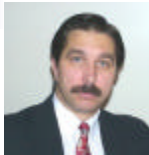# Transforming Web-Based Education: From Web2.0 to Web4.0

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

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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)
- **2004-2008** — Editor-in-Chief, International Journal on Advanced Technology in Learning (ISSN:1710-2251)

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**

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Part 1:
Introduction

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BRADLEY
UNIVERSITY

- 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)
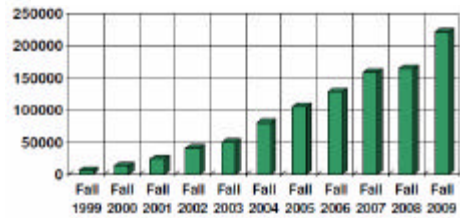
Member of *I2 Consortium*

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Illinois Virtual Campus:
Online Student Enrollment Growth

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

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

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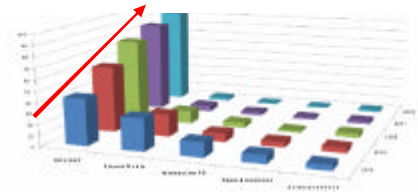### (Internet, I2, stored media, interactive TV, broadcast TV, correspondence)

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

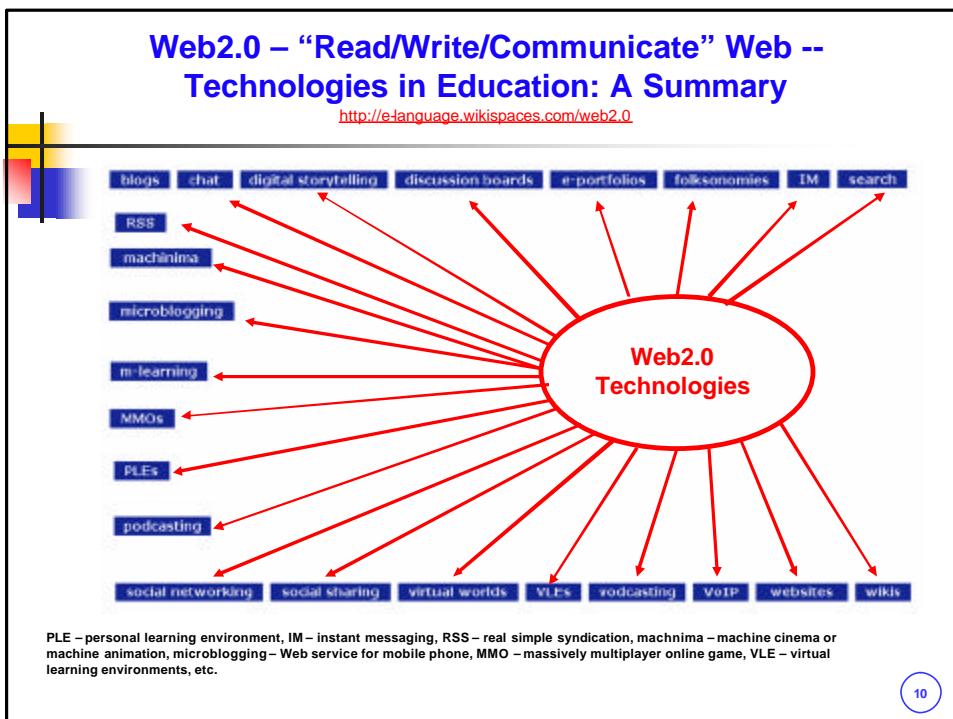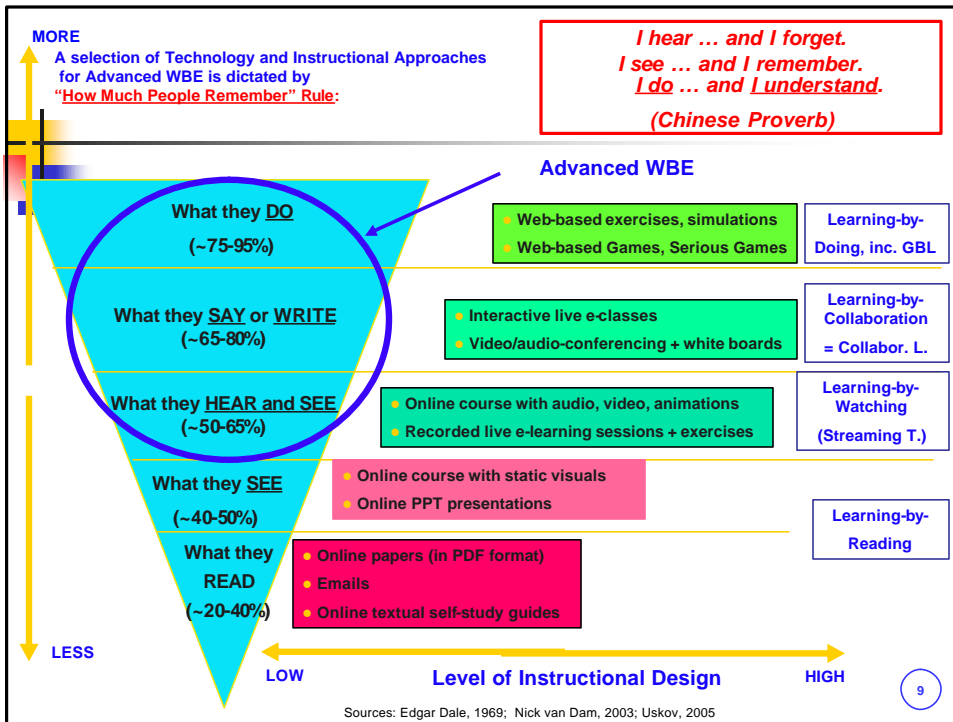Source: http://www.ivc.uillinois.edu/pubs/enrollPDF/Fall09.pdf

