

Encyclopedia of Information Technology Curriculum Integration

Lawrence A. Tomei
Robert Morris University, USA

Volume I
A–Interactive Videoconferencing

Information Science
REFERENCE

INFORMATION SCIENCE REFERENCE

Hershey • New York

Acquisitions Editor: Kristin Klinger
Development Editor: Kristin Roth
Senior Managing Editor: Jennifer Neidig
Managing Editor: Sara Reed
Assistant Managing Editor: Carole Coulson
Copy Editor: Ashlee Kunkle, Jeanie Porter, Angela Thor
Typesetter: Amanda Apicello, Larissa Vinci, Carole Coulson
Cover Design: Lisa Tosheff
Printed at: Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue, Suite 200
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com/reference>

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: <http://www.eurospanonline.com>

Copyright © 2008 by IGI Global. All rights reserved. No part of this publication may be reproduced, stored or distributed in any form or by any means, electronic or mechanical, including photocopying, without written permission from the publisher.

Product or company names used in this set are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark.

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this encyclopedia set is new, previously-unpublished material. The views expressed in this encyclopedia set are those of the authors, but not necessarily of the publisher.

If a library purchased a print copy of this publication, please go to <http://www.igi-global.com/reference/assets/IGR-eAccess-agreement.pdf> for information on activating the library's complimentary electronic access to this publication.

APEC Cyber Academy: An International Networked Learning Environment

Mark van 't Hooft

Kent State University, USA

Yimei Lin

National Chung Cheng University, Taiwan

Candace Chou

University of St. Thomas, USA

Chi-Syan Lin

National University of Tainan, Taiwan

INTRODUCTION

Web-based learning environments have become an integral part of both traditional face-to-face and online education (Bonk & Graham, 2006; Moore, 2005). Over the past decade, the boom of online learning has contributed to the creation of course management systems that are designed to provide better accessibility to students. Many of the systems claim to support pedagogical visions with good human-computer interfaces (HCI) that encourage peer collaboration, knowledge construction, mentoring, and community building, using such basic tools as content management, course delivery, discussion boards, and assessment modules. The functionalities of a Web-based learning environment can either dictate or extend the instructional activities that a teacher can apply in the classroom.

Most systems are primarily designed for college or adult learners, and only manage syllabi and instructional content. However, increasing numbers of students at primary and secondary levels are going online for at least some of their learning needs. In the U.S., for example, K-12 enrollment in online courses has risen from approximately 50,000 in 2001 to 700,000 during the 2005-2006 school year (Picciano & Seaman, 2007). Online participation seems especially strong in districts that are small or physically more isolated than others, as the Internet provides access to learning choices and resources not available otherwise.

BACKGROUND

Online learning comes in a wide variety of shapes and sizes. It can be completely online or blended; it can be synchronous or asynchronous, or a combination of both; it can be collaborative or independent (Garrison & Anderson, 2003; Turoff, 2005). The key to both learning and computer mediation is the “notion of interaction,” that is, interaction with content, interaction with instructors, and interaction among learners. Interaction with content refers to how learners interact with the course materials and the concepts and ideas these materials represent. Interaction with instructors includes the ways in which instructors teach, guide, correct, and support their students. Interactions among learners can be formal or informal and take on many forms, such as debate, collaboration, discussion, and peer review. All modes of interaction support learning and each can be uniquely enacted in online learning environments (Moore, 1989; Swan, 2003). In addition, the three modes of interaction depend on each other in practice, whether in face-to-face or online environments (Rourke, Anderson, Garrison, & Archer, 2001).

Hillman, Willis, and Gunawardena (1994) propose that new technologies create a fourth type of interaction, at least temporarily. This interaction takes place between learner and HCI, that is, the specific technologies, platforms, and applications used to access learning tools and resources. The quality of the interface thus affords or constrains the quality and quantity of the other three interactions (Gibson, 1996). A good HCI is especially important when working with children in primary and secondary schools if it is to encourage peer collaboration, knowledge construction, mentor-

ing, and community building. Many sources have reported international standards for HCI and usability of Web-based content for learning. Among others, these standards include guidelines on functionality, interface, interaction, support and feedback, and use of graphics and multimedia (Bevan, 1995; Janicki & Liegle, 2001; Nielsen, 2004; Schneiderman, 1998; UsabilityNet, 2006).

Easy-to-use and understand functionalities that assist the development of rich interaction, reflection, and problem-based or project-based learning are even more important when Web-based learning interactions take place across countries, cultures, and languages. Unfortunately, very few Web-based learning environments provide pedagogical tools and quality HCI to support effective interactions and collaboration among K-12 learners in international settings. One example of a learning environment that is specifically designed to meet the various standards for a quality HCI and usable Web-based content for learning with children is the APEC Cyber Academy.

