

Wisdom is not the product of schooling but the lifelong attempt to acquire it. - Albert Einstein

University of Colorado at Boulder

From Renaissance Scholars to Renaissance Communities:

Learning and Education in the 21st Century

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Basic Message

- fostering, nurturing, and supporting Renaissance communities is a necessity and not a luxury in the 21st century
- the objectives, theories, frameworks, and systems underlying Renaissance Communities are central topics for the present and future of the Conference "Collaboration Technologies and Systems"

Learning and Education in the 21st Century

The co-evolution between learning, new media, and new learning organizations



Overview

- Renaissance Scholars
- Renaissance Communities
- Conceptual Frameworks for Renaissance Communities
 - Meta-Design
 - The Seeding, Evolutionary Growth, and Reseeding (SER) Model
 - Social Creativity
 - Cultures of Participation
 - Rich Ecologies of Participation
 - Communities of Interest
- Implications

Examples of Renaissance Scholars

- Leonardo da Vinci (1452-1519) artist, astronomer, sculptor, geologist, mathematician, botanist, animal behaviorist, inventor, engineer, architect, musician
- Herbert Simon (1916-2001) multidisciplinary creativity: PhD in Political Science, administrative and organizational theory, cognitive psychology, design, complex systems, artificial intelligence (Turing Award), economics (Nobel Prize); unifying focus: human problem solving and decision making

Leonardo — the Artist





Leonardo — the Inventor (Design of a Glider)



Herbert Simon "Sciences of the Artificial" (1969, 1981, 1996)



Problems Transcending the Individual Human Mind

- problems of a *magnitude* which individuals and even large teams cannot solve and require the contribution of all interested stakeholders
- problems of a systemic nature requiring the collaboration of many different minds from a variety of backgrounds
- problems being *poorly understood and ill-defined* and therefore requiring the involvement of the owners of problems because they cannot be delegated to others
- problems modeling changing and unique worlds supported by open and evolvable systems based on fluctuating and conflicting requirements

From Renaissance Scholars to Renaissance Communities "Superhuman": Desired but Unrealistic



Realistic: Learning "something" about the Other Domain



Objective: Renaissance Communities

high reflective community low high low Domain Knowledge

Tools/Media Knowledge

Renaissance Communities

- "Nobody knows who the last Renaissance man really was, but sometime after Leonardo da Vinci, it became impossible to learn enough about all the arts and the sciences to be an expert in more than a small fraction of them" — Csikszentmihalyi, M. (1996) Creativity — Flow and the Psychology of Discovery and Invention
- "Even within disciplines, disciplinary competence is not achieved in individual minds, but as a collective achievement made possible by the overlap of narrow specialties" Campbell, D. T. (1969) "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience."
- "None of us is as smart as all of us" Bennis, W., & Biederman, P. W. (1997) Organizing Genius: The Secrets of Creative Collaboration
- "Linux was the first project to make a conscious and successful effort to use the entire world as a talent pool" — Raymond, E. S. (2001) *The Cathedral and the Bazaar*

Models Underlying Renaissance Communities: Ivan Illich's Learning Webs

<< source : Chapter 6 "Learning Webs" in "Deschooling Society" (1971)>>

Criteria for a Good Educational System

- provide all who want to learn with access to available resources at any time in their lives
- empower all who want to share what they know to find those who want to learn it from them
- furnish all who want to present an issue with the opportunity to make their challenge known

• Four Approaches

reference services to educational objects + skill exchange + peer-matching + reference services to educators-at-large

• Foundations for the Claim:

- Teaching and learning are not inherently linked. There is a lot of learning without teaching. And there is a lot of teaching without learning. (Wenger, 1998)

Models Underlying Renaissance Communities: T-Expertise Model

T-shaped skills (or T-shaped persons)

- metaphor to describe the abilities of persons in the workforce
- the vertical bar on the T represents the depth of skills and expertise in a single field
- horizontal bar is the ability to collaborate across disciplines with experts in other areas and to apply knowledge in areas of expertise other than one's own
- T-shaped person is not a jack-of-all-trades (with *"knowledge a mile wide and an inch deep"*), but a master of one

Models Underlying Renaissance Communities: The Fish-Scale Model

 "collective comprehensiveness through overlapping patterns of unique narrowness" (Campbell, 1969)



 research questions: symmetry of ignorance, common ground, shared understanding, boundary objects,



