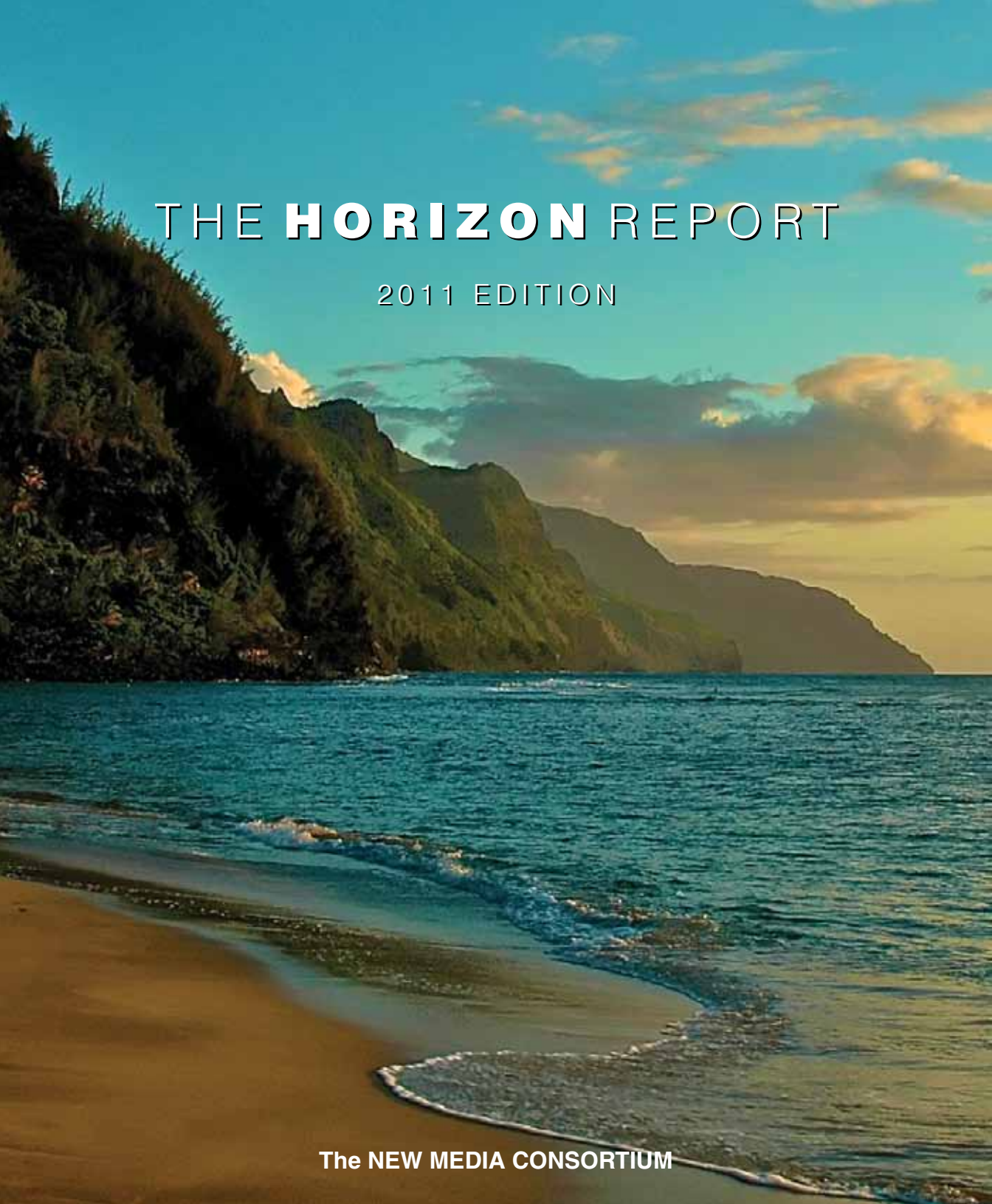

THE **HORIZON** REPORT

2011 EDITION

The NEW MEDIA CONSORTIUM

The 2011 Horizon Report is made possible via a grant from HP

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The *2011 Horizon Report* is a collaboration between

The NEW MEDIA CONSORTIUM

and the

EDUCAUSE Learning Initiative

An EDUCAUSE Program

Since 2005, the annual Horizon Report has been the most visible aspect of a focused collaboration between the EDUCAUSE Learning Initiative (ELI) and the New Media Consortium in which the two organizations engage their memberships in both the creation and outcomes of the research.

The New Media Consortium (NMC) is a globally focused not-for-profit consortium dedicated to the exploration and use of new media and new technologies. Its hundreds of member institutions constitute an elite list of the most highly regarded colleges, universities, and museums in the worlds. For nearly 20 years, the consortium and its members have dedicated themselves to exploring and developing applications of emerging technologies for learning, research, and creative inquiry. For more information on the NMC, visit www.nmc.org.

The ELI is a community of higher education institutions and organizations committed to advancing learning through information technology (IT) innovation. ELI is a strategic initiative of EDUCAUSE. While EDUCAUSE serves those interested in advancing higher education through technology, ELI specifically explores innovative technologies and practices that advance learning and promotes innovation in teaching and learning using information technology. To learn more about the ELI, visit www.educause.edu/eli.

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EXECUTIVE SUMMARY

The internationally recognized series of *Horizon Reports* is part of the New Media Consortium's Horizon Project, a comprehensive research venture established in 2002 that identifies and describes emerging technologies likely to have a large impact over the coming five years on a variety of sectors around the globe. This volume, the *2011 Horizon Report,* examines emerging technologies for their potential impact on and use in teaching, learning, and creative inquiry. It is the eighth in the annual series of reports focused on emerging technology in the higher education environment.

To create the report, the Horizon Project's Advisory Board, an international body of experts in education, technology, business, and other fields, engaged in a discussion based on a set of research questions intended to surface significant trends and challenges and to identify a broad array of potential technologies for the report. This dialog was enriched by a wide range of resources, current research, and practice that drew on the expertise of the NMC community and the communities of the members of the board. These interactions among the Advisory Board are the focus of the *Horizon Report* research, and this report details the areas in which these experts were in strong agreement.

Each edition of the *Horizon Report* introduces six emerging technologies or practices that are likely to enter mainstream use within three adoption horizons over the next five years. Key trends and challenges that will affect current practice over the same time frame add context to these discussions. Over the course of just a few weeks, the Advisory Board came to a consensus about the six topics that appear here in the *2011 Horizon Report.* The examples and readings under each topic area are meant to provide practical models as well as access to more detailed information. Wherever possible, an effort was made to highlight the innovative work going on among learning-focused institutions. The precise research methodology employed is detailed in the closing section of this report.

The report's format is consistent from year to year and edition to edition, and opens with a discussion of the trends and challenges identified by the Advisory Board as most important for the next five years. The format of the main section of this edition closely reflects the focus of the Horizon Project itself, centering on the applications of emerging technologies in higher education settings. Each section is introduced with an overview that describes what the topic is, followed by a discussion of the particular relevance of the topic to teaching, learning, and creative inquiry. Several concrete examples of how the technology is being used are given. Finally, each section closes with an annotated list of suggested readings and additional examples that expand on the discussion in the report, including a link to the tagged resources collected during the research process by project staff, the Advisory Board, and others in the global Horizon Project community.

Key Trends

The technologies featured in every edition of the *Horizon Report* are embedded within a contemporary context that reflects the realities of the time, both in the sphere of education and in the world at large. To ensure this context was well understood as the current report was produced, the Advisory Board engaged in an extensive review of current articles, interviews, papers, and new research to identify and rank trends that are currently affecting the practices of teaching, learning, and creative inquiry. Once detailed, the list of trends was then ranked according to how significant each was likely to be for learning-focused institutions over the next five years. The highest ranked of those trends had significant agreement among the Advisory Board members, who considered them to be key drivers of educational technology adoptions for the period 2011 through 2015. They are listed here in the order in which the Advisory Board ranked them.

- *The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators in sense-making, coaching, and credentialing.* This multi-year trend was again ranked very highly, indicating its continued influence. With personal access to the Internet from mobile devices on the rise, the growing set of resources available as open content, and a variety of reference and textbooks available electronically, students' easy and pervasive access to information outside of formal campus resources continues to encourage educators to take a careful look at the ways we can best serve learners.
- *People expect to be able to work, learn, and study whenever and wherever they want.* This highly-ranked trend, also noted last year, continues to permeate all aspects of daily life. Mobiles contribute to this trend, where increased availability of the Internet feeds the expectation of access. Feelings of frustration are common when it is not available. Companies are starting to respond to consumer demand for access anywhere; in 2010, programs like Google's Fiber for Communities sought to expand access to underserved communities, and several airlines began offering wireless network access in the air during flights.
- *The world of work is increasingly collaborative, giving rise to reflection about the way student projects are structured.* This trend continues from 2010 and is being driven by the increasingly global and cooperative nature of business interactions facilitated by Internet technologies. The days of isolated desk jobs are disappearing, giving way to models in which teams work actively together to address issues too far-reaching or complex for a single worker to resolve alone. Market intelligence firm IDC notes that some one billion people fit the definition of mobile workers already, and projects that fully one-third of the global workforce — 1.2 billon workers — will perform their work from multiple locations by 2013.
- *The technologies we use are increasingly cloud-based, and our notions of IT support are decentralized.* This trend, too, was noted in 2010 and continues to influence decisions about emerging technology adoption at educational institutions. As we turn to mobile applications for immediate access to many resources and tasks that once were performed on desktop computers, it makes sense to move data and services into the cloud. The challenges of privacy and control continue to affect adoption and deployment, but work continues on resolving the issues raised by increasingly networked information.

Critical Challenges

Any discussion of technology adoption must also consider important constraints and challenges, and the Advisory Board drew deeply from a careful analysis of current events, papers, articles, and similar sources, as well as from personal experience in detailing a long list of challenges institutions face in adopting any new technology. Several important challenges are detailed below, but it was clear that behind them all was a pervasive sense that individual organizational constraints are likely the most important factor in any decision to adopt — or not to adopt — any given technology. While acknowledging that local barriers to technology adoptions are many and significant, the Advisory Board focused its discussions on challenges that are common to institutions and the educational community as a whole.

The highest ranked challenges they identified are listed here, in the order of their rated importance.

- *Digital media literacy continues its rise in importance as a key skill in every discipline and profession.* This challenge, first noted in 2008, reflects universal agreement among those on the Horizon Project Advisory Board. Although there is broad consensus that digital media liter-

acy is vitally important for today's students, what skills constitute digital literacy are still not well-defined nor universally taught. Teacher preparation programs are beginning to include courses related to digital media literacy, and universities are beginning to fold these literacy skills into coursework for students, but progress continues to be slow. The challenge is exacerbated by the fact that digital technologies morph and change quickly at a rate that generally outpaces curriculum development.

