Through the Looking Glass

Examining Technology Integration in School Librarianship

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The school library profession has begun to develop a reputation for tech-savviness. Several school librarians are nationally recognized technology leaders and present at conferences where instructional technology is at the forefront. Others have become Google-certified teachers, developed robust virtual school library repositories, and trained fellow teachers on a laundry list of Web 2.0 tools. Technological proficiency is threaded throughout AASL’s Standards for the 21st-Century Learner, which call for student “mastery of technology tools for accessing information and pursuing inquiry” (2007, 4) so that students are able to use “technology skills to create products that express new understandings” (2007, 5). Although the development of these skills can be addressed directly when school librarians collaborate with classroom teachers (and become responsible for teaching the “techie part”), student technology skill development that impacts their academic achievement is best supported through teacher training and shifts in pedagogical practice and belief—changes school librarians make when they become technology leaders (Kopcha 2010). Melissa P. Johnston explains that “because of their knowledge of pedagogical principles and curriculum, paired with technology and information expertise, school librarians are in a unique position to serve as leaders and valuable assets through making meaningful contributions toward the integration of technology and learning” (2012, 2).

Notice that Johnston lists knowledge of pedagogical principles and curriculum as a key ingredient. Her assertion that the school librarian is a technology leader is clearly supported in the ALA/AASL Standards for the Initial Preparation of School Librarians: “Candidates acknowledge the importance of participating in curriculum development, of engaging in school improvement processes, and of offering professional development to other educators as it relates to library and information use” (AASL 2010). Unfortunately, while we have done a wonderful job of marketing our technological expertise in the professional development we provide, I believe we neglect to develop and emphasize pedagogical principles that should be guiding the technological choices of our teachers, as well as our own.

This concern grew out of two separate but related trends that I see in the world of school librarianship: our blind acceptance and sometimes misuse of technology integration models and the emphasis we place on technology integration versus technology-enabled learning (yes, there is a difference!). These two trends are directly tied to our position as technology leaders. How we approach the place of technology in education and how we visually present this placement to others determine the type of professional development we design and deliver to classroom teachers and determine the type of technology leaders we become.

**Misuse of Technology Integration Models and SAMR**

**What Is SAMR?**

SAMR, which stands for substitution, augmentation, modification, and redefinition, is a technology model developed by Dr. Ruben Puentedura. It is a basic grid that attempts to define different levels of technology tools and their use in the classroom. A graphic of the SAMR model, outlining the definitions of each stage, is available at <http://bit.ly/1kYSzs3>.

SAMR is an extremely popular model. A simple Google search results in all kinds of graphics and visuals adapting SAMR in charts and infographics. Ruben Puentedura has presented all over the world, and his presentation slides are commonly shared on Twitter. A day does not go by without a blog post or article that suggests aligning student writing, iPad...
lessons, or digital storytelling to SAMR, and I certainly understand its explosive growth. SAMR is clean and simple, which means it can be easily adapted and interpreted in multiple ways. It implies a hierarchy behind tech tool use, giving us a "goal" to shoot for is quickly explained to an administrator or to a grant evaluator.

Is SAMR Valid?
Due in part to SAMR's popularity, this spring one of my students attempted to write a paper on it. As she worked through the assignment, she struggled to find research and background on the development of the model. The assignment requires that students use peer-reviewed research articles, sources she simply could not locate. Her struggle awakened me to my own blind acceptance of a model that I did not, in all honesty, know much about. Then, I ran across a blog post by Dr. Jonas Linderoth.

Jonas Linderoth, whose PhD is in pedagogy, is an associate professor at the University of Gothenburg in Sweden. In October 2013 he wrote an open letter to Ruben Puentedura, asking pointed questions about the origin of SAMR and Puentedura’s qualifications as an educator and educational researcher. I encourage you to read the letter. (See list of recommended reading.)

In this open letter Linderoth engaged in the process of critically evaluating SAMR and its origins. In fact, his process was quite similar to the evaluative steps we teach our students to take as they investigate websites for accuracy and reliability. (See Kathy Schrock’s “The Five W’s of Web Site Evaluation” in list of recommended reading.)

1. Who created this model, and is the individual an expert?
2. What information is included and how does it differ from other sources?
3. When was this model created?
4. Where can I find out more about who sponsored this research?
5. Why should I use this model?

Reading through Linderoth’s critical evaluation and the surprising answers he uncovered made me keenly aware that as a school library educator and teacher trainer, I should have been asking these questions all along. I spent years in a school library pushing middle school students to investigate, to question, to never accept at face value information presented in neat packaging, and yet, here I was doing the exact same thing: using and promoting a technology integration model simply because it neatly categorized and packaged tech integration in a visually attractive format.