Conceptual Frameworks and Examples for Renaissance Communities

Conceptual Frameworks and Examples for Renaissance Communities

Meta-Design

- relevant publication: Fischer, G., & Giaccardi, E. (2006) "Meta-Design: A Framework for the Future of End User Development." In H. Lieberman, F. Paternò, & V. Wulf (Eds.), End User Development, Kluwer Academic Publishers, Dordrecht, pp. 427-457.
- The Seeding, Evolutionary Growth, and Reseeding (SER) Model
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- Distances and Diversity in Renaissance Communities

Meta-Design

meta-design = design for designers

assumptions:

- future uses and problems cannot be **completely anticipated** at design time, when a system is developed
- users, at use time, will discover **mismatches** between their needs and the support that an existing system can provide for them
- requires some level of **digital literacy** to be acquired by users

contributions:

- creates new (additional) design methodology democratizing design
- expands **boundaries** by supporting users as active contributors
- distributes control among all stakeholders in the design process users become independent of "high-tech scribes"
- creates foundations for cultures of participation
- supports social creativity

A Fundamental Aspect of Systems: Design Time and Use Time



Meta-Design: Extending Other Design Methodologies

professionally-dominated design

- works best for people with the same interests and background knowledge

user-centered design

- analyze the needs of the users
- understand the conceptual worlds of the users

participatory design ("design for use before use")

- involve users more deeply in the process as co-designers
- focus on system development at design time by bringing developers and users together to envision the contexts of use

meta-design ("design for design after design")

- create design opportunities at use time
- requires co-creation

more info: CHI Workshop 2007: "Converging on a 'Science of Design' through the Synthesis of Design Methodologies" <u>http://swiki.cs.colorado.edu:3232/CHI07Design/</u>

What Do Meta-Designers Do?

 use their own creativity to create socio-technical environments supporting users (domain professionals, owner of problems) to be creative

 create technical and social conditions for broad participation in design activities which are as important as creating the artifact itself

NSF Program "CreativeIT"

Developing the Synergies between Research in Creativity and Computer and Information Science and Engineering

http://www.nsf.gov/pubs/2007/nsf07562/nsf07562.htm

A Wiki about the CreativeIT Program

http://swiki.cs.colorado.edu:3232/CreativeIT



Conceptual Frameworks and Examples for Renaissance Communities

Meta-Design

The Seeding, Evolutionary Growth, and Reseeding (SER) Model

- relevant publication: Fischer, G., Grudin, J., McCall, R., Ostwald, J., Redmiles, D., Reeves, B., & Shipman, F. (2001) "Seeding, Evolutionary Growth and Reseeding: The Incremental Development of Collaborative Design Environments." In G. M. Olson, T. W. Malone, & J. B. Smith (Eds.), Coordination Theory and Collaboration Technology, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 447-472.
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The Seeding, Evolutionary Growth, Reseeding (SER) Model

• at design time:

- development of an initial system that can change over time (seed)
- underdesign: creating design options for users

• at use time:

- end-user modifications allow users to address limitations they experience
- evolutionary growth through incremental modifications

reseeding:

- significant reconceptualization of the system
- account for incremental modifications, mitigate conflicts between changes, and establish an enhanced system

The SER Model



Courses-as-Seeds

- examples: <u>http://l3d.cs.colorado.edu/~gerhard/courses/index.html</u>
- teachers act as meta-designers and create seeds
 - lecture notes
 - readings
 - assignments
 - questionnaires
 - project proposals
- students are active contributors \rightarrow evolutionary growth
 - answers to assignments and questionnaires: contributors and summarizers
 - project ideas, initial proposal, progress report, final report
- fundamental transformative change:

