One-to-one learning 2.0

Supporting today’s mobile learners and digital curricula

By Dr. Cathleen Norris and Dr. Elliot Soloway
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Introduction

The hallmark of the digital age is change – constant, rapid, and often disruptive. The computer itself has changed from mainframe to minicomputers, personal desktops to laptops, handheld devices to mobile computers. We now have tiny embedded computers in cars, in washing machines and even in cats and dogs. How we live our lives has changed. Virtually every activity humans engage in, is impacted by computers and that’s constantly changing too.

No surprise then, that K-12 education was also impacted by the constant transformation of computers.

In 2006, a computing device was an expensive, scarce resource and thus computing devices needed to be shared. One-to-one back then meant students visiting a room, once or twice a week that contained desktop computers, one desktop for each student for that 30-45 minute period. Or, one-to-one meant having a cart of bulky laptops wheeled into a classroom, one laptop for each student for that 30-45 minute period.

Given that students had limited access to a computing device, teachers used computers as supplements to their existing textbook-based curriculum. A small set of software applications were popular. For instance, word processor made revisions much faster and easier, math-based computer games made learning more fun, resulting in improved test scores and concept mapping tools and hypermedia tools enabled students to tell more ambitious and educational stories.

One-to-one then took a giant step forward in 2008 when Web 2.0 software entered classrooms. Web 2.0 supported students as they engaged in asynchronous collaboration, e.g., a student could post a blog about his/her research and other students could then post comments about the blog. Important for motivation, students finally had an audience for their writing, other than just their teacher.

Yes, teachers were using computers to give their students radically new opportunities to learn. For example, some particularly adventurous teachers, harbingers of things to come, used computers to provide their students with support for WebQuests, focused searches for people, events, information, etc. But true one-to-one access, 24/7 access to a computing device was still a limiting factor.
Enter, stage right, 2017!

The cost of a computing device has dramatically plummeted in the past ten years. Now one-to-one means each learner having her/his own personal computing device, 24/7. This supports all the time, everywhere learning: in the classroom, at the mall, on a field trip to the zoo, on the soccer field, etc. In the one-to-one of 2017, there is no need to share a computer; the cost of a computing device supports true one-to-one.

Concurrently, the textbook has gone the way of the dinosaur, and digital curricula is fast becoming the new normal. Computer-based learning activities are no longer supplemental, but rather they are core to the curriculum. Applications have given way to “apps” – single purpose, easy to use, and oftentimes free pieces of software. Open education resources (OER), freely available from several online marketplaces, form the basis of digital lessons. And, learning management systems (LMSs) that help teachers manage digital lessons and the digital artifacts created by the students, are increasingly being employed by schools and districts. Bottom line, computers are essential for the effective enactment of digital curricula.

And, in 2017, we have Social 3.0 software, that supports synchronous collaboration. It supports students working together, in real-time, a multimedia report on, say, climate change or an animation of, say, the water cycle. And the collaborating students don’t need to be co-located. One student can be sitting at the kitchen table in her home while her collaborator is sitting at his kitchen table in his home. No longer must a learner struggle, isolated, trying to understand a concept; with Social 3.0 software, a collaborator, a peer, a tutor is just a click away. Learning alone is a thing of the past.
One-to-one in 2017 is not what it used to be in 2006. In 2006, students went to the computers, but in 2017, computers go with today’s always moving, “always on” mobile students. And, one-to-one in 2017 means support for digital curricula – lessons that are composed of digital resources that are differentiated to support struggling learners as well as accelerated learners, and localized to support the unique qualities of individual schools and districts. Given the dramatic changes in one-to-one between 2006 and 2017, it’s fair to say that today, in 2017, one-to-one is really one-to-one 2.0.

