Finding the Missing Link

TO EFFECTIVE TECHNOLOGY USE IN SCHOOLS

An Exploratory White Paper

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INTRODUCTION

What is the missing link that enables one school to implement digital learning at a level consistent with the U.S. Department of Education's *National Technology Plan* and the Alliance for Effective School's *Future Ready Schools Framework* while an adjacent campus struggles to move their technology initiative forward? Does the issue lie with a sub-par digital infrastructure, inadequate funding for professional development, high stakes testing, or does it run much deeper into the abyss of individual beliefs about the role of digital learning or school climate factors? The LoTi Digital Age Survey 20th Anniversary Edition will be used both nationally and internationally as a metric to collect data relating to these questions. This data will hopefully unravel some of the mystery leading to more valid and reliable decision-making impacting the transformation of digital learning in schools.

Over the past 30 years, the field of instructional technology has witnessed a surplus of technology initiatives (e.g., podcasting, blogging, flipped classrooms, BYOD referendums, 1:1 mobile devices) along with a renewed emphasis on student-centered instructional models (e.g., *Challenged-Based Learning (CBL)*, *Project-Based Learning (PBL)*, *Enrichment Triad*)—each with the intent of achieving digital learning nirvana in K-12 learning environments. But have we fully achieved the goal as set forth by the *ISTE Standards* whereby students are fully engaged in exploring real-world issues and collaborating to solve authentic problems using digital resources?

The short answer is "No," but there exists empirical data to suggest significant progress toward reaching a plateau of transformational digital learning unseen in recent decades. The latest Levels of Teaching Innovation (LoTi) data, which is gathered annually worldwide to collect survey results on current uses of and support for digital tools and resources in schools, suggests that most teachers and building leaders hover between a LoTi 2 and LoTi 3. What do a LoTi 2 or LoTi 3 look like in practice? The descriptions for these predominant levels of teaching innovation are below.

- ✓ *At a LoTi 2 (Exploration), the instructional focus emphasizes content understanding and supports mastery learning and direct instruction. Student learning focuses on lower levels of cognitive processing (e.g., Bloom Levels - remembering, understanding, applying; Webb's Levels – recall & reproduction, working with skills & concepts). Digital resources are used by students for extension activities, enrichment exercises, or information gathering assignments that reinforce lower cognitive skill development relating to the content under investigation.*

- ✓ *At a Level 3 (Infusion), the instructional focus emphasizes student higher order thinking (e.g., Bloom Levels— analyzing, evaluating, creating; Webb's Levels—short-term strategic thinking) and teacher-directed problems. Though specific learning activities may lack authenticity, the instructional emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making). The concept attainment, inductive thinking, and scientific inquiry models of teaching are the norm and guide the types of products generated by students. Digital resources are used by students and/or the teacher to execute teacher-directed tasks that emphasize higher levels of student cognitive processing relating to the content under investigation.*

The above descriptions hardly provide fodder to laud the accomplishments of digital learning in K-12 schools. This article is not about who to blame, but rather, to make a concerted effort to highlight the unique variables that may contribute why some school systems are elevating digital learning practices consistent with the *National Technology Plan* and the *Future Ready Schools Framework* while others remain adrift in a cycle of complacency in the use of digital tools and resources.

Sorting out which variables have the greatest impact on digital learning has baffled researchers since the release of the first *Apple IIe* computers in the late 1970's. If spending patterns are any indication, then hardware procurement and technology training are at the forefront. Yet, school systems that have attempted to maintain a cutting-edge technology infrastructure, coupled with teacher training sessions focusing on how to use the equipment, have seldom realized digital learning's true potential.

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This article divides the discussion about variables impacting digital learning into four distinct categories: *Digital Landscape*, *Teacher Perceptions*, *School Climate*, and *Use of Resources*. These categories serve as the pillars for all comparative analyses involving the 2016 LoTi Digital Age Survey. Selected variables within each of the categories are discussed within the context of their correlation with the internationally-recognized LoTi (Levels of Teaching Innovation) Framework. Any conclusions drawn from the discussion are obviously relative given the aggregate persona for any school or district. Ultimately, data collection involving these targeted variables will provide stakeholders with the necessary information in which to track and report on the progress of transformational digital learning in their schools.

