Disrupting Low-Impact Technology Use

Aligning Visible Learning and the T3 Framework for Innovation

Sonny Magana

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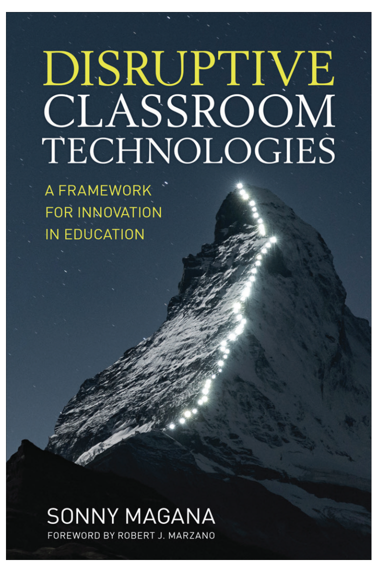

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The effects of Information & Communications Technology (ICT) remain too low and understanding the "why" it is so low is critical. Magana has advanced our understanding of the Visible Learning and used this to advance a major step forward. His T3 Framework aligns beautifully with the Visible Learning claims, inviting ICT to move beyond the translational (surface), to also incorporate the transformation (deep), and the transcendent (transfer). To thence use ICT in these powerful ways will require a revolution—asking teachers to reduce their emphasis on the "Tell and Practice" model and inviting and teaching students to be more involved in planning, teaching each other, and evaluating their impact on the three levels of learning. This is a powerful, credible, and exciting challenge that Magana has offered us: Let's do it.

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An Arguable Purpose of Education

Of the many stated purposes of organized educational systems, one that might meet with general agreement is this: To ensure students achieve ample academic proficiency by mastering current learning content and consolidate the requisite knowledge, skills, and aptitudes to successfully master future learning challenges. A key supposition underpinning this stated purpose is that in order to navigate the growing complexities of life and work in the digital age, learners entering K–12 education systems will need to gain more knowledge and master more skills than any previous generation (Schaeffer, Dykstra, Irvine, Pigozzi, & Torres, 2000). Realizing this stated purpose is a function of intentionally aligning learning content, instructional practices, assessment experiences, and digital learning tools within today's classrooms in order to better prepare students for the highly uncertain future that exists outside of those walls (Magana & Frenkel, 2010).

Education systems have responded in kind, as evidenced by the explosion of computers, Internet technologies, and one-to-one laptop programs in K–12 education (Downes & Bishop, 2015; Snyder & Dillow, 2012). School systems have also invested heavily in teacher and administrator training in order to improve teachers' confidence and competence with using digital tools (Gray, Thomas, & Lewis, 2010; Inan & Lowther, 2010). However, despite the tremendous growth in computer technology, Internet access, and training on using digital tools in schools, the role that technology should play in the context of teaching and learning hasn't, until now, been well understood. In fact, the preponderance of evidence suggests that the effect of digital tools on student learning is downright dismal (Cheung & Slavin, 2011; Cuban, Kirkpatrick, & Peck, 2001; NEA, 2008; Richtel, 2011).

Hattie (2017) analyzed over 10,200 studies exploring various aspects of computer technology on student achievement in a recent meta-analysis, determining that the average impact of computers on student achievement is a surprisingly low effect size of ES = .34. By way of comparison, an effect size of ES = .40 represents the average amount of learning productivity gained over one academic year. Effect sizes above ES = .40 are clearly desirable, while effect sizes falling short of this average indicator are not. The meager effect size of technology on student learning is well below Hattie's (2008) "Zone of Desired Effects."

What is even more surprising is that this meager effect size has not changed in 50 years, despite phenomenal changes in technologies (Hattie, 2017). The reasons for such low impact rest less with educational technology tools themselves, but more in the manner in which they are employed in our classrooms. When powerful and expensive technologies are used to simply digitize elements of the dominant "Tell and Practice" model of instruction—that is, when teachers tell their students what knowledge is, and what knowledge is important to memorize—it becomes more obvious why one can expect such a low impact on student learning. Sadly, digitizing the dominant "Tell and Practice" model of instruction represents the most common way that technologies are used in our classrooms, rendering many learning systems, particularly those serving our neediest populations of learners, digitally rich, yet innovatively poor.