- *Appropriate metrics of evaluation lag behind the emergence of new scholarly forms of authoring, publishing, and researching.* Noted first in 2010, this challenge continues. Electronic books, blogs, multimedia pieces, networked presentations, and other kinds of scholarly work can be difficult to evaluate and classify according to traditional metrics, but faculty members are increasingly experimenting with these alternate forms of expression. At the same time, reconciling new forms of scholarly activity with old standards continues to be difficult, creating tension and raising questions as to where faculty energy is best directed.
- *Economic pressures and new models of education are presenting unprecedented competition to traditional models of the university.* The twin challenges of providing high-quality services and controlling costs continue to impel institutions to seek creative solutions. As a result, innovative institutions are developing new models to serve students, such as streaming survey courses over the network so students can attend from their dorm or other locations to free up lecture space. As these pressures continue, other models will emerge as well.
- *Keeping pace with the rapid proliferation of information, software tools, and devices is challenging for students and teachers alike.* New developments in technology are exciting and their potential for improving quality of life is enticing, but it can be overwhelming to attempt to keep up with even a few of the many new tools that are released. User-created content is exploding, giving rise to information, ideas, and opinions on all sorts of interesting topics, but following even some of the hundreds of available authorities means sifting through a mountain of information on a weekly or daily basis. There is a greater need than ever for effective tools and filters for finding, interpreting, organizing, and retrieving the data that is important to us.

These trends and challenges are a reflection of the impact of technology that is occurring in almost every aspect of our lives. They are indicative of the changing nature of the way we communicate, access information, connect with peers and colleagues, learn, and even socialize. Taken together, they provided the Advisory Board a frame through which to consider the potential impacts of nearly 50 emerging technologies and related practices that were analyzed and discussed for possible inclusion in this edition of the *Horizon Report.* Six of those were chosen via successive rounds of ranking; they are summarized below and detailed in the main body of the report.

Technologies to Watch

The six technologies featured in the *2011 Horizon Report* are placed along three adoption horizons that indicate likely time frames for their entrance into mainstream use for teaching, learning, or creative inquiry. The near-term horizon assumes the likelihood of entry into the mainstream for institutions within the next twelve months; the mid-term horizon, within two to three years; and the far-term, within four to five years. It should be noted at the outset that the *Horizon Report* is not a predictive tool. It is meant, rather, to highlight emerging technologies with considerable potential for our focus areas of teaching, learning, and creative inquiry. Each of the six is already the focus of attention at a number of innovative organizations around the world, and the work we showcase here reveals the promise of a wider impact.

On the near-term horizon — that is, within the next 12 months — are *electronic books* and *mobiles.* Electronic books are moving closer to mainstream adoption for educational institutions, having appeared on the mid-term horizon last year. Mobiles reappear as well, remaining on the near-term horizon as they become increasingly popular throughout the world as a primary means of accessing Internet resources. Resistance to the use of mobiles in the classroom continues to impede their adoption in many schools, but a growing number of institutions are finding ways to take advantage of a technology that nearly all students, faculty, and staff carry.

> ***Electronic books*** continue to generate strong interest in the consumer sector and are increasingly available on campuses as well. Modern electronic readers support note-taking and research activities, and are beginning to augment these basic functions with new capabilities — from immersive experiences to support for social interaction — that are changing our perception of what it means to read.
>
> ***Mobiles*** enable ubiquitous access to information, social networks, tools for learning and productivity, and much more. Mobile devices continue to evolve, but it is the increased access to affordable and reliable networks that is driving this technology now. Mobiles are capable computing devices in their own right — and they are increasingly a user's first choice for Internet access.

The second adoption horizon considers technologies expected to gain widespread usage within two to three years, and this year's candidates are *augmented reality* and *game-based learning.* Both intersect with practices in mainstream popular culture, both have been considered significant tools for education for many years, and both have made appearances on a number of campuses already. Advances in hardware and software, as well as in a broader acceptance of new methods in teaching, secured the place of these innovations as the top technologies for the mid-term horizon.

> ***Augmented reality*** refers to the layering of information over a view or representation of the normal world, offering users the ability to access place-based information in ways that are compellingly intuitive. Augmented reality brings a significant potential to supplement information delivered via computers, mobile devices, video, and even the printed book. Much simpler to create and use now than in the past, augmented reality feels at once fresh and new, yet an easy extension of existing expectations and practices.
>
> ***Game-based learning*** has grown in recent years as research continues to demonstrate its effectiveness for learning for students of all ages. Games for education span the range from single-player or small-group card and board games all the way to massively multiplayer online games and alternate reality games. Those at the first end of the spectrum are easy to integrate with coursework, and in many institutions they are already an option; but the greatest potential of games for learning lies in their ability to foster collaboration, problem-solving, and procedural thinking. For a variety of reasons, the realization of this potential is still two to three years away.

Looking to the far-term horizon, four to five years from now for widespread adoption, are *gesture-based computing* and *learning analytics.* Both remain largely speculative and not yet in widespread usage on campuses, but both are also garnering significant interest and increasing exposure.

> ***Gesture-based computing*** moves the control of computers from a mouse and keyboard to the motions of the body via new input devices. Depicted in science fiction movies for years, gesture-based computing is now more grounded in reality thanks to the recent arrival of interface technologies such as Kinect, SixthSense, and Tamper, which make interactions with computational devices far more intuitive and embodied.

Learning analytics loosely joins a variety of data-gathering tools and analytic techniques to study student engagement, performance, and progress in practice, with the goal of using what is learned to revise curricula, teaching, and assessment in real time. Building on the kinds of information generated by Google Analytics and other similar tools, learning analytics aims to mobilize the power of data-mining tools in the service of learning, and embracing the complexity, diversity, and abundance of information that dynamic learning environments can generate.

Each of these technologies is described in detail in the main body of the report, where a discussion of what the technology is and why it is relevant to teaching, learning, and creative inquiry may also be found. Given the practical focus of the report, a listing of examples of the technology in use, especially in higher education, is a key component of each of the six main topics. Our research indicates that all six of these technologies, taken together, will have a significant impact on learning-focused organizations within the next five years.

The Horizon Project

This report is part of a longitudinal research study of emerging technologies that began in March 2002. Since that time, under the banner of the Horizon Project, the New Media Consortium and its research partners have held an ongoing series of conversations and dialogs with hundreds of technology professionals, campus technologists, faculty leaders from colleges and universities, museum professionals, teachers and other school professionals, and representatives of leading corporations from more than thirty countries. These conversations have been the impetus for a series of nearly 20 annual reports focused on emerging technologies relevant to formal and informal learning in colleges, universities, schools, and museums.

In 2008, the NMC embarked on a new series of regional companion editions of the *Horizon Report,* with the dual goals of understanding how technology is being absorbed using a smaller lens, and also noting the contrasts between technology use in one area compared to another. To date, companion editions have been prepared that center on education in Australia, New Zealand, and the fourteen countries of Iberoamerica; the series will expand to include Europe, Singapore, and Africa over the next two years.

The flagship *Horizon Report,* published each January, focuses on higher education globally, and is translated into multiple languages every year. Over all editions, the readership of the reports is estimated at well over 600,000 worldwide, with readers in more than 70 countries.

The Horizon Project Navigator. This edition of the *Horizon Report* kicks off the ninth year of the series and a turning point in the NMC's Emerging Technologies Initiative, which is dedicated to charting the landscape of emerging technologies for teaching, learning, and creative inquiry. In each of the preceding years, the Horizon Project process has focused on the creation of a print-based publication (or its pdf analog), one produced through a collaborative process that leveraged the productive potential of a wiki for posting and responding to ideas, RSS feeds for gathering information dynamically, and tagging for collecting and sharing references. The decision to print the NMC report was based on the fact that a physical report remains a powerful tool on many campuses.

However, in its continuing interest in modeling the advantages of new technologies, over the course of 2010, and with the generous support of the HP, the NMC designed and produced the Horizon Project Navigator (http://navigator.nmc.org), an online database that harnesses the power of technology and social media to create an information and resource hub that is made stronger through the participation of its users.

The Horizon Project Navigator leverages the affordances of social media and computation to offer users access to the same materials — and

more — used by the Horizon Project Advisory Board. It is a dynamic, customizable, and powerful tool for individuals who want the ability to chart the landscape of emerging technologies for teaching, learning, and creative inquiry through their own set of needs and interests. The platform provides a fully dynamic online version of the *Horizon Report* created for the emerging technology professional.

Dynamic reports can be adapted and modified to suit the needs of individual users, and Navigator itself provides a space within which anyone can participate in the gathering, sifting, and sharing of ideas related to the trends and challenges of emerging technologies in the context of formal and informal learning. The Horizon Project Navigator includes all the research materials, project information, and other ephemera that has been created from the intensive and collaborative process used in creating each annual *Horizon Report.* The *2011 Horizon Report* was the first of the series that was able to draw on the resources of the Horizon Project Navigator in its creation, and marks a new epoch in the history of the project.

The Horizon Project Wiki. The Horizon Project uses qualitative research methods to identify the technologies selected for inclusion in each report. The process begins with a comprehensive survey of the literature, technology news reports, and the work of other organizations. The 43 members of this year's Advisory Board engaged in a comprehensive review and analysis of research, articles, papers, blogs, and interviews; discussed existing applications, and brainstormed new ones; and ultimately ranked the items on the list of candidate technologies for their potential relevance to teaching, learning, and creative inquiry. This work took place entirely online and may be reviewed on the project wiki at http://horizon.wiki.nmc.org.

The effort to produce the report and the findings detailed within it began in mid-September 2010 and concluded in early January 2011, a period of just under four months. Most of the work on the project took place in and is preserved on the wiki. All of the interim materials and rankings used to create the report can be found there, as well as the discussions of the Advisory Board around each topic. The six technologies and applications that emerged at the top of the final rankings — two per adoption horizon — are detailed in the chapters that follow.

Each of those chapters includes detailed descriptions, links to active demonstration projects, and a wide array of additional resources related to the six profiled technologies. Those profiles are the heart of the *2011 Horizon Report,* and will fuel the work of the Horizon Project throughout 2011-12. For those wanting to know more about the processes used to generate the *Horizon Reports,* many of which are ongoing and extend the work in the reports, we refer you to the report's final section on the research methodology.

