Emerging and Future Trends in K-12 Education

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In the following report, Hanover Research examines emerging and future trends in K-12 education. The report includes profiles of two school districts that have adopted and successfully implemented several of these trends in innovative ways.

HANOVER RESEARCH

TABLE OF CONTENTS

EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION

With the advent of free, public educational programs like the Khan Academy, the landscape of K-12 education is shifting. In this report, Hanover Research discusses this and other trends that are likely to influence K-12 education within the next several years. Some of these trends are already being implemented in classrooms, but may become even more widely used in the future. The report is divided into two sections.

- **Section I:** This section discusses upcoming trends in K-12 education, and provides details about the implementation of these trends and the unique challenges presented by them.
- **Section II:** This section profiles two school districts—Vail School District and Oak Hills Local School District—that have implemented several of these trends in innovative ways.

KEY FINDINGS

- **The majority of upcoming trends in K-12 education relate to fostering 21st century skills by using technology in new and innovative ways.** Technological innovations such as cloud computing, mobile learning, bring-your-own-device policies, learning analytics, open content, and remote or virtual laboratories are directly related to improving student learning.
- **The changing uses of technology require that teachers also change their methods of instruction.** Many of the technologies identified in this report allow and encourage students to direct their own learning. As a result, teachers must shift from being holders and distributors of knowledge to becoming instructional facilitators who encourage students to direct their own learning.
- **Several tools are now available that are explicitly designed to support teachers.** Social learning networks, e-portfolios, and cloud computing allow teachers to virtually connect and encourage discussion about best practices among teachers.

SECTION I: TRENDS IN K-12 EDUCATION

In this section, Hanover Research discusses the current and upcoming trends in K-12 education.

EMPHASIS ON 21ST CENTURY SKILLS

Geoffrey Robertson, an Information Architect at Discovery Education, predicts that the **emphasis in education in the next few years will be on the development of students' 21st century skills.** Though "21st century skills" has become a buzzword in technology and business circles, Robertson emphasizes that students should minimally be equipped with these "multidimensional" skills so that when they need information, they know how to obtain it.[1]

Perhaps due to this emphasis on 21st century skills, the majority of trends identified in this analysis are largely technological in nature. Technological advances are touching K-12 education in ways never before imagined, and their influence on education as a whole is predicted to be pervasive and enduring.

CLOUD COMPUTING

The New Media Consortium (NMC)'s *Horizon Report: 2013 K-12 Edition* estimates that **within the next 12 months, cloud computing will become an integral part of K-12 education.** Cloud computing comprises Internet-based tools that do not "live" on an individual device. This flexibility allows for access to materials stored on the cloud at any location; students can access homework assignments, readings, and support materials anywhere they can connect with the cloud. Commonly used examples of cloud computing sharing devices are Dropbox and Google Drive.[2]

Cloud computing is popular in distance-learning programs for obvious reasons, but is also an extremely attractive option in K-12 education. Students utilizing cloud computing can collaborate, store files, and can interact virtually with any number of applications. Many schools—approximately 40 percent—currently take advantage of the benefits of cloud computing, in some form, due to the large variety of available applications. Cloud computing also reduces costs associated with non-cloud technologies. [3]

There are three categories of cloud computing that may be useful to K-12 educators:

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[1] Robertson, G. Personal communication with Hanover Research, November 16, 2013.
[2] Johnson, L., Adams Becker, C., Cummins, M., Estrada, M., Freeman, A., and Ludgate, H."NMC Horizon Report: 2013 K-12 Edition." The New Media Consortium, 2013, pp. 11-14. http://www.nmc.org/pdf/2013-horizon-report-k12.pdf
[3] Nagel, D. "Cloud Computing to Make Up 35% of K-12 IT Budgets in 4 Years." IT Trends Research, *THE Journal*. February 19, 2013. http://thejournal.com/articles/2013/02/19/cloud-computing-to-make-up-35-of-k12-it-budgets-in-4-years.aspx

- **Infrastructure-as-a-service (i.e., virtualization):** This category describes scalable virtual machines, bandwidth, and storage capacities.
- **Platform-as-a-service (PaaS):** This category describes the environment in which the development and delivery of applications occurs.
- **Software-as-a-service (SaaS):** This category describes software that is created for a specific organization's unique needs.

Innovations in cloud computing are steady. For example, the Prince George County Public School System in Maryland has partnered with Lockheed Martin and Cisco Systems, Inc. to create a STEM Innovation Cloud, designed to foster interest and "create equitable access" to STEM fields.

Other innovations such as Google's Chromebook are designed to work exclusively within the cloud, and may offer K-12 educators the opportunity to facilitate formerly cost-prohibitive one-on-one computing in their classrooms. The implications of using cloud computing for learning are wide-ranging and vast, influencing student learning experiences in locations even as far as Malaysia (which adopted Google Chromebooks in its schools) and India (where educational pioneer Sugata Mitra has created entire learning facilities that operate within the cloud).[4]

MOBILE LEARNING

Wireless devices and networks are now prolific, and their use has trickled into the K-12 education space. The NMC 2013 *Horizon Report* estimates that **within a year, mobile devices will have become integrated in K-12 education.** Mobile devices are portable, powerful, and intuitive, making them particularly useful as educational tools. The NMC *Horizon Report* notes that

> Tablets, smartphones, and mobile apps have become too capable, too ubiquitous, and too useful to ignore, and their distribution defies traditional patterns of adoption, both by consumers, where even economically disadvantaged families find ways to make use of mobile technology, and in schools, where the tide of opinion has dramatically shifted when it comes to mobiles in schools.[5]

Rather than confining education to the classroom or to a computer, schools are developing student resources that are optimized for mobile devices.[6] Arguably one of the most promising components related to optimizing mobile learning is the use of mobile applications (apps). Recent development surges have yielded a host of applications that can be used by students, including an app that maps deep space, an app that allows an in-depth look at chemical compositional structures, and a host of productivity apps.[7] A report

[4] Johnson, L., et al., Op. cit.
[5] Ibid, p. 16.
[6] Ibid.
[7] Ibid.

entitled "iLearn II: An Analysis of the Education Category of Apple's App Store" notes that in 2012, over 80 percent of Apple's top selling education apps targeted children, and nearly 72 percent of those apps targeted preschool or elementary aged children.[8] Targeted efforts to increase the ubiquity of educational mobile device apps simultaneously create the opportunity for K-12 educators to incorporate them into classroom instruction.

Mobile technologies have also attracted the attention of high profile educational publishers, such as Pearson. E-books, e-magazines, and interactive textbooks have all been optimized for mobile platforms and devices, and can easily replace heavier traditional textbooks. Mobile devices also "naturally encourage exploration," due to progressively more intuitive features that allow children to interact with material using simple finger swipes and pinches, which eliminates the need for detailed instructions.[9]

BRING YOUR OWN DEVICE (BYOD)

Though many districts aim to achieve one-to-one computing ratios, this aim remains far from reality. Budget constraints are a factor in many K-12 districts, limiting the possibility of providing each student with a laptop or tablet for schoolwork. **One workaround that has begun to crop up is the Bring-Your-Own-Device (BYOD) policy**, under which students are encouraged to bring their own mobile devices to the classroom, and teachers incorporate mobile technology in their classroom instruction.

