Quality Technology Integration Professional Development:
The Key to Building Teacher Capacity for Integrating Technology

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Introduction

Being digitally illiterate in Harnett County, North Carolina is no longer an option. Each year the number of technological devices in our schools continues to grow. As so eloquently stated by Spires, Oliver, and Corn (2012), “A computer in the hands of every child is no longer a farfetched idea” (p. 63). Implementation of the one-to-one initiative began in the elementary schools a couple of years ago and has trickled-up to our high schools for the coming school year. The delivery of ten laptop carts, containing 32 devices, will occur this summer. The lucky recipients, of these devices, must attend a two-day workshop to introduce them to potential computer resources. This approach to professional development is inadequate. Potter and Rockinson-Szapkiw (2012) were extremely correct in their remarks, “using technology for the sake of using technology is of little benefit” (p. 24). To supplement this snapshot to technology integration, in-depth and ongoing professional development will occur at the school level, beginning in the fall. The purpose of this internship is to plan for the implementation of quality professional development to assist teachers in building a capacity to use and integrate technology effectively in their classrooms.

My goal is to offer professional development opportunities to all staff members, at Triton High School, who wish to become more proficient at using and integrating technology into their instructional practices. For the coming school year, the primary focus will be to assist the classroom teachers implementing the one-to-one technology initiative. The degree of personal technology proficiency, by members of this group, varies greatly. For this reason, professional development will follow the SAMR model of substitution, augmentation, modification, and redefinition (Technology Is Learning, 2013). Professional development sessions will offer instruction, guided practice, and time to design and develop
lessons with the projected outcome being to transform learning experiences to higher levels of achievement.

**Review of the Literature**

A review of literature is essential in designing, developing, and delivering quality professional development. This section will explore the following educational topics: (a) one-to-one technology initiatives, (b) technology integration professional development, and (c) technology integrations models focusing specifically on TPACK and SAMR.

**One-to-One Technology Initiative Implementation**

Many school districts across the nation are implementing one-to-one technology initiatives. Research conducted in Texas showed that students who had access to one-to-one computer devices experienced greater levels of achievement, higher levels of engagement, better attendance profiles, fewer behavior problems and are more motivated (Godwinn, 2011). Many believe the infusion of technology into the classroom is the answer to how schools will prepare students for the 21st century. It is easy to see that computers provide easy and constant access to information. What they do not realize is that technology initiatives are not about what digital devices offer, but are about people who utilizing them (Overbay, 2011). Emphasis is shifting from the old standard of teaching and learning at the classroom level to a “NEW learning ecology” with the introduction of 1:1 computing devices (Spires et al. 2011). In this new learning ecology teachers become the content experts, consultants, and facilitators of instruction. Students become self-directed, self-regulated, and creative learners. Curriculum becomes intense, and relevant while learning becomes personalized. For these reasons changes must occur in communication, pedagogy, and context.
**Communication changes.** Communication is key and enthusiasm is crucial when implementing 1:1 initiatives. Technology can be used to build these open lines of communications. One way, of doing this, is to involve teachers in all phases of the implementation process. Teachers need to be asked these questions and administrators need to listen to their answers.

- What do you know about technology?
- What do you need to know about technology?
- What types of technology will you being willing to incorporate into your curriculum?
- What kinds of technological investments make the most sense to you? (Overby, 2011).

Principals and county level administrators may be the largest influence on whether teachers buy into the necessary changes; therefore, lines of communication need to be established. If administrators encourage teachers to take risk without fear of consequences then teachers are more likely to find creative means to daily implement technology use into their lesson; however, if restrictive measures are placed on teacher with 1:1 classroom, then many teachers will be deterred from incorporating it into their instruction. Effective teacher-administrator communication will be instrumental throughout the implementation process (Spires et al. 2011). By keeping administrators informed about changes in classroom practices as technology is integrated into the classroom, teachers will have better leverage in requesting resources and professional development.