LOTI FRAMEWORK

For those unfamiliar with the acronym LoTi (Levels of Teaching Innovation), this framework measures innovative teaching using digital tools and resources or, put simply, digital learning. The research-based LoTi Framework conceptualized in 1994 is a metric based on the early work of the *Apple Classrooms of Tomorrow (ACOT)* research (1992) and *Concerns-Based Adoption Model (CBAM)*. The framework provides common ground among competing metrics with its emphasis on high level thinking processes, engaged learning, authentic connections, and effective technology use. Its role as a valid gauge to assess progress with digital learning as defined by the *ISTE Standards*, the *National Education Technology Plan*, and the *Future Ready Schools Framework* has been qualified through content, construct, and criterion validation as well as through its ongoing use as the data collection instrument for doctoral dissertations and research studies worldwide.

Figure 1 compares the LoTi Framework with popular measures used to assess teaching practices, student cognitive processing, and/or technology use in the schools.

Moersch's Level of Teaching Innovation (LoTi)	Daggett's Rigor and Relevance Framework	Puentedura's SAM-R Framework	InTASC's Model Core Teaching Standards	Webb's Depth of Knowledge (DoK)
Level 0: Non Use	N/A	N/A	Unsatisfactory	N/A
Level 1: Awareness	Quadrant A: Acquisition	Substitution	Needs Improvement	Recall & Reproduction
Level 2: Exploration	Quadrant A: Acquisition/ Quadrant B: Application	Augmentation	Needs Improvement	Working with Skills & Concepts
Level 3: Infusion	Quadrant C: Assimilation	Modification	Proficient	Short-term Strategic Thinking
Levels 4a/b: Integration	Quadrant D: Adaptation	Redefinition	Distinguished	Extended Strategic Thinking
Level 5: Expansion	Quadrant D: Adaptation	Redefinition	Distinguished	Extended Strategic Thinking
Level 6: Refinement	Quadrant D: Adaptation	Redefinition	Distinguished	Extended Strategic Thinking

In theory, as one moves to a higher LoTi Level, a similar shift occurs with the other corresponding models. Using the LoTi Framework, therefore, provides a consistent empirically-validated instrument in which to measure the degree to which changes to the value of one variable such as years teaching, use of centers/stations, teacher voice on campus, or standards-based instruction, predicts changes to the value of another variable, LoTi.

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DIGITAL LANDSCAPE AND LOTI LEVEL

To what degree are the LoTi (i.e., digital learning) levels of a school system impacted by its digital landscape? For purposes of data collection, the digital landscape on campus includes the (1) number of years teaching, (2) digital infrastructure (e.g., laptops, social networks, websites, email, mobile devices, videos), (3) digital instructional/blended learning model (e.g., rotation model, online lab, flipped classroom), (4) source for guidance related to digital resources, and (5) greatest obstacle to advancing digital resources.

The variable, *Years Teaching*, was selected to address the question, "Are experienced teachers more or less likely to tap into the potential of digital learning to accomplish school outcomes than beginning teachers?" In her article, *Are Teachers of Tomorrow Prepared to Use Innovative Technology?*, Schwartz (2013) reports that, "... only half of current working teachers believe they can use technology to motivate students to learn, compared to 75 percent of incoming teachers." More telling is the fact that Schwartz's article points out that only 26% of experienced teachers believe that students can use technology for problem-solving activities relating to the content.

What implications then does the variable, *Years Teaching*, have for us when planning professional development or—equally important—preparing students for rigorous high stakes testing? If a decreased number of years in the classroom is associated with higher levels of digital learning, then follow-up interventions should address why teachers with more years of teaching experience are associated with lower levels of digital learning. Potential topics for PLC sessions, faculty meetings, and/or teacher inservices might involve increased peer connections among veteran teachers, teacher efficacy, technology mentorships, changing courses/grade levels, collaborative lesson planning, and/or student-centered strategies (e.g., jigsawing, reciprocal teaching).

Another variable, *Digital Instructional Model*, relates to the use of blended learning models including the ever-popular flipped classroom movement. Bishop and Verleger (2013) define the flipped classroom as an educational technique that consists of two parts: interactive group learning activities inside the classroom and direct computer-based individual instruction outside the classroom. If implementing blended learning using a flipped classroom approach is associated with higher levels of digital learning, then follow-up interventions might focus on ways of promoting the flipped classroom model using peer mentoring, accessing flipped classroom videos/articles from the *ISTE* (https://www.iste.org/) and/or *Edutopia* (http://www.edutopia.org/) websites, Project- and Problem-Based Learning orientation, and/or effective classroom management strategies.

