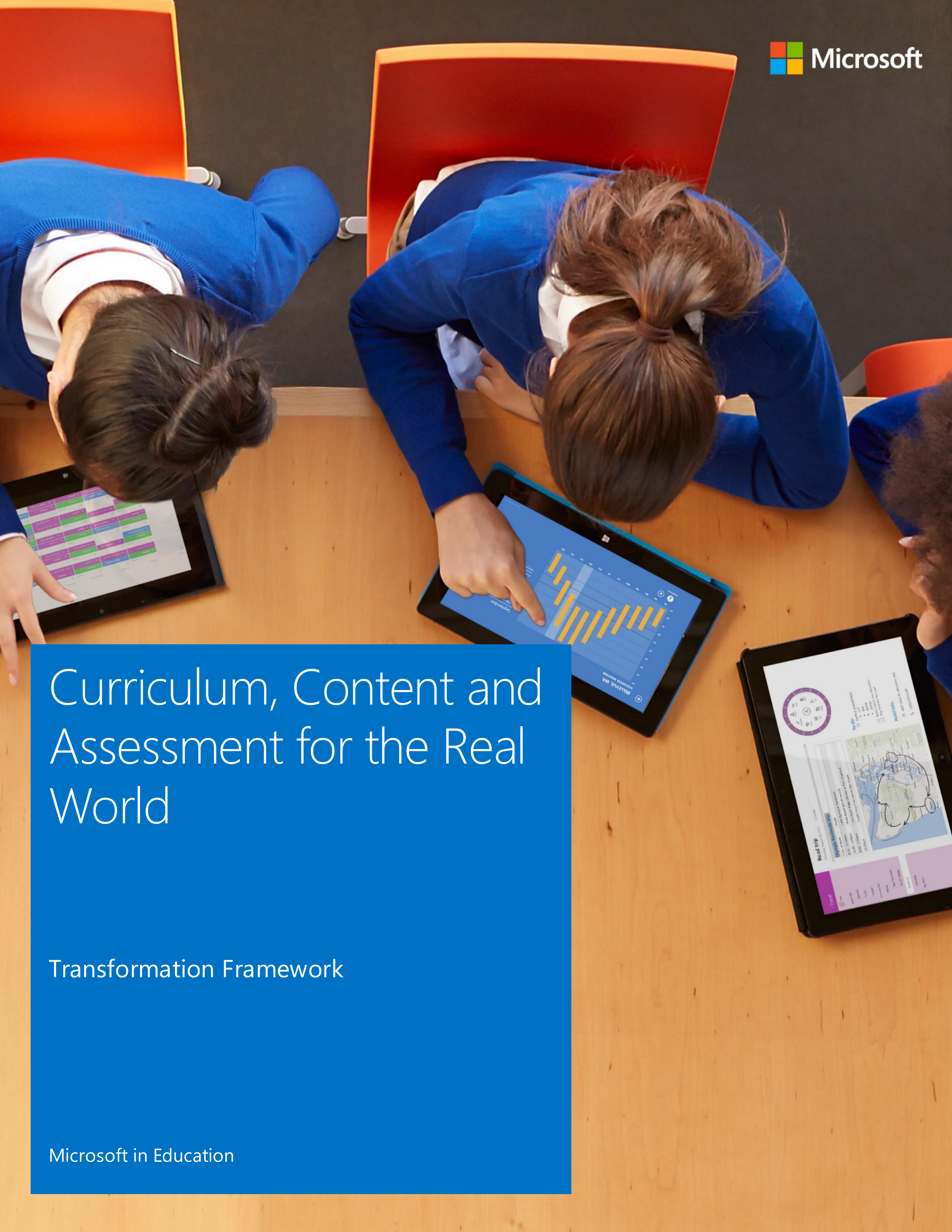

Curriculum, Content and Assessment for the Real World

Transformation Framework

Microsoft in Education

About this series

The Microsoft in Education Transformation Framework is a guide for educators and leaders engaged in holistic education transformation. The critical conversations needed for effective transformation of education systems are the focus of this paper series. Each expert author presents a global perspective on the topic through the current thinking and evidence from research and practice, as well as showcase examples. Specifically, the papers document the contributions of anytime anywhere approaches to K-12 learning and explore the potential of new technology for transforming learning outcomes for students and their communities.