The typical district IT budget may not be able to support one-to-one technology initiatives entirely, but allowing students to bring their own devices subsidizes this cost, since most students have access to some form of mobile device for entertainment or communication purposes,[10] and "86 percent of students use technology more outside of school than they do in class." [11] However, the advantages to adopting BYOD policies are more than financial. BYOD policies allow educators and students to utilize the many educational applications designed for mobile devices, expanding instructional possibilities. Furthermore, BYOD policies encourage student participation, collaboration, and communication about educational content.[12]

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[8] Shuler, C. Levine, Z. and Ree, J. "iLearn II: An Analysis of the Education Category of Apple's App Store." Sesame Workshop, The Joan Ganz Cooney Center, January 2012, p. 26. http://www.joanganzcooneycenter.org/wp-content/uploads/2012/01/ilearnii.pdf

[9] Johnson, L., et al., Op. cit.

[10] Norris, C., and Soloway, E. "Tips for BYOD K12 Programs." Going Mobile, *District Administration*, July 2011. http://www.districtadministration.com/article/tips-byod-k12-programs

[11] "Bring Your Own Device: Preparing for the Influx of Mobile Computing Devices in Schools." Whitepaper, CDW-G, p. 1. http://webobjects.cdw.com/webobjects/media/pdf/Solutions/K12-BYOD.pdf

[12] Ibid, p. 2.

BYOD policies allow districts to take advantage of the fact that most of their students already own and know how to use mobile devices, but implementation of BYOD policies requires that districts plan ahead for the implications of such policies. One of the main preparations that schools must undertake is preparing the network for the influx of mobile devices that will be using the network. Security concerns are also important for districts to consider, including creating appropriate internal and external firewalls. Districts should also develop and implement a "responsible use" policy. Finally, districts must train the educators themselves on how to effectively incorporate instruction with mobile technology.[13] There are also logistical concerns to consider. For example:

- Will students be responsible for keeping their devices charged?
- How will the devices be secured when not in use, such as during tests or lunch time?
- How will the district address students who do not have a device or forget their device?[14]

Several large companies such as Cisco have become aware of the BYOD trend in K-12 education, and now offer support and integration services for districts that wish to implement BYOD policies but are unsure how to proceed. K-12 Blueprint also offers a collection of case studies, best practices, and district checklists for K-12 educators interested in BYOD programs.[15]

Fundamentally, however, mobile learning and BYOD policies are only useful as instructional tools when instruction itself changes. Designing instruction for mobile learning is fundamentally different from traditional instructional methods, and mobile learning instructional strategies should reflect this fact. Lenny Schad, the Chief Information Officer at Katy Independent School District in Katy, Texas, says **that mobile learning should not be made to fit within existing structures, but should rather be thought of as a holistic educational plan.**[16] Furthermore, Schad states that "mobile learning is all about changing instruction…because if the instruction doesn't change, allowing the kids to bring their own device will do nothing." [17] He acknowledges that introduction of mobile learning technologies and **allowing students to BYOD fundamentally alters the dynamic of the classroom: teachers are no longer the holders and transmitters of information because students are actively directing their own learning.** This requires teachers to adopt facilitator roles and to monitor students' progress.[18]

[13] Ibid.
[14] "Challenges of BYOD." K-12 Blueprint, p. 1. http://www.k12blueprint.com/sites/default/files/BYOD-Challenges.pdf
[15] "Bring Your Own Device Toolkit." K-12 Blueprint. http://www.k12blueprint.com/byod
[16] "How to Launch a Successful BYOD program." MindShift, September 5, 2012. http://blogs.kqed.org/mindshift/2012/09/how-to-launch-a-successful-byod-program/
[17] Ibid.
[18] Ibid.

EQUITY

Robertson of Discovery Education estimates that as districts address larger systematic problems of an inadequate technology infrastructure, many will adopt BYOD policies in the interim.[19] However, one issue inherent in a BYOD policy is inequity. Allowing students to bring their own mobile devices into the classroom can create disparity between students from different socioeconomic backgrounds. Tim Clark, a district instructional technology specialist with Forsyth County Schools in Georgia, argues that though it may seem like BYOD policies encourage device competition and envy, the reality is that students who can bring their own devices to school frees up school-provided resources for those students who cannot.[20]

LEARNING ANALYTICS

Another trend comes to K-12 education from data analysis techniques used by market research firms to target marketing efforts: learning analytics. "Big data" are transforming entertainment, business, even medicine—and **experts estimate that "big data" will begin to influence K-12 education as well.**[21] Every student interaction with a mobile device or piece of software is an opportunity to gather real-time data about that student that can then be used to create personalized learning experiences driven by that student's unique academic needs. This data can inform educators in important ways, such as the early identification of students with learning disabilities; how a student learns best, and by what means; what interests students and how to keep them actively engaged in learning; and how to create flexibility in educational software programs. Once the data are collected and aggregated, educators will know more about the entire body of students using these tools, and progressive improvements to software, programs, and ultimately learning will be made.[22]

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Learning analytics has captured the attention of venture capitalists and large-scale investors like the Bill and Melinda Gates Foundation and the Carnegie Corporation of New York. Partnerships between school districts and such corporations can create opportunities for districts to use students' learning data on a scale not possible without such support. The Gates Foundation alone has contributed nearly $70 million in grants to various school districts and companies that support learning analytics initiatives.[23]

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[19] Robertson, G., Op. cit.
[20] "Privacy, Equity, and Other BYOD Concerns." MindShift, KQED. http://blogs.kqed.org/mindshift/2012/09/privacy-equity-and-other-byod-concerns/
[21] "Personalized Learning, Big Data and Schools." Education Trends, Edutopia, November 15, 2013. http://www.edutopia.org/blog/personalized-learning-big-data-schools-matt-levinson
[22] Johnson, L., et al., Op. cit.
[23] Ibid.

Though learning analytics offers districts and educators nearly unprecedented opportunities for future growth, there are concerns about the kinds of data that can be collected and used by students. Since students are minors, questions about whether their data should be used at all have arisen, and issues surrounding the safety of students and the proper use of their identifying data continue to be vehemently debated.[24] Efforts to collect and use student data without identifying information are still being made, though significant progress is still needed.

OPEN CONTENT

Due in part to the proliferation and easy access of information in today's world, **open educational content is becoming more important in education. The focus has shifted from the use of expensive, proprietary, published information to free, easily accessible information shared online.** Prior to the advent of open content, educators were the sole distributors of information and insight; now, information is freely available, and education and learning have themselves become priorities.

Some educators express concern that their roles would eventually become obsolete, though others argue that only educators can provide the level of skills, experience, and insight necessary for true understanding. Regardless of how information is shared, education and understanding are the main goals. As such, new licensing standards protect the works of authors while sharing them across wider audiences. This has allowed educators and students to freely and openly collaborate with one another in ways that have until now been impossible.[25] As a result, "open content has achieved global recognition as an effective means of distributing high-quality, accessible educational materials to schools in both developed and developing countries."[26]

The movement toward provision and use of open content began in higher education with programs such as MIT's Open Courseware Initiative, though recently these efforts have trickled into the K-12 education space. "Open" textbooks are now available, and have forced educational content providers to adapt their products to fit within this new paradigm. These and other innovations—such as Apple's iTunes U, which allows educators to create and share their own courses online—have revolutionized the concept of open content courses.[27]

One decided advantage of open content over traditional methods of information sharing (e.g., textbooks) is that open content can be modified and updated as new information and insights are gained. Textbook adoptions cost districts a great deal of money, and additional resources are often needed to supplement even the most recently published textbooks. Open content textbooks, on the other hand, cost districts much less and can be used and

[24] Ibid.
[25] Ibid.
[26] Ibid.
[27] Ibid.

adapted to fit a school or classroom's unique needs, freeing up resources that can be used elsewhere.[28]

3D PRINTING

What was once impossible is now a pervasive reality in some fields: 3D printing. 3D is currently used in several fields, including architecture, engineering, and industrial design, and due to its increasing affordability, **adoption of 3D printing technologies by K-12 educators is predicted within the next three to five years.** The possible uses for 3D printers in education are many, and provide opportunities for hands-on learning.[29]

Educators may find 3D printing capabilities useful in STEM disciplines. In an engineering class, students might build and print a model of a bridge or building; in chemistry, a 3D model students might help students understand how molecules bond. The applications for 3D printing in K-12 education are limited only by imagination and what is currently a moderate price-tag, starting at about $1300.[30]

VIRTUAL AND REMOTE LABORATORIES

One of the challenges that K-12 districts sometimes face is restricted funding for science laboratory materials. **Recent technological advances have made virtual and remote laboratories available to students and educators.** Virtual laboratories offer students opportunities to perform experiments online using simulated equipment and procedures, while remote laboratories offer students remote access via webcams and remote controls to real, physical laboratory equipment and experiments.[31]

Virtual and remote laboratories offer K-12 educators the opportunity to allocate limited funds elsewhere.