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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-Learning1.0, 2.0, 3.0, 4.0…

~2030

1) Rich multimedia Web applications and learning content
2) Web2.0-based communication tech.

~2020

Web 4.0
Intelligent Web
Intelligent Web Learning 4.0

~2010

Web 3.0
Semantic Web
Personalized Web Learning (3.0)

~2000

Web 2.0
Social Web
Collaborative
RMM Web Learning (2.0)

Web 1.0
Information Web
Web Learning/ Reading (1.0)

• 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

• 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

• Mostly READ-WRITE-COMMUNICATE Web
• Millions of authors
• Billions of users
• Great interactivity (blogs, wikis, etc.)
• Sharing content
• XML, RSS
• Web applications
• Tagging ("folksonomy")
• Ex: Wikipedia

• 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

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

Source 2: A. Amman, T.Kiss, M. Hirsch, H. Matthies: Where, What, Why: Mr. Q on the Web

Slide 9

A selection of Technology and Instructional Approaches for Advanced WBE is dictated by "How Much People Remember" Rule:

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

Advanced WBE

What they DO (~75-95%)
- Web-based exercises, simulations
- Web-based Games, Serious Games

Learning-by-Doing, inc. GBL

What they SAY or WRITE (~65-80%)
- Interactive live e-classes
- Video/audio-conferencing + white boards

Learning-by-Collaboration = Collabor. L.

What they HEAR and SEE (~50-65%)
- Online course with audio, video, animations
- Recorded live e-learning sessions + exercises

Learning-by-Watching (Streaming T.)

What they SEE (~40-50%)
- Online course with static visuals
- Online PPT presentations

Learning-by-Reading

What they READ (~20-40%)
- Online papers (in PDF format)
- Emails
- Online textual self-study guides

LESS

LOW **Level of Instructional Design** HIGH

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

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Slide 10

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

http://e-language.wikispaces.com/web2.0

blogs | chat | digital storytelling | discussion boards | e-portfolios | folksonomies | IM | search

RSS

machinima

microblogging

m-learning

MMOs

PLEs

podcasting

Web2.0 Technologies

social networking | social sharing | virtual worlds | VLEs | vodcasting | VoIP | websites | wikis

PLE – personal learning environment, IM – instant messaging, RSS – real simple syndication, machnima – machine cinema or machine animation, microblogging – Web service for mobile phone, MMO – massively multiplayer online game, VLE – virtual learning environments, etc.

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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**

Source: http://e-language.wikispaces.com/web3.0

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Part 3:

Most Important Issues for WBE in 2010-2015:

Outcomes of 2010 World Survey

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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 **61 countries** including (in alphabetical order) Argentina, Australia, Austria, Bahrain, Botswana, Brazil, Bulgaria, Canada, China and SAR Hong-Kong, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Kingdom of Bahrain, Korea, Kuwait, Latvia, Lithuania, Malaysia, Mexico, Macedonia, Netherlands, New Zealand, Norway, Oman, Pakistan, Poland, Portugal, Qatar, Republic of Yemen, Romania, Russia, Saudi Arabia, Scotland, Serbia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan/ROC, Thailand, Trinidad and Tobago, Turkey, UAE, UK, Ukraine, USA, and Venezuela.

