Best Practices
in Education
Technology

Production of this report, "Best Practices in Education Technology", started with identifying innovative projects and initiatives from around the world, where technology is or was used to support learning. These projects were compiled into a long list from which 22 were selected and developed into the case studies that form the web-based section of this publication. The projects that were turned into case studies were selected in part to ensure that the critical areas identified in commissioning the report were addressed, including:

- **Curriculum/Assessment**
    - Assessment
    - Curriculum redesign
    - Pedagogy/Instruction
    - Games and learning
    - Student voice, learner voice, and co-design of educational practice

- **Communities/Networks**
    - Teacher-directed innovation and professional learning networks
    - Social networks and informal learning
    - User-generated content and applications
    - Personal learning networks, e-portfolios, and virtual learning environments

- **Technology/Infrastructure**
    - Visualization technologies and learning
    - Mobile learning, including "location plus" and moves toward "contextual learning"
    - Pervasive and ubiquitous computing
    - Social inclusion, safety, and digital divides

The form of the case studies is standardized in order to help make sense of the information and to aid identification of their important technological components and their potential effectiveness within education both now and in the future. It is at that junction when technology, pedagogy, and leadership meet that the greatest opportunities for positive change appear to lie.

Reflection on the case studies led to the information summarized and reported in the section "Trends and Challenges Arising from Case Studies". These trends are gathered in five groups:

- New structures and funding models
- The relationships among teachers, pupils, and parents
- The relationships among education, technology, and innovation
- More sophisticated blended approaches to learning
- More sophisticated forms of assessment and evaluation

CISCO

An additional outcome of the review of case studies is the realization that simply looking at the outcomes or endpoints of exciting and successful initiatives is not enough. It is critical also to look at the underlying conditions that provide the foundations of success, including culture, relationships, and approach. A culture of responsibility and trust can act as a powerful support for innovative development, good relationships underpin the collaboration required in so many excellent projects, and a design approach that engages and works with all stakeholders in education can ensure initiatives do not become detached from addressing "the hopes and fears of all the years".

Few case studies provide direct correlation between a particular practice or use of technology and improvements in student achievement. Where they do, some caution is required in assuming causation. For example, NotSchool demonstrates extraordinary success with reengaging young people who have been excluded from school with learning. Ninety-eight percent of the learners return to learning. However, NotSchool has guidelines for eligibility to become a NotSchool.net learner that help ensure a high success rate, so it might reasonably be concluded that success is not contingent on the model alone. The success of the model is contingent on the context, culture, and circumstances in which the model is applied. This reality seems true for all case studies.

An additional trend that appears in some of the case studies may be summarized as a growing democratization of education. Several case studies point to an approach where *education is done **with and by** learners rather than done **to** them.* If it is true that learners more readily adopt and adapt technology, perhaps technology has an important role to play in encouraging that agency and increasing motivation. The future may hold less fitting technology to existing systems of curriculum, pedagogy, and assessment, and more transforming education.

CISCO

Trends and Challenges Arising from Case Studies

Trend 1: New Structures and Funding Models

Use of leading-edge technology in education often focuses on simple amplification of existing learning and teaching activities. However, the case studies indicate that the use of technology in education is broadening its scope and developing a wider effectiveness. Leading developments are challenging traditional school structures, both in terms of where and when learning takes place and also how it is supported and funded. Many of the case studies brought together in this report are making it possible for students and teachers to work beyond the common boundaries and constraints of formal and traditional education. They are **allowing new groups to form around learner interest or educational philosophy, rather than traditional structures associated with proximity, location, and age.** For example, Rafi.ki is a global community with members based in more than 1700 schools in more than 120 countries and across multiple time zones, exploring important concepts of global education from global community citizenship to human rights and climate change. Technology is bringing together global and local concerns ("glocalization"), with many of the case study initiatives—including Rafi.ki and Kennisnet Ambassadors—placing emphasis on the value of local knowledge and sensitivity to local concerns, while working on a national or global scale.

Alternative funding models are supporting experiences that engage with new partners and can provide new models of funding for learning. InSafe supports collaboration between widely diverse organizations ranging from public broadcast and media institutions to humanitarian organizations and private enterprise. This collaboration brings a wealth of knowledge and expertise to the global concern of Internet safety awareness, while providing participating organizations with valuable insights and market edge. The Magellan project illustrates how a partnership between the Portuguese government and Cisco, Intel, telecommunications operators (Optimus, TMN, Vodafone, and Zon), Microsoft, and local organizations and businesses provides new streams of income that can benefit education, society, and the commercial technology sector. And Rafi.ki offers a model in which those schools with the means to pay a subscription fee are able to help support participating schools from the developing world.

