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Finding Problems Versus Solving Them: Inquiry in Information Seeking

Bertram C. Bruce

Graduate School of Library & Information Science

University of Illinois at Urbana-Champaign

http://www.uiuc.edu/~chip

Abstract

Finding information, especially accurate, timely, and relevant information, is increasingly important in nearly all human endeavors. Accordingly, numerous studies have examined the processes information seekers employ, as well as the strategies information providers use to meet their needs. Most models emphasize satisfaction or closure as the criterion for successful completion of an information search; thus the emphasis is on solving a specific problem. But often, information seeking is part of some larger process, which is invisible to the information provider and often unclear even to the seeker. Successful search may lead not so much to eliminating an existing, well-defined problem, as to delineating a new problem within a complex, ill-defined space. This paper examines information seeking from an inquiry, or problem-based perspective, and argues that the fields of information seeking and problem-based learning can benefit from closer dialogue.

Outline

1. Relation between information-seeking and problem-solving
    - *why separation creates problems*
2. Tools for inquiry
    - *integrated tools*
    - *integrated design process*
3. Problem-solving and learning
    - *learning as authentic problem-solving*
4. Theory of inquiry
    - *connecting learning and life*

(1) Problem-solving within information-seeking

- Techniques for information seeking often ignore the larger context of problem solving
- Research = Finding information, not situated problem solving

Big6

1. Task Definition [i.e., the *information problem*]
2. Information Seeking Strategies
3. Location and Access
4. Use of Information
5. Synthesis [*of the information*]
6. Evaluation [closure]

—Mike Eisenberg, Bob Berkowitz

Information seeking within problem solving

- Techniques for problem solving and case-based learning often ignore the information needs

Case analysis and
problem solving

1. Comprehend the case situation: *collect data,* identify relevant facts
2. Define the problem [*not in terms of information*]
3. Identify the causes of the problem
4. Generate alternative solutions
5. Decide
6. Take action

—Edward G. Wertheim

Problems with the separation

- Obscure relationship between information seeking and problem solving
- Trivialization of both processes
- Linear structure, e.g.:
  - *PS*
  - *IS*
  - *IS* ⇒ *PS*
  - *PS-1* ⇒ *IS* ⇒ *PS-2*
- Constrained-by/constrains tools
- Disjointed curriculum

Weak/strong problem solving

- *weak problem solving*—ill-structured problem space; unclear or unsystematic steps; lack of prior domain knowledge
- *strong problem solving*—research on problems that are well-defined, systematic, and routine; expert methods associated with Kuhn's concept of normal science

—Herbert A. Simon, Allen Newell

Information and Discovery in Neuroscience

- information-seeking and problem-solving activities are inherently neither weak nor strong
- influenced by the particular scientific problem, the knowledge of individual scientists, the stage of research
- information-seeking varies accordingly

—Carole Palmer, Melissa Cragin, Tim Hogan, in press

Multiliteracies, School Libraries, and Cybraries

- comparative case studies school libraries in Australia & the US
- importance of the information ecology
- ⇒ indigenous understandings of "legitimate literacies" and the constructed definition of "information literacy"

—Cushla Kapitzke, Bertram C. Bruce, Sharon Comstock

Indigenous understandings: Which process?

One freshman student reported that there are 'levels' of searching for information when doing research...The first step is to use the Internet to contextualize a problem (using Wikipedia). But the student then runs into 'the credibility problem,' because he was instructed by teachers and librarians that the WWW is not a valid source...some teachers do not accept anything 'electronic,' so require 'only books'...the student admitted checking out a book that appeared to meet the topic and citing it, despite it never informing the student's understanding of the topic.

What literacies are legitimate in the sociotechnical environment of the high school library? Is a database of magazine articles more credible because it has been purchased and, therefore, presumably vetted? What is the validity of open source information avenues that compete with "traditional" media? Is the student be demonstrating a sophisticated understanding of "literacy, which solves an information problem? Why do the librarians see this as "information illiteracy"?

—Sharon Comstock, field notes

Indigenous understandings: Which tools?

When the student was asked how he finds information for non-school related subjects, without hesitating he said 'Wikis,' because 'they have links I can follow to find out more, and it's free.' When asked if there were times when there were not entries in a topic he was interested in, he said 'Then I Google: first five pages and that's it. The rest is going to be crap. If it's not in the first five, it's useless.' When asked why Google and not other search engines, he responded, 'It's the best. The others are dumb or have a ton of ads. It's the *iPod of search engines*!' Books were not mentioned.

The "iPod of search engines" phrase disturbed the librarians. While the student was referring to his informal learning searches, the online surveys concur. Despite the bibliographic instruction sheets in workshops explicitly and repeatedly stating not to use Google or Yahoo, these are the first and second most consulted by students...physical books are consulted as a last resort.