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- Curriculum, Content, and Assessment for the Real World
- Personalized Learning for Global Citizens
- Learning Communities and Support
- Building Leader and Educator Capacity for Transformation
- Transforming Learning Environments for Anytime, Anywhere Learning for All
- Designing Technology for Efficient and Effective Schools

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Summary

Education content, curriculum and assessment for learning must be student-centered, relevant, authentic, constructive, and interdisciplinary. They should develop innovation, creativity, and 21st century skills through deep learning. Content must be digital and shared widely. School leaders and educators are visionaries of a better future for their students and communities. To bring their vision to life, they work as orchestrators who put in place conditions in which technology will positively influence curriculum and assessment, based on the best evidence available. This paper provides an overview of recent practice and research to guide effective and dynamic curriculum, content, and assessment for future-ready students. There are two clear roles for the use of technology in content, curriculum and assessment. First, content, curriculum and assessment that provide authentic, real world learning that is sufficiently challenging and promotes ownership and collaboration, and that provides for creativity and artifact production is theoretically sound. Research consistently provides evidence that technology can support teachers in effective integration of curricula and assessment in classrooms. A second role for technology relates to the actual content being delivered. Digital technologies have helped to reshape our expectations of the curriculum that is being offered.

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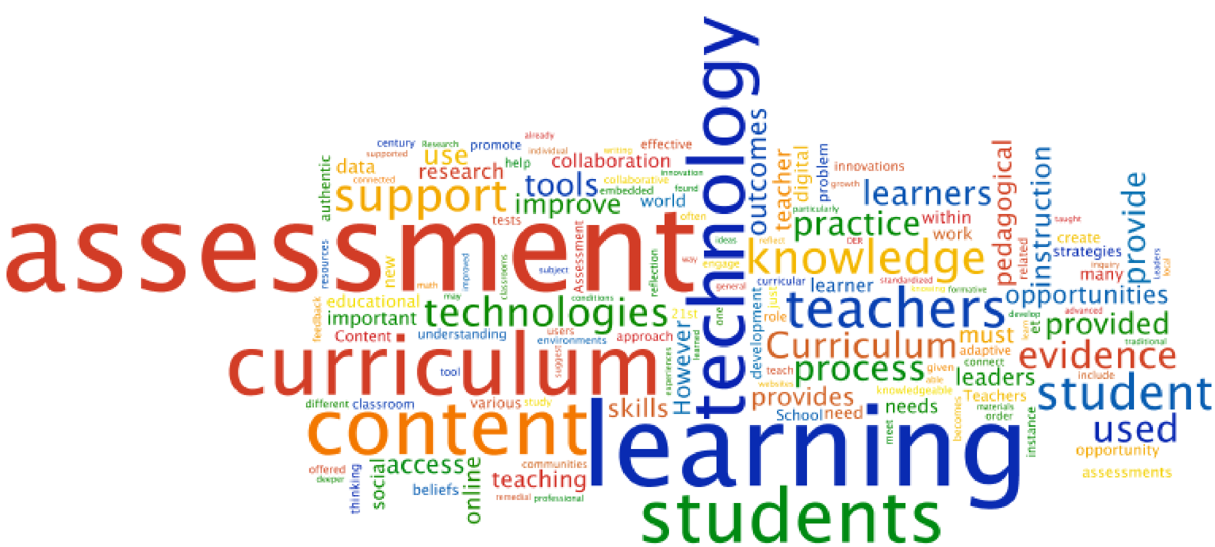

Curriculum, Content, and Assessment for the Real World

School curriculum and assessment of learning must be student-centered, relevant, authentic, constructive, and interdisciplinary. It should develop innovation, creativity, and 21st century skills through deep learning. Content must be digital and shared widely.

School leaders and educators are visionaries of a better future for their students and communities. To bring their vision to life, they work as orchestrators who put in place conditions in which technology will positively influence curriculum and assessment, based on the best evidence available. This paper provides an overview of recent practice and research to guide effective and dynamic curriculum, content, and assessment for future-ready students.

Somers School District in New York are using Windows 8 combined with Office 365 and OneNote to support student collaboration, personalize instruction, and provide opportunities for student and teacher reflection.

See more!

