opportunity to create a product and create commercials and learn the vocabulary, I have student engagement that I didn't have before.

The other component of cost (Doyle & Ponder, 1977) is a payoff in the form of professional recognition. Doyle and Ponder (1977) posited that teachers sometimes decided to adopt classroom innovations with the intent of earning prestige among their peer teachers. We found that other teachers in their buildings influenced participants in our study, but not always in the ways that Doyle and Ponder proposed. For example, in Eastern County, content level teachers planned together. In doing so, they were able to share practices that work well. Gina noted that the school had a culture of open sharing and that teachers were willing to support one another with technology integration. Similarly, in Central County, other teachers influenced Carmen to an extent, but not necessarily in the manner Doyle and Ponder suggested. Carmen said:

> I'm competitive….I don't want to ever rest on my past laurels or experiences….So to some extent, [professional recognition] probably does play a role because I have a lot of pride. And I want them to look at me and go, "Wow she's old and still kicking."

For the teachers in our study, professional recognition was a consideration, but rarely had a direct impact on their technology integration decision-making.

Teaching and learning elements. We found that teachers' expressed characteristics (e.g., flexibility, willingness to learn alongside students, etc.) combined with learners' perceived characteristics (e.g., students' behavior and acceptance of technology) influenced teachers' technology decision-making. In other words, elements related to teaching and learning influenced teachers' technology decision-making.

We refer to teachers' individual characteristics combined with elements that supported student learning as teaching and learning elements. For example, across both cases and all participants, our teachers reported that flexibility was key in their technology decision-making. Carla remarked, "you almost have to have a plan for when it doesn't go right." Similarly, Gayle stated, "when we have to plan [lessons with technology], we always have to have a back-up or two." Although teachers in our study indicated that this flexibility required more planning, they were willing to do so if the effort would support student learning. For example, teachers in Eastern County experienced challenges with Internet connectivity. Although it required her to take the iPads home and spend hours to reset them, Gayle continued to incorporate these into her lesson plans on a regular basis. Gayle and Gina also planned back-up activities that could be done on the iPads, but that did not require Internet access.

Additionally, teachers in both of our cases often entered the role of learner, building their own skills alongside students. This ultimately led to increased technology integration. Gina expressed that she learned alongside and often from her students. We also noted this in a classroom observation where Gina was sharing her inability to use the "quick method" to erase the SmartBoard. One of the students joked that Gina had difficulty because she was not doing it correctly and offered to demonstrate the correct way to do it. Carla also reported learning alongside her students: "sometimes I'm learning as the kids are learning and I think it helps them understand that this is something they can do. I think my role as a learner is very valuable to them."

Teachers' level of comfort with technology was another element that influenced decision-making. Similar to the instrumentality described by Doyle and Ponder (1977), teachers noted that the more they used technology, the more comfortable they were with it, and the more likely they

were to use it in the classroom. In fact, both Gina and Gayle had become so accustomed to using certain technologies as standard practice that they no longer even referred to them as technology. For example, in interviews neither Gina nor Gayle referred to three types of technology they used daily—their document camera, a digital timer, and a classroom set of graphing calculators. When we asked about these tools, both teachers remarked that they didn't even consider these to be technologies; they were just standard practice and "taken for granted."

Teachers also considered students' attention to learning when making decisions related to technology integration. For example, Gayle noted that if students were more focused on the technology rather than the content, she and Gina would reconsider use of these technologies in later activities. Carla stated that when they find students texting one another instead of completing classroom activities on their devices, they "have to shut down the technology; it doesn't happen often, but every once in a while…we call it going old school." Carla further noted that she and Carmen must consider students' attention spans when planning lessons that incorporate technology.

Finally, the teachers in our study repeatedly put students' best interests at the forefront of their technology decision-making. For example, Gina stated, "you want to do things and incorporate things that the kids like…it is all about the kids." Similarly, Carmen noted,

> I knew the children's future also depended on [technology] because it's an essential skill that they're going to have to master if they're to be successful in a career and future workforce. You just can't be successful in any career if you're not embracing technology. So I knew I needed to incorporate it in the classroom from the jump.