Virtual and remote laboratories offer K-12 educators the opportunity to allocate limited funds elsewhere. The flexibility in most virtual laboratories also offers students the ability to perform multiple experiments from virtually any location (e.g., home, class), without the pressure of performing the experiment perfectly the first time. If students do not achieve the expected results on the first pass, virtual labs allow students to modify aspects of their experimentation and gauge the results. Remote laboratories offer the same flexibility, but are slightly more controlled (e.g., only one student or group of students is allowed access at one time).[32]

Wide adoption of these virtual and remote laboratory technologies by K-12 educators is estimated within the next four or five years, though some districts currently already take

[28] Ibid.
[29] Ibid.
[30] "3D Printers." Newegg. http://www.newegg.com/3D-Printers/SubCategory/ID-3266?Tid=22377
[31] Johnson, L., et al., Op. cit.
[32] Ibid.

advantage of them. In addition to saving districts money on expensive lab equipment, using virtual and remote laboratories will become an important component in enhancing STEM education.[33]

PERSONALIZED LEARNING ENVIRONMENTS

Current technologies and educational practices cannot sustain the demand for personalized learning environments,[34] yet despite this fact, **demand for the development of personalized learning environments continues to increase.** There are several ways to facilitate personalized learning environments.

ADAPTIVE LEARNING

Adaptive learning is one personalized learning environment trend in K-12 education that is rapidly gaining momentum. Adaptive learning refers to the adjustment of the learner experience based on that individual student's progress.[35] Adaptive learning technologies have captured the attention of higher education,[36] and further study of its benefits in this setting have spurred grants provided by the Bill & Melinda Gates Foundation totaling more than $9 million.[37] Benefits associated with adaptive learning are many, including provision of formative evaluation opportunities, effective feedback mechanisms, emphasis on mastery-based learning, and concept mapping.[38]

"Adaptations" of student learning uses data that can be derived any of several different indicators. For example, some programs monitor how well students perform on after-unit assessments. Others take into account how long it takes students to complete questions and records whether a student needs "hints" to answer questions. This information is then accommodated to adjust that student's subsequent learning experience.[39]

One of the most promising adaptive learning programs under development is the product of a partnership between Houghton Mifflin Harcourt (HMH) and adaptive learning company Knewton called the *Personal Math Trainer Powered by Knewton.* This program

[33] Ibid.
[34] Ibid, p. 10.
[35] Riddell, R. "Adaptive Learning: The Best Approaches We've Seen So Far." Education Dive, October 31, 2013. http://www.educationdive.com/news/adaptive-learning-the-best-approaches-weve-seen-so-far/187875/
[36] Fain, P. "Intel on Adaptive Learning." *Inside Higher Ed*, April 4, 2013. http://www.insidehighered.com/news/2013/04/04/gates-foundation-helps-colleges-keep-tabs-adaptive-learning-technology
[37] "Gates Foundation Announces $9 Million in Grants to Support Breakthrough Learning Models in Postsecondary Education." Press Release, Bill and Melinda Gates Foundation. http://www.gatesfoundation.org/media-center/press-releases/2012/06/gates-foundation-announces-grants-to-support-learning-models
[38] Rajan, R. "Adaptive Learning Market Acceleration Program RFP Q& A Webinar." Session for Institutions, Bill & Melinda Gates Foundation, March 29, 2013, p. 4. http://www.gatesfoundation.org/~/media/GFO/Documents/How%20We%20Work/Adaptive%20Learning%20RFP%20Webinar%20Presentation.pdf
[39] "Adaptive Learning: Overview." EdSurge. https://www.edsurge.com/adaptive-learning

> …will analyze—down to the concept level—each student's interactions with HMH content to determine personal strengths, weaknesses, preferences and pace, and provide personalized trajectories for every student to ensure the most efficient path to achieving learning goals. The more each student uses the product, the more it learns about them and the "smarter" it becomes, using the combined data power of every student to help find the perfect strategy for each student for each concept. The system will provide educators with real-time insights into their students' individual needs, challenges, and learning styles.[40]

Other adaptive learning programs are currently available, although fewer programs designed for K-12 students exist than programs for students in higher education. A recent article in Education Dive evaluates the top ten most effective programs that are currently on the market.[41]

Blended Learning

Blended learning environments typically combine aspects of face-to-face instruction with online and digital instruction.[42] **In blended learning environments, students receive instruction that does not occur exclusively within the walls of a classroom.** Teachers, do not serve as "directors of instruction," but rather as "facilitator[s] or activator[s] of learning who [are] responsible for engaging each student in a personalized sequence of instruction that aligns with the student's skill level, stimulates the student's interest, and pushes the student to progress to the next level."[43]

Ideally, such varied modes and vehicles of instruction should enhance student engagement with the material, though several challenges arise with the use of blended learning techniques. One challenge is the integration of technology within lesson plans. Some schools adopt new technologies, but lack a clear vision of the basics of implementation and content integration. Another challenge newly-adopted blended learning classrooms face is alignment with state-mandated standards such as the Common Core State Standards. There may be a mismatch between state-mandated standards and the materials and techniques used in blended learning.[44]

Individualized College and Career Readiness Plans

Another type of personalized learning environment consists of creating for students individualized learning "pathways" to college and career readiness. Teachers, parents, school counselors and students collaborate to create these personalized pathways,

[40] "Houghton Mifflin Harcourt and Kewton Announce Pioneering Partnership to Deliver Adaptive Learning Solutions to K-12 Students." Knewton, June 6, 2013. http://www.knewton.com/about/press/houghton-mifflin-harcourt-and-knewton-announce-pioneering-partnership/
[41] Riddell, R., Op. cit.
[42] "Are Personalized Learning Environments the Next Wave of K-12 Education Reform?" Education Issue Paper Series, American Institutes for Research, August 2013, p. 3. http://www.air.org/files/AIR_Personalized_Learning_Issue_Paper_2013.pdf
[43] Ibid, p. 3.
[44] Ibid.

beginning as early as elementary school. This strategy ideally keeps students focused and on track to achieve their goals, and may also serve to engender a student's sense of autonomy and ownership over their own learning and educational opportunities.[45]

School districts can facilitate individualized college and career plans by in several ways. Some district offer dual enrollment courses in which a student participates in coursework beyond the high school level and earns college-level credits. Specialized curricula designed to educate students about college readiness exams, the college application and preparation processes are also offered. Many districts opt to provide more STEM focused coursework, and the St. Vrain Valley School District offer an intensive four year curriculum that culminates in a STEM certificate and guaranteed admission to the College of Applied Engineering and Science at the University of Colorado, Boulder. Districts also offer extended learning opportunities for students, including job shadowing, internships, and other opportunities to directly apply knowledge to practice. Project based learning and "career cluster models"—students grouped together by common career interests—are also used. In these ways, students receive individualized education that is not one-size-fits all, but rather tailored to their individual interests and future goals.[46]