teacher, learner = f{person} → teacher, learner = f{context}

Home Page of one Of Our Courses



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🖉 EDIT 🔻 EXPORT 🔻 MORE ACTIONS 🔻 ANNOTATIONS Home Human-Centered Computing Foundations, Fall 2010 Roster Human-Centered Computing Foundations, Fall 2010 Assignments Schedule and Syllabus Course Announcement Last modified by Hal Eden on 2011/12/05 06:37 Annotations | Comments (0) · Attachments (0) · History · Information Lecture Material Gerhard Fischer, Hal Eden, and Holger Dick - Fall 2010 Relevant Resources Questionnaires CSCI 3002: Human-Centered Computing Foundations Student Projects and Voluntary Contributions CSCI 7000: Current Topics in Computer Science: Human-Centered Computing Foundations Blog Tutorials Time: Monday and Wednesday 04:00pm-05:15pm (Edit this panel) Location: ITLL 1B50 (Integrated Teaching and Learning Lab, next to Engineering Center) This course will introduce the foundations for Human-Centered Computing (HCC). As computing is changing our lives, this RECENTLY VISITED transformation is shaped not only by technology but also by how people express themselves, how they think, how they interact with computational artifacts, and how they collaborate with other humans. The broad-based research area of HCC will prepare DocumentDoesNotExist students to contribute to this accelerating global process. Students will learn about, design, develop, and assess socio-Lecture 18 technical environments that tie together technology with communication, collaboration, and other social processes to address Lecture Material the challenges and opportunities of our future world. A3 The course will cover practice and research in human computer interaction, design of interactive systems, computer supported Assignments cooperative work, computer supported collaborative learning, educational technology, tools that support creativity, userdeveloped knowledge collections, and gaming. Specific topics addressed will include: Cultures of Participation, Web 2.0 CREATE PAGE Environments, Design, Meta-Design, End-User Development, (Social) Creativity, and Distributed Cognition. SPACE NAME: Tags: [+] HCCF2010 Created by Hal Eden on 2010/08/20 12:22 PAGE NAME: NewPage ANNOTATIONS COMMENTS (0) ATTACHMENTS (0) CREATE HISTORY INFORMATION

Conceptual Frameworks and Examples for Renaissance Communities

- Meta-Design
- The Seeding, Evolutionary Growth, and Reseeding (SER) Model

Social Creativity

- relevant publication: Fischer, G., Giaccardi, E., Eden, H., Sugimoto, M., & Ye, Y. (2005) "Beyond Binary Choices: Integrating Individual and Social Creativity," International Journal of Human-Computer Studies (IJHCS) Special Issue on Computer Support for Creativity (E.A. Edmonds & L. Candy, Eds.), 63(4-5), pp. 482-512.
- Cultures of Participation
- Rich Ecologies of Participation
- Distances and Diversity in Renaissance Communities

Social Creativity

Creativity — The "Wrong" Image? "The Thinker" by Auguste Rodin



Social Creativity

"The strength of the wolf is in the pack, and the strength of the pack is in the wolf." Rudyard Kipling

 social creativity: requires designers not consumers — domain professionals, discretionary users, and competent practitioners worry about tasks and are motivated to contribute and to create good products

- Individual versus social creativity → individual and social creativity
 - not a binary choice
 - explore the relationship between the individual and the social (e.g., autonomy ←→ collective goals)
- assumption: Renaissance Communities should consist and bring together knowledgeable and engaged individuals

The Envisionment and Discovery Collaboratory (EDC)



Boulder City Council and University of Colorado Regents



Buildings Sketched into a Google-Earth Client



Conceptual Frameworks and Examples for Renaissance Communities

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- Social Creativity

Cultures of Participation

- relevant publication: Fischer, G. (2011) "Understanding, Fostering, and Supporting Cultures of Participation," ACM Interactions XVIII.3 (May + June 2011), pp. 42-53.
- Rich Ecologies of Participation
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Cultures of Participation

Fundamental Challenge and Opportunity

consumer cultures

focus: produce finished goods to be consumed passively

cultures of participation

focus: provide all people are with the means to participate actively in **personally meaningful** problems

Consumer and Designers — Beyond Binary Choices

claims:

- there is nothing wrong about being a consumer (watching a tennis match, listening to a concert, ...)
- the same person wants to be a consumer in some situations and in others a designer → consumer / designer is not an attribute of a person, but of a context consumer / designer ≠ f{person} → f{context}

problems:

- someone wants to be a designer but is forced to be a consumer → personally meaningful activities
- someone wants to be a consumer but is forced to be a designer → personally irrelevant activities

