It probably goes without saying in this sort of column, but technology has become increasingly important in pretty much everyone’s day-to-day professional and private lives. Thousands of articles describe how technology has inserted itself into every aspect of our daily operations. Every day, I wake up to the sounds of a thunderstorm coming out of my smartphone. When I get into work, I log into my computer using two-factor authentication that is now required by the University System of Georgia. At the beginning of every semester, I am required by the university to post my syllabus and at least the first day of class assignments into our university supplied classroom management system. I used to joke with my friends that I was going to get rid of my cellphone and go back to an “at home” answering machine that I could listen to and respond to once a day. I’m pretty sure that is impossible now.

But not all technology is pushed on us. Many of us have quite a few technological decisions to make, such as how to implement what we already have or what new technology solutions to acquire. Teachers get to select, use, and advocate for certain kinds of course management tools, quizzing tools, and instructional material. Some of us manage our own integrated library system, ticketing, and space reservation systems. Many of us make technology decisions on numerous formal and informal fronts.

Breaking down the similarities and differences between Technological Pedagogical Content Knowledge (TPACK) and Substitution, Augmentation, Modification, Redefinition (SAMR). BY PATRICK PARSONS
The classroom end of these decisions led me to do a presentation last May at the Teaching the Teachers Conference at Georgia State College of Law. I have always struggled with selecting and implementing technology in my classroom. As I described in the presentation, most technology teaching discussions leave me on either end of a teaching continuum: at one end experiencing extreme technology FOMO (fear of missing out), or at the other so overwhelmed that I start considering using transparencies and ditto machines. However, I have found two analytical frameworks—Technological Pedagogical Content Knowledge (TPACK) and Substitution, Augmentation, Modification, Redefinition (SAMR)—that have helped me organize my evaluation and selection of classroom technology.

**TPACK v. SAMR**

Since giving that presentation last May, I have further concluded that both frameworks can be equally effective in thinking about technology outside the classroom, as well. Both TPACK, which focuses on the kinds of knowledge necessary to effectively teach and train with technology, and SAMR, which focuses on the intellectual demand of technologies, can be used to examine, select, and think about individual technology options irrespective of the setting.

**A Closer Look at TPACK**

The basic idea behind TPACK is that an instructor must possess understanding of each of the different and individual types of knowledge, as well as how they overlap and work together, to effectively teach within a technology-enhanced learning environment. The framework breaks down teaching with technology into three basic types of knowledge: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). Content knowledge (CK) represents knowledge of the specific subject matter. If we use legal research instruction as an example, content knowledge would be the instructor’s understanding of legal research, research tools, and the underlying relationship between legal sources. Pedagogical knowledge (PK) describes an understanding of effective teaching, instruction techniques, and learning theories. Finally, technological knowledge (TK) stands for a general understanding of technology and how it works. Technology knowledge is the most nebulous of the three types of knowledge, but it really just represents a general understanding and acknowledgment that tech exists.

TPACK’s analytical value for instruction stems from the intersections of the three basic types of knowledge. The model calls these intersections technological pedagogical knowledge (TPK), technological content knowledge (TCK), and pedagogical content knowledge (PCK). These intersections represent the mixtures of types of knowledge that are created from the overlaps of the three basic knowledge types. Effective instructors need to understand not only the three basic types of knowledge, but also their mixtures (overlaps) and how they work together. The examples below illustrate the framework’s type-overlap requirements.

For example, if we were going to use video modules to explain tax resources to a student or trainee, TPACK tells us we need to master several different types of knowledge, as well as knowledge-type overlaps. We need content knowledge (tax law research), technology knowledge (how to use technology), and pedagogical knowledge (how to teach effectively). We’ll also need to understand how each of these works together. Specifically, we’ll need to think about:

1. **PCK (P+C):** How do you effectively train your users on how to use tax materials?
2. **TPK (T+P):** How will the videos change the typical training dynamic?
3. **TCK (T+C):** How has technology changed information resources in tax law?
Finally, TPACK knowledge, which exists at the intersection of all the knowledge bases, is a sort of teaching with technology nirvana. It represents the acknowledgment and consideration of each of the basic knowledge types, their overlaps, and finally their collaborative (or cooperative) performance.