We repeatedly saw evidence that elements related to teaching and learning influenced teachers' technology integration decision-making.

Relative Advantage

The participants in Central County found classroom technologies to have additional benefits to the teaching and learning experience. Carmen and Carla noted that using technology saved time in making and preparing copies for students use in the classroom. Additionally, these technologies helped students keep track of materials and organize their assignments.

Rogers (2003) defined relative advantage as "the degree to which an innovation is perceived as better than the idea it supersedes" (p. 15). During our first round of interviews with our participants, relative advantage emerged repeatedly as a factor in teachers' technology integration decision-making. When we later asked our participants about the role of relative advantage in their decision-making, they said things similar to Carmen's observation about students using readability software to make complex passages of text more accessible:

> The technology facilitates it all so much easier. Think about it: if I gave them a document last year and had to read it….Some of it is pretty intense reading, and when I gave it to them on paper before, we really had to sit there and go through each passage and highlight and spent a lot of time just trying to figure out what they meant. The technology has made that part seamless.

Similarly, Gayle reported that when students practiced math facts with an interactive online program, there was a relative advantage to more traditional worksheet practice because students could be "self-paced with immediate feedback versus always having to get feedback from us." Her co-teaching partner, Gina, noted that technology allowed students to create without having to draw, "because a lot of kids don't like to draw. They like to create things, but

they just don't like to draw it." Across both cases, teachers identified multiple instances of how technology made tasks easier, faster, more efficient, or otherwise better than the previously used methods—all examples of relative advantage.

Relative advantage played a strong role in whether our teachers chose to integrate a technology as part of their standard classroom practice. For example, recall that at the point of our study, Gayle and Gina had so thoroughly integrated their document camera into standard classroom practice that they no longer thought of it as technology. This was in part, as Gina described, because the document camera made it easier to share spur-of-the-moment notes and reminders with the whole class and to show students how to use math manipulatives. Neither of these tasks could be as easily accomplished without the use of the document camera. Ultimately, we found that contextual, interpersonal, and teaching and learning elements often overlapped to influence teachers' determination of technology's relative advantage in the classroom, leading eventually to that technology becoming part of their standard classroom practice.

Conclusion

Although we found that instrumentality, congruence, and cost (Doyle & Ponder, 1977) played a part in teachers' technology integration decision-making, our findings went beyond the scope of the practicality ethic framework. Contextual elements, both those typical of any classroom setting and those specific to the co-teaching setting, played a larger role in teacher decision making related to technology integration. These were critical elements in determining whether the specific technologies would be deemed to have a relative advantage in the classroom.

Teachers considered contextual elements and teaching and learning elements to decide whether specific technologies or combinations of technologies had a relative advantage. Relative

advantage was a necessary precondition for these technologies to become standard classroom practice. In our two cases, it was the perception of relative advantage, first and foremost, that ensured technology became standard classroom practice.

Discussion

Context was an overarching theme through which all components of teacher decision-making connected in our results. Although teachers in our study chose technologies that supported instructional content and delivery, student engagement, and student learning, these decisions were made based upon the unique contexts within each classroom and co-teaching partnership. The teachers' shared approach to decision-making is a critical aspect of the co-teaching relationship, whereby two educators share students, responsibilities, and accountability for student learning (Cviko et al., 2014; Friend, 2014; Murawski, 2012). This collaboration in lesson design and planning, specifically around technology integration, influences the approach to and the effectiveness of technology integration (Cviko et al., 2014).