Environments Created by Cultures of Participation

Site	Objectives and Unique Aspects
Wikipedia	web-based collaborative multilingual encyclopedia with a single, collaborative, and verifiable article; authority is distributed (<u>http://www.wikipedia.org/</u>)
iTunes U	courses by faculty members from "certified institutions"; control via input filters; material can not be remixed and altered by consumers (<u>http://www.apple.com/education/itunes-u/</u>)
YouTube	video sharing website with weak input filters and extensive support for rating (<u>http://www.youtube.com/</u>)
Encyclopedia of Life (EoL)	documentation of the 1.8 million known living species; development of an extensive curator network; partnership between the scientific community and the general public (<u>http://www.eol.org/</u>)
SketchUp and 3D Warehouse	repository of 3D models created by volunteers organized in collections by curators and used in Google Earth (http://sketchup.google.com/3dwarehouse/)

Environments Created by Cultures of Participation

Scratch	Learning environment for creating, remixing, and sharing programs to build creative communities in education (<u>http://scratch.mit.edu</u>)
Instructables	socio-technical environment focused on user-created and shared do-it- yourself projects involving others users as raters and critics (<u>http://www.instructables.com/</u>)
PatientsLikeMe	collection of real-world experiences enabling patients who suffer from life- changing diseases to connect and converse (<u>http://www.patientslikeme.com/</u>)
Stepgreen	library of energy saving actions, tips, and recommendations by citizen contributors for saving money and being environmentally responsible (http://www.stepgreen.org/)

SketchUp – a high-functionality 3D Modeling Environment



3D Warehouse: a Web 2.0 Environment

http://sketchup.google.com/3dwarehouse/

features:

- search, share, and store 3D models created in SketchUp
- models include: buildings, houses, bridges, sculptures, cars, people, pets, ...
- download the 3D models to be modified in SketchUp
- if the model has a location on earth \rightarrow download it and view it in Google Earth

challenges:

- what will **motivate** people to participate?
- participation requires acquiring skills in using SketchUp → create learning environments for SketchUp

3D Warehouse

3D Building Collections



Featured Google Earth Modelers





Help Model a City



Featured Google Earth Collections



Google Earth - Ocean Layer

Popular Models





SketchUp Components

Chair by <u>Yeroc</u>



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Interior Furnishings
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People by Graphic Sketchbook

CU Boulder in 3D



Downtown Denver in 3D



A Tiny Percentage of a Huge Population \rightarrow Large Number of Participants



Conceptual Frameworks and Examples for Renaissance Communities

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Rich Ecologies of Participation

- relevant publication: Fischer, G., Piccinno, A., & Ye, Y. (2008) "The Ecology of Participants in Co-Evolving Socio-Technical Environments." In P. Forbrig, Paternò, F. (Ed.), Engineering Interactive Systems (Proceedings of 2nd Conference on Human-Centered Software Engineering), Volume LNCS 5247, Springer, Heidelberg, pp. 279-286
- Distances and Diversity in Renaissance Communities

Richer Ecologies of Participation

• *in the past:*

- software developers and users
- producers and consumers
- professionals and amateurs
- *in the future: more roles beyond* passive, undifferentiated consumers
 - producers, raters, taggers, curators, stewards, active users, passive users
- roles are distributed in communities:
 - power users, local developers, gardeners
- challenge: support migration paths with "low threshold, high ceiling" architectures

Richer Ecologies of Participation: Consumer \rightarrow Contributor \rightarrow Collaborator \rightarrow Meta-Designer



Ecologies in Open Source Communities



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Distances and Diversity in Renaissance Communities

 relevant publication: Fischer, G., & Ostwald, J. (2005) "Knowledge Communication in Design Communities." In R. Bromme, F. W. Hesse, & H. Spada (Eds.), Barriers and Biases in Computer-Mediated Knowledge Communication, Springer, New York, N.Y., pp. 213-242.

Distances and Diversity in Renaissance Communities

- distribution creates distances → these distances are not only spatial, but also temporal, conceptual, and technological
- conceptual dimension: "Communities of Practice" and "Communities of Interest"
 - **Communities of Practice (CoPs)**, defined as groups of people who share a professional practice and a professional interest
 - **Communities of Interest (Cols)**, defined as groups of people coming from different disciplines who share a common interest, such as framing and solving problems and designs artifacts (Envisionment and Discovery Collaboratory)

Communities of Practice (CoPs)

Homogenous Design Communities

- **CoPs:** practitioners who work as a community in a certain domain
- examples: architects, urban planners, research groups, software developers, software users, kitchen designers, computer network designer,

Iearning:

- masters and apprentices
- legitimate peripheral participation (LPP)
- develop a notion of belonging
- problems: "group-think" → when people work together too closely in communities, they sometimes suffer illusions of righteousness and invincibility

