Five Things To Know About How the Internet of Everything Will Affect K-12 Education

Increasingly, students have multiple connected devices. As the line between school and home continues to blur, K-12 districts will evolve in how they support learning and manage campuses in the Internet of Everything.
The Internet of Everything (IoE) brings together people, processes, data, and objects to make networked connections that can turn information into actions that create new capabilities. For example, sensors capture data and transmit it wirelessly in order to monitor environmental conditions, such as controlling home security systems through a smartphone app.
How the Internet of Everything Will Affect K-12 Education

As K-12 schools move toward increased connectivity and bandwidth to support digital initiatives, here are five areas where the Internet of Everything will have impact:

1. **Campus Security**—Some K-12 schools are already accessing the IoE for campus security, with Internet-connected surveillance cameras, motion detectors, and centralized door locks. Given the growing safety concerns at public school campuses, the ability to lock down the school immediately in the event of an emergency is a powerful tool to protect students and staff. Schools will increasingly add intelligent devices, smart sensors, and databases to their networks to harness the power of the IoE to protect their campuses.

Taking advantage of the IoE for K-12 campus security could mean the opportunity to reallocate resources. Connected schools can spend less time managing security and more time on teaching and learning.

2. **Resource Management**—In addition to tagging devices with Radio Frequency Identification (RFID) tags (or sensors) for tracking purposes, many connected devices have an IP address. This makes it easy to match demand for a device with the location of a device, delivering more efficient deployment of a school’s resources. The ability to manage lighting, heating, and electrical demands by time of day and campus area will allow schools to more effectively manage their utility costs. New streams of data will likely evolve in the years ahead that will help change how administrators support learning on their campuses.

The IoE can facilitate movement away from an hourly instruction schedule toward delivering curriculum content anywhere, anytime. The K-12 2014 edition of the NMC Horizon Report suggests that, “it is easy to envision a school experience where students are recognized as soon as they step foot on campus, and everything from science laboratory equipment to lockers automatically calibrate themselves to suit their specifications and needs.”

The practical implication of IoE on K-12 schools is that connections become more valuable as the right information or resource is delivered to the right person at the right time. This would produce efficiencies of time, staff, and money.
3. Impact on Learning—Digital convergence and the ability to access the Internet through a wider array of personal devices will expand our definition of personalized learning. Wearable devices that transmit information, along with smart sensors and data from multiple devices, may create a portfolio of information about a student that can include location awareness, time on task, perhaps even information to ensure that learning is done at peak biological times. Information interfaces that require voice and touch commands will become more sophisticated.

Networked information streams will support individual learners adapting to different learning styles. We will move beyond our current one-dimensional test-based assessments to multiple data streams that provide richer assessments and evaluations of student development in a way that motivates learners. For example, sensors could monitor eye movements or signs of confusion and frustration to help teachers better understand how to customize learning for individual students. Our evaluation of student achievement will move away from test-based to competency-based assessments.

Resources such as Khan Academy are already making an impact on K-12 schools as they experiment with flipped classrooms, challenging the traditional time-bound model of public education. Easy availability of open curriculum resources will eliminate “learning” as a destination at school, but instead take the learning to the learner.

In addition, IoE will provide underserved students with access to high-quality learning, no matter where they are. This will improve their opportunities for success.

4. **Impact on Instruction**—There will be new pedagogy and curriculum. By releasing learning from a traditional classroom mindset, new education models can use technology to focus on participation, negotiation, and collaboration, rather than direction and instruction. Development of these 21st century skills will help transform instruction and learning. Students will act as mentors to each other, facilitating greater independence as learners while pursuing inquiry-based explorations of topics.

STEM-focused, project-based learning explorations frequently make use of sensors. Students can use sensors to monitor their daily activity by collecting data on how far they walk or run, their heart rates, and other metabolic functions. Once students understand how these functions reflect their individual lifestyle choices, they can then urge each other to create more active and healthier life styles. Their study of human biology is interactive and more meaningful, being student-directed rather than teacher-directed, changing the teacher’s function from instructor to coach.