And, one-to-one 2.0 has come along just in time to support a new crop of standards which are, in turn, supported by digital curricula. Let’s start with the Common Core State Standards (CCSS), widely adopted (46 states plus the District of Columbia). A major theme in the CCSS is that “literacy” – reading and writing is not confined to English classes. Rather, literacy must be taught across all subject areas. Addressing this theme would be a real challenge without one-to-one 2.0. Kids need to read and write, all school-day long. And, reading includes not just text but video, audio, animation, etc. And writing means creating artifacts that contain not just text but video, audio, animation, etc. Today’s literacy is multimedia, and a computer is precisely the tool to enable multimedia literacy. Frankly, it’s hard to see how teachers and students could comfortably and effectively address the multiple literacies theme in CCSS without one-to-one 2.0.
Another emerging K-12 standard is the Next Generation Science Standards (NGSS), which are already adopted by 16 states. While in 2006, science was predominantly taught as a fact-based subject, e.g., the focus was on definitions of key terms and processes, on remembering the number and organization of components (there are 9 planets, there are 206 bones, etc.) The computer, then, was used by students to support that type of teaching and learning, e.g., filling out worksheets, and reading text or watching videos about science.

In contrast, in NGSS, the focus is on teaching children authentic science practices, e.g., explaining phenomena (e.g., why do earthquakes stop?), and solving engineering problems (e.g., build a bird feeder for humming birds that keeps out predators). Just as scientists use computers in their everyday work, in NGSS, for students, the computer is integral to the process of “figuring things out” or “designing and building artifacts.”

This means the computer needs to go where the students are going to observe and explain real scientific phenomena, e.g., cataloging (taking pictures of, keeping counts of) the different species of squirrels in a student’s neighborhood, and understanding how the underlying neighborhood habitat supports those species. And just as scientists collaborate synchronously, Social 3.0 software supports students synchronously working together, talking (verbally and/or texting) while co-editing the design of that bird feeder to solve challenging, real-world problems.
Doing math—sketching graphs and drawings—has always been a challenge with a computer. While the keyboard and mouse may be fine to play drill and practice math games, the keyboard and mouse are too cumbersome for doing math. But now, using new “inking” technology, children can use a “computer pen” and draw directly on the computer screen, sketching those graphs and drawings, while the computer “understands” those sketches and renders them into professional looking formats. Couple inking with Social 3.0 synchronous collaboration support, take the computer where math problems naturally occur into the garden, into the wood shop, and now “learning math” takes on a whole new meaning. Learning math, then, isn’t balancing equations, remembering when to divide by the numerator, etc., but learning math is about solving real-world problems that occur where students are actively engaged.

Time to fess up: data indicates that in the 2015-2016 school year, only 54% of classrooms in the U.S. are one-to-one 2.0. But, if one follows the trajectory of the spread of one-to-one 2.0 then in the 2020-2021 school year, one-to-one 2.0 should hit 100% in U.S. classrooms. The five-year gap is not a bug but a feature.

K-12 can use those five years: the transition to digital curricula is just getting started and it is going to take teachers and K-12 curricula developers’ time to figure out how to effectively create deeply-digital lessons. Currently, digital lessons that are available on OER marketplaces tend to be paper-based lessons but digitized, e.g., start with a lesson used during the textbook era, but now use digital versions (e.g., PDFs) of those resources. But the transition to deeply-digital lessons, lessons that employ digital resources from the get-go is going to take time.
Activity 1
Collabrify Reader

Explore

- Radiation Animation Collabrify Flipbook

Explore

- Conduction Animation Collabrify Flipbook

Explore

- Thermal Energy Review Collabrify Writer

Activity 2
Collabrify Reader

Explore

- Where does heat transfer occur in your home? Collabrify Writer

Reflect

Activity 3
Collabrify Reader

Explore

- How can you save energy in your home? Collabrify Writer

Reflect

- Thermal Energy Collabrify Map

Start here

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First, educators, teachers and curriculum developers need a new set of tools to create deeply-digital lessons. For example, consider the lesson roadmap in the graphic above, an example of a deeply-digital lesson on Thermal Energy for 6th grade. Each node in the roadmap is a learning activity, e.g., go to a URL and read the materials at that URL or watch an interactive simulation at that URL, or, working with two collaborators, create an animation that describes the process of energy transfer, or, again working with two peers, answer a set of questions about thermal energy posed by the teacher. A lesson roadmap might represent two to four “periods” of instruction, where a period of instruction is 45 minutes, approximately.