INTERNATIONAL NETWORKED LEARNING: APEC CYBER ACADEMY

APEC Cyber Academy, a networked learning environment, was originally designed for K-12 students of APEC (Asia-Pacific Economic Cooperation) member economies, and was developed to address the specific characteristics in pedagogy and HCI that are essential for supporting international collaboration among primary and secondary school learners. The original intent was to provide a place for students and teachers to communicate, share, and engage in virtual learning experiences in an international context. Launched in 2002, the project is hosted by the APEC Digital Content Production Center currently under the auspices of APEC/EDNET and the Ministry of Education of Taiwan. With its emphasis on active learning and creative digital content, the APEC Cyber Academy has attracted a growing number of international users. As of January 2007, there were more than 14,000 registered learners from various countries around the world (Lin, Chou, & Bagley, 2007).

Theoretical Foundations

The APEC Cyber Academy is founded on Vygotski's (1978) constructivist and Bandura's (1977, 1997) self-regulated learning theories. The two theories complement each other well in fostering learner-centered learning. While Vygotskian constructivism emphasizes knowledge is co-constructed with peers or experts and through immersion in a social context, self-regulated learning places a strong emphasis on cultivating an individual learner's ability to be an autonomous learner. As such, the APEC Cyber Academy serves as a venue for implementing innovative pedagogy that promotes motivation, creative thinking, critical thinking, and collaborative learning as outlined by Bonk and Reynolds (1997).

The main goal of the APEC Cyber Academy is to create an international learning environment for K-12 students to interact and collaborate on projects following the principles of social constructivism as well as self-regulated learning. The main objectives are: (1) providing a networked learning environment that follows the design principles of HCI to facilitate interaction for learning; (2) utilizing state-of-the-art technology to assist learning and assessment; (3) applying the pedagogical principles of collaborative learning into the design of online activities; (4) fostering international friendship among K-12 learners through online collaboration and computer-mediated communication; and (5) improving ICT (information and communication technology) skills through project-based learning.

Application of HCI Principles

A good HCI helps to reduce anxiety and fear of computer usage, assists with smooth introductions for novice users, provides direct manipulation of objects, offers input devices and online assistance, and allows for information exploration through easy navigation (Markopoulos & Bekker, 2003; Schneiderman, 1998). As mentioned, abundant guidelines have been written on what constitutes a good interface for computer-based training and learning. Dunham and Sindhvad (2003) summarized usability studies on children's behavior and concluded the following HCI elements are most important in the design of a child-centered learning environment:

1. **Animation:** Children are attracted to animation and tend to click on it when available (Bernard, 2003). Gilutz and Nielsen (2003) found that the appropriate use of sound and animation can help children to stay focused on a Web site;
2. **Geographic navigation metaphors and mine-sweeping:** Children prefer visual metaphors of geographic representations, such as rooms, villages, 3-D maps, or other simulations of real environments. They are willing to engage in minesweeping, such as scrubbing the screen with a mouse to find clickable items or to enjoy a sound effect;
3. **Reading online:** Children are willing to read instructions before starting an activity as long as the instructions are kept brief and simple. Children usually do not scroll pages to look for information;
4. **Icons as recognizable symbols:** Children between 8 and 12 prefer icons that represent symbols or languages that they are familiar with from their real environments;
5. **Advertisements:** Children will click on advertisements and think that they are part of the content.

APEC Cyber Academy's learning environment follows many of the usability guidelines for young learners. Animations are used where appropriate (e.g., navigation buttons), graphic representations are child friendly, and universal symbols are used consistently. One of the main activities utilizes the metaphors of camping, and provides a number of scavenger hunt games for collaborative problem solving, story telling, and media sharing. Instructions are kept short and to the point. All content and navigation buttons are accessible within the length of one screen (800 X 600 resolution), and there is no advertising on the site.

Collaborative and Project-Based Learning

The platform includes a lobby, playground, lecture hall, learning space with project-based learning programs, and several communication channels. The main component is the learning space, in which the Networked Collaborative Learning Program and ICT Cyber Camp are located. Various modules within these two programs encourage learners to interact; collaborate on projects;

and create, upload, and share a variety of artifacts such as stories and videos. In addition, APEC Cyber Academy provides many students with opportunities for second-language acquisition; while the working language of the platform is English, the majority of students are from Southeast Asia with a native language other than English. Learners can practice their language skills by way of specially created modules, such as the Magic House in the ICT Cyber Camp, or the creation of digital media that is shared online.