However, there is cause for renewed optimism. Recent compounding evidence now suggests that very large gains in student achievement are possible when digital tools are leveraged to enhance highly reliable instructional and learning strategies. The T3 Framework for Innovation, a new model for enhancing high-reliability pedagogy with technology, was synthesized from this emerging body of research. The T3 Framework organizes the impact of educational technology into three hierarchal domains: T1) Translational, T2) Transformational, and T3) Transcendent. Each domain is further organized into elements and strategies, which are concrete, actionable, observable, and measurable. The strategies in the T2) Transformational domain of the T3 Framework were observed to have an effect size of ES = 1.6. (Haystead & Magana, 2013; Haystead & Marzano, 2009, 2010; Magana, 2016). Such a large effect size is equivalent to an additional three or four years of academic achievement in a single year. Essentially, the effect of technology use coupled with the effective execution of highly reliable instructional strategies was greater than the effect of either variable in isolation (Magana & Marzano, 2014).

The T3 Framework elucidates critical shifts on how classroom teachers can better use their existing educational technologies to specifically enhance making students' thinking and learning visible to their teachers, themselves, and their classmates. This paper will show how the T3 Framework is aligned to key elements of Hattie's (2008) Visible Learning Model, and how the two can be implemented in combination to greater effect.

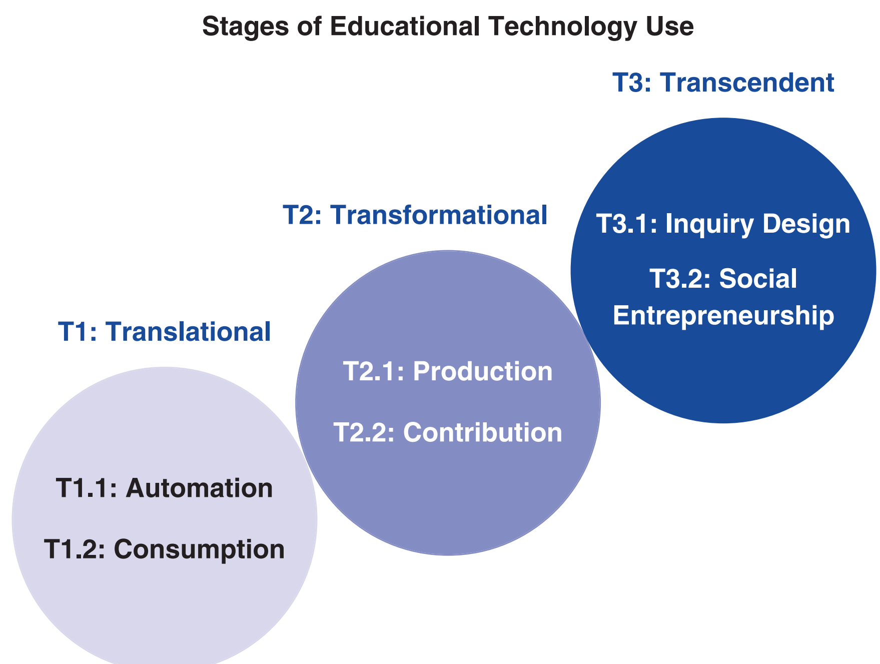
Hattie & Donoghue's Model of Learning

In order to better understand how modern technologies can enhance highly reliable pedagogies, an overview of Hattie and Donoghue's (2016) Model of Learning is warranted. Hattie and Donoghue's (2016) learning model includes three phases of learning: 1) Surface Learning, 2) Deep Learning, and 3) Knowledge Transfer. In the Surface Learning phase, students first acquire new content information, which is stored into short-term memory systems. This is followed by a consolidation phase in which students actively practice and rehearse their superficial understanding of new content. At this phase, students interact with basic facts about the new content, simple details, and new content-specific vocabulary.

In the Deep Learning phase, students employ a variety of learning strategies to both consolidate their surface-level knowledge and acquire a deeper understanding of that new content knowledge. In the Knowledge Transfer phase, students consolidate their deeper understanding of content knowledge into more permanent memory by applying, or transferring knowledge, in different situations or contexts to solve new problems.

The T3 Framework for Innovation in Education

The T3 Framework increments the use of technology in the realm of teaching and learning into three hierarchical domains: T1) Translational, T2) Transformational, and T3) Transcendent (Magana, 2017).



Source: Disruptive Classroom Technologies (Magana, 2017).

T1: Translational Technology Use

The T1) Translational technology domain reflects the most common ways that digital tools are used in schools. Translating tasks from an analog into a digital form adds value in terms of increasing efficiency, accuracy, and time savings. The two elements in this domain are T1.1) Automation, in which administrative teaching and learning tasks are automated, and T1.2) Consumption, in which teachers and students access and consume digital content knowledge and information from online sources or other electronic media.