Although the unique co-teaching context appeared to influence teacher decision-making in the two cases examined in this study, more general meso, macro, and micro contexts played roles as well (Porras-Hernández & Salinas-Amescua, 2013). Porras-Hernández and Salinas-Amescua (2013) have described the macro context as existing at a worldwide level, encompassing far-reaching policies and politics. The meso context level is more local, but reaches out to communities as well as all of the personnel within an educational environment. The micro context level, where our study is situated, is concerned with the individual classroom. When teachers in our study used technology to prepare students for state testing that would be administered on computers, they were influenced by the meso context. When they implemented technologies that were district-mandated, and they selected those technologies to which they had

access, they operated within the meso level. But when they took into consideration issues such as personal time constraints, their students' engagement, and their own level of comfort with a technology, they were concerned with the micro context. These levels of context create a complex decision-making process (Boschman et al., 2014; Webster & Son, 2014).

Even in examples from our two cases where teachers were given district mandates, they continued to have the autonomy to determine how best to implement these initiatives within the context of their classrooms. Our teachers found the balance between what students needed and what the district required of them as teachers, similar to findings reported by Boschman et al. (2014), Griffith et al. (2013), and Perfecto (2012). Our findings also mirror Griffith et al. (2013), who noted that context is a powerful influence on teacher decision-making.

Contextual as well as pedagogical issues are critical considerations in teacher decision-making (Badia et al., 2013; Boschman et al., 2014; Gün, 2014). Contextual issues, as we discovered, included many differing considerations such as available resources, student characteristics, functionality, and ease of instructional delivery (Badia et al., 2013; Boschman et al., 2014). It is clear that the balance of these (at times) conflicting contextual elements is the foundation upon which teachers make decisions about how to integrate technology into their instruction (Webster & Son, 2014).

References

Angus, R., & Oliveira, L. (2012). Diversity in secondary English classrooms: Conceptions and enactments. *English Teacher: Practice and Critique*, *11*(4), 7–18.

Badia, A., Meneses, J., & Sigalés, C. (2013). Teachers' perceptions of factors affecting the educational use of ICT in technology-rich classrooms. *Electronic Journal of Research in Educational Psychology*, *11*(3), 787–808.

Bazeley, P. (2013). *Qualitative data analysis: Practical strategies.* Los Angeles, CA: SAGE.

Beacham, N., & McIntosh, K. (2014). Student teachers' attitudes and beliefs towards using ICT within inclusive education and practice. *Journal of Research in Special Educational Needs, 14*(3), 180-191. doi: 10.1111/1471-3802.12000

Boschman, F., McKenney, S., & Voogt, J. (2014). Understanding decision making in teachers' curriculum design approaches. *Educational Technology Research and Development*, *62*(4), 393-416. doi:10.1007/s11423-014-9341-x

Creswell, J. W. (2013). *Qualitative inquiry and research design*. Los Angeles, CA: SAGE.

Cviko, A., McKenney, S., & Voogt, J. (2014). Teacher roles in designing technology-rich learning activities for early literacy: A cross-case analysis. *Computers & Education, 72*, 68-79. doi: 10.1016/j.compedu.2013.10.014

digedu. (2014). *Technology use in the classroom: Benefits & barriers.* Retrieved from http://digedu.com/benefitsandbarriers

Doyle, W., & Ponder, G. A. (1977). The practicality ethic in teacher decision-making. *Interchange, 8*(3), 1-12. doi: 10.1007/bf01189290

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal on Research of Technology in Education, 42*(3), 255-284. doi: 10.1080/15391523.2010.10782551

Friend, M. (2014). *Co-teach! Building and sustaining effective classroom partnerships in inclusive schools* (2nd ed.). Greensboro, NC: Author.

Friend, M., Cook, L., Hurley-Chamberlain, D., & Shamberger, C. (2010). Co-teaching: An illustration of the complexity of collaboration in special education. *Journal of Educational and Psychological Consultation*, *20*(1), 9-27. doi:10.1080/10474410903535380

Griffith, R., Massey, D., & Atkinson, T. S. (2013). Examining the forces that guide teaching decisions. *Reading Horizons, 52*(4), 305-332.

Gün, B. (2014). Making sense of experienced teachers' interactive decisions: Implications for expertise in teaching. *International Journal of Instruction*, *7*(1), 75–90.