Communities of Interest (Cols): Heterogeneous Design Communities

- **Cols** = bring different CoPs together to solve a problem
- membership in Cols is defined by a shared interest in the framing and resolution of a design problem

diverse cultures

- people from academia and from industry
- software designers and software users
- students and researchers from around the world

fundamental challenges:

- establish a common ground
- building a shared understanding of the task at hand
- learning to communicate with others who have a different perspective
- primary goal: not "moving toward a center" (CoP) but "integrating diversity"

Communication Problems in Cols



Implications

- culture changes
- drawbacks
- Massive Open Online Courses (MOOCs) Education for Everyone?

Major Cultures Changes Caused by New Media and New Technologies



Drawbacks of Meta-Design and Cultures of Participation

- participation overload: burden of being active contributors in personally irrelevant activities
 - o "do-it-yourself" societies
 - o companies offloading work to customers
- accumulation of irrelevant information
- lack of coherent voices (leading to fragmented cultures)

Massive Open Online Courses (MOOCs)

a hot topic!

the amazing facts: reach and impact

- moved beyond discussion in academics circles
- 160 000 participants (Stanford AI course) → 10% completion rate → 16 000 students

• Assessment Dimensions:

- almost all existing analyses: "Wall-Street (= economics) + Silicon Valley (= technologies)"
- my objective: assessment of MOOCS by the frameworks articulated in my presentation (from the learning sciences)

The Major Players

- <u>http://www.udacity.com/</u> -- Udacity: a teaching institution, not a research institution a company formed by Stanford people (Thrun) (for-profit)
- <u>https://www.coursera.org/</u> -- Stanford's alternative to Udacity (not-for-profit)
- <u>https://www.edx.org/</u> —EdX is a joint partnership between: MIT, Harvard, and UC Berkeley (not-for-profit)

The Promises of MOOCs

- courses from the top universities
- for free
- learn from world-class professors
- watch high quality lectures
- achieve mastery via interactive exercises
- collaborate with a global community of students

The Hype: MOOCs will Revolutionize Higher Education

- edX: "Most Important Educational Technology in 200 Years"
- John Hennessey (President, Stanford University): "there's a tsunami coming."
- A movement toward online higher education could have an enormous impact on American higher education, comparable to the impact the Internet has had on bookstores and publishers. There would undoubtedly be a very rapid and considerable consolidation of colleges and universities.
- The learning potential for society (globally) is wonderful. (India, Nepal, Africa: university students can't get the quality of instruction from some of our colleges that they get from MOOCs)
- Professors delight in reaching more students in one course than they could otherwise teach in a lifetime.
- There is a problem of asking questions of the lecturer in a class of ten thousand students, but some MOOCs solve it by allowing students to post questions that the student body votes on, and only the **most popular questions are put to the lecturer**.

Issues to be Explored

- how interactive are these sites / lectures?
- for which type of learning are these approaches a good fit?
- why are these efforts (or at least some of them) successful and what does success mean?
- why should we pay attention to these developments?
- what can we **learn** from these efforts for our own activities?
- how are the participants certified / credentialed?

My Interest: To Identify the

Core Competencies of Residential, Research-Based Universities

- Robert Birgeneau (Chancellor, UC Berkeley): "We are committed to excellence in online education with the dual goals of distributing higher education more broadly and enriching the quality of campus-based education.
- "The campus environment offers opportunities and experiences that cannot be replicated online — EdX is designed to improve, not replace, the campus experience."

challenges created by MOOCs

- commoditizing the 'content' sharpens the focus on the substantive values of residential education: personal attention from faculty and participation in learning and research communities
- o move away from large passive lectures towards active learning environments
- o emphasize "learning to be" (in addition to "learning about")
- o explore learning in contexts "when the answer is not known"

MOOCs = one important and exciting dimension in a Multi-Dimensional Learning Landscape



Conclusion

Renaissance Communities = exciting innovations and transformations

- **past decades**: digital media have provided new powers for the **individual**
- future: the world's networks are providing enormous unexplored opportunities for communities
- technologies are necessary, but not sufficient to explore and exploit these opportunities → co-evolution between learning, new media, and new learning organizations
- the themes underlying the Conference "Collaboration Technologies and Systems" are not a luxury, but a necessity to be explored for the years to come

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