There is strong alignment between the T1) Translational technology domain and tasks associated with accessing and acquiring surface-level knowledge. A plethora of digital tools, apps, and online environments can serve to enhance students' interactions with surface-knowledge acquisition. These include, but are not limited to, multisensory content and information environments, content–specific gaming environments, automated assessment and polling tools such as Kahoots! or Plickers, as well as a host of video tutorial sites that provide access to a wide variety of content knowledge that can be readily consumed by students using tablets, laptops, or smartphones. T1) Translational technology use is not trivial use, but neither should it be considered an ultimate stopping point; however, far too many educational systems limit their uses of technology to this entry-level domain. This, in no small way, may contribute to the low impact digital tools have had on student achievement.

T2: Transformational Technology Use

The elements and strategies in the T2) Transformational technology domain enact significant changes in both learning tasks and the students performing those tasks. "Transformational technology use in education reflects the intentional application of digital technologies to unleash students' learning expertise, in ways not possible without technology, to achieve ever higher levels of knowledge and mastery" (Magana, 2017, p. 39).

The two elements of the T2) Transformational stage of technology use are: T2.1) Production and T2.2) Contribution. The strategies in the T2.1) Production element guide students to use technologies to produce mastery goals (Visible Learning ES = .68) that help them monitor, track, and visualize their effort (VL ES = .77), progress, and emotions during their learning journeys. Students are also guided toward producing digital representations of their declarative and procedural knowledge in order to make their thinking and learning pathways explicit to themselves and their teachers (VL ES = 1.29). By using digital tools in these ways, students are afforded powerful forms of self-generated feedback (VL ES = .70) that serve to enhance their ability to evaluate, reflect on, and self-regulate their cognition, emotions, and learning behaviors as they progress toward their mastery goals (VL ES = .75). In combination, these learning strategies serve to enhance students' ability to appraise their own learning growth through self-reporting (VL ES = 1.33), to enhance their sense of self-efficacy (VL ES = .92), and to integrate their prior knowledge and abilities to master current learning (VL ES = .94)—all critically important influences of Visible Learning.

Moreover, the digital thinking and learning products they produce serve as scaffolds to help students more agilely store and retrieve knowledge into and from longer-term memory by developing metacognitive strategies (VL ES = .60). Over time, effectively executing the strategies also helps students become more skilled at considering, compiling, and archiving specific strategies that help them express and represent both surface- and deeper-level understanding of new content knowledge.

The strategies in the T2.2) Contribution element scaffold students' uses of digital tools to design, create, share, and curate digital tutorials with the express purpose of teaching others what they know. This is inherently transformational, because by designing rather than simply consuming digital tutorials, learners become substantively changed. In effect, they have transformed from consumers who simply recite content knowledge to intentional knowledge contributors. More specifically, they become interdependent contributive learners, who produce archivable and accessible digital tutorials that help them deeply consolidate knowledge by making their thinking and learning visible to their teachers and peers. These strategies allow students to transfer their knowledge into unique and useful contexts, thus demonstrating, modeling, and communicating their deeper understanding of content knowledge (VL ES = .86).

The strategies in the T2) Transformational technology domain also guide students to comment on each other's learning tutorials and to capture rich, student-led learning discussions focused on mastering content knowledge (VL ES = .82). Such cloud-based digital learning discussions can be easily archived and accessed at any time in a child's learning life, giving students the extraordinary ability to individually and collectively engage in cumulative reviews with their own thinking and learning products, available at their fingertips (VL ES = 1.20).

Student-generated contribution products also afford learners the opportunity to continuously explore the similarities and differences between their previously held understandings and newly gained conceptions of content knowledge. T2) Transformational technology use elucidates how digital tools can accelerate students' mastery of current content knowledge—not just by becoming their own teachers, but by helping every student become his or her own *learning sensei,* continuously endeavoring to master knowledge content *and* how he or she learns best at the surface, deep, and knowledge-transfer phases of learning. This is the harbinger of wisdom generation.

T3: Transcendent Technology Use

The findings, which underpin the strategies in the T2) Transformational technology use domain, are more descriptive and provide guidance in regard to preparing students to master current learning. However, the strategies in the T3) Transcendent technology use domain are designed to prepare students to master future learning. While this is equally important, it is much more predictive in nature.

At the dawning of this digital era, it is no longer sufficient to ask students what they want to be when they grow up, as the jobs to which they will aspire may likely not yet exist. A far more important question to pose to today's learners is this: "What wicked problem matters to you, and what are you going to do about it?" Wicked problems are tantalizing because they are ill-structured, highly complex, intractable, multifaceted, and as yet unresolved (Rittel & Webber, 1973). Affording students opportunities to wrestle with wicked problems provides students authentic and meaningful contexts for transferring their newly acquired and consolidated knowledge toward improving their world (VL ES = .86).

