Transforming Web-Based Education: From Web2.0 to Web4.0

Dr. Vladimir Uskov
Professor, Department of Computer Science and Inf. Systems
Co-Director, InterLabs Research Institute
Bradley University
Peoria, IL, U.S.A.

July 18-22, 2010, Gliwice, POLAND

Prof. Vladimir Uskov, Ph.D.

- Professor, Computer Science and Information Systems, Bradley University
- Co-Director, InterLabs Research Institute and Lab on Web-Based Education, Bradley University
- 2002-2010 Chair, International Annual Conference on Web-Based Education (WBE)
- 2002-2010 Chair, International Annual Conference on Computers and Advanced Technology in Education (CATE)

Web-Based Education Activities: experience, D&D, grants, consulting
- 1996 – D&D of the 1st course for Web-based education
- 1999 - 2008 Principal Investigator or co-PI of 4 National Science Foundation (NSF) grants on WBE with total funding of $ 1.5 M USD
- 1992 - present Visiting Professor at universities of the USA, Japan, Germany, Italy, France, Switzerland and Holland
- 1994 - present Consultant of ministries of education, corporations, academic and corporate universities, companies and businesses in about 20 different countries on Advanced Web-Based Education and Training
Part 1:
Introduction

- Private University (found. 1897)
- 5 colleges
- 6,000+ students (5,000 UG + 1,000 GR)
- 300+ faculty, or, 62%, use online learning every semester
- 300 academic courses every semester (including 275+ online or 90% academic courses per semester (almost 1 online course per each faculty)

Member of I2 Consortium
Illinois Virtual Campus: 
Online Student Enrollment Growth

Enrollment in Online Courses 
at Illinois Colleges and Universities 
(Fall 1999 – Fall 2009)

Source: http://www.ivc.illinois.edu/pubs/enrollPDF/Fall09.pdf

Illinois Virtual Campus: 
Technologies for Distance Education Content Delivery 
(Interior, I2, stored media, interactive TV, broadcast TV, correspondence)

Web-Based Education (WBE) is a dominant component of Distance Education, Online Learning, e-Learning

Source: http://www.ivc.illinois.edu/pubs/enrollPDF/Fall09.pdf
Part 2: Strategic Perspectives of Advanced Web-Based Education for 2010-2020 and beyond …

Web 1.0, Web 2.0, Web 3.0, Web 4.0 …
Web-Based Education/e-Learning 1.0, 2.0, 3.0, 4.0 …

~2000
- Mostly READ Web
- Limited number of authors
- Millions of users
- Limited interactivity
- Static info and home pages
- Owning content
- HTML, portals
- Web forms
- Directories (taxonomy)
- Ex: Britannica Online

~2010
- Web 2.0
- Social Web
- Collaborative RMM Web Learning (2.0)
- Mostly READ-WRITE-COMMUNICATE Web
- Millions of authors
- Billions of users
- Great interactivity (blogs, wikis, etc.)
- Sharing content
- XML, RSS
- Web applications
- Tagging (“folksonomy”)

~2020
- Web 3.0
- Semantic Web
- Personalized Web Learning (3.0)
- Mostly MOBILE&PERSONAL Web
- Focus on individual user
- Integrated on-demand dynamic content
- Semantic web and content objects
- Widgets, mashups, metadata, dynamic web services, ontology
- User behavior
- Active user engagement

~2030
- Web 4.0
- Intelligent Web
- Learning 4.0
- Mostly SELF-LEARNING, SELF-ORGANISING Web
- Focus on Individual User +
- Subject Domain +
- Level of Knowledge
- Internet as a universal World Computer
- Web as a universal Knowledge Base

Source 1: http://www.labnol.org/internet/web-3-concepts-explained/8908/

1) Rich multimedia Web applications and learning content
2) Web 2.0-based communication tech.
A selection of Technology and Instructional Approaches for Advanced WBE is dictated by the "How Much People Remember" Rule:

- What they DO (~75-95%)
- What they SAY or WRITE (~65-80%)
- What they HEAR and SEE (~50-65%)
- What they SEE (~40-50%)
- What they READ (~20-40%)

I hear … and I forget. I see … and I remember. I do … and I understand.
(Chinese Proverb)

Advanced WBE

Level of Instructional Design

LOW

LES

MORE

Web-based exercises, simulations
Web-based Games, Serious Games
Interactive live e-classes
Video/audio-conferencing + white boards
Online course with static visuals
Online PPT presentations
Online papers (in PDF format)
Emails
Online textual self-study guides
Learning-by-Doing, inc. GBL
Learning-by-Collaboration = Collabor. L.
Learning-by-Watching (Streaming T.)
Learning-by-Reading