ELECTRONIC BOOKS

Time-to-Adoption Horizon: One Year or Less

Now that they are firmly established in the consumer sector, electronic books are beginning to demonstrate capabilities that challenge the very definition of reading. Audiovisual, interactive, and social elements enhance the informational content of books and magazines. Social tools extend the reader's experience into the larger world, connecting readers with one another and enabling deeper, collaborative explorations of the text. The content of electronic books and the social activities they enable, rather than the device used to access them, are the keys to their popularity; nearly everyone carries some device that can function as an electronic reader, and more people are engaging with electronic books than ever before.

Overview

Electronic books have continued to rise in popularity since their appearance on the mid-term horizon in the *2010 Horizon Report* and that popularity has won them a place on the near term horizon for 2011. The variety of content available — and the range of readers that cater to individual preferences — has grown over that time to the point that electronic books are a viable and easy alternative to printed ones. In addition to dedicated electronic readers, multifunction devices like the Apple iPad and the Samsung Galaxy represent a new class of tools that merges the utility of electronic book readers with web browsing, a wide variety of applications, and an expanding set of entertainment options. The ready availability of both reading devices and digital content makes it very easy to integrate electronic books into everyday portable computing.

The most interesting aspect of electronic books, however, is not the devices they are accessed with; it is not even the texts themselves. What makes electronic books a potentially transformative technology is the new kinds of reading experiences that they make possible. Publishers are beginning to explore richly visual interfaces that include multimedia and collaborative elements. The social magazine format used by Flipboard, for example, turns the browsing of RSS-enabled web content into a serendipitous experience, a dynamic journey that changes every time it is opened. Magazines like *Time, Wired,* and others include interactive graphs, links that extend the reader's experience, video, and more. *Epicurious* for the iPad is a rich media cookbook complete with reviews, tips, recommendations, and the ability to add recipes.

As the electronic book moves further from a digital reproduction of a printed piece, some writers are seeing it become something far richer, allowing journeys through worlds real and imagined, undertaken not alone but in company with other readers. The gestural interfaces of new electronic devices enhance the intellectual experience of reading with tactile interactions. Electronic books have the potential to transform the way we interact with reading material of all kinds, from popular titles to scholarly works. For three compelling visions of the future promised by the electronic book, see the five-minute video *The Future of the Book* produced by design firm IDEO (http://vimeo.com/15142335).

Standards for the creation of electronic publications are still in development, and those that exist often focus on the text and do not include guidelines for the kinds of interactivity that is possible in electronic books. As more of its media morphs into digital forms, the publishing industry is undergoing a shift very similar to the one that took place in the music industry in the last decade. New business models and methods of distribution are appearing as older ones begin to falter. While there is no clear winner among the many available and emerging formats, the acceptance and widespread use of electronic books has enabled the industry to see a potential path through the times ahead.

Relevance for Teaching, Learning, Research, or Creative Inquiry

Despite their obvious advantages of size and weight, electronic books are not as established among scholarly readers as they are among the general public. Several obstacles have stood in the way of general adoption among academic institutions: scarcity of academic titles, lack of necessary features in electronic readers to support scholarly work, a restrictive publishing model, and digital rights management (DRM) issues. Most of these constraints are now vanishing. Still to be solved are accessibility issues, as a number of institutions found with 2010 Kindle textbook programs. Many academic titles are now available alongside the broad selection of consumer titles; reader technology has developed to the point that graphs, illustrations, videos, and interactive elements can easily be included, and many enable bookmarking, annotation, commentary, dictionary lookup, and other useful functions.

Publishers have at last begun to uncouple print and electronic sales of textbooks, making it easier to choose one or the other as desired. In some parts of the world, DRM restrictions still impede the adoption of electronic textbooks; titles that are released in one country may be unobtainable in another, or available only on certain platforms. Until electronic textbooks are divorced from reader-dependent formats, broad adoption will continue to be problematic for universities. Nonetheless, the promise offered by the technology is such that electronic books are being explored in virtually every discipline. Clear advantages for students (e.g., price and portability) are other factors that make this technology worth pursuing.

For those with smart phones, iPads, and similar devices, subscription-based services are available that allow students to receive textbooks and ancillary materials on the devices they already own. Some models offer free membership with a pay-per-book feature; others charge on a per-course basis. Business models are emerging that may lower costs for students, including textbook rentals and bulk purchases by the institution. For-profit universities such as the University of Phoenix have begun requiring faculty to assign electronic texts, and in 2010, the California State University system piloted a similar program. While this reduces student choice, it also provides a way for the university to secure cheaper buying options for students. Course management systems (CMS) are another point of entry to electronic texts; Blackboard has partnered with McGraw-Hill and two booksellers to enable faculty to assign, and students to buy, electronic texts within the Blackboard system. CourseSmart, a consortium of five publishers, has also developed CMS integration for assigning and purchasing electronic texts.

Scholarly journals are beginning to appear in electronic form as well. The European-based Directory of Open Access Journals lists some 5,500 titles — nearly half of which are searchable online at the article level — and a typical university research library will have access to many more. Scholarly journals are not yet common in the mobile space, although electronic versions of many consumer periodicals are already available as custom apps. Pricing models for mobile periodicals vary widely; paper subscribers can sometimes receive mobile versions free, but others must pay separately per issue — sometimes at a higher rate than for a paper subscription.

Pricing and DRM issues aside, electronic books have the potential to truly transform educational practice. Currently, most electronic books and journals are essentially copies of printed versions that can be read on a computer or mobile device. Exciting new examples hint at the possibilities offered by more advanced forms of electronic books — self-directed, interactive experiences; easy exploration; collaborative work; multi-modal, immersive activities; and other deeply engaging approaches to learning. Mobile applications add easy social interaction around electronic books that could be marshaled in support of group study and focused teacher-student interaction at any point in the text. Electronic texts

can be linked to a myriad of supporting materials that can extend and enrich them.

A sampling of applications of electronic books across disciplines includes the following:

- **Biology.** *Raven Biology,* an electronic text from publisher Inkling, brings the study of this science to life with detailed illustrations and animations, in-line keyword definitions, and interactive quizzes embedded in each chapter.
- **Business.** Students in *Business Computing* at RMIT University participated in an electronic book pilot using custom course material developed from the traditional textbook. Students using the electronic books were able to delve more deeply into the material, access related information beyond what the instructor provided, and use the device's highlighting and annotation tools to take notes in the digital text.
- **Education.** At Ball State University, a grant-funded project provided Kindles to students in *Studies in Educational Technology.* While using the readers for their own study, the future teachers also experienced firsthand how electronic books can be used in teaching and learning.

Electronic Books in Practice

The following links provide examples of how electronic books are being used in higher education settings.

Amazon to Launch "Kindle Singles"

http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=irol-newsArticle&ID=1481538

In the fall of 2010, Amazon announced the launch of "Kindle Singles," short texts of between 10,000 and 50,000 words. The service is designed to provide a market for pieces longer than a magazine article but shorter than a novel, such as academic articles, thought pieces, and research papers.

Constellation

https://content.ashford.edu/horizon

Created and maintained by Ashford University, Constellation is an electronic textbook series developed expressly for Ashford courses by faculty and special editorial boards. Students may use textbooks on their computers or mobile devices, print them, or store them locally, as they wish.

Cooliris Releases a Wikipedia Magazine Experience for iPad

http://www.padgadget.com/2010/07/27/cooliris-releases-a-wikipedia-magazine-experience-for-ipad

The Cooliris Wikipedia application draws in content from the online encyclopedia, transforming it into a visually rich, magazine-like display that invites browsing and exploration.

Page2Pub

http://opl.rit.edu/projects/page2pub/

Rochester Institute of Technology's Open Publishing Lab has developed a system for collecting different types of digital content that can then be published to the open epub format for use on a variety of different electronic readers.

The Pedlar Lady of Gushing Cross

http://www.moving-tales.com

This interactive, immersive retelling of a classic story with animation, audio, and rich graphics is designed for the iPad.

Stanford University Medical School Issues iPads to Students, Potentially Replacing Textbooks

http://med.stanford.edu/ism/2010/september/ipads-0913.html

The Stanford University School of Medicine provides students with iPads containing course materials and interactive study aids. Students find that the iPad reduces the number of textbooks they must carry between classes and appreciate having content in a variety of forms, including video and interactive graphics.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about electronic books.

2009 Librarian eBook Survey

http://www.apo.org.au/research/2009-librarian-ebook-survey

(Michael Newman, *HighWire-Stanford University,* 26 March 2010.) This comprehensive report analyzes how electronic books are being used in libraries in 13 countries.

Delicious: Electronic Books

http://delicious.com/tag/hz11+ebooks

Follow this link to find additional resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz11" and "ebooks" when you save them to *Delicious.*

Handheld E-Book Readers and Scholarship: Report and Reader Survey

http://www.humanitiesebook.org/heb-whitepaper-3.html

(Nina Gielen, *American Council of Learned Societies (ACLS) Humanities E-Book,* 18 August 2010.) This report describes an experiment and reader survey conducted by the ACLS Humanities E-Book in 2009-10 to assess the effectiveness of electronic scholarly monographs.

A Magazine Meant for Mobile

http://www.nytimes.com/2010/08/11/business/media/11nomad.html

(Tanzina Vega, *The New York Times,* 10 August 2010.) This article discusses a new online publication for mobile devices. *Nomad Editions,* written by freelance journalists, will appear on a subscriber's mobile device as a monthly mini-magazine tailored to his or her interests.

Making Disposable Dynamic Displays With Electronic Ink on Real Paper

http://www.wired.com/gadgetlab/2010/11/making-disposable-dynamic-displays-with-electronic-ink-on-real-paper/

(Tim Carmody, *Wired Gadget Lab,* 23 November 2010.) Electrowetting allows electronic ink to be embedded in real paper, merging analog and digital media to create inexpensive displays. This article describes a prototype project that is exploring the possibilities.

What Publishers Can and Should Learn from "The Elements"

http://radar.oreilly.com/2010/08/what-publishers-can-and-should.html

(Mac Slocum, *O'Reilly Radar,* 12 August 2010.) This article interviews Theodore Gray, author of *The Elements,* and discusses how the digital version pushes the envelope of electronic book publishing.

Yes, People Still Read, But Now It's Social

http://www.nytimes.com/2010/06/20/business/20unbox.html

(Steven Johnson, *The New York Times,* 18 June 2010.) Writer Steven Johnson argues that electronic books will transform reading into a more social experience.