Interaction and Feedback

All modules are built to fully support learner-computer interaction, learner-learner interaction, learner-teacher interaction, and learner-content interaction. Learners can find ample online and human support throughout the learning process by way of discussion boards, e-mail, real-time text and video chat with peers and teachers, and artifact showcases. Two types of online tutors are available: one being human tutors who maintain discussion boards and interact with students by way of the integrated synchronous and asynchronous communications channels, the other being an online intelligent agent named WuKong.

Assessment of learning is ongoing and takes place in a variety of ways. Students are encouraged to evaluate each other's work in constructive ways using online feedback tools. In addition, experts are invited to assess the quality of student participation and artifacts. Finally, interpersonal communication is evaluated using a built-in tracking system. Building up a versatile international learning community is one of the primary goals of *APEC Cyber Academy*. Therefore, participants of the camp are strongly encouraged to interact with their peers, especially with those who are in different teams or from different countries, by using forum and communication tools in the camp. A built-in tracking system is utilized to automatically aggregate the frequency of interpersonal communication for each team.

FUTURE TRENDS

Internet technologies have developed at unprecedented rates in recent years, and they will continue to do so. Many of the currently available Web 2.0 tools allow for collaborative knowledge creation (e.g., wikis), social networking (e.g., MySpace), open reflection and

discussion (e.g., blogs), media creation and manipulation (e.g., Jumpcut, Fauxto, Pknic), and media sharing (e.g., YouTube, Uth TV, Flickr, BubbleShare). As these activities are Web based, they have the potential to reach a global audience.

Many of the students we teach today are fluidly accessing digital, networked, information wherever and whenever the need arises (and this includes learning needs). They simply do not know a world without it. However, just like actions have consequences in real life, so do they in cyberspace, and this is an aspect of being online that children often forget or are unaware of. Therefore, it is essential that students at younger ages have access to safe, virtual environments that provide opportunities for learning about and practicing safe, responsible, and ethical online behavior. For example, students need to learn how to use communication channels, such as discussion boards, for their intended purposes, which include posting appropriate material in the appropriate location, as well as replying to other participants' posts when called for. This is an area in which much work remains to be done, both in terms of developing suitable and useful learning environments and resources, as well as academic research.

Second, as stated, online learning can easily range from local to global levels, and anything in between. Consequently, it is imperative that in online learning activities, such as the APEC Cyber Academy, that involve cross-cultural communication and collaboration, opportunities are provided for participants to learn about and come to appreciate cultural similarities and differences. In addition, online instructors/facilitators need to be aware of cultural differences in the learners' online behaviors, taking them into account to foster online collaboration among culturally diverse learners (Kim & Bonk, 2002).

A third and related issue is that of peer assessment. Feedback on student artifacts is extremely important, and can be very powerful when it is constructive and timely, as it allows students to not only evaluate what their peers create and share, but also reexamine their own work within a much more tangible context. Even young students can learn to do this well. Again though, cultural differences with regards to providing and receiving feedback need to be taken into account. In addition, the development of useable and solid assessment tools is essential here.

Finally, even though students are communicating and collaborating at a global level, they need support.

In many cases, online facilitators or instructors are not adequate, and local, face-to-face guidance is needed. It is because of this need that teacher preparation is crucial, that is, teachers need to learn ahead of time what learning materials are offered (and how they may fit in with existing local curricula and standards), who is participating, what students are expected to do, what communication and support channels are available for students and teachers, and how assessment of learning will be done. In addition, teachers should be able to provide suggestions for improving existing materials and resources.

CONCLUSION

Online learning has seen explosive growth in higher education over the past decade. It is only reasonable to expect that a similar trend will occur in primary and secondary education. The APEC Cyber Academy is a good example of how networked learning environments that follow pedagogical principles and HCI guidelines can encourage students to develop 21st century skills such as the use of ICT to gather, organize, validate, and communicate information to solve problems, and communicate and collaborate with others on levels ranging from local to global. By participating in learning that is characterized as such, students can and will develop an understanding of what it means to use ICT in safe, ethical, and meaningful ways, and develop the means to become responsible, digital, and global citizens.

REFERENCES

- Bandura, A. (1977). *Social learning theory*. New York: General Learning Press.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.
- Bernard, M. L. (2003). *Criteria for optimal web design (designing for usability)*. Retrieved Nov. 21, 2005, from <http://psychology.wichita.edu/optimalweb/children.htm>
- Bevan, N. (1995). Human-computer interaction standards. In Y. Anzai, K. Ogawa, & H. Mori (Eds.), *Proceedings of the 6th International Conference on*

Human Computer Interaction. Amsterdam, The Netherlands: Elsevier.