Trend 2: The Relationships Among Teachers Students, and Parents

Recent education developments in many schools and countries have seen a move away from traditional "delivery" toward more student-centric, facilitated, and constructivist models, in which the teacher is the guide. We are also **beginning to see new collaborative approaches in which teachers and pupils are co-learners. Focus is increasingly on participation and negotiation rather than direction and instruction,** giving students opportunities to act as nontraditional mentors providing support to other students and to teachers. This scenario can give students new insights into the education system and greater independence as learners. By helping to introduce commercially produced games into the classroom, Consolarium can reverse the teacher/pupil relationship, offering children who may not

CISCO

previously have excelled at school the opportunity to be the experts, acting as mentors to their peers and to their teachers. At NotSchool, pupils are "researchers", their teachers "mentors", with researchers involved in the shaping of their learning experience at multiple levels, from their personal goals to participation in mentor recruitment.

Personalization of learning is also extending beyond an assumed understanding of learner needs and interests **to projects** such as Fountaineers **that fully engage learners in the co-design and co-construction of their own education**. Norway's YouDecide has also taken what to some cultures may seem a bold step by placing the responsibility of Internet safety largely in the hands of its audience, with the recognition that placing trust in children encourages engagement, reflection, and maturity.

Connectivity is supporting new learner-mentor relationships beyond the classroom or school wall. For School of Everything, NotSchool, and many of the other projects, education is no longer the sole responsibility of teachers and parents, but of learners and a wider, distributed network of support. **Connectivity has enabled the formation of new communities of practice,** and encouraged greater awareness and tolerance of diversity and multiple perspectives, and it has engendered a growing sense of citizenship on a global scale.

Children whose parents take an active interest in their education tend to do better at school, and projects such as the Shireland Gateway succeed in encouraging involvement through the **creation of a "family portal" supporting two-way communication between home and school**. In addition, there is growing recognition that these benefits do not rest with the child alone. Some innovative projects, such as Portugal's Magellan Project, start with young children but aim ultimately to engage other family members in developing new skills and learning opportunities.

Trend 3: The Relationships Among Technology, Education, and Innovation

Innovation in education does not necessarily require high-tech and complex solutions. Often innovation is about an attitude of mind or culture. Many of the most successful and forward-thinking projects that we have considered use existing, easily accessible, and common technologies that are a familiar part of learners' everyday lives such as social networks, games, and discussion forums.

Case studies suggest that use of familiar technology can help students engage more directly with learning, and gain confidence in their own skills. That use of familiar technology can have particular benefits for learners who perhaps have not excelled in more traditional classroom settings. Simple-to-use and simple-to-understand technologies can also help give teachers the confidence to integrate them into their existing practices in creative ways. Consolarium's use of off-the-shelf, pick-up-and-play games and OOKL's emphasis on simple mobile interfaces for use by the youngest schoolchild—both supporting infinitely varied, immersive learning experiences—are good examples.

The relationship between education and technology is changing. Rather than wondering whether it should be technology that promotes change in education or if education should lead the way, there is growing recognition that **the relationship between the two is symbiotic;** that **technology and educational change** (whether curriculum, pedagogy, or teacher attitudes) **happen alongside one another**. At NotSchool, rather than attempting to make incremental changes to a model that had failed certain students, the project was designed from the beginning by looking at education afresh. In the process, **technology has played a supportive rather than disruptive role**. At the same time in developments such as that of High Tech High, building on their three established principles of personalized learning, adult world connection, and common intellectual mission has helped to integrate the use of technology in teaching and learning in a particularly effective way. Equally, projects such as Personalisation by Pieces, Rafiki, and the Danish Assessment projects that take a grass roots approach, growing organically and constantly involving stakeholders in an iterative development cycle, seem to be robust and sustainable.

In other words, projects that adopt the principles of good design practice seem to show significant success. Perhaps it is simply that good design practice including stakeholders is a necessary, but not sufficient, factor for successful innovation in education.