MOBILES

Time-to-Adoption Horizon: One Year or Less

According to a recent report from mobile manufacturer Ericsson, studies show that by 2015, 80% of people accessing the Internet will be doing so from mobile devices. Perhaps more important for education, Internet-capable mobile devices will outnumber computers within the next year. In Japan, over 75% of Internet users already use a mobile as their first choice for access. This shift in the means of connecting to the Internet is being enabled by the convergence of three trends: the growing number of Internet-capable mobile devices, increasingly flexible web content, and continued development of the networks that support connectivity.

Overview

Mobiles continue to merit close attention as an emerging technology for teaching and learning. The devices available today are multi-functional and robust, but the story of mobiles is no longer solely about the devices we carry. Mobiles — be they phones, iPads, or similar "always-connected" devices — are doorways to the content and social tapestries of the network, and they open with just a touch. The *2010 Horizon Report* placed mobile computing on the near term horizon, with an emphasis on the wide range of activities that are now possible using mobile devices. This year, mobiles are here because so many people use them as their first choice for accessing networked resources. The impact of mobiles is being felt in every part of the globe and by more people than ever before. Active mobile accounts continue to grow dramatically, and the supporting infrastructure continues to expand both in urban and remote areas.

The number of mobile devices produced and purchased each year continues to grow, and the new devices like the iPad and its counterparts are expanding our notions of portability. With increased screen real estate, battery life, and input options, these new mobile devices have rapidly become a viable alternative to heavier, more expensive laptop computers. It is not uncommon to find that someone carries both a smart phone and a tablet; when a quick glance at email, social networks, or other tools is needed, the smart phone fills the bill. For more involved web browsing, reading, watching videos, or to use any of the tens of thousands of Internet productivity and lifestyle applications, the tablet provides just enough extra space to enable comfortable use over longer periods of time.

For most people in the developed world, a mobile is always close at hand and available with speedy Internet access whenever it is needed. Mobiles are easy to use for web browsing; much of the available content seamlessly adjusts for optimal display on whichever device is used to access it. Mobile and wireless data networks continue to evolve, supporting faster connections and higher bandwidth throughput; the forthcoming 4G network promises the highest speeds yet, and 4G devices are already beginning to appear on the market.

As more people choose to reach for a mobile rather than sitting at a desk to access the Internet, our views and behaviors about that access are shifting. Specialized applications are available that, for many, replace a standard web browser for mobile access. It is not unusual to use several different applications to access online financial information, read and contribute to social networking sites, check email, browse and upload media, and so on. Tasks that once were gathered into a single piece of software — the web browser — are now distributed among many specialized (and optimized) applications.

Easy mobile access also means that the full range of networked information and applications accompany us wherever we go. The Internet is no longer something that is piped into homes and offices via a cable anchored to the wall; it is a pervasive, ever-present entity, accessible from anywhere there is a cell signal.

Relevance for Teaching, Learning, Research, or Creative Inquiry

Mobiles embody the convergence of several technologies that lend themselves to educational use, including electronic book readers, annotation tools, applications for creation and composition, and social networking tools. GPS and compasses allow sophisticated location and positioning, accelerometers and motion sensors enable the device to be used in completely new ways, digital capture and editing bring rich tools for video, audio, and imaging — more and more, mobiles encompass it all, and innovation in mobile device development continues at an unprecedented pace.

The potential of mobile computing is already being demonstrated in hundreds of projects at higher education institutions. At Ball State University, computer science students can study mobile applications programming, creating usable applications in a single semester; recent examples include games, a reference tool for birdwatchers, and an English-Spanish tutoring program. At Oberlin College, faculty may borrow iPads to evaluate their potential use in courses. Countless applications are available for self-study, reference, drill and practice, fieldwork, and research in hundreds of disciplines. Cultural heritage organizations and museums are also turning to mobiles to educate and connect with audiences. The Museum of Science in Boston, for example, collaborating with researchers from Tufts University, has created Firefly Watch, a mobile application for visitors and native Bostonians that allows them to serve as local "citizen scientists" to aid real scientists in a large regional study of firefly populations.

Mobiles allow very simple tools to be easily integrated into classroom activities with no need for involvement of IT or support staff. Twitter, a short-message micro-blogging service that is very easy to use on phones, is a good example, finding ever more common use as an in-class discussion tool. Students participate by sending messages to ask and answer questions or expand on thoughts. Another simple tool, Poll Anywhere, turns mobiles into personal response systems, enabling teachers to quiz students, assess their understanding before, during, and after a lesson, and reveal patterns of thinking in the classroom. Any mobile will work for these purposes; all that is required is the ability to send text (SMS) messages. At Abilene Christian University, attendees at a recent performance of Othello were asked not to turn their phones off during the performance, but instead to use them to receive messages throughout the performance. Cast members behind the scenes sent messages to clarify Shakespearean language, share scene summaries, and interact with the audience through a live blog.

The increasing availability of network access means that the growing capabilities of mobiles are available to more students in more locations each year. Educational institutions around the world are investing in the infrastructure that supports mobile access, sponsoring programs that provide devices to students who do not already have them, and commissioning custom mobile applications to serve their communities. Mobiles are recognized as advantageous tools for learning and study, and mobile offerings are quickly becoming a selling point for prospective students considering educational options.

The unprecedented evolution of these devices continues to generate great interest. They are increasingly capable tools for learning that schools often do not have to buy or maintain: virtually 100% of university students worldwide come equipped with mobiles. The sheer power of these devices is what makes them interesting, and that power derives from their ubiquity, their portability, the wide range of things that can be done with them, and their ability to access the Internet nearly anywhere.

A sampling of applications of mobiles across disciplines includes the following:

- **Chemistry.** Reference applications assist students studying chemical formulae, allowing them to review and take notes on what they learn,

visualize 3D structures, see the reactions taking place — and then test their understanding.

- **History.** Mobile applications using location-based data and augmented reality help students discover historical information about places they visit on field trips.
- **Journalism.** A team of sixteen faculty and students across three academic departments at Abilene Christian University collaborated to produce the first university student newspaper designed expressly for the iPad.

Mobiles in Practice

The following links provide examples of how mobiles are being used in higher education settings.

100 Most Educational iPhone Apps

http://www.accreditedonlinecolleges.com/blog/2009/100-most-educational-iphone-apps

This is a comprehensive list of mobile applications that can be used for study in a wide variety of disciplines.

ACU Business Students Integrate iPads into Innovative Study Abroad Experience

http://www.acu.edu/news/2010/100611_iPadinOxford.html

Abilene Christian University business students studying in Oxford are using iPads to deploy research plans, present product concepts, and conduct market research. As part of the program, the students will evaluate the use of the devices for education and research.

Bucks County Community College

http://buckslib.wordpress.com/2010/05/24/bucks-unveils-first-mobile-app

Bucks County Community College has developed a mobile application for the campus community. Early features focus on library use, allowing users to browse the library collections, map a route to BCCC campus locations, and communicate with library staff. The application will be expanded to include course offerings and other campus resources.

Cupids 400

http://www.cupids400.com/english/education/iphone.php

This application, designed for the iPhone and iPod Touch, is used to explore the 1610 English Canadian settlement at what is now Cupids, Canada. The application includes an interactive map, details about the settlement of the area, and historical information in a variety of media. Visitors to Cupids using the application can use the map to explore real-world locations of the original settlement.

LIU Brooklyn Campus Extends iPad Program

http://campustechnology.com/articles/2010/10/04/liu-brooklyn-campus-extends-ipad-program.aspx

Following a successful pilot in which freshmen were issued iPads, Long Island University's Brooklyn Campus has improved the campus wireless network and committed to subsidizing iPad purchases for its 11,000 students.

Mobile Devices as Emerging Educational Tools

http://emergingmediainitiative.com/project/mobile-education

Computer science faculty members at Ball State University are developing mobile applications for political science, computer science, and chemistry. Once the applications are deployed, the faculty plan to conduct longitudinal testing to evaluate the effectiveness of mobiles as a study tool.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about mobiles.

Abilene Christian University's 2009-2010 Mobile Learning Report

http://www.acu.edu/promise/innovative/mlreport2009-10.html

(Abilene Christian University, 2010.) Two years after launching an innovative pilot program to is-

sue mobiles to every student, Abilene Christian University has published a comprehensive report detailing the program and its impact on campus.

AdMob Mobile Metrics Highlights 2010
http://metrics.admob.com/2010/06/may-2010-mobile-metrics-report

(*AdMob Metrics,* 30 June 2010.) This report analyzes data captured by AdMob, a mobile research unit owned by Google, to discern trends about mobile uptake and use.

***Delicious:* Mobiles**
http://delicious.com/tag/hz11+mobiles

Follow this link to find additional resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz11" and "mobiles" when you save them to *Delicious.*

Designing mLearning: Tapping into the Mobile Revolution for Organizational Performance
http://www.designingmlearning.com/

(Clark Quinn, *Pfiiffer,* February 2011) This new book offers a comprehensive guide for designing learning for the mobile platform.

Global Mobile Statistics 2010
http://mobithinking.com/mobile-marketing-tools/latest-mobile-stats

(*MobiThinking,* October 2010.) This compilation of independent research on mobile uptake and usage includes global statistics related to mobile use. Of special interest is a section of reports about the 'mobile-only generation,' or those consumers who only use a mobile device to access the Internet.

Pew Internet Research Report: Mobile Access 2010
http://pewinternet.org/Reports/2010/Mobile-Access-2010.aspx

In this article drawn from his 2005 Clair Maple Memorial Address at the Seminars on Academic Computing, MIT President Emeritus Charles Vest discusses open content and outlines the promise and opportunity that drove the creation of MIT OpenCourseWare.

Smartphones Give You Wings: Pedagogical Affordance of Mobile Web 2.0
http://www.apo.org.au/research/smartphones-give-you-wings-pedagogical-affordance-mobile-web-20

(Thomas Cochrane, Roger Bateman, *Australasian Journal of Educational Technology,* 7 June 2010.) This paper examines how mobile Web 2.0 tools can be used in higher education.

The State of Mobile Apps 2010
http://blog.nielsen.com/nielsenwire/online_mobile/the-state-of-mobile-apps

(The Nielsen Company, *Nielsen Wire,* 1 June 2010.) This report identifies global usage patterns for mobile applications by mobile device type.

World's Largest Open University Goes Mobile
http://www.pr-inside.com/world-s-largest-open-university-goes-r1553595.htm

(Press release, *PR-inside.com,* 29 October 2009.) The Indira Gandhi National Open University, in partnership with Ericsson, offers courses on mobile phones to more than 2.5 million students.