Exploring Curriculum, Content, and Assessment

What are curriculum, content and assessment? Curriculum and assessment are integral components to any learning or teaching environment. Curriculum is the content and learning progressions that are engaged, taught or learned. Assessment helps determine the outcomes of the instruction of that content—a process that provides feedback to both the learner and the instructor. Both curriculum and assessment work together cyclically and recursively to provide the learner with direction and focus.

Clearly curriculum and assessment do not occur in a vacuum. This process involves a learner who brings prior knowledge, interests, and individual needs (Rochelle, 1997). It also involves a more knowledgeable other (Vygotsky, 1978) who can scaffold and support the learner. Finally, where the curriculum addresses what content is being taught, the pedagogical approach addresses how the content is taught.

One's beliefs about how learners acquire knowledge will certainly influence the instructional strategies used to present the content. These various components form a complex relationship such that one piece of content could be offered in multiple and various presentations and teaching styles. The assessment will then often mirror both the pedagogical beliefs and the instructional strategies of the presenter.

What does research say about what works regarding curriculum and assessment? Research has provided evidence that innovations in both curriculum and assessment work best when they are tied to academic content and practice (Salomon, 1993). From a social constructivist perspective, innovations must be based in authentic, real world problems (Blumenfeld, Krajcik, Marx & Soloway, 1994). Designers of successful classroom interventions must make sure that they are engaging enough to seduce children into the world of learning... Once ensnared, it may be possible to guide students toward the intrinsic rewards that follow from self-initiated disciplined inquiry' (Brown, 1992, p. 173). Real-world refers to opportunities to legitimately participate in communities of practice (Lave and Wenger, 1991). Students have the opportunity to solve real world problems as authentic apprentices.

Such innovations must also be sufficiently challenging. Content or assessment too far above or below a learner will either bore them or frustrate them to the point of quitting. Sufficiently challenging content meets a learner at what Vygotsky calls the zone of proximal development (ZPD; 1978). The ZPD is the space at which a learner grows with the support and scaffolding of a more knowledgeable other. Researchers have provided evidence this more knowledgeable other can be a human or a computer (Scardamalia & Bereiter, 1991).

Important curricular and assessment innovations must also provide learners with a sense of ownership. Ownership here could refer to both the design of the problem as well as the solution. McLoughlin and Lee (2010) argue that the "socially based tools and technologies of the Web 2.0 movement are capable of supporting informal conversation, reflexive dialogue and collaborative content generation, enabling access to a wide raft of ideas and representations.

> Cloud technologies "are capable of supporting informal conversation, reflexive dialogue and collaborative content generation, enabling access to a wide raft of ideas and representations... (H)owever, in order for self-regulated learning to come to fruition, students need not only to be able to choose and personalise what tools and content are available, but also to have access to the necessary scaffolding to support their learning"
>
> (McLoughlin & Lee, 2010, p. 28)

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A final important point about curricular innovations is that the assessments must provide multiple opportunities for the creation of artifacts. The publication of artifacts provides teachers with a way to "infer the process by which students transform meanings and strategies appropriated within the social domain, making those strategies their own" (Gavelek & Raphael, 1996, p. 188). This publication also provides opportunities for feedback from teachers and others which can promote knowledge construction, knowledge integration (Linn, 1992), higher order thinking and self-regulatory behavior (Laurillard, 1996). Assessment here becomes more than just a process of learning; it becomes a process for learning (Black, 2004). The goal is to use assessment as a tool for the student acquisition of knowledge; the creation of artifacts provides that opportunity.

What is the role of technology in curriculum and assessment, particularly in cloud and mobile learning environments? There are two clear roles for the use of technology in curriculum and assessment. First, curriculum and assessment that provides authentic, real world challenges, that is sufficiently challenging and promotes ownership and collaboration, and that provides for creativity and artifact production is theoretically sound. However, it is not always easy to implement in classrooms, particularly as a teacher is trying to meet the advanced or remedial needs of individual students. Research consistently provides evidence that technology can support teachers in effective integration of curricula and assessment in classrooms.

