

My Thoughts on Educational Technology
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The integration of technology in education is no longer an option for schools and teachers; it is a necessity. To students today, what we call technology is an integral part of their lives. For that reason alone it needs to be more than just another feature of education; it needs to be incorporated seamlessly into our teaching, as seamlessly as pen and paper. Another reason it is necessary is that students today must be comfortable with technology in order to be prepared for life outside of school, and by comfortable I don't mean being able to use a cell phone and update Facebook; they need to be able to connect and communicate and collaborate and do research and make videos and present results. They need to have a digital portfolio of their work to demonstrate their competencies.

Technology can provide teachers the ability to do more meaningful and more frequent formative assessments and get feedback to students more quickly; personalize and differentiate instruction and allow students to work at their own pace; prepare students for work in university and beyond by teaching them the skills needed in today and tomorrow's world; provide access to all available content; help students research, evaluate, analyze, synthesize, and present information, and communicate more effectively. Among other benefits, technology:

- engages students;
- allows for the use of a wide range of tools;
- allows for greater student collaboration;
- promotes student self-directed learning;
- enhances creativity;
- provides access to unlimited resources;
- allows teachers to 'flip' the classroom;
- makes differentiated instruction easier;
- allows for clearer communication and organization;
- enables teacher collaboration on a large scale;
- simplifies the task of catering to different learning styles;
- allows for the ongoing creation and retention of course material;
- raises student readiness for college +.

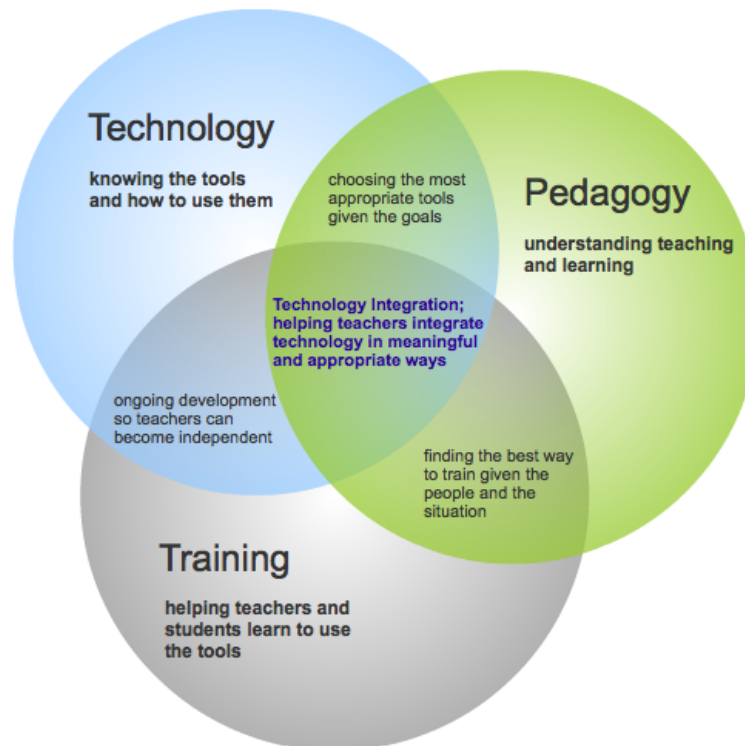
As I have learned tool after tool, and gotten increasingly excited about using them, I always come back to the overriding idea that they are just tools, and this is the difference between instrumental and missional thinking. Too often, the focus we see on technology is on the tool. The tool becomes the focus, rather than what teachers are going to do with it, how best to use it, or how to use it to improve learning outcomes. So whenever we think about technology, we have to start with the end in mind: what are we trying to do; what is the goal? Only then can we make good decisions about the appropriate tool and how to use it.

As a result of being raised exposed to so much digital content, some observers have suggested that the brains of today's students work differently than our own. [See the book *Understanding the Digital Generation*, by Jukes, McCain and Crockett, 2010.] Because of this, the variety of presentation methods - audio, visual, interactive, text, graphic - afforded by technology means both that students can choose how to get the information - how to access it and what works best for them - and that the medium can be used to attract and retain their interest.

What this all leads to is students taking control of their own learning. When learning is fun and meaningful and relevant and accessible, it becomes compelling, and when it is compelling students will want to engage. When they engage, learning can take place. Many studies show that blended learning - combining traditional in-class learning with online learning - has a positive impact on learning outcomes.