AUGMENTED REALITY

Time-to-Adoption Horizon: Two to Three Years

Augmented reality, a capability that has been around for decades, is shifting from what was once seen as a gimmick to a bona fide game-changer. The layering of information over 3D space produces a new experience of the world, sometimes referred to as "blended reality," and is fueling the broader migration of computing from the desktop to the mobile device, bringing with it new expectations regarding access to information and new opportunities for learning. While the most prevalent uses of augmented reality so far have been in the consumer sector (for marketing, social engagement, amusement, or location-based information), new uses seem to emerge almost daily, as tools for creating new applications become ever easier to use.

Overview

Augmented reality (AR) refers to the addition of a computer-assisted contextual layer of information over the real world, creating a reality that is enhanced or augmented. AR was on the mid-term horizon for 2010, and throughout the year, enjoyed widespread attention in conferences and industry showcases internationally. The Augmented Reality Event in June 2010, for example, featured keynotes by Bruce Sterling and Will Wright, which suggests the technology's growing cultural significance. Augmented reality was the Advisory Board's highest-rated topic for 2011, which is a testament to its increasing importance within higher education.

Various forms of augmented reality, starting with early head-mounted displays, have been around for more than 30 years. Over that time, increased bandwidth and smart phone adoption, as well as a proliferation of AR browser applications, have helped AR evolve from a family of cool gadgets on the periphery of graphics and visualization technologies to an increasingly central player in the technology landscape. Further, the powerful significance of the concept of "blending" information and the real world in an increasingly experiential environment has pushed AR to the forefront in the realms of business, technology, entertainment, branding, and education. Companies are developing augmented reality brochures, packaging, and kiosks, while game developers are using augmented reality to create new kinds of entertainment.

Augmented reality is often described with reference to its two predominant modes of gathering information. The first mode relies on a visual metaphor and the second relies on spatial positioning. In the first method, the position of "markers," which are visual cues, are "seen" by a camera on a computer or mobile device. The marker is interpreted by software that brings up information in response to physical reference points. These points (markers) are used to interpret the device's precise location and the nature of objects in their field of view. As marker-based systems continue to develop, many are beginning to recognize common real-world objects as markers, or even special gestures, increasing their flexibility dramatically.

Position-based applications are called "gravimetric," and make use of a mobile device's GPS and compass information, and then use the device's location and position to discern what objects are nearby. Some applications also use image recognition, in which input to the camera is compared against a library of images to find a match; more recent applications can detect and interpret gestures and postures as commands to perform certain functions.

Relevance for Teaching, Learning, Research, or Creative Inquiry

One of the most promising aspects of augmented reality is that it can be used for visual and highly interactive forms of learning, allowing the overlay of data onto the real world as easily as it simulates dynamic processes. A second key characteristic of augmented reality is its ability to respond to user

input. This interactivity confers significant potential for learning and assessment. Augmented reality is an active, not a passive technology; students can use it to construct new understanding based on interactions with virtual objects that bring underlying data to life. Dynamic processes, extensive datasets, and objects too large or too small to be manipulated can be brought into a student's personal space at a scale and in a form easy to understand and work with.

In a broader context of education, augmented reality is appealing because it aligns with situated learning. Students find connections between their lives and their education through the addition of a contextual layer. The ability to transfer learning from one context to another is a significant skill, one that AR can facilitate in its overt use of context and layering. Finally, AR that relies on mobile devices leverages an increasingly ubiquitous tool, not for social interactions but for learning, blurring the boundaries between formal and informal learning, which can in turn contribute to the evolution of a learning ecology that transcends educational institutions. Indeed, the potential for just-in-time learning and exploration, without special goggles or other equipment, is a deeply compelling aspect of this technology.

A tremendous market is emerging for network-aware applications that convey information about specific places or objects. These applications have great promise for learning. This market is being explored in especially compelling ways by museums. The J. Paul Getty Museum, for example, has made available an AR complement for the Augsburg Display Cabinet, a 17th century collector's cabinet of wonders, often described as the precursor to the contemporary museum. Both Web-based and on view in the museum, the presentation offers users the opportunity to explore the cabinet without actually touching the delicate objects within. London's Natural History Museum is also using AR with a recent project called *Who Do You Think You Really Are?* that gives museum visitors handheld screens featuring an interactive video that allows users to learn about the evolution of dinosaurs, which are seen in the video moving around the actual space of the museum. Embedding AR within video and merging these two media forms is a novel use of this technology.

One of the most prevalent uses of augmented reality is to annotate existing spaces with an overlay of information. The Museum of London, for example, released a free iPhone app called StreetMuseum that uses GPS positioning and geo-tagging to allow users as they travel around the city of London to view information and 3D historical images overlaid on contemporary buildings and sites. Similarly, a project call iTacitus (Intelligent Tourism and Cultural Information Through Ubiquitous Services) allows users to visit historical locations, such as the Coliseum, pan with their mobile device, and witness an event from the past.

Augmented books are also gaining traction. Developers at the Gwangju Institute of Science and Technology have created a format that allows 3D characters to emerge from the pages of books, but the technology requires the use of goggles. Tony DiTerlizzi's book *The Search for WondLA* incorporates "WondLA Vision," which gives readers an AR experience by having them hold the book and several special images up to a webcam. While much of the early exploration of this area has centered on children's books, the use of AR for textbooks in higher education holds great promise.

Creating projects using augmented reality is becoming far more prevalent in media design programs across the U.S. For example, Georgia Institute of Technology is home to the Augmented Reality Lab, where Iulian Radu and Blair MacIntyre recently developed "Augmented Reality Scratch," an augmented reality programming environment for children. Ball State University's Department of Emerging Technologies and Media Design, in partnership with augmented reality developer Total Immersion, offers students an opportunity to develop a range of augmented reality applications. And at New York University's Interactive Telecommunications Program, as part of a class assignment, students Craig Kapp and Nisma Zaman

created an interactive AR memory matching game designed for children in rehabilitation at the Rusk Institute of Rehabilitation Medicine.

Continued experimentation in the development of AR simulations, games, texts, and situated information bode well for the expansion of AR in higher education learning in the coming year.

A sampling of applications of augmented reality across disciplines includes the following:

- **Chemistry.** Using handheld devices, students explore a physical space to uncover clues and receive data related to a simulated environmental disaster detailed in a game-based scenario using AR simulations.
- **Geography.** Students study an augmented globe in a textbook, and gain both a better representation of the cartographic information and greater options for interaction and comprehension.
- **History.** Visiting actual locations tagged with information, students view images and information from the past in situ, enhancing their comprehension.

Augmented Reality in Practice

The following links provide examples of how augmented reality is being used in higher education settings.

Augmented Reality, Blogs and Geo-Tagging to Connect Students with their Environment Abroad
http://blogs.dickinson.edu/edtech/2010/11/23/augmented-reality-blogs-geo-tagging-to-connect-students-with-their-environment-abroad/

Study Abroad students from Dickinson College visiting Japan were assigned the task of documenting their surroundings using augmented reality. They built a simple AR layer that was complemented with geo-tagged photographs and blog entries. The project's goal was to help better familiarize students with the new surroundings.

MIT Teacher Education Program
http://education.mit.edu/drupal/ar

This is a description of augmented reality simulations created by the MIT Teacher Education Program, in conjunction with The Education Arcade, to enhance student learning.

Powerhouse Museum Augmented Reality Application
http://www.powerhousemuseum.com/layar/

The Powerhouse Museum has developed an augmented reality application that allows visitors to use their mobile phones to see Sydney, Australia, as it appeared one hundred years ago.

Radford Outdoor Augmented Reality (ROAR) Project
http://gameslab.radford.edu/ROAR.html

ROAR is an augmented reality game developed by researchers in the Games, Animation, Modeling and Simulation (GAMeS) Lab at Radford University. The project uses AR to help teach K-12 students more about Native American history and teamwork through a game called Buffalo Hunt. The project was done in collaboration with HP Labs and MIT.

Skidmore Campus Map
http://academics.skidmore.edu/blogs/onlocation/2010/10/21/augmenting-reality/

The Skidmore GIS Center used augmented reality to create the Skidmore Campus Map.

Text Spaces in Augmented Reality
http://blogs.ubc.ca/etec540courseproj/course-assignment-major-project/

Text Spaces in Augmented Reality is a project at the University of British Columbia using AR in conjunction with text. The project gives many examples and a list of references related to the subject.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about augmented reality.

Augmented Reality - Its Future in Education
http://www.publictechnology.net/sector/augmented-reality-its-future-education

(Mark Smith, publictechnology.net, 15 November 2010.) This post offers a look at how augmented reality can have an impact on education.

Blended Reality: Superstructing Reality, Superstructing Selves
http://www.iftf.org/node/2598

(Kathi Vian, Institute for the Future, 4 March 2009.) This in-depth report looks at the impact of augmented reality as it is increasingly integrated into technology and society, focusing specifically on the transformation of sensory perception and its implications culturally.

Collaborative Augmented Reality in Schools
http://ltee.org/uploads/cscl2009/paper236.pdf

(Lyn Pemberton, Marcus Winter, University of Brighton, 2009.) This brief research paper discusses the use of augmented reality for collaboration and learning, and describes a specific collaborative project deploying three AR prototypes.

***Delicious:* Augmented Reality**
http://delicious.com/tag/hz11+augmentedreality

Follow this link to find additional resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz11" and "augmentedreality" when you save them to *Delicious.*

How Augmented Reality Apps Can Catch On
http://radar.oreilly.com/2010/10/two-ways-augmented-reality-app.html

(Mac Slocum, *O'Reilly Radar,* 13 October 2010.) This article discusses standards for development of AR applications.

How The New York Times, Others Are Experimenting With Augmented Reality
http://www.poynter.org/how-tos/digital-strategies/e-media-tidbits/99162/how-the-new-york-times-others-are-experimenting-with-augmented-reality/

(Dorian Benkoil, *poynter.org,* 30 October 2009.) This post discusses how *The New York Times* and other publishers are exploring the use and application of augmented reality. The author also suggests how AR can be used in conjunction with other technologies such as the semantic web and smart objects.

GAME-BASED LEARNING

Time-to-Adoption Horizon: Two to Three Years

Game-based learning has gained considerable traction since 2003, when James Gee began to describe the impact of game play on cognitive development. Since then, research — and interest in — the potential of gaming on learning has exploded, as has the diversity of games themselves, with the emergence of serious games as a genre, the proliferation of gaming platforms, and the evolution of games on mobile devices. Developers and researchers are working in every area of game-based learning, including games that are goal-oriented; social game environments; non-digital games that are easy to construct and play; games developed expressly for education; and commercial games that lend themselves to refining team and group skills. Role-playing, collaborative problem solving, and other forms of simulated experiences constitute topics for further research, but are recognized for having broad applicability across a wide range of disciplines.