For instance, Cheung & Slavin (2013) completed a meta-analysis on computer-aided instruction. The results showed a positive (albeit modest) effect size compared to traditional instruction in K-12 mathematics classrooms. Bernard et al.'s (2014) meta-analyses demonstrated that students in blended learning conditions exceeded students in traditional classroom environments by about one-third of a standard deviation. Barrow, Markman, & Rouse (2009) offered positive evidence for the use of a computer-based curriculum in supporting pre-algebra and algebra concepts to middle and high school students. Finally, Cavanaugh et al. (2004) provided evidence

The following Microsoft resources are available when thinking about curriculum and instruction.

- Dynamics in Education

Communicate and Collaborate services and resources:

- Office 365 for Education
- Lync "Connects people everywhere."
- Skype in the Classroom
- Yammer

"There are two clear roles for the use of technology in curriculum and assessment. First, curriculum and assessment that provides authentic, real world challenges, that is sufficiently challenging and promotes ownership and collaboration, and that provides for creativity and artifact production is theoretically sound."

that K-12 online learning was just as effective—and in some cases, more effective—than traditional face-to-face schooling.

Simply adapting and implementing technology does not mean that positive results are imminent. However, research has provided that technology can play an important role in promoting effective teaching and in supporting learning.

A second role for technology relates to the actual content being delivered. Digital technologies have helped to reshape our expectations of the curriculum that is being offered. Binkley et al. (2012) proposed ten skills within four general groupings that change how we view innovative curriculum (pp. 18-19):

Innovative Curriculum	Ways of thinking	1 - Creativity and innovation 2 - Critical thinking, problem solving, decision 3 - Learning to learn, Metacognition
	Ways of working	4 - Communication 5 - Collaboration
	Tools for working	6 – Information literacy 7 – ITC literacy
	Living in the world	8 – Citizenship – local and global 9 – Life and career 10 – Personal and social responsibility – including cultural awareness and competence

The authors developed this list from an analysis of twelve existing frameworks across various countries. Others have mirrored such efforts, adapting or renaming them to make local contexts (Assessment and Teaching of 21st Century Skills, 2014; Voogt, Erstad, Dede, & Mishra, 2013). Regardless of the terminology, there is a general agreement that schooling in the 21st century involves a deeper and more enhanced understanding of curriculum and what is to be taught and learned in order for students to be successful after graduation.

What is the role of the teacher in this process? The teacher or more knowledgeable other is critical in the curriculum and assessment process. They scaffold the learner beyond what the student could achieve on their own. More importantly, research has provided evidence of **pedagogical content knowledge** (Shulman, 1986). Pedagogical knowledge is an understanding of learning and instruction; content knowledge is a deeper understanding of a particular subject matter. But, pedagogical content knowledge is understanding how to teach that particular subject matter. Said differently, knowing how to teach and knowing math is different than knowing how to teach math. If you add technology to the mix, knowing how to teach math with technology is yet another layer of complexity (Ferdig, 2006).

Cochran-Smith and Lytle also suggest that knowledge for teaching (learned in preparation programs) and knowledge in practice (knowledge learned while teaching) is different than knowledge of practice. This third category represents a meta-cognitive process where a teacher becomes a creator of knowledge through inquiry. As such, teachers must not only be knowledgeable about their practice, they must be able to think more deeply as they practice. It is not about having a set curriculum or assessment, it is about having teachers who understand how to adapt that curriculum and assessment to meet the needs of the learners. Teachers may not be prepared to handle such tasks, nor may they be able given traditional tools; however, research has provided evidence that technology can support teachers in this important process (Russell, Carey, Kleiman, & Venable, 2009; Ferdig, 2010).

Evidence from Research on Effective Practice Related to Curriculum, Content, and Instruction

The aforementioned research has provided evidence that we must prepare qualified individuals who can help learners acquire knowledge through innovative curriculum and assessment. That curriculum must match high pedagogical standards while also reflecting twenty-first century skills required by our graduates. Moreover, research has provided evidence that technology can both scaffold and support learners and teachers in this process.

Given pedagogical content knowledge and its relationship to technology, many of the studies within curriculum and assessment are located within particular subject areas. For instance, a recent study demonstrated that electronic games could be used effectively in elementary students' study of migratory bird patterns (Chu & Chang, 2014). And, Lysenko & Abrami (2014) used two web-based applications to successfully promote reading and writing expression in Canada. However, there are some general outcomes that can be explored more broadly in reference to technology, curriculum, and assessment. The following list contains emerging trends in the use of technology to support reform and innovation in curriculum and assessment.