Trend 4: A More Sophisticated, Blended Approach to Learning

Increasingly, **efforts are being made to recognize and integrate learning that takes place within and outside classroom settings**, whether at home, within local communities, or within the global community to which technology provides access. **Learning can be formal or informal, reflecting either standard curricula or learning that is initiated by the interests and enthusiasms of the learners themselves**. Schome Park brings together a variety of online experiences, from group discussions in text-based forums to role-play in virtual worlds, in order to bring together not only the classically used "learning by doing" and "learning through role play" but also "learning by becoming" to explore the potential of new contexts and alternative learning blends.

This mode of learning presents a range of challenges, including:

· Ensuring that the digital divide does not exclude some learners from participation
· Ensuring Internet safety with significantly different approaches to development based on quite separate cultural attitudes in different parts of the world
· Assessing and accrediting such learning
· Developing curricula that reflect these new learning opportunities
· Valuing learning that does not necessarily sit comfortably within traditional curricula but may better reflect the needs of 21st century learners.

CISCO

What seems certain is that, although no ideal ratio is clear, **it is important to balance virtual and face-to-face contact, formal and informal learning, and serious and playful learning**. Devices such as the e-portfolios offered by Shireland's gateway and Careers Wales bring coherence to the multimedia, multiworld, multifaceted experiences that new technologies support.

Trend 5: More Sophisticated Assessment and Evaluation

Assessment plays a crucial role in learning, but perhaps too often becomes its sole focus. Assessment often appears to serve the needs of the system while not adequately providing information to learners to allow them to take steps to improve their own performance.

In some instances a more sophisticated approach to assessment is developed. Greater emphasis on formative and competency-based evaluation and improved ability to track achievements with greater reliability, accuracy, and frequency are being developed. And learners are being given more control over what is assessed, when it is assessed, and how assessment results are used.

Careers Wales places a wide range of assessment tools in the hands of the learner, including an e-portfolio, simulations, and online tests with immediate feedback. The Personalisation-by-Pieces trust-based peer-assessment model enables primary school children to set their own goals and plan personally meaningful projects in order to achieve them, as well as offering valuable insight into the assessment process. These new tools also allow schools, teachers, mentors, and students to view evaluative reports in many different ways, providing them with deeper insight into learner achievements and learner needs. They can offer a greater sense of continuity and future direction.

Finally, Denmark's pilot assessment project in senior secondary schools provides an excellent example of a complete and successful rethinking of assessment. By allowing access to the Internet during exams, it is challenging the traditional role of assessment as a simple measurement of recall and instead opening up opportunities to evaluate the skills associated with searching for, analyzing, and synthesizing information in response to real-world problems.

Trends and Challenges Arising from Case Studies

Conclusions

Table 1 summarizes the recent trends and their challenges.

Table 1 Summary of Trends and Challenges

Trends	Challenges
New structures and funding models	· Acknowledging and integrating new locations for learning · Acknowledging and integrating learning that takes place outside traditional times · Acknowledging and integrating learning that goes beyond traditional curricula and schools · Supporting learners in gathering and learning around emerging areas of common interest · Developing and supporting new learning coalitions and partnerships · Identifying and engaging funding sources beyond those of government, and sharing government's traditional responsibilities for education
The relationships among teachers, students and parents,	· Developing and supporting new roles for education professionals · Changing the balance of control of and responsibility for learning · Developing personalization beyond traditional curricula · Changing the balance of responsibility associated with access to new media and Internet use, and providing the associated infrastructure · Extending support for education to learners, to include their families and communities
The relationships betweentechnology, education, and innovation	· Developing a culture of innovation · Providing a changing balance to scaffold learners' use of the Internet, social networking, and new media · Supporting sustainable organic growth through encouraging grass roots development · Developing excellent education design practice
A more sophisticated, blended approach to learning	· Recognizing and accrediting learning outside traditional classroom and curriculum settings · Recognizing and supporting informal learning · Adopting and adapting new technological developments for education · Providing a balanced approach to Internet safety · Recognizing and anticipating changing skills requirements · Finding an appropriate and sustainable balance for face-to-face and virtual communications in developing successful communities and networks
More sophisticated assessment and evaluation	· Changing assessment practice to better balance support for learning and for passing tests · Tracking progress individually and collectively while minimizing intervention in learning · Minimizing unnecessary assessment load on learners and teachers · Developing balance of self, peer, and teacher assessment · Assessment of 21st century skills

CISCO

Trends and Challenges Arising from Case Studies

Perhaps an important trend reflected by a changing approach to learning, with **education being something that is done** with **learners rather than done** to **them, is particularly important**. If it is true that learners more readily adopt and adapt technology, in a "done-with-learners" education system, perhaps technology will play a greater role more readily and more rapidly. **It may become less a case of fitting technology to existing systems of curriculum and assessment, and more a case of supporting these systems**. It is apparent that using technology to support the current aims and methods of education is a near-term recognition of the way in which the education system needs to respond. A longer-term view is to recognize how the sociotechnological changes challenge not only the processes, but also the curricula and assessment systems that structure formative education.