Conducting my own background research on SAMR proved to be just as challenging for me in 2014 as it was for Linderoth in 2013. Below is the information I was able to track down to answer the five questions listed above.

1. Who? Qualifications? Ruben Puentedura has a PhD in chemistry and taught at both Harvard and Bennington College in the 1990s. I was able to locate his name on several institutional documents and news articles concerning his work with physics, chemistry, and multimedia labs. His experience seems to be in managing these labs and in managing technology resources for the hard sciences. I could not locate any evidence of K–12 educational experience or work with K–12 students beyond his presentations through consulting firms.

2. What info? How is it different? The SAMR model seems to have come out of Puentedura’s experience but not his research. No peer-reviewed papers on this model have been authored.
and published by Puantedura; he has not published any results of the decade of study he claims to have conducted. To me, this lack is the most worrisome, especially when one compares this paucity to the hundreds of research articles published on the second model I address in this article, TPACK. The closest I came to locating anything resembling SAMR in research was in an article by Joan Hughes in which three functions of technology were identified: a) replacement, b) amplification, or c) transformation (2005, 281). In fact, the explanation and theoretically supported description provided by Hughes is strikingly similar to the SAMR model.

3. When? In the summer of 2003, Puantedura left academia and, in the following blog post, announced the beginnings of his consulting firm: “I decided it was time to try something new. Hence—Hippasus—a consulting company designed to make the best use of the experience I garnered via teaching, administration, and research in the physical, biological, and social sciences, and to bring together some of the most interesting minds I have encountered in those years” (Puantedura 2003). Again, I was unable to find any publications in educational research journals related to research on SAMR, pedagogy, or technology integration authored by Puantedura, and so I cannot answer question number three. However, keep in mind that the Hughes article was published only a few years later. It is not uncommon for researchers to share their ideas at conferences or workshops even before publication, which means Hughes could have discussed her organization of technology-supported pedagogy as early as 2004. Again, if Puantedura based the SAMR model on the research of others (and I have located no evidence to support or refute this), he did absolutely nothing wrong. What would be disingenuous and misleading would be his promoting this model as the result of his own research and experience, research and experience that we still have no ability to review or confirm.

4. Who sponsored research? Since there is no record of research studies that could document the development and validation of SAMR, it is impossible to know if Harvard sponsored the research on SAMR, if Puantedura began developing SAMR while at Bennington College, or if he simply developed the model as a visual for his lectures and presentations as an educational consultant. I suspect this last assertion may be correct.
5. Why use the model? I encourage you to conduct your own background research on SAMR and answer this question for yourself.

Is It Useful?
All this is not to say that models such as SAMR are completely unusable. Our human brains are wired for categorization, and creating structures that crystallize those categories can be extremely useful. However, applying simplistic models to the development of large-scale technology integration programs, professional developments, and the like without investigating the research and pedagogical beliefs that shape those models is irresponsible and dangerous. Such application flies directly in the face of a profession that emphasizes information-literate behavior: finding, retrieving, analyzing, and using information.

Misuse of Technology Integration Models and TPACK

What Is TPACK?
TPACK, which stands for technological pedagogical content knowledge, is a conceptual framework famously defined by Dr. Punya Mishra and Dr. Matthew Koehler, both from Michigan State University. TPACK represents "teachers’ knowledge of how to integrate content knowledge with appropriate pedagogical approaches, including those that use emerging technologies, to enable learners to master the subject matter at hand" (Brantley-Dias and Ertmer 2013, 106). TPACK is typically demonstrated in the manner shown in figure 1.

What Is TPACK’s Purpose?
The TPACK (or, sometimes, “TPCK”) framework grew out of Lee S. Schulman’s (1986) PCK (pedagogical content knowledge) construct. Schulman originally...
shared this framework because he wanted a clear way to explain just how large and specialized teacher knowledge needed to be. In doing so, he hoped to inspire well-deserved respect for professional educators—especially respect in the minds of those who directly impact the field of teacher preparation (researchers, teacher educators, and policy makers). The intention for TPACK was much the same in that it visually organized and categorized labels for thinking about how pre-service and in-service teachers learn to use technology in the classroom (Polly, McGee, and Sullivan 2010). Charles R. Graham, Jered Borup, and Nicolette B. Smith described it as “an analytical lens with which to look at the instructional decisions teachers make” (2012, 3). Much like PCK, the target audience for TPACK comprises educational researchers and teacher educators of pre- and in-service teachers.