Bonk, C. J., & Graham, C. R. (Eds.). (2006). *The handbook of blended learning: Global perspectives, local designs*. San Francisco, CA: Pfeiffer.

Bonk, C. J., & Reynolds, T. H. (1997). Learner-centered web instruction for higher-order thinking, teamwork, and apprenticeship. In B. H. Khan (Ed.), *Web-based instruction* (pp. 167–178). Englewood Cliffs: Educational Technology Publications.

Dunham, T., & Sindhvad, S. (2003). *Exploring development & design of web-based learning environments for children*. Paper presented at the 19th Annual Conference on Distance Teaching and Learning, Madison, WI.

Garrison, D. R., & Anderson, T. (2003). *E-learning in the 21st century: A framework for research and practice*. New York: Routledge Falmer.

Gibson, J. J. (1996). *The senses considered as perceptual systems*. Boston: Houghton Mifflin.

Gilutz, S., & Nielsen, J. (2002). *Usability of websites for children: 70 design guidelines*. Fremont, CA: Nielsen Norman Group.

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education*, 8 (2), 30-42.

Janicki, T., & Liegle, J. O. (2001). Development and evaluation of a framework for creating web-based learning modules: A pedagogical and systems approach. *Journal of Asynchronous Learning Networks*, 5 (1), 58-84.

Kim, K. J., & Bonk, C. (2002). Cross-cultural comparisons of online collaboration. *Journal of Computer-Mediated Communication*, 8(1). Retrieved March 28, 2007 from <http://jcmc.indiana.edu/vol8/issue1/kimand-bonk.html>

Lin, C. S, Chou, C., & Bagley, C. (2007). APEC Cyber Academy: Integration of pedagogical and HCI principles in an international networked learning environment. In E. McKay (Ed.). *Enhancing learning through human computer interaction* (pp. 152-175). Hershey, PA: Idea Group Publishing, Inc.

Markopoulos, P., & Bekker, M. (2003). Interaction design and children. *Interacting with Computers*, 15(2), 141-149.

Moore, J. C. (Ed.). (2005). *Elements of quality online education: Engaging communities: Wisdom from the Sloan Consortium*. Needham, MA: Sloan-C.

Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education*, 3 (2), 1-6.

Nielsen, J. (2004). *Kids' corner: Website usability for children*. Retrieved Nov. 21, 2005, from <http://www.useit.com/alertbox/20020414.html>

Picciano, A. G., & Seaman, J. (2007). *K-12 online learning: A survey of U.S. school district administrators*. Needham, MA: Sloan-C.

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2001). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education*, 14 (2), 2001. Retrieved March 27, 2007 from http://cade.athabascau.ca/vol14.2/rourke_et_al.html

Schneiderman, B. (1998). *Designing the user interface: Strategies for effective human-computer interaction* (3rd ed.). Reading, MA: Addison-Wesley.

Swan, K. (2003). Learning effectiveness: What the research tells us. In J. Bourne & J. C. Moore (Eds) *Elements of quality online education, practice and direction* (pp. 13-45). Needham, MA: Sloan Center for Online Education.

Turoff, M. (2005). Online learning as a social innovation: Lessons from the past. In J. C. Moore (Ed.), *Elements of quality online education: Engaging communities: Wisdom from the Sloan Consortium* (pp. 229-244). Needham, MA: Sloan-C.

UsabilityNet. (2006). *International standards for HCI and usability*. Retrieved March 27, 2007, from http://www.usabilitynet.org/tools/r_international.htm

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.

KEY TERMS

Asynchronous Learning: Allows the sequence of interaction between the teacher and the student to happen at different times. Examples of asynchronous tools include e-mail and discussion boards.

Blended Learning: Learning that combines face-to-face instruction with computer-mediated learning.

Cyber Academy: a Web-based learning environment for elementary and junior high students to enjoy learning constructively in an authentic collaborative manner.

Human-Computer Interface (HCI): The interface used by humans to access a computer system. A common HCI is the operating system.

Information and Communication Technology (ICT): Phrase used to describe a range of technologies for gathering, storing, retrieving, processing, analyzing, and transmitting information.

Online Learning: Course where most or all of the content is delivered online, with at least 80% of seat time being replaced by online activity.

Synchronous Learning: Takes place when instructors and learners are present at the same time in a real virtual-learning space, allowing for real-time interaction such as through instant messaging.

Web 2.0: A perceived second generation of Web-based services that emphasize online collaboration and sharing among users.