Experience in WBE area

Primary Involvement into WBE

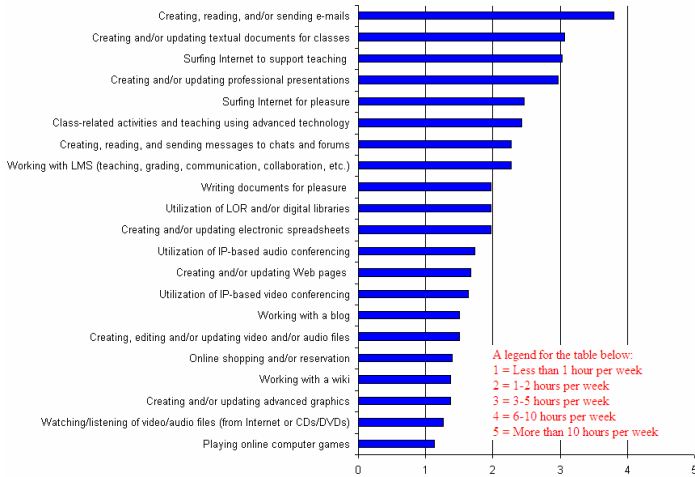### Ownership of Advanced Technology

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

Self-Reported Skills' Level: Communication T.

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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

- Creating, reading, and/or sending e-mails
- Creating and/or updating textual documents for classes
- Surfing Internet to support teaching
- Creating and/or updating professional presentations
- Surfing Internet for pleasure
- Class-related activities and teaching using advanced technology
- Creating, reading, and sending messages to chats and forums
- Working with LMS (teaching, grading, communication, collaboration, etc.)
- Writing documents for pleasure
- Utilization of LOR and/or digital libraries
- Creating and/or updating electronic spreadsheets
- Utilization of IP-based audio conferencing
- Creating and/or updating Web pages
- Utilization of IP-based video conferencing
- Working with a blog
- Creating, editing and/or updating video and/or audio files
- Online shopping and/or reservation
- Working with a wiki
- Creating and/or updating advanced graphics
- Watching/listening of video/audio files (from Internet or CDs/DVDs)
- Playing online computer games

A legend for the table below:
1 = Less than 1 hour per week
2 = 1-2 hours per week
3 = 3-5 hours per week
4 = 6-10 hours per week
5 = More than 10 hours per week

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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

In terms of student **academic performance** in classes (at university or college)

In terms of student **post-graduate outcomes** (marketability, employment, positions, promotions, salary, etc.)

Learner measures

50%	Learning gains
52%	Learner performance measures

Course measures

73%	Course enrollments
58%	Course completion rates
17%	Course revenue or profits
58%	Customer satisfaction with specific course
52%	Customer satisfaction with curriculum offerings
44%	Increased customer demand for e-Learning

Business measures

50%	Reduction in training time
52%	Reduction in training costs (time, travel, etc.)
2%	Other

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Source: http://www.elearningguild.com/

Instructor's Issues
Advanced WBE

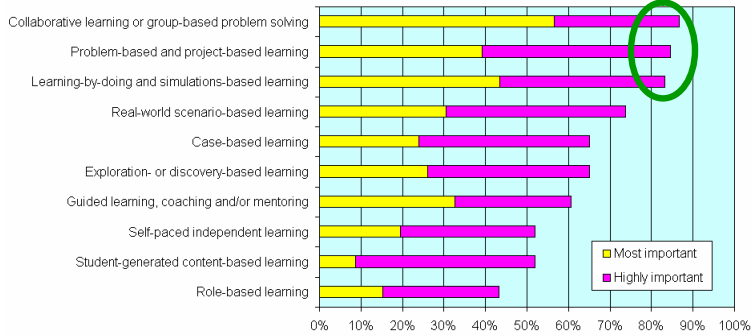## Skills of Advanced Web-Based Educator (instructor, teacher, trainer) to be in great demand in 2010-2015
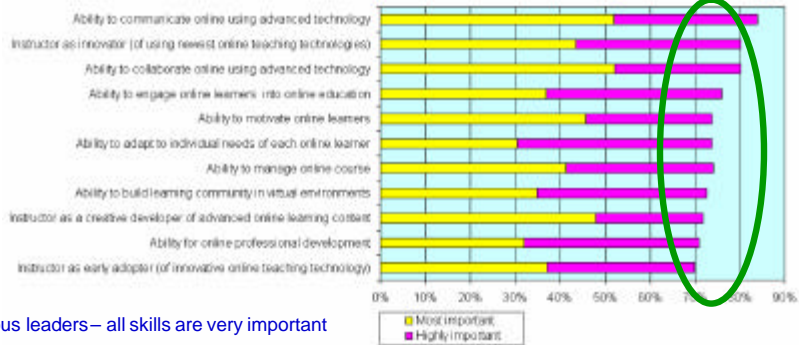
No obvious leaders – all skills are very important