For technology integration to occur requires a leader: the technologist. A technologist should be the champion of appropriate and meaningful technology use in the school, providing a clear vision for integrating technology into the curriculum. He should align technology use with the school mission and teacher goals. He should be the main technology resource for teachers and students. He should work in an ongoing manner with teachers and departments to ensure that they have an understanding of and access to the best and most appropriate technologies, and be instrumental in helping them integrate that technology. He should provide the means for teachers to pursue the use of technology in as simple, straightforward, and effective a manner as possible, so that teachers can focus on teaching and not on technology. He should create a course of professional development that helps teachers raise their knowledge without unduly burdening them, and help them move towards a level of independence in their use of technology. I created the following image using gliffy.com to explain my understanding of technology integration.

Technology Integration



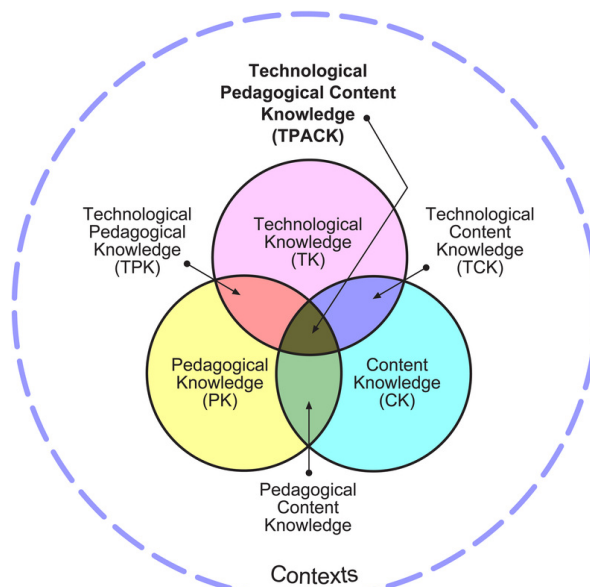
In order to help teachers integrate technology, a consistent and individualized course of professional development is essential. An ideal course would include weekly sessions with the entire faculty or departments, but that still recognizes the needs of each individual teacher. The technologist should also spend time in teachers' classrooms in order to understand how they teach, how their classroom functions, their technology needs and what will work best for them. Teachers can start by using tools to improve their own work - collaboration with other teachers

(Google Docs), social bookmarking (diigo.com), wikis to assemble and organize materials (wikispaces.com) - and then start to use the same tools with their students. As teachers become increasingly comfortable with the various technologies and come to understand the affordances they bring, they will be able to start to integrate them into their teaching. Ideally, they eventually will become independent users and integrators. Part of the development work with teachers should involve discussions of the affordances of technology and models for integration, such as [SAMR](#), [LoTI](#), and [TPaCK](#). Certain standards - [NETS-S](#) and the [AALS 21st century learning standards](#) - are excellent tools to help keep the use and integration of technology in focus.

Technological Levels of Use

	<i>Transformation</i>	
Redefinition	Tech allows for the creation of new tasks, previously inconceivable	Integrated with workgroup and content management software
Modification	Tech allows for significant task redesign	Integrated with email, spreadsheets, graphing packages
Augmentation	Tech acts as direct tool substitute, with functional improvement	Basic functions (e.g., cut and paste, spellchecking) used
Substitution	Tech acts as direct tool substitute, with no functional change	Word processor used like a typewriter
	<i>Enhancement</i>	

SAMR Model



TPaCK Model

Teachers should also be encouraged to create personal learning networks (PLNs), including memberships in communities of teachers, subscriptions to RSS feeds that contain relevant information, and participation in online education discussions (Twitter). However, it is not the teacher's job to keep up on the latest technology on her own; it is the technologist's responsibility to help and lead and engage the teacher.

The technologist must also demonstrate to teachers the value of integrating technology. Once teachers understand the value, and have begun to feel comfortable with the tools, then the real work can begin. Ultimately, what technology looks like will vary from classroom to classroom, but certain features of it should be consistent across a school.