1. **Curriculum and assessment outcomes can improve when technology is used to connect learners and to support already connected learners**. Researchers argue that we live and work in a connected world. Ito et al. (2013) suggest:

   Connected learning posits that by connecting and translating between in-school and out-of-school learning, we can guide more young people to engaging, resilient, and useful learning that will help them become effective contributors and participants in adult society. We also believe that networked and digital technologies have an important role to play in building these sites of connection and translation… Our hypothesis is that in order to develop these cross-cutting repertoires of practice, young people need concrete and sustained social networks, relationships, institutional linkages, shared activities and communication infrastructures that connect their social, academic, and interest-driven learning (p. 46-47).

   Said differently, to provide disconnected content or learning opportunities leaves our young learners disconnected from a world they hope to engage with. Moreover, it is discordant with the ways they have already used technologies to connect in their world. An excellent example of connected learning is the use of student blogs. Blogs provide a way for students to publish their ideas to a live audience. They can draw on and comment on existing content, creating a new network around topics integral to their interests. In one study, blogging improved students' writing and supported development of related skills and knowledge (Drexler, Dawson, and Ferdig, 2007).

Examples of technologies used to create a connected curriculum include social networking tools such as Twitter, Facebook, social bookmarking, blogging, and wikis. The value in these tools is that they are already in use by many students. Other examples include websites aimed at connecting classrooms like ePals, and eTwinning.

2. **Curriculum and assessment outcomes can improve when technology is used to personalize instruction.** "Increasing personalization in schools as a strategy for increasing students' academic achievement and social development is a longstanding goal of educational reform, both structurally and instructionally" (Yonezawa, McClure, & Jones, 2012, p.10). Personalization of instruction is important, given a pedagogical belief that every student enters the classroom with different background knowledge, different abilities, and differing levels of interest in the content. However, it is not easy for a teacher to easily or consistently personalize instruction. There is evidence that technology can help support teachers in scaffolding student learning, particularly as they seek remedial or advanced instruction. For instance, Hwang et al. (2012) developed a role playing game to teach elementary students about natural science.

   They found that the personalized approach improved learning outcomes and increased students' motivation to learn about science.

   Some of the most recent and prevalent technologies used for personalization of learning are related to narrative and virtual characters. For instance, Meograph lets users create virtual stories with graphics, text, videos, and context. DIY provides users a space to upload and share videos that demonstrate their expertise, interests, and skills. Teachers can also utilize emerging tools to support their personalized instruction. Weebly lets teachers create websites and blogs for any audience and any purpose, including the use of classroom websites around various topics. Voki allows teachers and students to create animated characters that can scaffold users on webpages and in assignments.

Microsoft products and programs create a connected curriculum. These include:

- Yammer
- Lync
- SharePoint
- Skype for Education
- Microsoft Educator Network

Microsoft Bing and Wolfram Alpha bring powerful discovery and analysis to each student.

Read more!

3. **Curriculum and assessment outcomes can improve when technology is used to support student collaboration.**
   Collaboration is a critical part of constructivist pedagogies. It has been widely studied and cited in the professional literature as an important factor in increasing both interest and critical thinking (Gokhale, 1995). Researchers would also argue that collaboration helps develop communities of practice where students can try out ideas and challenge each other's thinking (Resnick, Rusk, & Cooke, 1998). These communities and related collaboration are both supported through and emergent from interactions with and through technologies (Krajcik, Blumenfeld, Marx, & Soloway, 1994).

   Research suggests two important factors for successful technology-supported collaboration (Clegg et al., 2013). First, learners need multiple entry points into collaboration around various topics. Some learners will engage instantly in synchronous chats; others prefer to reflect and to post more time-intensive asynchronous experiences. Second, students need to have models of exemplary collaboration within the learning context. It is not enough to lead didactic, individualistic experiences within the face-to-face classroom and then to expect students to engage wholeheartedly and collaboratively without a model.

   There are numerous examples of technologies that support collaboration. Those technologies include synchronous and asynchronous chats (e.g. Skype), wikis, and collaborative learning environments (e.g. Coursesites). However, one of the most prevalent recent examples is that of document sharing and collaborative writing through online document sharing (e.g. Office 365). In these environments, students can collaborate on assignments in real-time, supporting the notion of sharing, editing, and revision.