Another aspect of these IoE changes will be how teachers acquire new information, training, and professional development. K-12 teachers will form professional learning communities with other educators and leading experts around the world that will have a direct impact on how they teach. As data about practice is collected through observation, student feedback, and video recordings, the data can be used to improve or make adjustments in a teacher’s instructional practice.
5. **Data-driven Decision Making**—New technologies and ubiquitous connectivity will fuel a transformation in how we construct and manage learning environments. Data at all levels will be analyzed to inform better decisions by teachers, parents, school leaders, and students themselves. Connecting people, data, and things requires processes to evaluate the outcomes of the interactions. It will also allow those in the educational community to make better-informed decisions that result in more efficient learning modalities and the scaling of personalized learning. Data integrity and security issues will assume even greater importance than they have now.

Research has shown that access to real-time information and engagement with experts has a real impact on learning. K-12 learners could have access to real data — either collecting it themselves as primary researchers or manipulating data to contribute to research data banks. Not only would students be in contact with researchers, they would be contributing to the solution of local and global problems.

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**Challenges to K-12 Implementation of the Internet of Things**

Although development of the IoE is still early in K-12 schools, it is clear that the primary challenges are access to the Internet and adequate bandwidth. The reauthorization of the E-Rate program and the ConnectEd initiative will help more schools improve their networks, but many schools are not yet able to support a 1:1 initiative, much less multiple devices per student. The future for consumers will be ubiquitous connection with the ability to access the Internet from a range of devices. Schools need to create the same kind of access while addressing the issues of the digital divide.

Consumers routinely surrender their privacy for convenience. That is not acceptable for K-12 schools. Experts in the IoE assert, “The realities of this data-drenched world raise substantial concerns about privacy and people’s abilities to control their own lives. If many everyday activities are monitored and people are generating informational outputs, the level of profiling and targeting will grow and amplify social, economic, and political struggles.”

(Pew-Elon study)
In 2008, the number of Internet-connected devices first outnumbered the human population. There will be 50 billion Internet-connected devices in 2020, up from 13 billion in 2013. The 2020 IoE marketplace is expected to reach $7.1 trillion by 2020, up from $1.9 trillion.

**HOW IT WILL IMPACT K-12**

1. **ENERGY EFFICIENCIES**
   
   IoE will allow more intelligent and proactive management of energy usage. Savings can be significant.

   - Energy is the #2 expense for schools after personnel. About 2-4% of total expenditures or $8 billion a year.
   - 70% of school energy use is heating, cooling, lighting.
   - Estimated savings from improved energy efficiency $2 billion.

2. **SECURITY IMPROVEMENTS**
   
   Internet-connected surveillance cameras, motion detectors, and door locks will strengthen campus security.

   - 75% of schools used security cameras to monitor school activity.
   - 93% of schools controlled access with automatic locks or monitors.
   - 82% of schools used automatic notification emergency system to parents.

3. **IMPROVE TEACHING AND LEARNING**
   
   Wearable devices to track learning, and networked information streams support individual learners.

   - Schools will combine multiple streams of information to create a portfolio of learning that is more competency-based than test based.
   - IoE will allow personalized learning targeted to individual needs, learning styles and aspirations.

   "The knowledge explosion, driven by the power of the network to connect people and spread ideas, has changed the very nature of learning."

   — John Chambers, Cisco Systems CEO

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Sources: Elon-Pew Research; IDC; Business Energy Advisor
Conclusion

Much of the technology in today’s schools is there as a result of consumers’ drive for greater connection. K-12 schools will need to provide students with a guided experience into this new ever-connected reality so that they are equipped to participate as citizens and members of the global economy. Once the connectivity issues are solved for schools, the next set of challenges concerns the level of privacy students are willing to relinquish for universal access to information on the IoE.

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