As with blended learning, individualized plans such as these pose distinct challenges for districts looking to adopt them. For example, to be successful, the programs require students to understand, identify, and plan for college or careers at an early developmental stage. This could result in undue pressure on students to maintain a previously-decided pathway, and may limit a student's future opportunities in other areas.[47]

Competency-Based Models

Another personalized learning model is the competency-based model. In traditional educational models, students must log "seat time" in order to pass a course. This method does not guarantee content competency, and frustrates both students who have fallen behind as well as students who need more challenging material. Sitting through the required hours for a course is not sufficient cause to determine mastery, **so some districts are devising new and innovative ways to assess content mastery.[48]**

Some school districts have chosen to operationalize the use of competency-based models by offering accelerated and extended learning opportunities. In conjunction with "seat time waivers" that free students from traditional course requirements, some school districts allow students who demonstrate mastery and graduate in three years or less to use their senior year per-student allocation to defray college tuition costs. Other districts allow their students to demonstrate mastery of core subjects in multiple ways, including standardized tests, presentations, work experiences, or testing out of required coursework.[49]

[45] Ibid.
[46] Ibid.
[47] Ibid, pp. 6-9.
[48] Ibid, pp. 10-12.
[49] Ibid, pp. 10-12.

There are some potential disadvantages to these strategies. For example, if a student tests out of coursework and graduates high school early, there might be social and emotional consequences when that student arrives in a more traditional higher education classroom setting. Another concern is whether there is actual value to be derived from "seat time," and whether a student appreciates the depth and breadth of understanding of a subject, despite meeting mastery requirements.[50]

SOCIAL LEARNING NETWORKS

Though many school districts are aware of the influence and possible danger of social media giants like Facebook and Google+ in classrooms, **social learning networks (SLNs) are being utilized in some districts as a means by which students can learn 21st century skills in a controlled environment.**[51] SLNs allow students to use online networking to create online portfolios and resumes or to connect with peers for project-based learning opportunities. [52] Though SLNs have been available to K-12 educators for several years, new advances in SLN platforms such as Edmodo and Nimbus are making widespread adoption of such technology a reality. Some estimate that if social learning networks continue to grow in popularity, their use will be poised to significantly reduce the achievement gap.

- **Edmodo:** Edmodo is a free, customizable online tool that provides students with the tools to collaborate with one another about classroom content. Edmodo affords teachers a high level of control: teachers can monitor student discussion, assign and grade assignments, post files to for groups to view, create quizzes, and can comment on student work. Students can earn "badges," which can incentivize student achievement. Edmodo is available as a computer-based platform, but can also be used on iPhones and Androids via user-friendly apps.[53] Currently, Edmodo has over 17 million users.[54]
- **Nimbus:** Nimbus, a product offered by Schoolwires, offers an instructional community in which teachers, parents, and students can collaborate and build critical thinking and problem solving skills while fostering creativity and innovation. Nimbus emphasizes that its online community is secure and safe, which it achieves with built-in profanity filters, user activity logs, and strict role-based permission controls.[55] Teachers can use Nimbus to supplement their instruction with tools that support project-based learning, but they can also use it to create teacher learning

[50] Ibid, pp. 10-12.
[51] Sohn, T. "Schoolwires Launches Social Learning Platform for Grades K-12." Social Networking News, *THE Journal*, November 15, 2011. http://thejournal.com/articles/2011/11/15/nimbus-launches-social-learning-platform-for-grades-k12.aspx
[52] Williams, C. "Social Learning Networks for K12 Education." *District Administration*, April 2012. http://districtadministration.com/article/social-learning-networks-k12-education
[53] Ibid.
[54] Rubin, C. M. "The Global Search for Education: Social Learning." Impact, *Huffington Post*, November 15, 2013. http://www.huffingtonpost.com/c-m-rubin/the-global-search-for-edu_61_b_2729435.html
[55] "Features & Benefits: Nimbus." Schoolwires. http://www.schoolwires.com/domain/32

communities wherein they can discuss best practices and strategies to enhance student learning.[56]

Social learning networks are not without their critics, however. Perhaps the biggest concern to districts is the question of affordability: not all classrooms can afford to equip every student with a laptop or mobile device on which to digitally connect with social learning networks. However, because most students do have access to some kind of mobile device, many districts have begun to adopt "bring your own device" (BYOD) policies, allowing students to bring their own devices to school. Another concern for some is that teachers and students will spend too much time online, though SLNs are not designed to be mutually exclusive with offline education.[57]

DIGITAL TEXTBOOKS

There are many disadvantages to paper textbooks. Textbook content can quickly become outdated or obsolete, they can be easily damaged, and they are expensive. Conservative estimates place the per-student cost of paper textbooks at approximately $3,871 annually,[58] and typical paper textbooks costs approximately $100 apiece. **Digital textbooks, however, offer an alternative to traditional textbooks that can be continually updated, cost far less, and can even embed additional content such as videos or interactive diagrams.[59]**

Advances in mobile technologies have made digital textbooks a mainstay in higher education markets. However, they have been slow to infiltrate the K-12 education market, though the financial and educational benefits of digital learning materials will eventually outweigh the outdated paper textbook dependence in K-12 education, and **gradual adoption of digital textbooks is expected**.[60] Districts have also been encouraged to quickly adopt digital and e-textbook materials by the United States Secretary of Education, Arne Duncan.[61]

Districts may opt to create a collection of curated digital sources that students use in place of a textbook.

A related option available to K-12 educators is that of a curated digital textbook. Rather than adopting digital textbooks from big publishing houses, districts may opt to create a collection of curated digital sources that students use in place of a textbook. Similar to a song playlist, educators within a district can create their own instructional material for

[56] "FAQs About Schoolwires Nimbus." Nimbus, Schoolwires, p. 1. http://www.schoolwires.com/cms/lib3/SW00000001/Centricity/Domain/32/Nimbus_FAQs.pdf
[57] Rubin, C. M., Op. cit.
[58] "Leaders Discuss Transition to Digital Textbooks." LEAD Commission, 2012. http://www.leadcommission.org/news/leaders-discuss-transition-digital-textbooks
[59] Rapp, D. "The End of Textbooks?" *Scholastic Administrator Magazine*, November-December, 2008. http://www.scholastic.com/browse/article.jsp?id=3750551
[60] Ibid.
[61] Davis, M. R. "Big Three Publishers Rethink K-12 Strategies." Digital Directions, *Education Week*, February 6, 2013. http://www.edweek.org/dd/articles/2013/02/06/02textbooks.h06.html

students for free.[62] Teachers can curate digital learning material from many different sources, and can provide students with a variety of perspectives on a given subject.