4. **Curriculum and assessment outcomes can improve when technology provides opportunities for student and teacher reflection.** John Dewey (1933) made the famous claim that we learn from reflecting on our experiences. Reflection, for Dewey, was an "active, persistent and careful consideration of any belief or practice in light of reasons that support it and the further consequences to which it leads" (p. 9). Without reflection, students spend time in class only focusing on the present and the future; the learning that just occurred becomes isolated and thus easy to discard (Costa & Kallick, 2008). Reflection can occur through discussion, questioning, and journaling. Technology can also support the process of reflecting (Lin, Hmelo, Kinzer, & Secules, 1999).

   Collin & Karsenti (2013) conducted a literature review of the use of online learning to support reflective practice (also see Kori, Pedaste, Leijen, & Mäeots, 2014). They found that the time and space flexibility of online learning gave users the opportunity to reflect and become metacognitive about their posts (see Ferdig, Roehler, and Pearson, 2002). Forums were also the most beneficial form of online practice to promote reflective practice. Finally, their own research provided evidence that online interaction encouraged "both individual and groups to exercise a range of reflective functions. Furthermore, online interaction was positively and significantly correlated with cognitive engagement" (pp. 57-58).

   Technological tools to support reflection have already been highlighted in citations of their effectiveness. For instance, asynchronous discussion forums provide opportunities for students to think—and re-think—about posts made by themselves, their teachers, and their colleagues. Another excellent tool for reflection is screen-capturing software (e.g. Jing; http://www.techsmith.com/jing.html). Screen capturing allows students to narrate and record their thoughts either as they complete a task or as they reflect back on the product they have created. There are also tools like Vialogues and Popplet that allow users to make semantic maps and connect ideas with existing videos or images.

OfficeMix is a PowerPoint add-in that supports student reflection and brings the power of pretests to each student.

https://mix.office.com/Gallery

5. **Curriculum and assessment outcomes can improve when technology is used to provide access to open resources.**
   Pre-purchased textbooks and other curricular materials often provide resources that are suitable to meet the needs of many students. However, teaching is flexible as are the teachers that guide reform-oriented instruction. Teaching is a process of continual learning, adaptation, improvisation and instant decision making (Becker & Riel, 1999; Engestrom & Middleton, 1996). Teachers require access to a variety of resources to meet flexible teaching moments and the remedial and advanced inquiries of their students.

   Unfortunately, there is no way to predict these pedagogical jaunts. There is also often limited resources to support forays into uncharted territories. Open educational resources (OER) can act as an important supplement for both curriculum and assessment. Camilleri et al. (2012) suggest that educators can collaboratively improve materials and curricula with OER with less duplication of effort (p. 7). Students also grow by being introduced to high quality material that is adaptable and can be remixed for teacher or student purposes. Finally, low or no cost access to such materials can improve equity and access issues. This is not to suggest OER is without limitations. Indeed, the authors cite the concern of assessment related to OER.

   There has been a tremendous amount of attention paid to massively open online courses (MOOCs). MOOCs provide an opportunity to connect learners to others that share their same interests. Teachers can avoid assessment issues by having students participate in a portion of a MOOC, using content to supplement the needs of the class or the individual student, with current assessment being undertaken by the local teacher (Ferdig, Pytash, Merchant, & Nigh, 2014).

6. **Curriculum and assessment outcomes can improve when technology is used to support alternative, comprehensive assessments like student digital portfolios.** There are many types of assessment that can be conducted to assess learning outcomes, including observations, formative and summative assessments, quizzes, tests, standardized exams, etc. Although standardized tests have their value in comparing states and countries, they lack the ability to provide a comprehensive portrait of the student. Portfolios—and later digital portfolios were introduced as a way to ascertain a deeper understanding of the strengths and accomplishments of students. The electronic aspect provided a broader audience to promote feedback and reflection. Portfolios have also been found to positively impact specific areas of learning such as student engagement and skills such as self-assessment (Fielke & Quinn, 2011).

   Nicolaidou (2013) explored the use of digital portfolios in a fourth grade class in Cyprus. Drawing on pre- and post-tests, student essays, and evidence of peer feedback, the author provided statistically significant evidence of a growth in writing performance. The study also provided evidence that the digital portfolio process improved peer feedback skills.