Students learn quickly to use of variety of communication tools, such as email, chat tools, and social interactive sites; whereas, teachers often need professional development to become proficient in the same tools. Through the utilization of these tools, stronger student-to-student, student-teacher, and teacher-teacher relationships are forged (Spires et al. 2011). Advantages for building stronger
relationships include; (a) the formation of collaborative alliances, (b) greater interaction between students and teachers as teachers learn to rely on their tech-savvy students for support and assistance, (c) the removal of barriers that once kept students from asking the teachers question, and (d) opportunities for teachers to plan and collaborate with other teachers within the school, district or globally to create quality lessons and learning activities (Tusch, 2012). By increasing student online collaboration, teachers are forced to make some careful pedagogical choices ensuring productive dialogue during collaborative sessions.

**Pedagogy changes.** It is well document that the implementation of one-to-one computing devices is not what makes the difference in student achievement. The main factor that affects the potential for greater achievement revolves around the changes teachers make in their pedagogy and usage of available cognitive tools (Spires et al. 2011). Studies show that how teachers chose to utilize computing technologies depends more on the teacher than on the subject taught. Technology use that remains teachers-centered results in little to no change in student performance; however, when teachers chose to shift the focus of instruction toward a student-centered approach, gains in student growth are experienced (Donovan & Green, 2010). For teachers to change the ways in which they teach takes time, preparation, and a willingness to explore new avenues. Often this means changing from a behaviorist or cognitive approach where learning is teacher controlled and students are passive receivers of knowledge. Assessment is focused on a product rather than process. Implementing one-to-one technology requires teachers to apply a constructivist approach in which the teacher supports and motivates students by providing them with advice and context-rich opportunities to engage in real-world problem solving activities (Petersen, & Bunting, 2012). In this environment, assessment is more about
the process than the solution.

Having greater access to teaching materials requires time to locate and evaluate resources which are constantly changing. To stay afloat teachers need to collaborate with one another to discuss what is working and what needs to be tweaked. Technology allows students to have greater access to information thus increasing their research capability. One way teachers are discovering to shift the focus of instruction from the teacher to the student is to through the creation of project-based and problem-based units (Spires et al. 2011). These methods engage students in active, collaborative, and creative learning situations that allow them to find solutions to real problems. An additional benefits to using these methods of instruction is they are conducive to integrating common core objectives and proved student-directed evaluation (Petersen, & Bunting, 2012). The availability of one-to-one computing devices and the teachers willingness to change their pedagogical thinking will ultimately determine the effectiveness of implementing a one-to-one initiative.

**Context changes.** According to Spires, Oliver, and Corn (2011), when planning a one-to-one computing initiative several contextual considerations need to be taken. School districts need to be prepared to offer quality professional development, purchase high quality hardware and software, and invest in the technical support that is essential to keeping the technology up and running. In his article, *Expect Surprises with 1-to-1 Laptops*, Tusch (2012) suggest the following factors be considered prior the actual implementation of the initiative. Districts need to (a) provide strong wireless network security, (b) develop a detailed acceptable use policy, (c) provide instructions on responsible computing, and (d) understand that the school/district can not control everything a student does with a laptop or any other technological device. Being ready for the surprises that will occur during the implementation stage of the
program will help make the overall transition smoother.

**Technology Integration Professional Development**

Researchers are finding that technology purchased for classroom often goes unused. The primary reason for the lack of technology integration stems from the lack of effective professional development (Potter & Rockinson-Szapkiw, 2012). Traditional approaches to professional development has been driven by products or programs instead of instructional needs. Training on “new” technological tool must be embedded in the professional development “not isolated from it” (Jones, 2007, p. 23). For professional development to be effective it must be designed, developed, and delivered using a constructivist approach. Learning needs to applicable and provide opportunities for teachers to work collaboratively. It needs to be long term and embedded into the day-to-day practices that supports the schools goals and curricula needs (Potter & Rockinson-Szapkiw, 2012). By providing training in small increments, with time to practice, teachers are less likely to become overwhelmed and more likely to implement the technology integration into their classroom instruction.