In 2012, the Federal Communications Commission and the United States Department of Education released the "Digital Textbook Playbook," a set of guidelines that educators can use to create compelling, informative material to form their own digital "textbooks". It also provides resources for districts to use when adopting a more digital learning environment, such as determining required bandwidth support, securing students' data, device selection, and creating online support communities.[63]

The "Digital Textbook Playbook" asserts that the adoption of digital learning material is beneficial for students in many ways. Modern students are considered "digital natives," and as such require more interactive, digital modes of instruction. Digital textbooks increase student engagement, create more personalized classroom experiences, reduce costs, contain updated content, and have been shown to increase student achievement by reducing the time it takes for student learning by up to 80 percent.[64]

FLIPPED CLASSROOMS

Though not a new idea, the use of flipped classrooms is gaining rapid popularity, particularly in middle schools, high schools, and math classrooms.[65] A flipped classroom "refers to a model of learning that rearranges how time is spent both in and out of class to shift the ownership of learning from the educators to the students."[66] Typically, students come to class having watched video lectures, listened to podcasts, collaborating with peers on project-based learning objectives, or other forms of remote instruction. Then, when students arrive in class, they actively collaboratively participate in working on problems or challenges that are designed to deepen their understanding of the content.[67] Students benefit from flipped classrooms in many ways, including increased engagement, the ability to learn at their own pace, and more meaningful homework.[68]

In the flipped classroom, the teacher becomes an instructional guide, rather than a dispenser of information. Teachers can also use valuable class time to answer questions or provide further instruction on difficult topics. This gives many teachers the valuable time that is necessary to deliver differentiated instruction.[69] The flipped classroom model

[62] Ibid.
[63] "Digital Textbook Playbook." The Digital Textbook Collaborative, February 1, 2012. http://transition.fcc.gov/files/Digital_Textbook_Playbook.pdf
[64] Ibid, pp. 9-12.
[65] Finkel, E. "Flipping the Script in K12." *District Administration*, November 2012. http://www.districtadministration.com/article/flipping-script-k12
[66] "Flipped Classroom: What Is the Flipped Classroom?" NMC Horizon Report 2013 K12 Edition Wiki, New Media Consortium, 2013. http://k12.wiki.nmc.org/Flipped+Classroom
[67] Ibid.
[68] Goodwin, B. and Miller, K. "Research Says / Evidence on Flipped Classrooms Is Still Coming In." *Educational Leadership*, 70:6, March 2013, pp. 78-80. http://www.ascd.org/publications/educational-leadership/mar13/vol70/num06/Evidence-on-Flipped-Classrooms-Is-Still-Coming-In.aspx
[69] Finkel, E., Op. cit.

provides teachers the flexibility to adapt instructional strategies to suit individual students' learning needs.

One caveat to this method is that a flipped classroom typically requires the teacher to be relatively experienced in both pedagogy and the subject matter itself. Flipping classrooms can be chaotic, and most successful flipped classroom teachers have taught for at least seven years, on average, and use their considerable experience to troubleshoot inevitable issues that arise upon initial implementation of a flipped classroom. Flipping a classroom can result in as much as two addition weeks of content coverage over traditional methods of instruction, which makes the flipped classroom an attractive option for some districts.[70]

Some critics of this method of teaching cite the potential challenges for low-income students, such as limited access to the internet outside of school. Districts implementing flipped classrooms have, on the whole, addressed equity concerns by making accommodations for those students (e.g., by providing those students with flash drives or DVDs that require no internet connection, allowing students to watch necessary videos before or after class, etc.). Perhaps surprisingly, most students—regardless of socioeconomic status—have access to smartphones, which allows teachers more flexibility to accommodate those students.[71]

To date, there is little published research to provide evidentiary support for flipped classrooms. Preliminary data that are available show that flipping classrooms can benefit student achievement. One survey indicated that 67 percent of teachers who flipped their classrooms saw increased test scores, particularly with special needs students. Eighty percent of those teachers also reported that their students' attitudes toward that subject improved as a result of the flipped classroom. Finally, in perhaps the largest possible endorsement of the flipped classroom methodology, 99 percent of teachers said that they would flip their classrooms again the following year.[72]

In the flipped classroom, the teacher becomes an instructional guide, rather than a mere dispenser of information, which provides teachers the flexibility to adapt instructional strategies to suit individual students' learning needs.

The ASCD (formerly the Association for Supervision and Curriculum Development) emphasizes that the dearth of currently available research should not dissuade districts from trying to flip classrooms.[73] In fact, a recent report entitled "A Review of Flipped

[70] Ibid.
[71] Ibid.
[72] Goodwin, B., and Miller, K," Op. cit.
[73] Ibid.

Learning" indicates that there are four requirements that form the foundation for successfully flipped classrooms. Flipped classrooms require:[74]

- **Flexible environments:** Traditional rigid classroom environments are not conducive to learning, and flipped classroom learning often requires students to work collaboratively in groups. In the most flexible environments, "students choose when and where they learn,"[75] and educators accept this fact.
- **A shift in learning culture:** Traditional instructional models relegate teachers to the sole holders of knowledge, but flipped classroom models are built around the notion that students—not teachers—direct learning. Ideally, "flipped educators help students explore topics in greater depth using student-centered pedagogies aimed at their readiness level or zone of proximal development."[76]
- **Intentional content:** In the flipped classroom, teachers must be actively involved in selecting content and mode of instructional delivery. For example, some concepts are best learned by video demonstration or lecture, while others lend themselves more to Socratic methods or collaborative exploration. The teacher becomes the curator of the instructional content, and must be flexible enough to adjust from ineffective instructional methods.[77]
- **Professional educators:** Flipped classrooms require experienced teachers to operate effectively. Contrary to what some critics believe to be an inevitable consequence of flipping classrooms—that educators will become obsolete—the role of a flipped classroom teacher is "more important than ever, and often more demanding, than a traditional one." [78] Flipped classroom teachers must maximize the learning opportunities presented by the materials, and must constantly observe students to guide their learning effectively.

E-PORTFOLIOS

E-portfolios, or electronic portfolios, are "collections of text, electronic files, blog entries, hyperlinks, multimedia, and images that demonstrate learning outcomes, skills, and competencies."[79] In other words, e-portfolios represent a "continuum of work."[80] E-portfolios are designed to allow students the opportunity to create an alternate form of assessment that combines formative with summative assessments, and reflects students' selves as learners. Ideally, e-portfolios should be used in conjunction with other forms of assessment. Furthermore, e-portfolios should be highly individual and student-centered,

[74] Hamdan, N., McKnight, P., McKnight, K., and Arfstrom, K. M. "A Review of Flipped Learning." Flipped Learning Network, Pearson, and George Mason University collaborative publication, pp. 5-6. http://www.flippedlearning.org/cms/lib07/VA01923112/Centricity/Domain/41/LitReview_FlippedLearning.pdf
[75] Ibid, p. 5.
[76] Ibid.
[77] Ibid.
[78] Ibid.
[79] McCrea, B. "A Balanced Approach to E-Portfolios." *THE Journal*, October 24, 2012. http://thejournal.com/articles/2012/10/24/a-balanced-approach-to-eportfolios.aspx
[80] Donston-Miller, D. "7 Ways to Create E-Portfolios." *Information Week*, July 9, 2013. http://www.informationweek.com/software/7-ways-to-create-e-portfolios/d/d-id/1110673?

and students should take ownership of their own learning to create a longitudinal portrait of their own strengths, weaknesses, achievements, and ideas over time.[81]

The uses of e-portfolios can vary, depending on the content students and educators wish to emphasize. Some educators prefer chronological records of student learning, while others find that thematic organization is the best form in which students can illustrate their learning. One central theme that should be common to all e-portfolio formats, however, is student reflection. E-portfolios aim to provide a method by which can derive deeper meaning from instructional content by encouraging students to reflect on what they have learned in creative, illustrative ways. Experts agree that to be most effective, e-portfolios should never be relegated to "busy work."[82]

E-portfolios are designed to allow students the opportunity to create an alternative assessment that combines formative with summative assessments, and reflects students' selves as learners.