   There are a number of technologies that promote opportunities for student collection of work in digital portfolios. These include student websites and dedicated portfolio sites such as Foliospaces. However, teachers can also use familiar desktop and publishing software, social networking tools, and online repositories to implement broader concepts such as digital storytelling and online presence.

7. **Curriculum and assessment outcomes can improve when technology is used in providing problem-based learning.** Problem or project-based learning (PBL) "is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem. Critical to the success of the approach is the selection of ill-structured problems (often interdisciplinary) and a tutor who guides the learning process and conducts a thorough debriefing at the conclusion of the learning experience" (Savery, 2006, p. 12).

Microsoft tools support ePortfolios for students and educators.

- OneNote
- SharePoint
- Office 365

There are a number of reasons for the growth in popularity for PBL as a real-world and authentic educational activity and assessment. Most notably, educational content that requires higher order thinking is complex and ill-structured (Spiro, Coulson, Feltovich, & Anderson, 1988). Problem or project-based learning provides an opportunity to traverse the complexity domain using Wittgenstein's notion of criss-crossed landscapes (Wittgenstein, 1953). Rather than passing over the content once, students take many passes through the concepts, skills, and knowledge, beginning to recognizing the depth and complexity of the subject matter. Technology can support that complex inquiry. In one study, a PBL based approach to STEM (Science, Technology, Engineering, and Mathematics) education influenced student achievement in mathematics (Han, Capraro, & Capraro, 2014). Most notably, low performing students were able to decrease the achievement gap.

There are a number of technologies that can be used to support problem or project-based learning. Examples include WebQuests online field trips and experiments such as Go-Lab and Global Excursion and blended interactions such as Geocaching. Game and simulation development tools like Alice, Kodu and Scratch also provide opportunities to problem solve by turning learners into producers rather than simply consumers of content. Hands on technologies such as Raspberry PI and Arduino enable learners to experiment and also produce their own technology tools.

8. **Curriculum and assessment outcomes can improve when technology is used for adaptive and embedded assessment.** Many of the current assessment practices in education take the form of a quiz or test given at the beginning, middle, or end of a content unit. The assessment is tied to the curriculum in the sense that it tests facts, knowledge, and occasionally skills and attitudes related to the content that was offered.

   Innovative technologies can create a new relationship between curriculum and assessment. Students still complete assessments, but the opportunity to assess their learning happens naturally—embedded within the content being offered. It is not isolated from the content, and it occurs frequently. The frequent nature of the assessment promotes the delivery of adapted and dynamic content. As a student progresses through the curriculum (now defined broadly as a combination of content and embedded assessment), they are presented with materials that meet various needs (e.g. learning styles, remedial or advanced content, etc.).

There is a tremendous amount of excitement and promise for computer adaptive testing. Most notably, standardized tests are better suited for those with average abilities, compared to adaptive tests that can be used for most learners (Thissen & Mislevy, 2000). Shute (2009), in discussing stealth assessment, adds:

We now can more accurately and efficiently diagnose student competencies at various levels during the course of learning. With regard to low-level diagnoses (i.e., at the problem or task level, addressing how the person handled a given problem), new technologies allow us to embed assessments into the learning process; extract ongoing, multifaceted information (evidence) from a learner; and react in immediate and helpful ways. On a more general level, we can support learning by using automated scoring and machine-based reasoning techniques to infer things that would be too hard for humans (e.g., estimating competency levels across a network of skills, addressing what the person knows and can do, and to what degree). These competency-level diagnoses then provide the basis for improved instruction, self-reflection, and so on. (p. 504).

Given the relative difficulty of any single teacher creating computer-based adaptive testing, it is more likely that teachers will use aforementioned technologies to embed authentic assessments within learning environments. However, leaders and teachers working with educational companies can begin to seek technological solutions that provide just-in-time data from embedded assessments. They can also push to have a deeper understanding of the factors and characteristics that go into commercial adaptive tests.

Implications and Recommendations for Policy and Practice Related to Curriculum, Content, and Instruction

1. **School leaders and teachers should examine their pedagogical beliefs for congruence with their technological efforts.** Curriculum and assessment do not happen in a vacuum. Technological innovations to either curriculum or assessment will be imbued with certain pedagogical strategies and/or beliefs. The extent to which those beliefs are congruent or discordant with the beliefs of the teachers or administrators will, to a large extent, determine the successfulness of the implementation. There are times when a new technology will push to change old and non-working pedagogical beliefs of some instructors. However, there are other times when a technology, regardless of how engaging it looks, simply fails to match the pedagogical strategies of the teacher or the learning needs of the student.