TEACHER BELIEFS AND LOTI LEVEL

Data collection from the LoTi Digital Age Survey relating to the category, *Teacher Perceptions*, targets five primary variables including (1) teacher beliefs, (2) teacher readiness, (3) teacher support, (4) teacher/administrator feedback, and (5) the use of instructional grouping strategies. Penny Parks addresses the variable, *Teacher Beliefs*, in her 2003 article, *How Our Beliefs Affect Our Lives*. This article provides a practical illustration of the physiological process comprising our belief system. Simply put, when we establish meaning a few times after a repeated experience without any conflicting information, that meaning turns into a belief.

As educators, we have our own beliefs as to how children learn best, what constitutes quality teaching, what role differentiated instruction should play in the classroom, and so forth. As professional development planners, how do we change negative or perhaps, even worse, ambivalent beliefs about the impact of digital learning on student outcomes? According to Parks, the brain is continually sorting and sifting events within our life experiences that confirm or align with our belief system.

If a teacher plans lessons using a class set of Chrome Books and connecting online fails repeatedly or an initial attempt at implementing a flipped classroom produces modest results on a quarterly math benchmark assessment, these experiences may confirm an existing negative belief. As Parks points out, the good news is that, "…the brain does the same diligent job with positive beliefs."

If teachers and administrators have negative beliefs about the pedagogical impact of digital learning in the classroom, what interventions—in the form of lunch and learn sessions, online courses, or mentoring/coaching opportunities—can we muster to reverse the trend and make positive perceptions about digital learning a reality? Possible options might include research

studies that demonstrate the positive impact of digital learning on student achievement, successful modeling of digital learning with "at-risk" students, and/or digital resources that directly support high-stakes testing programs (e.g., Smarter Balanced Assessment Consortium/PARCC).

Addressing the variable, *Teacher Readiness*, what do teachers perceive as the necessary prerequisite skills to integrate digital resources successfully into the classroom learning experience? Is viable digital learning a state of mind, a set of digital literacy outcomes, or a command over a variety of digital tools and resources ranging from social networking to interactive apps?

One need look no further than the *ISTE Standards for Teachers* for inspiration as to what constitutes a truly digitally-literate educator. These standards articulate five key domains that infuse skills, knowledge, and, of course, attitude.

- ✓ *Facilitate and inspire student learning and creativity*
- ✓ *Design and develop digital learning experiences and assessments*
- ✓ *Model digital age work and learning*
- ✓ *Promote and model digital citizenship and responsibility*
- ✓ *Engage in professional growth and leadership*

Ultimately, defining a set of prerequisite skills needed to maximize student learning, address each state's content standards, and promote lifelong learning within a digitally-based learning environment is a relative experience based on one's philosophy as to how children learn best and the resources that individuals believe are necessary to achieve the desired student outcomes.

If data collection results show that teacher's positive perception about their ability to integrate digital tools and resources (e.g., 1:1 laptop/mobile devices, BYOD) is associated with higher levels of digital learning, then strategies should be considered that focus on elevating the technical skill level of all staff members through both formal and informal training on word processing, spreadsheet, and database skills; electronic presentation skills; using peripheral devices; computer-related storage devices; content management systems (e.g., Blackboard, Moodle); and/or mobile apps. Conversely, if teacher's positive perception about their ability to integrate digital tools and resources is associated with lower levels of digital learning, then strategies should be considered that focus on best practices relating to effective digital learning including student-directed pedagogical models (e.g., *Enrichment Triad*, *Challenge-Based Learning*), technology-infused performance-based assessments, and/or Digital Age Best Practices.

Regarding the variable, *Teacher/Administrator Feedback*, I have for years asserted that the building principal controls the LoTi Level on campus. From a digital learning standpoint, how the building principal prioritizes agenda items for an upcoming faculty meeting, makes recommendations to the school site council regarding next year's budget, models the effective use of technology within his/her own job duties, offers suggestions for future professional development, and provides quality feedback to staff following a classroom walkthrough or formal teacher evaluation all directly impact the quality of digital learning on campus.