AUGMENTED REALITY

Augmented reality describes a process by which relevant information is superimposed or layered on top of what a user perceives as reality. Recent smartphone applications allow users to superimpose additional information—or augment—on to what a user perceives as reality (typically through a smartphone camera lens). Though it may sound complicated, achieving augmented reality is relatively simple; all that is required is a way to perceive reality (e.g., a camera phone), integration application or software, and an internet connection. However, augmented reality is still somewhat new in the K-12 education space. Many educators interpret augmented reality as being tangential to real education efforts, because applications for real classroom still seem distant and theoretical.[83] Despite this fact, several augmented reality applications are being used in innovative ways in K-12 education, and as the technology becomes more prolific, many more applications and programs are expected. However, the effectiveness of augmented reality within K-12 classroom contexts takes time to ascertain, meaning that widespread adoption of augmented reality applications may still be several years away.[84]

One such innovation is the Getty Museum's augmented reality, which can be used for in-depth exploration of 3D versions of exhibits through the use of a computer's webcam. This application reads a virtual PDF code from a piece of paper held up to the computer's webcam, and movement of the paper will move the virtual exhibit model on the screen.[85]

[81] McCrea, B., Op. cit.
[82] Ibid.
[83] Demski, J. "Augmented Reality is Going Mobile—and Coming to a Classroom Near You." *THE Journal*, Digital Edition, April 2013. http://thejournal.com/articles/2013/04/23/augmented-reality-is-going-mobile-and-coming-to-a-classroom-near-you.aspx
[84] Ibid.
[85] Byrne, R. "5 Uses of Augmented Reality in Education." Free Technology for Teachers, February 3, 2013. http://www.freetech4teachers.com/2013/02/5-uses-of-augmented-reality-in-education.html#.Uoo6I_mkpik

Free augmented reality applications such as Aurasma[86] allow students to overlap statics content with videos that are activated when scanned with the camera of an iPad or tablet.[87] GeoGoogle allows students to interact virtually with their surroundings to learn the fundamentals of geography, including longitude, latitude, and directionality.[88]

Supporters of augmented reality in K-12 classrooms argue that these applications are capable of increasing the amount of contextualized information a student processes in everyday situations. For example, augmented reality would allow "students to see an ecosystem through the eyes of a scientist, a mall through the eyes of an economist, or a cemetery through the eyes of an historian….it provides an educational way of interpreting reality without having to rely on a skilled person to be physically present to provide that structure and knowledge."[89]

Should educators wish to adopt augmented reality in their districts and classrooms, they should consider the items on the following checklist: [90]

- Schools should adapt filters and policies to control student-accessible content via the displays;
- Content creation tools should be user-friendly and efficient, otherwise teachers will not adopt them; and
- Educators must set parameters for their own use of the displays.

CLASSROOM GAMIFICATION

The gamification—or the process of utilizing games for educational purposes—of classrooms is still controversial, though several high-profile research studies have touted the benefits of the gamification of classrooms.[91] One of the core principles underlying the use of this strategy is that games are naturally engaging for children. **Students often find challenging or "dry" subjects like math to be boring, so educators have found ways to engage their students in those subjects by using games.**

Classroom gamification does not have to be of the digital variety to be beneficial for students. Play-based learning—whether it occurs digitally or offline—has been shown to benefit cognitive development and increase students' attention spans.[92] John Hunter—a

[86] Aurasma. http://www.aurasma.com/#/whats-your-aura
[87] "Using Augmented Reality in the Classroom." Technology Tailgate Blog, November 16, 2013. http://www.technologytailgate.com/2013/11/using-augmented-reality-in-classroom.html?m=1&spref=tw
[88] Bhaskar, S. K. "Few Amazing Augmented Reality (AR) Apps for Education." *EdTech Review,* August 2013. http://edtechreview.in/news/news/products-apps-tools/492-amazing-augmented-reality-apps-for-education
[89] Demski, J., Op. cit.
[90] Bullets adapted from Gittlen, S. "Will Google Glass Usher Augmented Reality into the Classroom?" *EdTech Magazine*, October 21, 2013. http://www.edtechmagazine.com/k12/article/2013/10/will-google-glass-usher-augmented-reality-classroom
[91] Walsh, K. "8 Research Findings Supporting the Benefits of Gamification in Education." *Emerging Ed Tech*, December 5, 2012. http://www.emergingedtech.com/2012/12/8-research-findings-supporting-the-benefits-of-gamification-in-education/
[92] Ibid.

veteran teacher and innovator—created a board game for the classroom called the "World Peace Game." The success of the game in classrooms around the world has garnered an incredible amount of attention because it requires students to collaborate to solve the "problems of the world." A YouTube video of students playing the World Peace game shows them negotiating with one another to solve global issues such as water rights, international conflict, and other political science issues within the context of the game. Students get to solve real-world problems in a safe yet challenging environment, and must utilize strategic thinking skills to resolve the problems presented in the game.[93]

A benefit of integrating content knowledge into a game format is that it tends to alter students' attitudes toward that subject area. For example, one study conducted at Deakin University found that students' positive attitudes and confidence in math rose as a result of playing mathematically-themed games.[94]

Classroom gamification—and the benefits derived from it—can be extended to include game *creation.* Students who take on the task of creating their own video game use "prior knowledge, create links between scenes, and take control of their learning through trial and error…[and] must use logic, survival skills, and generate new ideas and solutions in order to complete the game."[95] Scratch, a free program developed at MIT by Mitchel Resnick, encourages even young children (ages eight and up) to use coding to animate characters and create games.[96] Scratch also allows children to collaborate and share animations with other children to create longer, more elaborate animations. Resnick insists that learning to code is as important in today's digital world as learning to write, and continues to improve upon the Scratch platform, hoping to eventually create a similar program for children as young as four or five years of age.[97]

[93] "World Peace and Other 4th Grade Achievements: Extended Trailer." http://www.youtube.com/watch?v=lCq8V2EhYs0

[94] Bragg, L. "Children's Perspectives on Mathematics and Game Playing." Deakin University. http://www.merga.net.au/documents/RR_bragg.pdf

[95] Walsh, Op. cit.

[96] [1] "About Scratch." Scratch, Michigan Institute of Technology. http://scratch.mit.edu/about/ http://scratch.mit.edu/about/ [2] Barshay, J. "MIT Technology Trailblazer is a Critic of Computerized Learning." The Hechinger Report, July 23, 2013. http://hechingerreport.org/content/mit-technology-trailblazer-is-a-critic-of-computerized-learning_12697/

[97] Barshay, J., Op. cit.