While the lesson roadmap, as a way to characterize a unit of instruction, is straightforward, the implication for instruction is anything but straightforward. In the one-to-one 2.0 classroom, dialogue, where teachers and students engage in conversation, is the dominant instructional strategy. Gone are the days when a teacher would stand in front of a classroom and deliver a monologue. In the one-to-one 2.0 classroom, the class moves between group work, two or three students working together on a learning activity, and whole class instruction, e.g., where a teacher brings the class together because the teacher has noticed several groups making the same mistake or where a teacher brings the class together so that each group can share how that group is approaching a learning activity (e.g., creating an animation of energy conduction).
The Christensen Institute has coined a term for the type of instruction that is engendered by a deeply-digital lesson:

Blended learning is any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace.

In the “blended learning”, one-to-one 2.0 classroom, the teacher becomes a manager of instruction, not a deliverer of instruction. And students take significant ownership for their learning, after all, each student has the lesson on her/his computer and can move through that lesson “with some element of student control over time, place, path, and/or pace.”

Now, in a blended learning, one-to-one 2.0 classroom, teachers need tools to distribute those deeply-digital lesson roadmaps, making sure collaboration groups are set up properly, and tools to monitor the enactment of those lessons. And, post-enactment, teachers will need tools to access the artifacts that students have created during the lesson and tools to provide feedback to the students concerning their artifacts. Phew! Like we said earlier, while digital curricula is the “new normal” it is going to take a bit more time to work out the details.
Let’s end by returning to how we started this article: the one-to-one of 2006 gave teachers and students a glimpse of what was possible. But with the arrival of one-to-one 2.0, teaching and learning in K-12 can finally realize the potential of the digital era, a dramatic change, for the better. Think about the impact on student achievement that one-to-one 2.0 is having already and is going to have over the next five years. One-to-one 2.0 empowers learners by giving them tools to ask questions, search for information, reflect on that information, create sophisticated artifacts, post their artifacts, all the while conversing and working together synchronously with others, who are sitting around the same table or half-way around the world. Put simply: one-to-one 2.0 supports 24/7, all-the-time, everywhere learning – end of story.
Dr. Norris’ 14 years in K-12 classrooms, and receiving Dallas’ Golden Apple Award, has shaped her university R&D agenda of developing resources to support K-12 teachers as they move into 21st century classrooms. From 1995-2001, Dr. Norris was President of the National Educational Computing Association (NECA), and led its merger with ISTE, the International Society for Technology in Education, creating the largest, international organization for technology-minded educators in the world. Dr. Norris was Co-President/President of ISTE from 2001-2004.
For over 15 years, Dr. Soloway’s R&D efforts have been guided by the vision that mobile, low-cost, networked devices are the only way to truly achieve universal 1:1 in schools – all across the globe. In 2001, the UMich undergraduates selected him to receive the “Golden Apple Award” as the Outstanding Teacher of the Year at the University of Michigan. In 2004 and 2011, College of Engineering HKN Honor Society students selected Dr. Soloway to receive the “Distinguished Teacher of the Year Award”.

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In 2001, Dr. Norris and Dr. Soloway founded GoKnow, Inc., one of the first mobile learning companies; GoKnow’s Mobile Learning Environment (MLE), a suite of apps for K-12, was used by 40,000+ students, worldwide. In 2012, Norris and Soloway founded the Intergalactic Mobile Learning Center, and with support from private (e.g., Qualcomm, Google, George Lucas Education Foundation) and public (e.g., National Science Foundation) sources. Their organization has published the Collabriify Suite of Apps and the Blended Learning Platform – free, device-agnostic, tools already used by over 1,000 primary/secondary students in the U.S. Recognized as pioneers in mobile learning, Norris and Soloway have published 200+ articles and given 250+ presentations all over the world on mobile learning, and, more lately, on blended and social learning.
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- **Virtual Collaboration:** peer reviews are more effective. Easily annotate electronic documents

- **Environmentally Friendly:** greatly reduces the need for paper. Digitized forms are easily saved and shared
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