Martin and Strother (2010) emphasize that the focus of the professional development needs to be closely aligned to core concepts which take into account the following three aspects: (a) technology operation, (b) technology application, and (c) technology integration. “Teaching teachers how to operate the technology is important; however, it should not be the primary focus” (Potter & Rockinson-Szapkiw, 2012, p. 23). Time spent ensuring that the teacher knows how to operate a piece of hardware or software is essential to the overall success of technology integration. If the teacher does not know how to turn on the equipment then integration will not happen. Knowing how to use the equipment is only the first step. More important is the application of technology. Professional
development trainers need to structure the training to model effective practices. Instead of the one session fits all approach, sessions should be designed with specific content in mind. Professional development activities should help teachers identify how the technology can be effectively integrated into their curriculum. Types of technology integration include:

- Online/distance learning
- Blended classroom learning that combines online with face-to-face instruction
- Project-based and problem-based learning modules
- Game-based learning simulations
- Interactive WhiteBoards and student response systems
- Web-based projects such as Webquest, research, and virtual fieldtrips.
- Student-created media such as podcast, videos, and slideshows
- Collaborative assignments (Shaffner, 2007).

Training needs to provide quality opportunities for teachers to explore and to practice becoming proficient at utilizing the application for the chosen methods. The final aspect is the actual integration of technology into classroom instruction. Technology integration will provide active engagement, encourage group participation involving frequent interactions between student-to-student or student-to-teacher, and deliver immediate feedback (Shaffner). As integration becomes more the norm, notable changes in the roles of the teacher and student will occur. The role of the teacher will be that of a facilitator and the role of the student will be to explore, inquire and draw conclusions (Potter & Rockinson-Szapkiw). The shift to a student-centered pedagogy will gradually take place and observers will witness students utilizing technology daily to access a variety of tools to complete assigned task in order to gain a deeper
understanding of course content.

Personal experience with technology outside the classroom was the number one predictor for successful technology integration. Attitude ran a close second. According to Potter & Rockinson-Szapkiw (2012), effective professional development can change both. For the professional development to be successful, it needs to be offered in small increments with plenty of opportunities for teachers to practice using the technology and provide time for collaboration with other teachers to develop student-centered units of instruction. A teacher’s attitudes, beliefs, and experience affect the use of technology; therefore, the final ingredient for integrating technology into the classroom is the teacher.

**Technology Integration Models**

There are a variety of technology integration models available for professional development trainers and teachers to use when implementing a one-to-one technology initiative. Two of the most widely used are the SAMR model and the TPACK model. The TPACK model has a multitude of academic literature to back its instructional value; however, at the time of this paper, the SAMR model was lacking the academic support generally recognized in a literature review. Even without the preferred references materials, these two models will be the focus of this assignment.

**SAMR model.** The SAMR model design is to help teachers evaluate where they are in their personal utilization of technology (Loader, 2012) and see how computer technology might impact teaching and learning ("SAMR Model - Technology Is Learning", n.d.). It was developed by Dr. Ruben Puente-dura (2008) as a means to answer the question the “What types of technology use would have greater or lesser effects upon student learning?” (p. 1). The name was derived from the four levels of
technology integration described by Puenteedura (2008) as shown in Figure 1.

![The SAMR Model](image)

**Figure 1.** The 4 Stages of SAMR. Copied from a PowerPoint created by Edcanvas and located at [http://www.edcanvas.com/lessons/XuTjEAjlsa6QEA/teaching-with-technology](http://www.edcanvas.com/lessons/XuTjEAjlsa6QEA/teaching-with-technology) and is copyrighted by the Hippasus Company.

Enhancement levels- These add intrigue to assignments but offer little to no changes in a student’s performance.

- **Substitution** - The use of computer technology that takes the place of either a non-technology or a previous technology without any change to the assignment. [Example] Students use a word processor to write a report instead of paper and pencil or they answer their bellringer in Google Forms.

- **Augmentation** - The use of computer technology that provides some functional improvements but is still a direct tool substitution. [Example] While using a word
processor to write a report, students perform spell check, insert images, or use the copy/cut/paste tools to complete their assignment.