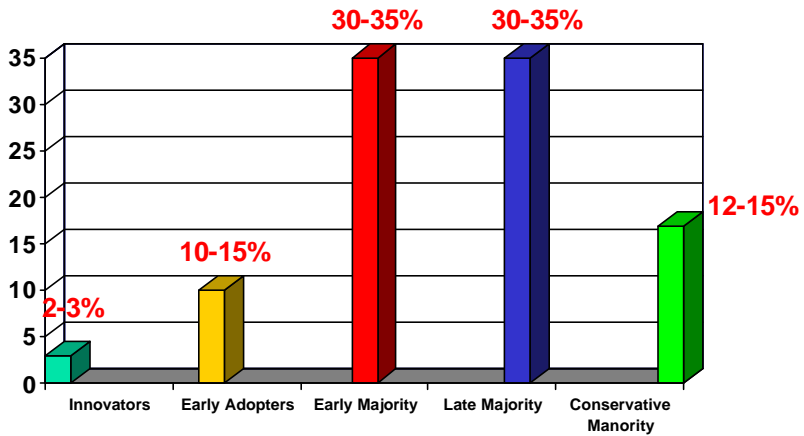**Employee with online skills to be most needed in WBE systems in 2010-2015**

A legend
1 = Most Unlikely
2 = Unlikely
3 = Neutral
4 = Likely
5 = Most Likely

Instructional Strategies to be widely used in Advanced WBE in 2010-2015

Collaborative learning or group-based problem solving
Problem-based and project-based learning
Learning-by-doing and simulations-based learning
Real-world scenario-based learning
Case-based learning
Exploration- or discovery-based learning
Guided learning, coaching and/or mentoring
Self-paced independent learning
Student-generated content-based learning
Role-based learning

Legend: □ Most important ■ Highly important

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

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

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Innovative Technology and Faculty: Roger's Typology

2-3%   10-15%   30-35%   30-35%   12-15%

Innovators   Early Adopters   Early Majority   Late Majority   Conservative Manority

Source: E.M. Rogers, *Diffusion of Innovations,* (4th Ed), Free Press, New-York, 1995.

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Technologies
for Advanced WBE

Optimal Number of Media to be Used in 1 WBE Course?
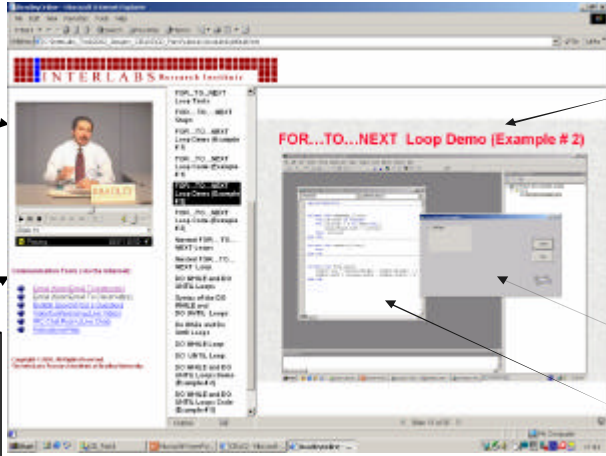(based on feedback from students, Fall-2009)

Number of MM and Communication Technologies to be used in one WBE course	% resp.
1 to 5 different technologies	19
6 -10	39
11 - 15	22
16 – 20	16
21 - 25	4

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

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

Text
PPT slides
Pictures

FOR...TO...NEXT Loop Demo (Example # 2)