Sources: Edgar Dale, 1969; Nick van Dam, 2003; Uskov, 2005

Web2.0 – “Read/Write/Communicate” Web -- Technologies in Education: A Summary

blogs, chats, digital storytelling, discussion boards, e-portfolios, folksonomies, IM, search, RSS, machinima, microblogging, m-learning, MMO, PLEs, podcasting, social networking, social sharing, virtual worlds, VLEs, videoconferencing, VLE, websites

PLE – personal learning environment, IM – instant messaging, RSS – real simple syndication, machinima – machine cinema or machine animation, microblogging – Web service for mobile phone, MMO – massively multiplayer online game, VLE – virtual learning environments, etc.
Web3.0 – “Read/Write/Collaborate at any time, at any place” -- in Education

**Web3.0 Drivers:**

1. **Smart Mobile Technology**
   (ubiquitous access to tools, technologies, knowledge and learning objects, etc.)

   **Distributed Computing**
   (Mobile Computing, Ubiquitous Computing, GRID Computing, Cloud Computing)

2. **Personalization**
   (of learning, of teaching, of learning environment, user, etc.)

3. **Advanced Software Engineering Technologies**
   - Telepresence in 3D

**Part 3:**

**Most Important Issues for WBE in 2010-2015:**

**Outcomes of 2010 World Survey**
Profile of 357 respondents from 174 organizations in 61 countries (faculty – 55%, administrators – 30%, PhD. students – 12%, others 3%)

Countries.
Respondents represent a total of 174 organizations including in alphabetical order:
Argentina, Australia, Austria, Bahrain, Botswana, Brazil, Bulgaria, Canada, China and SAR Hong Kong, Czech Republic, Estonia, Egypt, Ethiopia, Finland, France, Germany, Greece, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kingdom of Bahrain, Korea, Kuwait, Latvia, Lithuania, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Oman, Pakistan, Poland, Portugal, Qatar, Republic of Yemen, Romania, Russia, Saudi Arabi, Scotland, Serbia, Singapore, South Africa, Spain, Sweden, Switzerland, Tunisia, UAE, Thailand, Trinidad and Tobago, Turkey, USA, UK, Ukraine, USA, and Venezuela.

Experience in WBE area

Ownership of Advanced Technology

Primary Involvement into WBE

Self-Reported Skills’ Level: LMS, LOR, OCW

Self-Reported Skills’ Level: Communication T.

Profile of 357 respondents from 174 organizations in 61 countries (faculty – 55%, administrators – 30%, PhD. students – 12%, others 3%)

Hours Spent Per Week on Technology-Related Activities
Strategic Issues of Advanced WBE for 2010-2015

Selected Strategic Issues of Advanced WBE

1. Administration
2. Courseware
3. Evaluation
4. Faculty
5. Funding
6. Infrastructure
7. Instructional Approaches
8. Intellectual Policy
9. Other
10. Outsourcing
11. Partnerships
12. Quality
13. Security
14. Services
15. Social Networking
16. Strategic Planning
17. Students
18. Technology
Quality Issues of Advanced WBE

Quality of Web-Based Education vs. Quality of Traditional Education in 2010, 2015, and 2020

Possible Methodologies to Evaluate Quality of WBE

**Learner measures**
- 50% Learning gain
- 32% Student performance evaluation

**Course measures**
- 33% Course evaluations
- 50% Course completion rates
- 17% Course revenue or profits
- 10% Course satisfaction with specific course
- 5% Course satisfaction with curriculum offerings
- 44% Increased student demand for e-Learning

**Business measures**
- 50% Reduction in training costs
- 32% Reduction in time-to-learn (e.g., training, etc.)
- 2% [Other]

Source: http://www.elearningguild.com/
Instructor’s Issues
Advanced WBE

Skills of Advanced Web-Based Educator (instructor, teacher, trainer) to be in great demand in 2010-2015

No obvious leaders – all skills are very important

Employee with online skills to be most needed in WBE systems in 2010-2015
Instructional Strategies to be widely used in Advanced WBE in 2010-2015

Leaders: 1) Collaborative learning,
          2) Problem-based and project-based learning,
          3) Learning-by-doing.