- Transformation levels - These create new learning experiences allowing students to do things that were previously impossible.
  - **Modification** - The use of computer technology that allows portions of the task to be redesigned by integrating multiple tools. [Example] Students are still required to write the report but now they must make an audio recording of the report that can be played to an authentic audience such as a school’s open house.
  - **Redefinition** - The use of computer technology that allows for the creation of new task that were previously inconceivable. [Example] Students are still required to write the report but this time the report has many contributors. They collaborate and communicate with their teacher and other students using Web 2.0 tools such as Google Docs (Loader, 2012; Puente, 2008; "SAMR Model - Technology Is Learning", n.d.).

The graphic in figure 1.2 was created by professional development trainer Silvia Rosenthal Tolisano to provide teachers with a concrete visual illustrating the types of task that are considered in the substitution/augmentation/modification/redefinition stages of the SAMR model. In addition, the illustration “emphasizes the progression” of technology integration and “shows what transformational teaching and learning looks like” (Rosenthal Tolisano, 2011, para. 2). This graphic will be a valued tool to assist teachers in making the transition from the lower levels of enhancement to the higher order thinking and learning levels of transformation.
Just recently teachers and professional development trainers have been provided with a gift from Allan Carrington. He has developed a new version of the Bloom’s Taxonomy Wheel (Figure 1.3) allowing teachers to view cognitive domain categories, action verbs that are helpful in writing learning outcomes in lesson plans, activities designed to achieve the desired outcomes, links to computer applications that will be useful in incorporating the activities into instruction, and the SAMR model showing the level of technology integration into the curriculum (Carrington, 2013). Carrington (2013) states, the motivation behind the new Pedagogical Wheel addresses the question “How do we show teachers that the pedagogy should drive the technology and not the other way around?” (para. 1) In
essence the new wheel is about transformation and integration.

Figure 1.3 The Pedagogy Wheel by Allan Carrington is licensed under a Creative Commons Attribution 3.0 Unported License. Based on a work at http://tinyurl.com/bloomsblog.

**TPACK model** TPACK stands for Technological Pedagogical Content Knowledge and can be described as a model that can be used to successfully add technology to traditional approaches of teaching. It encourages teachers to make wise and purposeful decisions about why and when to use technology and within what context (Linton, 2012). TPACK, developed by Mishra and Koehler
(Koehler, 2012), is composed of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). TPACK emphasizes the “new” knowledge that forms where the primary types of knowledge intersect. These new domains are Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), TEchnological Pedagogical Knowledge (TPK), and TPACK (Koehler). Developing an understanding of the complex relationships between technology, content, and pedagogy results in quality teaching (Linton, 2012). As Hervey (2011) point out in her doctoral dissertation, “Teachers generally have a deep knowledge of their content as well as a knowledge of how to teach it” (p. 4). The problem arises when technology enters the equation. By building an understanding of the TPACK framework teachers will have a better chance of successfully integrating technology into their curriculum.

Professional development activities offer teachers help in learning more about their content areas, effective teaching practices, and useful technology tools. Most often these are taught in isolation. School media coordinators and instructional technology facilitators are beginning to step up and provide the professional development needed that will have the greatest impact on student achievement by providing instruction on each component of the TPACK model (Linton, 2012). By receiving training on how to access and organize information, utilize research strategies, understanding copyright issues, and implementing technology tools for effective teaching and learning, teachers will be better prepared to successfully integrate technology effectively into their classrooms.
As previously mentioned in the introduction, the goal is to offer professional development opportunities to all staff members, at Triton High School, who wish to become more proficient at using and integrating technology into their instructional practices with the targeted group being the teachers who will begin implementing a one-to-one computing initiative in the coming school year. Research on successful technology initiatives indicate that long term and sustainable technology professional development is vital to the programs success (Potter & Rockinson-Szapkiw, 2012). For this reason, I am presenting the following two year intervention plan design, based on the Framework for 21st century learning, to assist teacher in making the transformation to a totally technology integrated
classroom. The instruction will center on the learning and innovation skills, the 4Cs - communication, collaboration, creativity and innovation, and critical thinking and problem solving (The Partnership for 21st Century Skills, n.d.), that are necessary to prepare our students for the 21st century workforce. The SAMR model for integrating technology into the classroom will be used in designing, developing and delivering the instruction for the professional development.