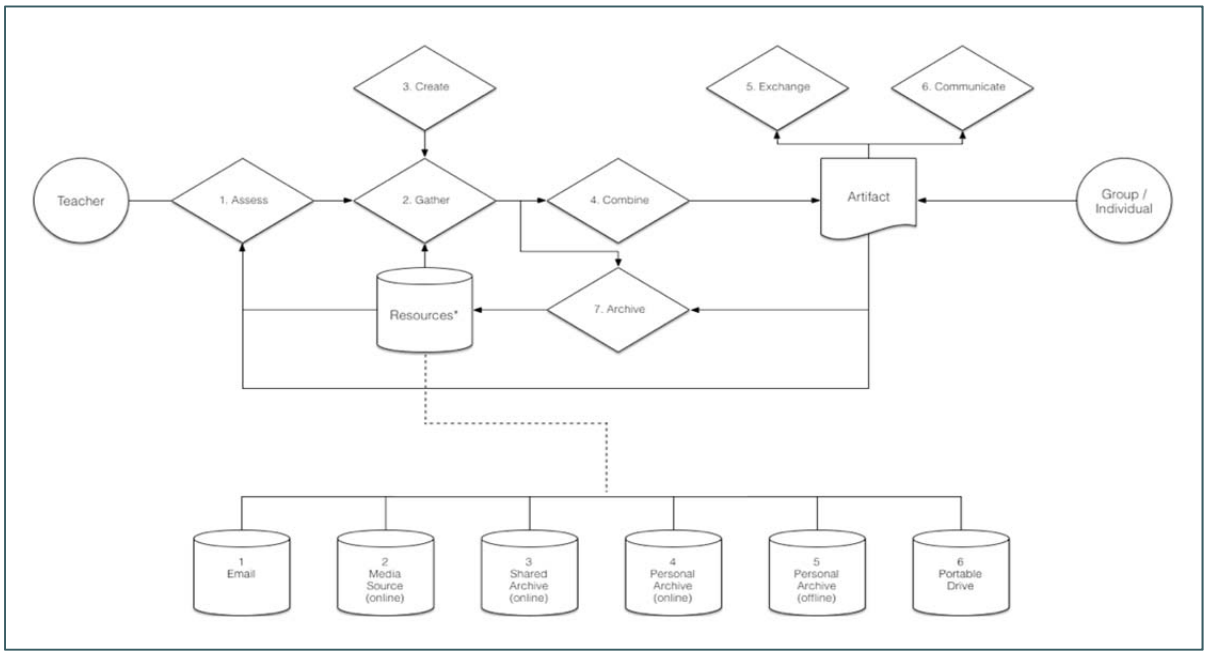
CHALLENGES

Each of the trends introduced in this section has its unique challenges, but several challenges are common to many.

ROLE OF THE TEACHER

Though the majority of the trends discussed in this report are technological in nature, **many are also depend upon teachers for successful implementation.** Robertson argues that the future of education lies in how teachers adopt and implement technology within the classroom. Teachers are the gatherers and providers of content, and the process by which they find and disseminate content information is fundamental to many of the educational trends discussed in this section. Robertson's framework (Figure 1.1)[98] describes the process teachers use to assess, gather, create, share, and exchange content with both students and other educators. The trends discussed below address different parts of this process. Figure 1.2 provides further detail describing these various stages of the process.

Figure 1.1: Robertson's Framework Describing Teachers' Acquisition and Dissemination of Classroom Content



Source: Geoffrey Robertson

[98] Author note: This framework assumes that the teacher has already established a connection mechanism with the recipient(s).

Figure 1.2: Description of Stages Used in Robertson's Framework

Stage	Description
1. Assess	The educator assesses recipient needs.
2. Gather	The educator gathers content relevant to the needs of the recipient.
3. Create	If the relevant content is unavailable, then the educator will create it.
4. Combine	The educator combines the gathered content into an artifact.
5. Exchange	Artifacts are exchanged between the educator and recipient.
6. Communicate	Communication occurs over the exchanged artifacts.
7. Archive	The educator archives gathered content, artifacts, or communications.

Source: Geoffrey Robertson

Technology might assist teachers at any of these stages. For example, learning analytics might help teachers assess students' instructional needs; teachers may gather instructional content from open content sources; and personal learning networks may help teachers combine and exchange instructional strategies.

Infrastructure

One of the major challenges K-12 educators face when they adopt new technologies in the classroom is dealing with the limitations of inadequate internet infrastructure, such as low bandwidth (data transfer capacity) and low transfer speed. To be of use in the classroom, many of the tools discussed in this section require internet access, and many tools are optimized when students can interact online simultaneously. However, the current infrastructure ensures that few schools can support high-volume internet use because of low bandwidth, and future technological innovations will likely require even more bandwidth to operate effectively.

Many experts recommend that K-12 districts use high-speed broadband in their schools. A recent survey conducted by the Federal Communications Commission found that of the schools with access to broadband services, nearly 80 percent believed it to be inadequate to meet their schools' current needs.[99] Unfortunately, at the cost of additional tens of thousands of dollars annually,[100] adequate broadband is priced out of reach for many. Figure 1.3 displays the minimum bandwidth recommended by the State Educational Technology Directors Association (SETDA).

[99] Fox, C., Waters, J., Fletcher, G., & Levin, D. "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs." State Educational Technology Directors Association (SETDA), 2012. http://www.setda.org/c/document_library/get_file?folderId=353&name=DLFE-1515.pdf

[100] King, J. "FASTER Arkansas: Beebe Gathers Education, Tech Leaders to Evaluate K-12 Internet Needs." *Arkansas Business Magazine*, July 29, 2013. http://www.arkansasbusiness.com/article/93732/faster-arkansas-beebe-gathers-education-tech-leaders-to-evaluate-k-12-internet-needs?page=all

Figure 1.3: SETDA Recommendations for K-12 Broadband Infrastructure Needs

Access for Teaching, Learning, & School Operations	2014-2015 School Year Target	2017-2018 School Year Target
An external Internet connection to the Internet Service Provider (ISP)	Minimum of 100 Mbps per 1,000 students/staff	Minimum of 1 Gbps per 1,000 students/ staff
Internal wide area network (WAN) connections from the district to each school and among schools within the district	Minimum of 1 Gbps per 1,000 students/staff	Minimum 10 Gbps per 1,000 students/staff

Source: SETDA[101]

[101] Table adapted from Fox, C., Waters, J., Fletcher, G., & Levin, D. "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs." State Educational Technology Directors Association (SETDA), 2012, p. 3. http://www.setda.org/c/document_library/get_file?folderId=353&name=DLFE-1515.pdf

SECTION II: DISTRICT PROFILES

This section profiles two school districts—Vail School District and Oak Hills Local School District—that have adopted and successfully implemented several of the trends discussed in Section I.

VAIL SCHOOL DISTRICT: VAIL, ARIZONA

The Vail School District (VSD) in Tucson County, Arizona, has grown to serve nearly 10,000 K-12 students in the past ten years. In order to ensure that their students thrive in the larger global community, VSD "strives to ensure that students are given the technology tools and skills they need to be successful in the larger global community."[102]

TEXTBOOK FREE

In 2005, with the opening of Empire High School, district officials decided to implement a one-to-one laptop policy, making Empire High one of the nation's first schools to adopt such an initiative. To fund the laptops, the district decided that the $500 per student typically spent on textbooks would be allocated to buy laptops instead. The new school was built with the necessary network wiring and hardware, and giving each student a laptop eliminated the need for computer labs. Also critical to the one-to-one initiative was teacher adoption: the district hired teachers that were highly motivated to use these kinds of technology. Though VSD has successfully implemented a one-to-one initiative and the district believes that it is encouraging students' development by using technology, the district emphasizes that adopting such policies is not a panacea, and warns that other districts should not expect miracles.[103]

OPEN CONTENT

After successfully implementing the one-to-one laptop initiative, VSD needed a way to provide students with content that aligned to the state standards. Rather than attempting to fit the curriculum into the standards, VSD began with the standards and created content around them, in what they call an "inverted curriculum."[104] However, VSD soon realized that "no vendor can provide it all…[we] want…the best bits and pieces from multiple sources that most closely match our instructional goals."[105] As a result, VSD created the digital curriculum system called "Beyond Textbooks." This system allows educators to create their own content that aligns with standards, saving the district money. The district agreed to pay for digital resources from places such as Discovery Education Streaming and BrainPOP, but only after they had been identified as useful by teachers. Educators can connect online by

[102] "Digital Content Case Study: Vail School District, AZ." K-12 Blueprint, p. 1. http://www.k12blueprint.com/sites/default/files/Case-Study-Vail-SD.pdf
[103] Robbins, T. "Textbook Free: Checking in at Laptop High." National Public Radio (NPR), May 31, 2007. http://www.npr.org/templates/story/story.php?storyId=10588659
[104] "Digital Content Case Study: Vail School District, AZ," Op. cit.
[105] Ibid.