**How Is TPACK Being Misused?**

Sadly, the TPACK framework has recently been promoted as a technology integration model. In re-reading the definition and exploring the large body of research on TPACK (over three hundred articles catalogued at tpack.org), it is exceedingly clear that TPACK is a construct for measuring a teacher’s knowledge and capacity to integrate technology in instruction.

Let me be clear: TPACK is *not* a technology integration model. It is *not* appropriate for the selection and evaluation of technology tools or mobile apps. TPACK should *not* be combined with SAMR in a colorful graphic perfect for tweeting out to unsuspecting followers who may not have access to the research that clarifies the correct application of TPACK.

Instead, use this model to design professional development for your teachers. Use it to assess how effective your training was in developing areas of teacher technological pedagogical content knowledge. Several surveys and assessments have been created for this purpose and can be implemented to collect data useful for teacher trainers and district administrators. Even so, be aware that there is much debate about the practicality and realism of TPACK—and whether it is actually possible to measure teacher growth in the overlapping domains of technological pedagogical content knowledge (Archambault and Barnett 2010).

**Technology Integration vs. Technology-Enabled Learning**

*Why Does This Misuse Matter?*

If the misuse of technological models hurts our ability to be effective technology leaders, then the emphasis we place on technology over pedagogy may negate our influence altogether. Despite the millions of dollars spent by school districts nationwide...
on technology and professional development, teachers still struggle to integrate technology in the classroom. This is because, to do so, teachers need two skill sets aside from a background in and knowledge of the content they are teaching: 1) basic technology skills and comfort with tech tools, and 2) pedagogical practice aligned with meaningful, student-centered learning (Brush and Saye 2009; Kopcha 2010).

At the beginning of this article, I stated that students’ technology skill development that impacts their academic achievement is best supported through teacher training and shifts in pedagogical practice and belief. Why is a shift in teacher pedagogical practice so central to the relationship between students’ use of technology and their academic achievement?

First, a large body of research supports a connection between increased student academic growth and student-centered learning activities such as collaborative information gathering, realistic problem solving, and use of technology to explore and create new representations of knowledge (Kopcha 2010). When technology is integrated into student-centered instruction, the same potential for academic achievement is present (Lei and Zhao 2007).

Second, a common pattern is identified by those who investigate the relationship between what teachers believe about teaching and how they use technology in instruction. Teachers who subscribe to constructivist pedagogy tend to use technology in student-centered activities, while those who are more traditional in their teaching use technology to support teacher-directed activities (Ertmer and Ottenbreit-Leftwich 2010).

Consequently, no matter how much technology training and how many resources we provide, without a corresponding and overarching emphasis on pedagogy, the training and resources have little to no impact on teachers’ technology practice and on the interactions with technology their students experience.

When we refer to SAMR, TPACK, and other visuals to organize technology tools and promote technology integration, we are allowing the tools themselves to determine their own categories. A prime example is seen in figure 2.

How Should We Focus Our Efforts?

Technology tools, whether mobile apps or Web 2.0, offer such a broad range of overlapping characteristics that what determines their taxonomy or classification (even in a basic model such as SAMR) is the way in which these tech tools are used. That means that depending on who is using or integrating a tool in instruction at any particular point in time, the tool may be classified as three or four different things. Additionally, a tool or app may offer all kinds of possibilities, but, if a teacher chooses not to access these features, the technology is then categorically basic. Therefore, becoming effective technology leaders involves shifting the focus of our efforts from promoting technology tools and usage to supporting teachers in designing technology-enabled learning experiences.

While technology integration implies increased and indiscriminate technology use by teachers and students, technology-enabled learning “places the primary emphasis where it needs to be: on the content-based pedagogy of teachers’ lessons followed by a consideration of all the tools teachers might use to implement it, in order to effect student learning” (Brantley-Dias and Ertmer 2013, 120).

If you would like to explore an excellent approach to technology-based learning in visual form, I encourage you to visit the Technology Integration Matrix maintained by Northern Arizona University <www.azk12.org/tim>. This matrix, linked to example lessons and video clips, organizes technology-enabled learning around the characteristics of meaningful learning experiences.

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learning environments: active, collaborative, constructive, authentic, and goal-directed.

Final Thoughts
As school librarians, as educators who value and promote information literacy, we are responsible for carefully reviewing and analyzing the resources and information we ourselves use to support our instruction and our practice. If we truly aim to become technology leaders who “acknowledge the importance of participating in curriculum development, of engaging in school improvement processes” (AASL 2010), then we must make sure that meaningful learning is at the center of all we do. This commitment means that we support the professional practice of teachers and academic achievement of students not only through our pedagogical and technological expertise but also through our critical examination of the tools, models, and frameworks we use and disseminate to others.

Works Cited:

Recommended Reading:

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