Overview

Proponents of game-based learning in higher education point to its role in supporting collaboration, problem-solving, and communication, the 21st century competencies needed by American students outlined by Secretary of Education Arne Duncan in late 2010 in the National Education Technology Plan. Advocates also underscore the productive role of play, which allows for experimentation, the exploration of identities, and even failure. Gaming also contributes to the development of a particular disposition well-suited to an information-based culture and rapid change.

Gaming is an expansive category, ranging from simple paper-and-pencil games such as word searches all the way up to complex, massively multiplayer online (MMO) and role-playing games. Educational games can be broadly grouped into three categories: games that are not digital; games that are digital, but that are not collaborative; and collaborative digital games. The first category includes many games already common in classrooms as supplemental learning tools. Digital games include games designed for computers, for console systems like the Nintendo Wii, and online games accessed either through a special game client (like IBM's *Power Up*) or through a web interface (like *Whyville*).

Research into games for educational purposes reveals some interesting trends. Early studies of consumer games helped to identify the aspects of games that make them especially engaging and appealing to players of various ages and of both genders: the feeling of working toward a goal; the possibility of attaining spectacular successes; the ability to problem-solve, collaborate with others, and socialize; an interesting story line; and other characteristics. These qualities are replicable, though they can be difficult to design well, and they can transfer to games featuring educational content.

More recently, the Serious Games movement responded to the desire to unite significant content with play. The games within this genre layer social issues or problems with game play, helping players gain a new perspective through active engagement. While some criticize these games as being too serious, and therefore lacking the fun aspects that can increase engagement, research shows that players readily connect with learning material when doing so will help them achieve personally meaningful goals.

A few years further out, but increasingly interesting, is the creation of massively multiplayer online (MMO) games designed for learning. Like their entertainment- or training-focused counterparts (*World of Warcraft, Everquest, Lord of the Rings Online, America's Army,* and others), games of this type bring many players together to work on activities that require collaborative problem-solving. Games like these are complex, and include solo as well as group content

and goals that are collaborative as well as some that are competitive. They are often goal-oriented in ways that tie to a storyline or theme, but the highest levels of interaction and play require outside learning and discovery. What makes MMO games especially compelling and effective is the variety of sub-games or paths of engagement that are available to players — there are social aspects, large and small goals to work towards, often an interesting back story that sets the context, and more. Players dedicate enormous amounts of time on task pursuing the goals of these games. The problem that needs to be solved, and which is being tackled on many fronts today, is that of embedding educational content in such a way that it becomes a natural part of playing the game.

One area in which there is currently a great deal of development is social games, especially those that can be taken along and played anywhere at all using a mobile device. With social games, players are never far from a game environment, whether it be a mobile in a pocket, a desktop or laptop computer, or a networked gaming console. With this kind of ubiquity, games are becoming a pervasive part of everyday life, and our notions of what constitutes a game are changing as fast as the games themselves.

Relevance for Teaching, Learning, Research, or Creative Inquiry

Considering the relevance of gaming within higher education can take one of two admittedly overlapping paths. In the first, gaming is deemed significant as a conceptual practice with outcomes that enable students to gain skills needed specifically in an information-based culture. The second path finds relevance in specific gaming content, which can overlap with course content, helping students learn material in an innovative way.

In the first direction, advocates support the act of gaming. They see value, for example, in creating a disposition or stance that enhances skills in decision-making, innovation, and problem-solving. The ability to identify with experts as one adopts differing identities in games can allow students to experiment with leadership. In MMO games, the "conceptual blending" required in navigating the real world and virtual spaces simultaneously in game play similarly contributes a valuable skill. Finally, gaining an understanding of the "procedural logic" or meta level of game design is also useful, helping students garner a deeper understanding of the systems that drive contemporary culture. In these ways, gaming as an activity contributes to learning broadly.

In the second direction, gaming related specifically to course content helps student gain a fresh perspective on material and can potentially engage them in that content in more complex and nuanced ways. Alternate reality games (ARGs), in which players find clues and solve puzzles in experiences that blur the boundary between the game and real life, offer a clear example in which course content and game play can overlap. Recent examples of large-scale ARGs include the educational games *World Without Oil,* a collaborative and social imagining of the first 32 weeks of a global oil crisis, and *Superstruct,* in which players imagined themselves 10 years in the future, in a world facing daunting environmental, political, and health challenges. *The Tower of Babel,* an ARG designed by the European ARGuing Project, was used in schools as well as by learners of all ages for learning languages other than their own.

Online games for single users are also popular, although they may be used more in informal than formal learning contexts. Examples of single-player online games useful in an educational context include those developed by Persuasive Games, which explores advocacy issues in a format intended to engage players in serious questions related to health, policy, and contemporary topics. Similarly, the Italian design collective Molleindustrial uses gaming to address pressing social needs. *The Free Culture Game,* for example, is described as "a playable theory" and deals with copyright and free culture, while *Oligarchy* considers international oil drilling. The premise behind these games is that while students may read about social issues in a given college course, actively playing through the topics

may lend a new perspective and thorough means of involvement.

Open-ended, challenge-based, truly collaborative games have tremendous potential to transform higher education. Games like these, which occur in both massively multiplayer online (MMO) and non-digital forms, can draw on skills for research, writing, collaboration, problem-solving, public speaking, leadership, digital literacy, and media-making. When embedded in the curriculum, they offer a path into the material that allows the student to learn how to learn along with mastering, and truly owning, the subject matter. These games lend themselves to curricular content, requiring students to discover and construct knowledge in order to solve problems. They are challenging to design well, but the results can be transformative.

Research and experience have already shown that games can be applied very effectively in many learning contexts, and that games can engage learners in ways other tools and approaches cannot. As this area continues to expand, and as game designers continue to explore new ways to integrate serious topics and content area in engaging formats, gaming will become more useful and prevalent in higher education.

A sampling of applications of game-based learning across disciplines includes the following:

- **Engineering.** An engineering game called *"Cool It": An Interactive Learning Game for Cryogenics* developed at the University of Wisconsin-Madison teaches students about cryogenics by providing detailed information and feedback based on the engineering decisions they make when designing objects for this field.
- **Music.** *Melody Mixer* is a game developed at the University of Wisconsin-Madison that teaches music students how to read and compose music. It encourages students to experiment with sound and composition to better learn how pieces are constructed.
- **Nursing.** Professor Ann Burgess of Boston College's Connell School of Nursing has developed a game called *Virtual Forensics Lab* that teaches students how to conduct forensics at a crime scene. The virtual game helps students develop critical thinking for solving crimes and piecing together evidence.

Game-Based Learning in Practice

The following links provide examples of how game-based learning is being used in higher education settings.

Ghosts of a Chance

http://www.ghostsofachance.com/

This game allowed visitors to the Smithsonian American Art Museum a chance to decipher codes, follow treasure maps, send text messages, and uncover hidden objects in this multimedia scavenger hunt. The game was held in the fall of 2010.

Global Conflicts

http://www.globalconflicts.eu/

This educational game is designed to help teach concepts in citizenship, geography, and media. Developed by Serious Games International, it has detailed lesson plans and assignments for students.

Mass Extinction

http://shass.mit.edu/research/cms_game

MIT's Education Arcade in the Comparative Media Studies Program is developing a curated game called "Mass Extinction" about climate change. The game will take place in the spring of 2011.

PeaceMaker Game

http://www.peacemakergame.com/game.php

This game is designed to teach concepts in diplomacy and foreign relations. The game allows the player to take on the role of either the Israeli Prime Minister or Palestinian President, trying to find peaceful resolutions to conflicts before the term of office expires.

Simulation Games for Business Students

http://it.uoregon.edu/itconnections/playing-for-a-good-grade

A sports business professor at the University of Oregon has taken a commercial game, *Madden NFL,* and used one of its modes for developing football franchises to help teach students about marketing and business decisions. The approach leverages an off-the-shelf game and uses it for educational purposes.

Sustainability Games — Video Games for Sustainability and Design

http://emergingmediainitiative.com/project/sustainability-games/

Researchers at Ball State University are designing video games for use in teaching landscape architecture and environmental design.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about game-based learning.

Deep Learning Properties of Good Digital Games: How Far Can They Go?

http://www.jamespaulgee.com/node/37

(James Paul Gee, Arizona State University, January 2009.) This study by noted games-based learning researcher James Paul Gee discusses the design and effects of digital games.

Delicious: Game-Based Learning

http://delicious.com/tag/hz11+gamebasedlearning

Follow this link to find additional resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz11" and "gamebasedlearning" when you save them to *Delicious.*

Design Outside the Box (video)

http://g4tv.com/videos/44277/DICE-2010-Design-Outside-the-Box-Presentation/

(Jesse Schell, *DICE conference,* 18 February 2010.) Carnegie Mellon professor Jesse Schell gives a compelling talk about the future of gaming and what the world may look like as games get embedded into the fabric of everyday life with sensors and network connections helping to create sophisticated feedback and scenarios.

How Video Games Are Infiltrating—and Improving—Every Part of Our Lives

http://www.fastcompany.com/magazine/151/everyones-a-player.html

(Adam L. Penenberg, FastCompany, 13 December 2010.) This article discusses the prevalence of gaming in everyday life and how this trend will only increase in surprising and interesting ways.

Moving Learning Games Forward (PDF)

http://education.mit.edu/papers/MovingLearningGamesForward_EdArcade.pdf

(E. Klopfer, S. Osterweil and K. Salen, *The Education Arcade,* 2009.) This white paper provides an overview of the field of game-based learning, focusing on K-12 education but is also useful as background for those in higher education.

Reality Is Broken, Game Designers Can Fix It (video)

http://www.avantgame.com/

(Jane McGonigal, Institute for the Future, 2010.) This TED talk features Jane McGonigal, a leader in the design of ARGs, who advocates incorporating principles of game design into the real world to effect social change.

GESTURE-BASED COMPUTING

Time-to-Adoption Horizon: Four to Five Years

Thanks in part to the Nintendo Wii, the Apple iPhone and the iPad, many people now have some immediate experience with gesture-based computing as a means for interacting with a computer. The proliferation of games and devices that incorporate easy and intuitive gestural interactions will certainly continue, bringing with it a new era of user interface design that moves well beyond the keyboard and mouse. While the full realization of the potential of gesture-based computing remains several years away, especially in education, its significance cannot be underestimated, especially for a new generation of students accustomed to touching, tapping, swiping, jumping, and moving as a means of engaging with information.