Imagine a classroom where the teacher has provided students access to a wealth of materials - from universities and experts and other teachers - utilizing all sorts of delivery methods - video, audio, interactive websites, simulations, PDFs; where the teacher has chosen tools based on how they help students achieve the learning goals; where students are working at their own pace because the resources - well beyond what is available in any textbook - are all available and organized for them to do so; where they collaborate not only with their classmates, but with students in other classes taking the same course, in other parts of the country and the world and even consult with experts; where the stronger students help the weaker students; where students keep track of their own learning with learning journals that other students and the teacher comment on, and take their newly acquired knowledge and add it to the set of online course materials so that students in subsequent years can benefit from it; where the results of their hard work are authentic projects that yield tangible artifacts that they can add to their own

digital portfolio (When students graduate, they have a portfolio full of examples of their work that demonstrates not only their understanding of the content but also their mastery of the tools.); where the best work becomes exemplars that the teacher shares with subsequent classes, so the quality of work improves every year. In other words imagine a classroom where the teacher makes meaningful and appropriate use of technology and where students are in control of their own learning.

To summarize, meaningful and appropriate technology integration necessitates a technologist and includes having a comprehensive plan based on school mission and teacher goals, professional development, ongoing support for teachers and students, consistency, an understanding of the affordances of technology and the tools available and making both broad and deep use of them, and a reimagining of the teaching and learning process.

LoTI Model

Technology Integration Matrix		Levels of Technology Integration into the Curriculum				
		Entry: The teacher uses technology to deliver curriculum content to students.	Adoption: The teacher directs students in the conventional use of tool-based software. If such software is available, this level is the recommended entry point.	Adaptation: The teacher encourages adaptation of tool-based software by allowing students to select a tool and modify its use to accomplish the task at hand.	Infusion: The teacher creates a learning environment that infuses the power of technology tools throughout the day and across subject areas.	Transformation: The teacher creates a rich learning environment in which students regularly engage in activities that would have been impossible to achieve without technology.
Characteristics of the Learning Environment	Active: Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	Students use technology for drill and practice and computer based training.	Students begin to utilize technology tools to create products, for example using a word processor to create a report.	Students have opportunities to select and modify technology tools to accomplish specific purposes, for example using colored cells on a spreadsheet to plan a garden.	Throughout the school day, students are empowered to select appropriate technology tools and actively apply them to the tasks at hand.	Given ongoing access to online resources, students actively select and pursue topics beyond the limitations of even the best school library.
	Collaborative: Students use technology tools to collaborate with others rather than working individually at all times.	Students primarily work alone when using technology.	Students have opportunities to utilize collaborative tools, such as email, in conventional ways.	Students have opportunities to select and modify technology tools to facilitate collaborative work.	Throughout the day and across subject areas, students utilize technology tools to facilitate collaborative learning.	Technology enables students to collaborate with peers and experts irrespective of time zone or physical distances.
	Constructive: Students use technology tools to build understanding rather than simply receive information.	Technology is used to deliver information to students.	Students begin to utilize constructive tools such as graphic organizers to build upon prior knowledge and construct meaning.	Students have opportunities to select and modify technology tools to assist them in the construction of understanding.	Students utilize technology to make connections and construct understanding across disciplines and throughout the day.	Students use technology to construct, share, and publish knowledge to a worldwide audience.
	Authentic: Students use technology tools to solve real-world problems meaningful to them rather than working on artificial assignments.	Students use technology to complete assigned activities that are generally unrelated to real-world problems.	Students have opportunities to apply technology tools to some content-specific activities that are based on real-world problems.	Students have opportunities to select and modify technology tools to solve problems based on real-world issues.	Students select appropriate technology tools to complete authentic tasks across disciplines.	By means of technology tools, students participate in outside-of-school projects and problem-solving activities that have meaning for the students and the community.
	Goal Directed: Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	Students receive directions, guidance, and feedback from technology, rather than using technology tools to set goals, plan activities, monitor progress, or self-evaluate.	From time to time, students have the opportunity to use technology to either plan, monitor, or evaluate an activity.	Students have opportunities to select and modify the use of technology tools to facilitate goal-setting, planning, monitoring, and evaluating specific activities.	Students use technology tools to set goals, plan activities, monitor progress, and evaluate results throughout the curriculum.	Students engage in ongoing metacognitive activities at a level that would be unattainable without the support of technology tools.

Citations

The SAMR graphic is from a presentation by Ruben R. Puentedura, the originator of the model, at <http://hippasus.com/resources/tte/>;
 the TPaCK graphic is from <http://tpack.org/>;
 the LoTI model is from <http://fcit.usf.edu/matrix/download/indicators.pdf>