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education, 41*(4), 393-416. doi: 10.1080/15391523.2009.10782536

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research & Development, 55*(3), 223-252. doi: 10.1007/s11423-006-9022-5

Hodges, C. B., & Prater, A. H. (2014). Technologies on the horizon: Teachers respond to the Horizon Report. *TechTrends, 58*(3), 71-77. doi: 10.1007/s11528-014-0754-5

Huberman, M., Navo, M., & Parrish, T. (2012). Effective practices in high performing districts serving students in special education. *Journal of Special Education Leadership*, *25*(2), 59–72.

Jackson, R. M. (2004). *Technologies supporting curriculum access for students with disabilities.* Retrieved from National Center on Accessible Instructional Materials website: http://aim.cast.org/sites/aim.cast.org/files/TechSupport.pdf

Leyser, Y., Zeiger, T., & Romi, S. (2011). Changes in self-efficacy of prospective special and general education teachers: Implication for inclusive education. *International Journal of Disability, Development and Education, 58*(3), 241-255. doi: 10.1080/1034912X.2011.598397

Lincoln, Y. S. (1995). Emerging criteria for quality in qualitative and interpretive research. *Qualitative Inquiry, 1*, 275-289. doi: 10.4135/9780857028211

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE.

McGrail, E. (2005). Teachers, technology, and change: English teachers' perspectives. *Journal of Technology and Teacher Education, 12*(1), 5-24.

Murawski, W. W. (2012). 10 tips for using co-planning time more efficiently. *Teaching Exceptional Children, 44*(4), 8-15.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (pp. 243-244). Thousand Oaks, CA: SAGE.

Pellerin, M. (2013). E-inclusion in early French immersion classrooms: Using digital technologies to support inclusive practices that meet the needs of all learners. *Canadian Journal of Education, 36*(1), 44-70.

Perfecto, M. R. G. (2012). Contextual factors in teacher decision making: Extending the Woods model. *Asia-Pacific Education Researcher*, *21*(3), 474-483.

Porras-Hernández, L. H., & Salinas-Amescua, B. (2013). Strengthening TPACK: A broader notion of context and the use of teacher's narratives to reveal knowledge construction. *Journal of Educational Computing Research*, *48*(2), 223–244. doi:10.2190/EC.48.2.f

Puentedura, R. R. (2013, May 29). SAMR: Moving from enhancement to transformation [Web log post]. Retrieved from http://www.hippasus.com/rrpweblog/archives/000095.html

Richardson, V. (1990). Significant and worthwhile change in teaching practice. *Educational Researcher, 19*(7), 10-18. doi: 10.3102/0013189x019007010

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Rossman, G.B., & Rallis, S.F. (2003). *Learning in the field: An introduction to qualitative research* (2nd ed.). Thousand Oaks, CA: SAGE.

Schwandt, T. A. (2007). *The SAGE dictionary of qualitative inquiry.* Los Angeles, CA: SAGE.

Seale, C. (2002). Qualitative issues in qualitative inquiry. *SAGE Research Methods, 1*(1), 97-110. doi: 10.4135/9780857028211

Voogt, J., Knezek, G., Cox, M., Knezek, D., & ten Brummelhuis, A. (2013). Under which conditions does ICT have a positive effect on teaching and learning? A call to action. *Journal Of Computer Assisted Learning, 29*(1), 4-14. doi:10.1111/j.1365-2729.2011.00453.x

Webb, L. (2011). Supporting technology integration: The school administrators' role. *National Forum of Educational Administration & Supervision Journal, 28*(4), 1-8.

Webster, T. E., & Son, J. (2014). Doing what works: A grounded theory case study of technology use by teachers of English at a Korean university. *Computers & Education*, *80*, 84–94. doi:10.1016/j.compedu.2014.08.012

Yin, R. K. (2014). *Case study research: Design and methods*. Los Angeles, CA: SAGE.