Overview

It's almost a cliché to say it, but the first exposure to gesture-based computing for many people may have occurred over a decade ago when they saw Tom Cruise in *Minority Report* swatting information around in front of him by swinging his arms. The fact that John Underkoffler, who designed the movie's fictional interface, presented a non-fiction version of it, called the G-Speak, in a TED Talk in 2010, fittingly asserts the growing relevance and promise of gesture-based computing. The G-Speak tracks hand movements and allows users to manipulate 3D objects in space. This device, as well as SixthSense, which was developed by Pranav Mistry while at the MIT Media Lab and uses visual markers and gesture recognition to allow interaction with real-time information, has ignited the cultural imagination regarding the implications for gesture-based computing. This imagination is further fueled by the Kinect system for the Xbox, which continues to explore the potential of human movement in gaming. In short, gesture-based computing is moving from fictional fantasy to lived experience.

The approaches to gesture-based input vary. The screens for the iPhone, iPad and the multi-touch Surface from Microsoft all react to pressure, motion, and the number of fingers used in touching the devices. Some devices react to shaking, rotating, tilting, or moving the device in space. The Wii, for example, along with similar gaming systems, function by combining a handheld, accelerometer-based controller with a stationary infrared sensor to determine position, acceleration, and direction. Development in this area centers on creating a minimal interface, and in producing an experience of direct interaction such that, cognitively, the hand and body become input devices themselves. The Sony PlayStation 3 Motion Controller and the Microsoft Kinect system both move closer to this ideal.

The technologies for gesture-based input also continue to expand. Evoluce has created a touch-screen display that responds to gestures, and is working on a way to allow people to interact with Windows 7 through the Kinect system. Similarly, students at the MIT Media Lab have developed DepthJS, which unites the Kinect with the web, allowing users to interact with the Google Chrome web browser through gestures. Also at MIT, researchers are developing inexpensive gesture-based interfaces that track the entire hand. Elliptic Labs recently announced a dock that will let users interact with their iPad through gestures.

Another direction for technological innovation centers on haptics, which refers to the tactile feedback communicated to a user. At McGill University researchers are developing a haptic feedback system that allows people with visual impairments to get more feedback with fine degrees of touch, and a researcher with the Media Computing Group at RWTH Aachen University, Germany, has created a localized active haptic feedback interface called MudPad for fluid touch interfaces that promises to offer more nuanced ways to interact with screens through touch.

Other researchers are exploring ways to use gestural computing with mobile devices. GestureTek's Momo software, for example, uses two different trackers to detect motion and the position of objects, and is designed to bring gesture-based computing to phones. iDENT Technology's Near Field Electrical Sensing Interfaces is designed to allow mobiles to respond to grip and proximity sensing. A ringing mobile will put the call through if it is picked up and held, but will send it to voice mail if it is picked up and quickly put down again.

While gesture-based computing has found a natural home in gaming, as well as in browsing files, its potential uses are far more broad. The ability to move through three-dimensional visualizations could prove compelling and productive, for example, and gesture-based computing is perfect for simulation and training. Gesture-based computing has strong potential in education, both for learning, as students will be able to interact with ideas and information in new ways, and for teaching, as faculty explore new ways to communicate ideas. It also has the potential to transform what we understand to be scholarly methods for sharing ideas.

Gesture-based computing is changing the ways that we interact with computers, both physically and mechanically. As such, it is at once transformative and disruptive. Researchers and developers are just beginning to gain a sense of the cognitive and cultural dimensions of gesture-based communicating, and the full realization of the potential of gesture-based computing within higher education will require intensive interdisciplinary collaborations and innovative thinking about the very nature of teaching, learning, and communicating.

Relevance for Teaching, Learning, Research, or Creative Inquiry

Gesture-based computing has already proven productive in training simulations that operate almost exactly like their real-world counterparts. Gestural interfaces can allow users to easily perform precise manipulations that can be difficult with a mouse, as the video editing system Tamper makes plain (see the demonstration video at http://www.youtube.com/user/oblongtamper). Gesture-based computing also opens up unparalleled avenues of accessibility, interaction, and collaboration for learners.

Imagine an interface that allows students to determine or change the DNA of a fruit fly by piecing it together by hand, page through a fragile text from the Middle Ages, or practice surgical operations using the same movements a surgeon would. With gestural interfaces, discovery-based learning opportunities like these are likely to be common scenarios. Although these examples are hypothetical, research in the field of gesture-based computing is expanding rapidly and early results show that applications like these are not far-fetched.

While one direction for gesture-based computing attempts to recreate or improve upon existing practices, a more compelling direction for gesture-based computing in the context of learning will move beyond replicating what is already known in order to create entirely new forms of interaction, expression, and activity, along with the metaphors needed to make them comprehensible.

A sampling of applications of gesture-based computing across disciplines includes the following:

- **Art.** The UDraw GameTablet uses the Wii Controller to combine gestures for creating drawings and gaming, indicating directions for using gesture-based technology to expand creative inquiry through gaming and art.
- **Education.** The research agenda for the Media Design Program at Art Center College of Design includes educational technologies that use gesture-based computing, and students focus on creating new interfaces for learning.
- **Music.** The EyeMusic project at the University of Oregon uses eye-tracking sensors to compose multimedia productions based on the movements of the user's eyes.

Gesture-Based Computing in Practice

The following links provide examples of how gesture-based computing is being used in higher education settings.

3Gear Systems

http://www.threegear.com/

A pair of MIT graduate students have created a gesture-based interaction system using off the shelf computer cameras and a pair of Lyvra gloves that would cost $1 to produce.

Auckland Museum's Hybridiser Exhibit (video)

http://vimeo.com/6580702

This innovative project at the Auckland Museum uses touch-screen interfaces to allow visitors to create custom virtual orchids in lifelike detail.

EyeDraw

http://www.cs.uoregon.edu/research/cm-hci/EyeDraw/

This project, being developed at the University of Oregon, uses eye-movement to create drawings on a computer screen. The sensors can track eye motion and give users fine control over the image they compose.

Laterotactile Rendering of Vector Graphics with the Stroke Pattern

http://www.cim.mcgill.ca/~haptic/laterotactile/papers/VL-VH-EH-10.pdf

(Vincent Lévesque1 and Vincent Hayward, Proc. of *Europhaptics 2010, Part II, Kappers, A.M.L. et al. (Eds.), LNSC 6192, Springer-Verlag, pp. 25–30,* 2010.) At the University of British Columbia and the Institut des Systèmes Intelligents et de Robotique, researchers are developing a haptic feedback system that allows people with visual impairments to get more feedback with fine degrees of touch.

Morpholuminescence

http://www.i-m-a-d-e.org/morpholuminescence

Created by students at Ball State University, this project uses body gestures to adjust the light in a room for optimal viewing results. Designed for use in the fashion industry, the system offers an integrated lighting and sensor system, much of it built using the open-source Arduino prototyping platform.

MudPad

http://hci.rwth-aachen.de/mudpad

(Yvonne Jansen, *RWTH Aachen University Media Computing Group,* 2010.) Researchers in the Media Computing Group at RWTH Aachen University are developing a localized active haptic feedback interface called MudPad for fluid touch interfaces in order to offer more nuanced ways to interact with screens through touch.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about gesture-based computing.

7 Areas Beyond Gaming Where Kinect Could Play A Role

http://radar.oreilly.com/2010/12/dancing-with-kinects-future-in.html

(Alex Howard, *O'Reilly Radar,* 3 December 2010.) This post looks at how the gesture-based Kinect System from Microsoft can have broad use beyond its intended use as a gaming platform. Uses include applications in art, health and education.

Controlling Phones With the Body Electric

http://bits.blogs.nytimes.com/2010/02/17/controlling-phones-with-the-body-electric/

(Ashlee Vance, NYTimes.com, 17 February 2010.) At the 2010 Mobile World Congress, technology companies demonstrated technologies that can detect disruptions to electrical fields allowing a smartphone to perform certain functions when this happens, such as answering the phone without a need for pushing a button on the device. Other technology demonstrated includes the use of eye-movements to control computer functions on mobile devices.

Delicious: Gesture-Based Computing

http://delicious.com/tag/hz11+gesturecomputing

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Is Apple Considering Next-Gen Tactile Feedback for iOS Devices?

http://www.patentlyapple.com/patently-apple/2010/08/is-apple-considering-next-gen-tactile-feedback-for-ios-devices.html

(Jack Purcher, *PatentlyApple.com,* 2 August 2010) Apple is exploring potential technology that would bring tactile feedback to it's mobile devices, giving users new levels of feedback and interaction aside from just simple touch gestures. A unique feature of this technology provided by Senseg is the lack of mechanical motors, so there are no moving parts to break or wear out.

New Interaction Rituals: Getting the Playful Interfaces We Deserve

http://dma.ucla.edu/events/calendar/?ID=478

In this presentation from 2007, Julian Bleecker asks how we might take an art-technology approach to interface design that is gestural to create more playful experiences.

Point, Click: A Review of Gesture Control Technologies

http://games.venturebeat.com/2010/02/09/point-click-a-review-of-gesture-control-technologies

(Damian Rollison, VentureBeat.com, 9 February 2010.) This article discusses the key developers and platforms working with gesture-based technologies.

LEARNING ANALYTICS

Time-to-Adoption Horizon: Four to Five Years

Learning analytics promises to harness the power of advances in data mining, interpretation, and modeling to improve understandings of teaching and learning, and to tailor education to individual students more effectively. Still in its early stages, learning analytics responds to calls for accountability on campuses across the country, and leverages the vast amount of data produced by students in day-to-day academic activities. While learning analytics has already been used in admissions and fund-raising efforts on several campuses, "academic analytics" is just beginning to take shape.

Overview

Learning analytics refers to the interpretation of a wide range of data produced by and gathered on behalf of students in order to assess academic progress, predict future performance, and spot potential issues. Data are collected from explicit student actions, such as completing assignments and taking exams, and from tacit actions, including online social interactions, extracurricular activities, posts on discussion forums, and other activities that are not directly assessed as part of the student's educational progress. Analysis models that process and display the data assist faculty members and school personnel in interpretation. The goal of learning analytics is to enable teachers and schools to tailor educational opportunities to each student's level of need and ability.

At its heart, learning analytics is about analyzing a wealth of information about students in a way that would allow schools to take action. This information can include student profiles within an institution's database, as well as the interactions of students within course management systems. A long absence from a course's online activities, for example, can trigger faculty intervention. At its best, however, learning analytics goes much further than this, marrying information from disparate sources to create a far more robust and nuanced profile of students, in turn offering faculty members more insight.