**Year One - Fall Semester - Communication**

According to Spires, Oliver, and Corn (2012), “Professional development on communication strategies supported in one-to-one programs, as well as tool available to enable the strategies, will help introduce teachers to new possibilities and requirements to carry them out” (p. 69). This revelation is a major factor affecting the selection of communication as the first year's focus. To prevent teachers from being overwhelmed training will be broken up into 3 to 4 one-hour sessions in the fall of the first year. Each session will include modeled instruction using technology integration, time to practice new technologies, and time for collaboration with other teachers on how they plan to incorporate what they are learning into their daily practices.

Table 1.1 Communication Professional Development

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sessions Offered Differentiation along SMAR Model</th>
<th>TPACK Addressed</th>
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<tbody>
<tr>
<td>Communication &amp; Web 2.0 Tools</td>
<td>S - Communication tools A - Student to Student M - Teachers to Teacher; Student to Teacher R - Digital Footprint</td>
<td>TK TPK TPK TCK</td>
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</tbody>
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Year One - Spring Semester - Collaboration

Collaboration is the ability to work effectively and respectfully with a diverse community of learners. Participants must be willing to exercise flexibility and be willing to compromise as needed to achieve a common goal. In addition, participants must be willing to value contributions made by each individual team member and share the responsibility for the end result (The Partnership for 21st Century Skills, n.d.). Collaboration is about searching for solutions to real-world problems. To assist teachers in gaining a better understanding of collaboration, instruction will be spread out over 4 one-hour sessions and will be modeled using technology integration. Participants will be given time to practice new technologies as well as time for collaboration with other teachers. Follow up will be provided as needed.

Table 1.2 Collaboration Professional Development

<table>
<thead>
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<th>Topic</th>
<th>Sessions Offered Differentiation along SMAR Model</th>
<th>TPACK Addressed</th>
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<tbody>
<tr>
<td>Collaboration &amp; Web 2.0 Tools</td>
<td>S - Collaboration tools A - Collaboratively create multimedia presentations with PLT members M - Establish Classroom Blogs to engage students in real world collaboration R - Foster student - teacher collaboration by involving students in creating Smart Board resources and lessons</td>
<td>TK TPK TPK TPCK</td>
</tr>
</tbody>
</table>
Year Two - Fall Semester - Creativity and Innovation

Creativity and innovation is generally affected, either positively or negatively, by either the works of others or environmental influences. It is not limited to the constraints of discipline, time or culture but often integrates common core values and objectives (Robinson, 2013). The dynamics of creativity and innovation have profound implications for integrating technology to transformational level in the technology integrated classroom.

Table 1.3 Creativity and Innovation Professional Development

<table>
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<tr>
<th>Topic</th>
<th>Sessions Offered</th>
<th>TPACK Addressed</th>
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<tbody>
<tr>
<td>Creativity and Innovation &amp; Web 2.0 Tools</td>
<td>S - Creativity tools</td>
<td>TK</td>
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<td></td>
<td>A - Student generated Voki or Xtranormal clips</td>
<td>TPK</td>
</tr>
<tr>
<td></td>
<td>M - Utilize Digital Storytelling for student assessment</td>
<td>TPK</td>
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<tr>
<td></td>
<td>R - Implementing the use of screencast as an instructional aid, student produced product and class assessment tool.</td>
<td>TPCK</td>
</tr>
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Year Two - Spring Semester - Critical Thinking and Problem Solving

Critical thinking is defined by the American Dental Education Association (2013) as the “intellectually engaged, skillful, and responsible thinking that facilitates good judgment because it requires the application of assumptions, knowledge, competence, and the ability to challenge one's own thinking” (para. 2). The skills of critical thinking and problem solving require learners to be self directed and self
motivated. When implementing critical thinking and problem solving units of technology integration, students need to be (a) engaging in problem-based learning, (b) analyzing case-based scenarios, or (c) engaging in debates, role-play, argument mapping, thinking aloud, and simulation (American Dental Education Association, 2013). When teachers and students become proficient in these methods they will have reached the highest level of technology transformation.