2. **School leaders and teachers should find ways to capture and utilize data to promote curriculum and assessment adaption.** One of the advantages of twenty-first century technologies is the amount of data that is generated with its use. Although this has led many pundits and critics to a concern over access and privacy, this also provides an important opportunity to capitalize on data to improve student learning. Enhanced data systems can provide opportunities for data-driven decision-making at any point throughout the learning process, rather than waiting until a student has passed or failed a unit-or, worse yet, a course. Data can be used to help assessment become a learning tool; it becomes a formative approach to improving curriculum. It can help point to where a student is headed rather than a summative assessment of where a student has gone.

3. **School leaders and teachers should provide opportunities for consistent and embedded professional development related to curriculum, assessment, and technology.** Teachers need opportunities for sustained growth, particularly with growth in access to new data and new technologies for teaching and learning. Teachers understand the importance of the individualization and personalization of instruction for students; yet many school, leaders offer one-size-fits-all

professional development for teachers. Those instances also typically occur once or twice a year. Teachers need access to just-in-time content; they also need access to professional communities of practice so that they conduct inquiry about their practice. For instance, just because data is now largely available, it does not mean that teachers will know how to use big data sets to personalize instruction. And, math teachers will end up having access to and needs for tools that may be different than what science or language arts teachers need. Professional development should focus on pedagogy, technology, content, and the intersections of all three.

4. **School leaders should refocus their attention and teachers' perspectives on data and assessment as learning and not just testing tools.** There is no doubt that in an era of international comparisons of standardized test scores, leaders are focused on assessment outcomes. However, an assessment is more than just an outcome. It can be used as a formative and summative means to improve curriculum. It can also be used as a learning tool. Researchers have provided evidence that learners often learn by failing. Rather than making the test the final outcome, teachers and leaders can create an environment where the assessment is a critical part of the curricular process.

5. **School leaders should engage with new opportunities for technology advancements, but ignore one-size-fits all technology proposals.** Leaders should be willing to stay on the cutting edge of educational technologies. They can do this by creating and sustaining partnerships with companies, local educational agencies, and educational technology researchers. They can also create innovation spaces in their institutions where new tools and approaches can be tested. This will help lessen the divide between what students engage with at home and what they have access to at school. However, leaders should be wary of sales efforts that focus on one-size-fits-all technology. Educators capitalize on flexible teaching moments. Different learning or teaching moments call on for varying tools, strategies, content, and technology. Although many claim to have found the magic tool, there is no one panacea for the needs of educators and students. Leaders should attempt to understand each technology as having affordances and constraints that will impact their ability

"Leaders should be willing to stay on the cutting edge of educational technologies."

to be useful for assessment or curriculum integration and implementation. Leaders should also be wary of studies that claim that a technology will always work or will never work. Decades of research have provided evidence that technologies sometimes work, given the right conditions. Leaders should be willing to ask, "under what conditions will this technology improve or impact my school's curriculum or assessment?"

Guiding Questions for Curriculum, Content, and Assessment for the Real World

- **Enabling constructivist learning through communication and collaboration - how will this be supported and managed?**
- **How will classroom task/resource management and teacher orchestration/workflow be supported?**
- **How will 21st Century Skills be structured and integrated into everyday lessons and curricula?**
- **What knowledge management is required? Links to National Curricula, internal and external repositories and agencies to ensure compliance with state and safety requirements.**
- **How balanced is the curriculum for authentic performance-based formative and summative assessment?**
- **Does the curriculum support collaborative, differentiated and game-based experiences?**
- **Does the digital content from publishers, teachers and students reflect the interactive, collaborative expectations of 21st Century Learners?**
- **How easy is it for the community to Search, Create, Collaborate, Store and Share curriculum content?**
- **Does the curriculum and assessment enable pedagogy for deep learning?**
- **How are 21st century skills placed in the context of content standards?**
- **What are course management and administration requirements?**
- **Do we have systems to allow adaptive teaching and learning (authoring, branching)?**

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