In practice, instructors can use TPACK as a tool in the preparation and evaluation of training materials. Using the tax training example from above, TPACK provides us with a framework to take inventory of our educational questions. If we’re thinking about selecting new tech or evaluating current tech, TPACK encourages us to examine our knowledge types. For example, let’s run our potential tax training through TPACK. If we evaluate the trainings by breaking them apart in required knowledge types, some resulting questions could be:

- Who will create the content, and can it be updated? Do our trainers understand the video creation technology enough to continually update and create the teaching material? (TPK)

- Is this video an effective substitute? Are our viewers going to pay attention or take the time to watch this? Will viewers adequately absorb the video, or do we need to implement some hands-on components? (TCK)

- Can we be responsive enough in video format, or are the uses of the system so specific that they need person-to-person tailoring? Do the videos need to be overly comprehensive to address every situation? (PCK) (TPK)

- What medium are our users using? Will the videos accept user resource preference or will they attempt to move them to newer sources, workflows, or systems? (PCK) (TPK)

TPACK helps us break technology and training down into their component knowledge types. By running a technology through TPACK, we can better plan our efforts in the purchase, operation, and implementation of technology.

A Closer Look at SAMR

SAMR is another model designed to help users evaluate their incorporation of technology into instruction or training. The acronym SAMR stands for Substitution, Augmentation, Modification, and Redefinition, which are four steps that represent the increasing transformative value of using technology in training or teaching.

The system is an extension of the popular Bloom’s Taxonomy, which identifies a selection of action verbs used to create learning objectives, including:

- Create
- Evaluate
- Analyze
- Apply
- Understand
- Remember

When instructors select verbs from higher on the Bloom’s taxonomy pyramid or scale, they encourage technology, we can better plan our efforts in the purchase, operation, and implementation of technology.

Learning objectives with “remember” require less intellectual processes than those using “evaluate.”
higher-order thinking skills. For example, if we use our tax training model again, the learning objectives “evaluate the usefulness of tax resources” and “remember the main tax resources” seem similar but require very different intellectual processes. The former, which uses “evaluate,” encourages critical thinking and more interaction with the material. Exercises, trainings, or interactions attempting to satisfy this objective will require a much richer learning experience than those requiring students to “remember.”

Similarly, moving higher on the SAMR steps (levels) helps an instructor evaluate the transformative potential of a technology. Starting at the bottom levels, Substitution and Augmentation are the enhancement steps. Each makes noticeable changes to the instruction but only acts as a replacement. Let’s examine the possibilities of our proposed tax law videos using the SAMR model.

The videos can certainly act as a substitution, where the tool “acts as a direct substitute with no functional change.” If we provide learners with the videos to watch, they (the videos) would be functionally the same as a live demo or a written guide. They can also act as an augmentation, where tech “acts as a direct tool substitute with functional improvement.” What if, instead of just sending the videos out to potential users, we used them in a guide? We could even break up videos into smaller, more easily referenced chunks, or link to bookmarks in the video so users can find answers more efficiently. This tool directly replaces a written guide or live demo, and it also provides “enhanced functionality” and more user-friendly interaction.

Modification and Redefinition are the transformation steps of SAMR. Integrating tech in these ways significantly changes the original task. Moving from augmentation to modification “allows for significant task redesign.” Continuing with our tax training example, maybe instead of static videos, the instructor could also embed questions or links to other systems. Maybe classroom videos could refer to outside materials or other technologies to significantly change the lecture, exercise, and homework model of instruction. Redefinition takes the use of technology even further, allowing for “complete redesign previously inconceivable without technology.” In a professional setting, videos could use review questions or exist inside larger institutional practice pages. Perhaps chatbots or remote reference can somehow embed materials into artificial intelligence-produced results.

The key to using SAMR is not about correctly placing technological changes into the correct categories. SAMR is a tool that forces users to consider what could be possible with technology by imagining options and possibilities.

Sometimes substitution or augmentation is exactly what you need. Maybe you work in a firm and all you need or have time for is a series of brief videos explaining how to do certain tasks. That’s fine. One SAMR level is not better than another. The real utility in the model is that by running technological choices through it, users force themselves to think about what might be possible with the addition of technology to their workflow.

Final Thoughts
Increased technological options bring about a flurry of questions to consider: Is this technology feasible? What will it do to our current workflow? Do we have the knowledge bases to enable implementation? Is there a way we can do more with what we already have? What kind of higher-level options may be available with new technology? The use of the TPACK and SAMR frameworks will reliably pull these questions together and challenge us to evaluate why and how we are using technology in the classroom. Both frameworks help us to decide whether we’re using a technology because it’s new or trendy or because it adds real educational value to our teaching and training. In a world where there are 10 tech solutions to every problem, TPACK and SAMR give us frameworks to examine each in a deliberate way, providing a workable method to examine current and future technology practices.