Table 1.4 Critical Thinking and Problem Solving Professional Development

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sessions Offered Differentiation along SMAR Model</th>
<th>TPACK Addressed</th>
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<tbody>
<tr>
<td>Critical Thinking and Problem Solving &amp; Web 2.0 Tools</td>
<td>S - Problem Solving tools&lt;br&gt;A - Cooperative Learning utilizing integrated technology&lt;br&gt;M - Guided Design utilizing integrated technology&lt;br&gt;R - Problem-Based Learning utilizing integrated technology</td>
<td>TK&lt;br&gt;TPK&lt;br&gt;TPK&lt;br&gt;TCK</td>
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Since technology changes so rapidly, it must be noted that the professional development training will focus on the 4C’s, but the tools used for the training will change as the technology changes.

**Assessment**

The most important goal on implementing technology professional development is to promote the use of technology to improve student achievement. Effective technology integration professional development should utilize both formative and summative assessment methods to ensure that the training
is meeting the needs of all participants and is providing them with new learning experiences.

By conducting formative assessments, trainers receive immediate feedback, which will assist them in determining what types of changes, if any, need to be made during an activity or before the next training session (Gurkey, 1998). Formative assessments do not require structured surveys or forms. It can be implemented before during or at the end of a training session. One example of formative assessment at the end of a training session is to use the “ticket out the door” strategy allowing teachers to post sticky notes to a Padlet board asking questions or expressing what they felt was the most useful and least useful materials from that day’s training.

Summative assessments need to be conducted as a follow up at the conclusion of a professional development activity. It allows participants an opportunity to evaluate the overall worth of the activity. Information gathered from the summative assessments can then be used to plan for future technology professional development activities. According to Gurkey (1998), a good technology summative assessment contains five areas of evaluation. They are, (1) the participants reaction, (2) the participants learning experience (3) the organization of the training, (4) new knowledge and skills acquired, and (5) student learning outcomes. The most efficient and effective means to collect information in areas 1-3 is to ask participants to complete an anonymous online survey. Interviews, direct observation, and small focus group sessions will be helpful for gathering information about any benefits the new knowledge and skills acquired from the professional training has provided in redefining classroom instruction through the integration of one-to-one technology. Evaluation of student learning outcomes can be determined by analyzing EOC, MSL, and Elements data.

**Drivers and Anticipated Barriers**

The staff that will most benefit from this training consist of six science teachers, 2 math teachers, an English teacher, and a social studies teacher. Each of these were selected, to receive a one-to-one classroom set of laptops, based on either the person’s leadership in their chosen field or their eagerness...
to embrace the use of technology in the classroom. Four of the science teachers, one of the math teachers, the social studies teacher and the english teacher are excited to have the opportunity to integrate technology into their lessons and are willing to put the time and effort needed to restructure their teaching to incorporate the technology in a meaningful way. The two remaining science teachers and the other math teacher are excited to have the technology in their classroom, but they only want to use it as a resource to their text or as a tool for standard research. There is little to no desire to restructure their teaching practices to make the use of technology more meaningful to the students. These three will be the biggest challenge since it will involve them having to change their pedagogical and technological knowledge.

It would be wonderful to believe that teachers will enthusiastically and energetically embrace the opportunity to become more proficient at using and integrating technology into their instructional practices; however, having limited experience as a technology professional development trainer and plenty experience as a technology professional development participate this will most likely not be the case. Some of the anticipate barriers associated with building the classroom teachers capacity for integrating technology into their instructional lessons are as follows:

- Many veteran teachers are reluctant to change. For the one-to-one technology initiative to be successful, teachers will need to be willing to make changes in their pedagogy, context, and communication practices.
- Lack of knowledge about new and available technological tools that will be needed to implement technology integration seamlessly into the curriculum
- Time constraints that limit the preparation of new lessons that integrate technology effectively.
● Lack of adequate technological support to fix hardware and software issues when they occur.

● The establishment of classroom management procedures to ensure that students are engaging in appropriate technology use.

Overcoming these barriers will take time and patience. Quality professional development that is long term, offered in small increments, and provide follow-up opportunities will be the key to building teacher capacity for integrating technology.
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