Assuming that the LoTi Digital Age Survey data yields a strong correlation between the usefulness of the administrative feedback that a teacher receives and the level of digital learning reported, possible safeguards school leaders can use to ensure quality feedback include:

- ✓ *Pose challenging and thought-provoking questions to teachers relating to the use of technology in the classroom such as, "How does your students' use of Survey Monkey for survey construction promote higher order thinking?"*
- ✓ *Provide non-threatening feedback to teachers with specific recommendations relating to the use of technology such as, "You might want to consider using the web applet, Sprinter, as a tool to support your students' understanding of slope."*
- ✓ *Stimulate collaborative, professional conversations about pedagogy through the gathering of evidence related to technology use in the classroom.*
- ✓ *Use the anecdotal feedback collected by the entire leadership team to create an agenda for an upcoming faculty or PLC meeting, or for deciding on future staff development opportunities.*

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Recognizing that elevating the level of digital learning is an ongoing process that requires time, school leaders can accelerate the process by providing constant, consistent, and targeted feedback that helps staff improve their collective professional practice and teaching innovation over the entire school year.

SCHOOL CLIMATE AND LOTI LEVEL

Research abounds regarding the positive impact of school climate on an extensive and impressive list of variables including drop-out rate, achievement, self-concept development, school improvement, teaching and learning, and so on. If school climate represents the quality and character of school life, does a strong correlation, therefore, exist between school climate and the manner in which classroom teachers are using digital tools and resources to elevate their professional practice?

In the LoTi Digital Age Survey, we ask respondents to agree/disagree with statements related to specific school climate variables including (1) how well they feel they are respected as professionals, (2) whether 2-way communication exists with colleagues and leadership, (3) how well they feel they are listened to relating to campus policies, programs, and procedures, and (4) how well they understand/support the school's shared vision for digital learning.

For years, I have heard from schools frustrated by the fact that efforts to promote heightened uses of technology through massive hardware purchases, special technology institutes, and/or technology mentorships did not produce any measurable positive results. Think about it. If a school has the digital resources in place with abundant teacher training and support, shouldn't they have seen some measurable result? Unfortunately, many staff members feel slighted, perceive that they have little or no voice in the decision-making process, or, in general, hate their work environment. Should we really be surprised that teachers who are not involved in campus decision-making processes have trouble implementing student-centered processes in their own classrooms?

Seldom mentioned is the importance of the variable, *Teacher Voice*, in the ongoing conversation about digital learning. In the business sector, voice is frequently viewed as the lynchpin for ongoing business growth. A report published in December 2012, *Releasing Voice for Sustainable Business Success*, concluded that employee voice, "increases employee engagement, enables effective decision-making and drives innovation."

Relating the importance of teacher voice to the classroom environment is fairly easy. Kahlenberg and Potter's (2014-15) article, *Why Teacher's Voice Matters*, provides a compelling argument about the connection between teacher voice and increased student achievement, lower teacher turnover, and the positive effects on school climate. From my perspective, the word, *voice*, can be easily substituted with the word, *trust*. When was the last time you heard someone on the job utter, "I don't trust that person." What are they really saying? The interpretations are unlimited and unfortunately all negative.

USE OF RESOURCES AND LOTI LEVEL

Applying for grants, executing a tax bond levy, seeking donated computers, and qualifying for special federal funding are all creative ways to expand the digital infrastructure, but none of these options guarantee its frequency of use or the resulting level of teaching innovation. In the LoTi Digital Age Survey, the category, *Use of Resources*, determines the frequency of student and teacher use of digital resources as well as the frequency of standards-based instruction..

If the frequency of student use of digital tools is associated with higher levels of digital learning, then strategies should be considered that focus on ways getting all students using technology more effectively and frequently such as using mobile carts as a station/center, collaborative learning methodologies that emphasize social media, course management systems (e.g., Edmodo, Moodle, Blackboard) that offer discussion threads, and/or online interactive word walls.

Conversely, if the increased frequency of teacher use of digital tools is associated with lower levels of digital learning, then strategies should be considered that focus on ways of promoting a culture of high level cognitive processing and student engagement relating to technology use by designing Focus strategies (e.g., simulations, surveys, discrepant events, role playing) that promote student engagement, authentic performance assessments aligned to the content standards, and/or instructional models that promote student activism and issues resolution (e.g., 5E Model).

The LoTi Digital Age Survey provides school systems with informative data that explores how *Digital Landscape*, *Teacher Perceptions*, *School Climate*, and *Use of Resources* impact innovative teaching using digital tools and resources. Understanding those factors ensures that precious staff development dollars can be spent where they are most needed—whether it is a workshop entitled, *New Apps for Your Math Classroom*, or a session called, *Ten Ways to Improve A Positive Work Environment*. If the net outcome results in more innovation, achievement, and effective technology use, then we have all collectively done our jobs.

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