Table 2 shows projects in each of the target areas, from assessment to visualization technologies and learning. The projects are classified according to the nature of their effectiveness, with the left column containing those that demonstrate weak signals of future effectiveness and the right column for those already with a national or international scale that is already achieving or likely to achieve effectiveness.

The process of selection started with identification of projects and initiatives that were considered by some to represent leading practice. Opinions of experts outside the project were canvassed to confirm or add to the list of projects. The project team then reflected on the complete list to remove any projects that were considered not to meet the criterion of reflecting leading practice, and to identify candidates for further development.

As the case studies were developed, some adjustments were made to the overall list, again to remove some and to confirm or promote others.

The table represents the final list of case studies, with long case studies shown in bold and short case studies shown in italics.

Table 2 Case Studies
(Note: Long case studies in bold, short case studies in italics)

Early Signals Emerging trends in the adoption of digital technologies to support teaching and learning that may be seen as signposts to further adaptation and more widespread use	Initial or Strong Developments Use of digital technologies to support teaching and learning that has become established and is having a significant, although not necessarily widespread, effect on educational practice	Scale and Potential Effectiveness Adoption and adaptation of digital technologies that have had or are likely to have a significant widespread effect on teaching and learning, at a multiregional, national, or international scale
Curriculum/Assessment		
Assessment		
	Personalisation by Pieces (England and international)	**National assessment system (Denmark)**
Curriculum (re)design		
School of One (United States)	*Curriki.org (United States and international)* *High Tech High (United States)* *Florida Virtual School (United States)*	

Case Studies

Early Signals Emerging trends in the adoption of digital technologies to support teaching and learning that may be seen as signposts to further adaptation and more widespread use	Initial or Strong Developments Use of digital technologies to support teaching and learning that has become established and is having a significant, although not necessarily widespread, effect on educational practice	Scale and Potential Effectiveness Adoption and adaptation of digital technologies that have had or are likely to have a significant widespread effect on teaching and learning, at a multiregional, national, or international scale
Pedagogy/Instruction		
Serious Games (Games and Learning)		
World Without Oil (United States)		**Consolarium (Scotland)**
Student Voice, Learner Voice, and Co-design of Educational Practice		
	NotSchool (England and international)	
Teacher-Directed Innovation and Professional/Personal Learning Networks		
		Lektion.se (Sweden) *Promethean Planet (England and international)* *Kennisnet Ambassadors' Network (Netherlands)*
Students' Social Networks and Informal Learning (and informal organization of learning)		
Schome (England) *School of Everything*	**Rafi.ki** (England and international)	
User-Generated Content and Applications		
FutureLab's Fountaineers (England)		
Personal Learning Networks, E-Portfolios, and Virtual Learning Environments		
Careers Wales	**Shireland's Learning Gateway** (England)	

Early Signals	Initial or Strong Developments	Scale and Potential Effectiveness
Emerging trends in the adoption of digital technologies to support teaching and learning that may be seen as signposts to further adaptation and more widespread use	Use of digital technologies to support teaching and learning that has become established and is having a significant, although not necessarily widespread, effect on educational practice	Adoption and adaptation of digital technologies that have had or are likely to have a significant widespread effect on teaching and learning, at a multiregional, national, or international scale
Technology/Infrastructure		
Visualization Technologies and Learning		
		Video Conferencing Virtual Learning Network (New Zealand)
Mobile Learning, Including "Location Plus" and Moves Toward "Contextual Learning"		
Amsterdam's Frequency 1550 (Netherlands) OOKL (myartspace)		**Grameen Network Learning Programmes**
Pervasive and Ubiquitous Computing		
		Magellan laptop roll-out (Portugal)
Social Inclusion, E-Safety, and Digital Divides		
		InSafe Programme (EU) *YouDecide (Norway)*