Web-based
Animation

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

Web-based
programming
and simulation

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

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

PowerPoint HOE

Oracle DB HOE

26
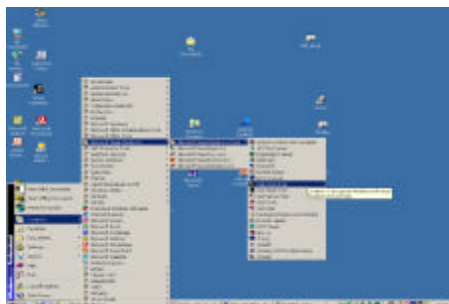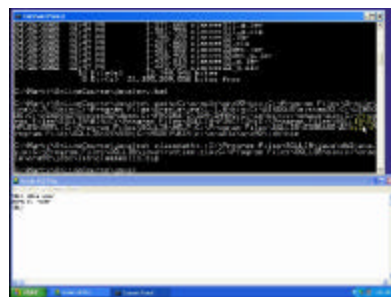
**Internet-2: Collaboration of 200+ U.S. Universities
on D&D of 100+ Gbps = 100,000+ Mbps Network
(at least 1,000 times faster than commodity Internet)**

Abilene International Peering
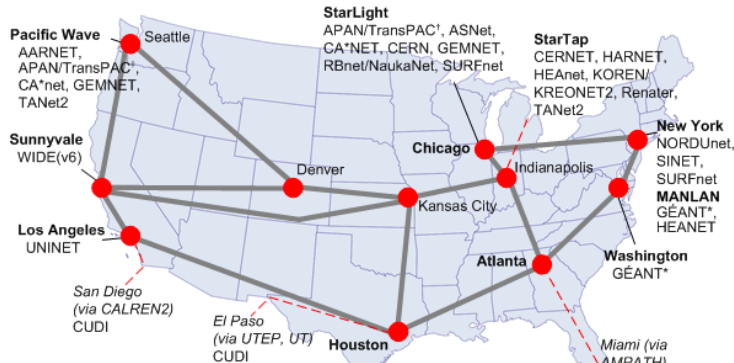
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**Examples of Internet-2
Applications in Education**

- 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
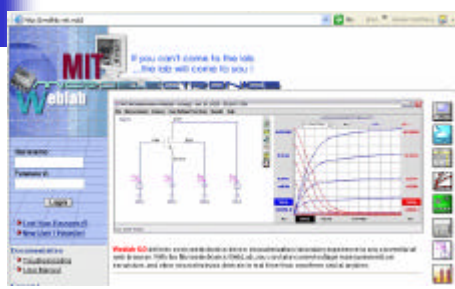
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Virtual Scientific/Educational Labs

Web-Based Simulations and Serious Games

Start "Pump" Demo

Start "Waves" Demo

Start "Arc" Demo

Start "BMV" Demo

Towards **Web 3.0** and Web-Based Learning 3.0
(Mobile and Personalized Web-Based Learning)

- Toshiba e805 Pocket PC

- 4" + VGA (480x640 pixels); standard – 3.5 " + 320x240 pixels

- Voice over IP is great

- Video window only

- Acceptable for "Talking Head" teaching technology (for courses in Sociology, Psychology, Business, History, etc.)

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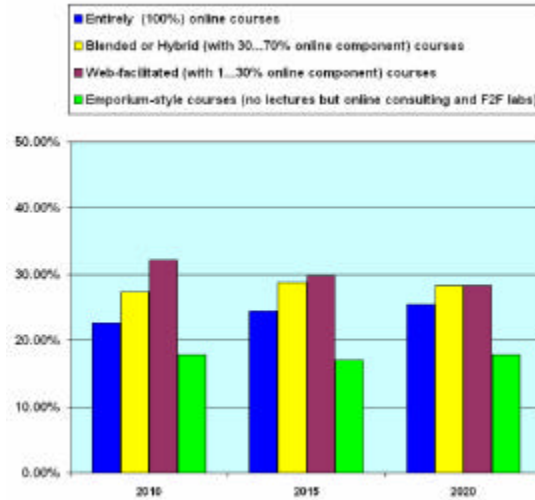
+
Good Achievements in AI area
- Intelligent tutoring systems
- Intelligent agents
etc.

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WBE Courses

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

■ Entirely (100%) online courses
□ Blended or Hybrid (with 30...70% online component) courses
■ Web-facilitated (with 1...30% online component) courses
■ Emporium-style courses (no lectures but online consulting and F2F labs)

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*"The Future Belongs to Those
Who Prepare For It Today"*

(American Proverb)

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