joining the "Beyond Textbooks" group and can find professional development opportunities, a way to connect with fellow teachers, and ways to save time and money.[106]

ONLINE & BLENDED LEARNING

In 2011, VSD decided to undertake the design and construction of its own online instruction program, Education2020. One of the main goals was to enhance student engagement with content. The Vail Blended Learning Center (VBLC) serves 60 students in grades 6-8 with a combination of online and in-class instruction, and a separate distance education program—the Vail Digital Learning Program (VDLP)—is fully virtual. The VDLP serves approximately 85 students. As a result of implementing these programs, administrators have seen an increase in students' completion of classes and graduation, in addition to a greater percentage of students who take courses to graduate early or to advance academically.[107]

OAK HILLS LOCAL SCHOOL DISTRICT: CINCINNATI, OHIO

BYOD

The Oak Hills Local School District in Cincinnati, Ohio has adopted several of the trends discussed in Section I of this report. One of the biggest initiatives supported at Oak Hills is that it encourages students to BYOD. The Oak Hills website states that as a district, it is "committed to providing 'Anywhere, Anytime, Any Device Access' to support students and staff."[108]

The BYOD technology policy began with engagement of the community of stakeholders, including parents, students, and other community members. After their vision for incorporating technology into district education initiatives has been identified, Oak Hills decided to implement the BYOD policy because they believe that "using technology in the classroom will help to prepare… high school students for work in the 21st century world."[109] Furthermore, Oak Hills believes that "the tremendous value of technology and the information technology network as an educational resource far outweighs the potential risks."[110]

Despite this position, there are still significant potential risks associated with a district-wide BYOD policy. To address safety and privacy concerns, the district implemented a "Personal Device Passport" form that each student must complete before being allowed to bring their own device into a classroom. The Personal Device Passport includes a "student friendly" acceptable use policy, a set of hypothetical questions based on that policy to check for

[106] "BeyondTexbooks Common Core Ready." BeyondTextbooks. http://beyondtextbooks.org/common-core-transition-plan/
[107] "Digital Content Case Study: Vail School District, AZ," Op. cit.
[108] Ibid.
[109] "BYOD Case Study: Oak Hills Local School District." K-12 Blueprint, p. 1. http://www.k12blueprint.com/sites/default/files/Case-Study-OHLSD_0.pdf
[110] "Bring Your Own Device (BYOD)." Powerpoint, Oak Hills School District, p. 9. https://docs.google.com/presentation/d/1W9kd87_uull2H-JYKL4dO4Zd_-BOyZmabK_rnJZUVis/present#slide=id.p

understanding, a written security plan, a parent signature form, and an electronic student sign off form.[111]

In addition to the BYOD policy, however, Oak Hills provides a host of other options for students and staff to connect through technology. Oak Hills also adopted a "virtual desktop" system that allows system access from any mobile or computing device students bring to school. The combination of these two systems has saved the district just over $1.27 million.[112] Oak Hills offers companion sites that "complement a teacher's brick and mortar classroom,"[113] offering information such as syllabi, schedules, open news forums, an FAQ page, important class links, and electronic copies of important classroom resources such as handouts and worksheets. Oak Hill also offers various hybrid courses, which allow students to split time between the classroom and online classrooms, as well as fully-online courses that students can complete on their own time, including language and personal finance courses.[114]

eKIDs

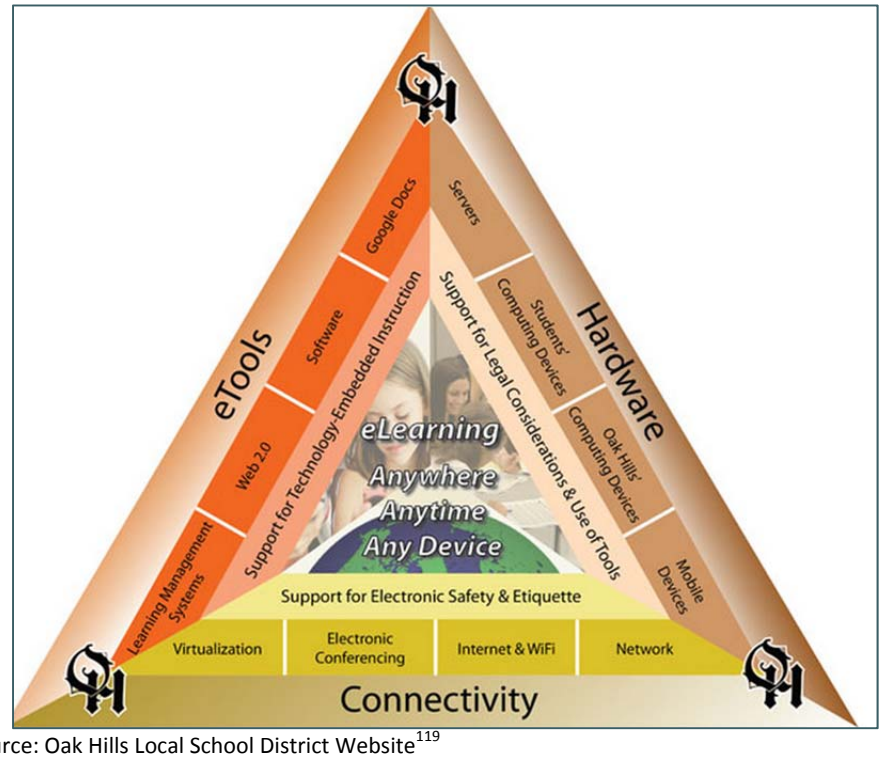
One of the most unique programs offered by Oak Hills is the eLearning-Kids-In-Demand (eKIDs) program. Students in the eKIDs program participate in the eLearning track, and are tasked with learning new technologies at a deep level in unsupervised classrooms. They also assist staff with their technology needs.[115] The eKIDs program is available to students starting in grade 4 as an after school activity, and progresses through grade 12 where students receive more sophisticated technological instruction and increasing responsibility in unsupervised classrooms. Frequently, eKIDs will help younger students log in to computers, assist their teachers with using Google/Moodle and additional technology in the classroom.[116] This is an obvious benefit for teachers because they can focus more on instruction, but also benefits the students by giving them the opportunity to become technologically fluent. The program has garnered national attention, and eKIDs even hosted their own TEDx Youth Day in 2011.[117]

eLearning Philosophy

Underpinning its technological trendsetting is an eLearning & Technology philosophy that unites the use of eTools, hardware, and connectivity: "Technology: A part of us; not apart from us!"[118] Figure 2.1 depicts this relationship.

[111] "Personal Device Passport." Oak Hills eLearning Portfolio, Oak Hills Local School District. http://ohlsd.org/portfolio/personal-device-passport/
[112] Ibid.
[113] Ibid.
[114] Ibid.
[115] "BYOD Case study: Oak Hills Local School District," Op. cit.
[116] "eKids." Oak Hills eLearning Portfolio, Oak Hills Local School District. http://ohlsd.org/portfolio/topics/ekids/
[117] Fernandez, K. "When the Students Become the Teachers." *EdTech Magazine*, November 1, 2011. http://www.edtechmagazine.com/k12/article/2011/11/kid-power
[118] "eLearning & Technology." Oak Hills Local Schools. http://ohlsd.us/elearning/

Figure 2.1: Oak Hills Local School District's eLearning & Technology Philosophy



Source: Oak Hills Local School District Website[119]

[119] Vander Veen, Z. "7. BYOD: Building Your Curriculum." Oak Hills Local School District, April 30, 2012. http://ohlsd.org/portfolio/byod-building-your-curriculum/

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