Innovative Technology and Faculty: Roger’s Typology

# Technologies for Advanced WBE

## Optimal Number of Media to be Used in 1 WBE Course?

(based on feedback from students, Fall-2009)

<table>
<thead>
<tr>
<th>Type of Technology</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web-based text (PDF, DOC, XLS, HTML, XML, PPT formats)</td>
<td>100</td>
</tr>
<tr>
<td>Web-based search engines and hyperlinks to Internet-based knowledge res.</td>
<td>100</td>
</tr>
<tr>
<td>Web-based graphics, pictures, photos (JPEG, BMP, GIF, VML, SVG formats)</td>
<td>98</td>
</tr>
<tr>
<td>Streaming media (WMA, AVI formats)</td>
<td>63</td>
</tr>
<tr>
<td>Recorded Computer Screen tech. (1024 x 768 pixels, AVI format)</td>
<td>58</td>
</tr>
<tr>
<td>Online testing</td>
<td>56</td>
</tr>
<tr>
<td>Streaming video, films, movies (AVI, MPEG, MOV, QT, RV, WMV)</td>
<td>52</td>
</tr>
<tr>
<td>Streaming animation (animated GIF, dynamic HTML, Flash, Director)</td>
<td>45</td>
</tr>
<tr>
<td>Virtual reality, virtual worlds, 3D animation (VRML format)</td>
<td>35</td>
</tr>
<tr>
<td>Software simulation and programming (VB, C, C++, Java, etc.) tools</td>
<td>35</td>
</tr>
<tr>
<td>Programming or scripting (JavaScript, VBScript, PHP) tools</td>
<td>31</td>
</tr>
<tr>
<td>Educational audiotapes</td>
<td>6</td>
</tr>
<tr>
<td>Educational VHS videotapes</td>
<td>3</td>
</tr>
<tr>
<td>Televised courses (one-way educational TV programs)</td>
<td>3</td>
</tr>
</tbody>
</table>

Number of MM and Communication Technologies to be used in one WBE course

<table>
<thead>
<tr>
<th>Number of MM and Communication Technologies to be used in one WBE course</th>
<th>% resp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 different technologies</td>
<td>19</td>
</tr>
<tr>
<td>6 - 10</td>
<td>39</td>
</tr>
<tr>
<td>11 - 15</td>
<td>22</td>
</tr>
<tr>
<td>16 - 20</td>
<td>16</td>
</tr>
<tr>
<td>21 - 25</td>
<td>4</td>
</tr>
</tbody>
</table>
Rich Multimedia Streaming Technology
(the InterLabs Web-Lecturing Technology - current v. 7.2; v. 1.0 - Nov 2001 as a part of NSF-CCLI grant outcome)

- Video/Audio
- Email
- Bulletin B.
- Chat
- Whiteboard
- Video-conf.
- Audio-conf.

http://www.interlabs.bradley.edu/nsf_ccli/demo/

Recorded Computer Screen (RCS) Technology
(Web-based Hands-On Exercises, Animations, Simulations, Games)

- PowerPoint HOE
- Oracle DB HOE
Internet-2: Collaboration of 200+ U.S. Universities on D&D of 100+ Gbps = 100,000+ Mbps Network (at least 1,000 times faster than commodity Internet)

Examples of Internet-2 Applications in Education

- Stanford University: Interactive and Simulation-Based Learning Environments
- Bradley University: Live (synchronous) e-Learning (2-way interactive video+ audio) for courses in Screenwriting and Hand Drumming
- Carnegie-Mellon University: Digital Libraries
- University of Delaware: Remote Instrumentation
- Univ. of North Dakota: Distributed Learning
Virtual Scientific/Educational Labs

Web-Based Simulations and Serious Games

Start "BMV" Demo

Start "Arc" Demo

Start "Waves" Demo

Start "Pump" Demo
Towards Web 3.0 and Web-Based Learning 3.0
(Mobile and Personalized Web-Based Learning)

Web 3.0:
- Mobile and personal Web
- Focus on individual user
- Integrated on-demand dynamic content
- Based on user behavior (profile)
- Semantic Web and learning objects

Recent Software Engineering Technologies:
- Syndication technology
- Mashup technology
- AJAX technology
- Web services
- Metadata, folsonomy, ontology
- Hypermedia technologies
- Location-aware technology
- Recommendation engines
  etc.

Good Achievements in AI area
- Intelligent tutoring systems
- Intelligent agents
  etc.

WBE Courses
Types of Web-Based Courses most likely to be taken by online students/learners in 2010-2015

“The Future Belongs to Those Who Prepare For It Today”

(American Proverb)