Transcendent technology use begins with student passion and concludes with students engaging in designing original lines of inquiry, transferring newly acquired and consolidated knowledge, and applying social entrepreneurship strategies to solve wicked problems that matter to them. These learning strategies are intrinsically motivating for students (VL ES = .69). Thus, the strategies in the T3) Transcendent technology use domain push past the boundaries of prior experiences and expectations for education systems.

The two elements of T3) Transcendent technology use are T3.1) Inquiry Design and T3.2) Social Entrepreneurship. The strategies in the T3.1) Inquiry Design element scaffold students' uses of digital tools to identify, investigate, hypothesize, and design resolutions to wicked problems that matter to them. The strategies in the T3.2) Social Entrepreneurship element guide students to intentionally and contextually wield new and emerging software coding environments and communications platforms to iteratively generate and scale more robust digital solutions to the wicked problems that matter to them. Doing this at least once a week, for example, on "Wicked Problem Fridays," will afford students ample opportunities to explore, interpret, discuss, and critically analyze knowledge and information that is important to them.

Moreover, doing so will empower students to become leaders for action who make a significant contribution to their local and extended communities (Magana, Henly, Murphy, Rayl, & Travis, 1996). This represents an entirely new domain of strategies that are possible only when students mindfully wield digital and cloud-based production technologies. Arguably, we are only just beginning to scratch the surface of what's possible when students' limitless passion and purpose are catalyzed in educational settings.

Realizing the "T3 Effect"

Modern learning systems can no longer rely on evidence-free opinions and industry propaganda to generate meaningful understanding of how technologies will improve student achievement. That has been the pathway taken for the last several decades, resulting in classrooms that are digitally rich, but innovatively poor. Compounding evidence suggests that implementing the strategies in the T3 Framework with reasonable fidelity will likely increase the impact of digital technologies to unlock students' limitless capacities for self-regulation, self-determination, and contributive learning (Haystead & Magana, 2013; Haystead & Marzano, 2009, 2010; Magana, 2016, 2017). A reasonable inference can be made that such capacities will arguably serve to better prepare today's students, not only for current learning challenges but for the future learning challenges they will encounter. Using the guidance provided by the T3 Framework, educational systems can build rather than rely upon pedagogies of the past to generate collective efficacy. Doing so not only will disrupt the historic pattern of low technology use in education, but will serve to unlock students' potential, passion, and purpose for limitless learning.

Educational systems would benefit from a road map with crystal-clear goals, and just enough mileposts to allow creativity to flourish over prescriptive, lock-step compliance. This is perhaps one of the most valuable attributes of the T3 Framework for Innovation in education: It is a precise, yet tempered guide, designed to both stimulate the realization and determine the impact of collective efficacy, through agile and adaptive implementation of the elements and strategies in the framework (VL ES = 1.57). Collective efficacy is shown to have the highest effect size of the Visible Learning influences, therefore the T3 Framework could be used to help schools and school districts realize the full potential of their people, processes, and products to positively influence learning.

It is also important to continuously evaluate the impact of implementing evidence-based methods. This is particularly true when it comes to building collective efficacy with educational technology use. Learning systems would benefit from using the T3 Framework for Innovation to guide this process. The first step is to assess the current level of technology use within the three domains, elements, and strategies of the T3 Framework. With these incremental stages clearly in mind, teachers can then more accurately establish meaningful growth goals and monitor and track their progress toward mastery within and between the elements in the T3 Framework. Such a systemic process would serve to spark organizational growth and strengthen the causal relationship between teachers' mastery of strategies in the Transformational and Transcendent domains and students' learning mastery.

Final Thoughts

It can be argued that while the "Tell and Practice" pedagogical model may have served students in the industrial and postindustrial ages, this model is woefully insufficient to prepare the current generation of students for future success in the digital age. The primary objective of *Disruptive Classroom Technologies: A Framework for Innovation in Education* (Magana, 2017) is to provide learning systems with a common and actionable language for implementing and measuring the impact of innovative teaching and learning practices with readily available technologies. The T3 Framework for Innovation in education provides a much-needed pathway forward that is grounded in sound research and theory, and promotes educational technology uses that accelerate student learning by helping to make student thinking and learning visible, actionable, and perhaps more importantly, contributive.

If evidence-based practices matter, then implementing evidence-based practices matters more. Learning systems can transcend the status quo of low-impact technology use by disrupting the current trajectory with evidence-based, innovative practices that are aligned with the Visible Learning Model. The strategies in the T3 Framework are both aligned with Visible Learning and scaffold the process of implementing disruptively innovative pedagogies that offer highly reliable pathways for learning organizations to build collective efficacy. Such a vision will help ensure that today's students are fully prepared to masterfully address whatever learning challenges their present or future may hold. Arguably, that matters most of all.

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