Learning analytics need not simply focus on student performance. It might be used as well to assess curricula, programs, and institutions. It could contribute to existing assessment efforts on a campus, helping provide a deeper analysis, or it might be used to transform pedagogy in a more radical manner. It might also be used by students themselves, creating opportunities for holistic synthesis across both formal and informal learning activities.

While EDUCAUSE has announced a major program in partnership with the Gates Foundation, the Hewlett Foundation, and others that identifies learning analytics as one of five key areas for development, it is still very early and most of the work in this area is conceptual. Learning analytics also faces some challenges. It requires combining data from disparate sources, often in different formats. It also carries with it concerns about student privacy and profiling, as well as the sense that students are being reduced to information and numbers. Indeed, learning analytics to date generally falls within the purview of IT departments. For the information and its use to be more productive within curricula and pedagogy, faculty will need both to understand its technical potential, as well its pedagogical usefulness. These challenges will need to be addressed as the work moves forward. The potential for learning is clear, but the technology to deliver that potential is still very young.

Relevance for Teaching, Learning, Research, or Creative Inquiry

Learning analytics in higher education has centered primarily on identifying at-risk students who can then receive attention to avoid failure in a particular course. The Signals project at Purdue University is an exemplary instance of this use. Initiated in 2007, Signals gathers information from SIS, course management systems, and course gradebooks

to generate a risk level for students, and those designated as at-risk are targeted for outreach.

The larger promise of learning analytics, however, is that when correctly applied and interpreted, it will enable faculty to more precisely identify student learning needs and tailor instruction appropriately. This has implications not simply for individual student performance, but in how educators perceive teaching, learning, and assessment. By offering information in real time, learning analytics can support immediate alterations, suggesting a model of curriculum that is more fluid and open to change.

There are currently several kinds of tools for learning analytics including those that might be adapted for educational purposes, and those developed specifically to connect with existing educational tools. Commercial applications include Mixpanel analytics, which offers real-time data visualization documenting how users are engaging with material on a website. Similarly, Userfly, designed for usability testing, provides the ability to record the behavior of visitors to websites, and then play it back for analysis. Moving in a different direction, Gephi is a free, open source interactive visualization and exploration platform described as "Photoshop but for data." It is connected to exploratory data analysis.

Among the tools developed specifically for learning analytics is Socrato, an online learning analytics service that generates diagnostic and performance reports. SNAPP (Social Networks Adapting Pedagogical Practice), developed by the University of Wollongong in Australia, is a tool designed to expand on the basic information gathered within learning management systems; this information tends to center on how often and for how long students interact with posted material. SNAPP instead visualizes how students interact with discussion forum posts, giving significance to the socio-constructivist activities of students.

Perhaps one of most compelling aspects of learning analytics centers on collaborations between IT staff and faculty, or those working in computer science and HCI, and those working in non-computational disciplines. At Ball State University, for example, computer science professor Paul Gestwicki and English professor Brian McNely are co-developing software for enhancing collaborative knowledge work. Using current theories of learning, rhetoric, writing, and human-computer interaction, the pair is designing an interactive visualization system with the goal of providing a richer understanding of collaboration and a framework for more effective evaluation of the collaborative process within writing.

The explosion of data has offered access to tremendous amounts of information, and one of the challenges for educational institutions centers on how best to keep pace with the tools used for processing and interpreting this data in the fields of business, marketing, and entertainment. Learning analytics offers one direction, with considerable potential to enhance teaching, learning, and assessment if used with sophistication and in tandem with productive theories of contemporary learning practices.

A sampling of applications of learning analytics across disciplines includes the following:

- **Education.** Students in education programs can utilize learning analytics to incorporate into their pedagogy when they leave the academy. The use and study of analytics in their coursework can better prepare them to be leaders in this emerging area of education.
- **Instructional Technology.** Instructional technologists can use learning analytics to help educators design systems and approaches to better measure student outcomes and faculty development. These approaches can help lead the way to new ways of thinking and new technologies to better track, visualize, and mine data for application in learning analytics.
- **Nursing.** By analyzing the access patterns of students watching online videos captured from class lectures, the College of Nursing at The Ohio State University is able to track who is watching videos, how much they are viewing, and how they are viewing the content.

Learning Analytics in Practice

The following links provide examples of how learning analytics are being used in higher education settings.

Academic Early Alert and Retention System

http://www4.nau.edu/ua/GPS/student/

Northern Arizona University uses a guidance system for students aimed at improving student academic success and retention. The system provides feedback to students in four areas (attendance, grade, academics, and positive feedback). Depending on the feedback given, students are given options and pointed to resources to help them improve.

Learning Analytics — Visualizing Collaborative Knowledge Work

http://emergingmediainitiative.com/project/learning-analytics/

The Visualizing Collaboration Knowledge Work project at Ball State University is designed to visualize collaborative writing processes in order to support stronger formative evaluation.

Scribd Stats

http://blog.scribd.com/2010/11/19/scribd-stats-reading-the-numbers-between-the-lines/

Scribd, a document sharing hub, has created a feature that it describes as "Google Analytics for documents" due to its ability to measure in greater detail how differing documents, presentations, and files are being used.

Signals — Stoplights to Student Success

http://www.itap.purdue.edu/tlt/signals/

The Signals system at Purdue University provides tools for faculty to identify and help students through analytical data mining.

SNAPP—Social Networks Adapting Pedagogical Practice

http://research.uow.edu.au/learningnetworks/seeing/snapp/index.html

The University of Wollongong in Australia uses SNAPP, a software application that visualizes data from discussion forum posts to allow faculty to perceive behavioral patterns.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about learning analytics.

7 Things You Should Know About Analytics

http://net.educause.edu/ir/library/pdf/ELI7059.pdf

(*Educause,* April 2010.) This brief report explains how analytics are used for teaching, learning and assessing student progress.

Academic Analytics: A New Tool for a New Era

http://net.educause.edu/ir/library/pdf/erm0742.pdf

(John P. Campbell, Peter B. DeBlois, and Diana G. Oblinger, *Educause Review,* July/August 2007.) The authors give an overview of learning analytics citing several case studies along with a discussion of the challenges and promise of incorporating analytics into the higher education landscape.

A Case for Nudge Analytics

http://www.educause.edu/library/EQM1047

(Colleen Carmean and Philip Mizzi, *Educause Quarterly Review,* 33, no.4, 2010) Taking a cue from observations of consumer behavior, the authors suggest the nudge principle can be deployed in education to subtly influence learner behavior without taking away freedom of choice.

Delicious: Learning Analytics

http://delicious.com/tag/hz11+learninganalytics

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What Are Learning Analytics?

http://www.elearnspace.org/blog/2010/08/25/what-are-learning-analytics/

(George Siemens, *eLearnspace.org,* 25 August 2010.) George Siemens explains learning analytics and how it can be applied by learning institutions and used much the way other web analysis tools are used to interpret online data.

METHODOLOGY

All editions of the *Horizon Report* series are produced via a carefully constructed qualitative research process that draws on the input of a diverse group of people representing a range of backgrounds, nationalities, and interests. This group, known as the Horizon Project Advisory Board, is reconstituted annually and with each new edition, with at least one third of the group being new to the process each year to ensure a fresh perspective. To date, more than five hundred internationally recognized practitioners and experts have participated in the Horizon Project as a member of an Horizon Project Advisory Board.

With each new edition, the board begins by examining a broad range of primary and secondary references, trend reports, and technological innovations, along with the challenges they pose on college and university campuses. Starting with a broad overview, the board moves systematically toward a final list by examining each technology, trend, and challenge in increasing detail using a modified Delphi process. Using an extensive archive of materials, the board members comment on, and add to, the materials, focusing specifically on higher education and the potential relevance of varying technologies for teaching, learning, or creative inquiry. Conversations emerge within the wiki as participants annotate the materials. RSS feeds from dozens of relevant publications continue to supply up-to-the-minute updates, and ensures that background resources stay current as the project progresses.

Following the review of the literature, each Advisory Board member engages in the heart of the project by answering the research questions that are at the core of the Horizon Project. These questions are tailored to the focus of each edition and are designed to elicit a comprehensive listing of interesting technologies, challenges, and trends from the Advisory Board:

1. *Which of the key technologies catalogued in the Horizon Project Listing will be most important to teaching, learning, or creative inquiry within the next five years?*
2. *What key technologies are missing from our list? Consider these related questions:*
   - *What would you list among the established technologies that some educational institutions are using today that arguably all institutions should be using broadly to support or enhance teaching, learning, or creative inquiry?*
   - *What technologies that have a solid user base in consumer, entertainment, or other industries should educational institutions be actively looking for ways to apply?*
   - *What are the key emerging technologies you see developing to the point that learning-focused institutions should begin to take notice during the next four to five years?*
3. *What trends do you expect to have a significant impact on the ways in which learning-focused institutions approach our core missions of teaching, research, and service?*
4. *What do you see as the key challenge(s) related to teaching, learning, or creative inquiry that learning-focused institutions will face during the next five years?*

Each board member answers these questions systematically, making sure to engage the full range of relevant topics. The *Horizon Report* process then moves to a fast-paced ranking period that uses an iterative Delphi-based methodology to discern consensus. In the first step, the responses to the research questions are systematically ranked and placed into adoption horizons by each Advisory Board member using a multi-vote system that allows members to weight their selections. Each member is asked to also identify the timeframe during which they feel the technology would enter mainstream use — defined for the purpose of the project as about 20% of institutions adopting it within the period discussed. (The 20% figure is based on the research of Geoffrey A. Moore and refers to the critical mass of adoptions needed for a technology to have a chance

of entering broad use.) These rankings are compiled into a collective set of responses, and inevitably, the ones around which there is the most agreement are quickly apparent.

The first round of voting reveals the twelve highest-ranked technologies — four per adoption horizon. These twelve are further researched and expanded, with attention to the ways in which the technologies might be used in teaching, learning, and creative inquiry. Significant attention is paid to this research, examining not only existing applications for each area, but also potential uses in the near future.

For every edition, when that work is done, each of these twelve topics is then written up in the format of the *Horizon Report,* in an interim document referred to as the "short list." With the benefit of the full picture of how each topic will look in the report, the twelve items on the "short list" is then ranked yet again, this time in reverse. The six technologies and applications that emerge are those detailed in the *Horizon Report*.

For additional detail on the *Horizon Project* methodology or to review the actual instrumentation, the ranking, and the interim products behind the report, please visit http://horizon.wiki.nmc.org. For more information on the *Horizon Project Navigator,* please visit http://navigator.nmc.org/.

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