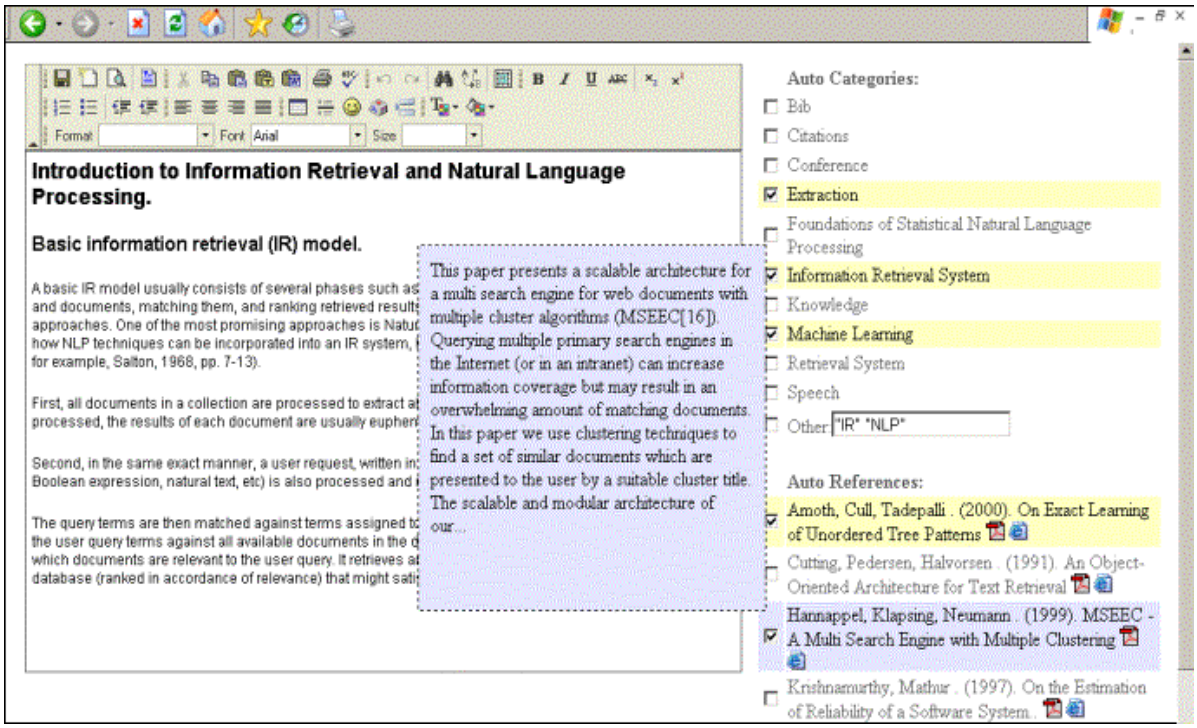
—Sharon Comstock, field notes

Searching the web

The true value of the web lies in the way it can open up our questions. We ask one thing, but the web leads us to ask more questions and to become aware of how much we do not know. A recognition of these problems leads us to move from a conception of searching the web to find a piece of information to one in which a search is embedded in how we think: How can searching become not only "looking up," but truly productive inquiry?

—Bertram C. Bruce, 2000

(2) Tools: Personal Information Research Assistant



http://WriteWhileSearching.com

—Anatoliy Gruzd, Michael Twidale

How PIRA works

- Yahoo! Term Extraction Web Service
- CiteSeer
- passive mode ambient search
- query term aging mechanism
- reference archive

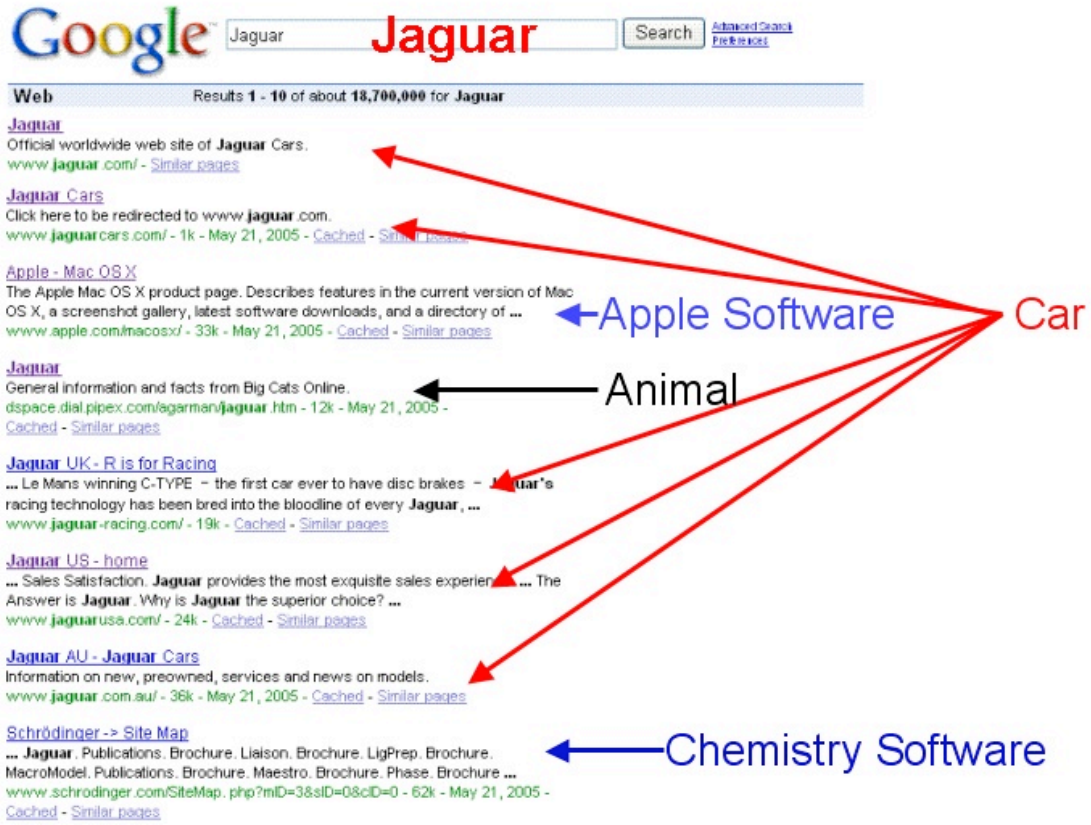
—Anatoliy Gruzd, Michael Twidale

User-Centered Adaptive Information Retrieval

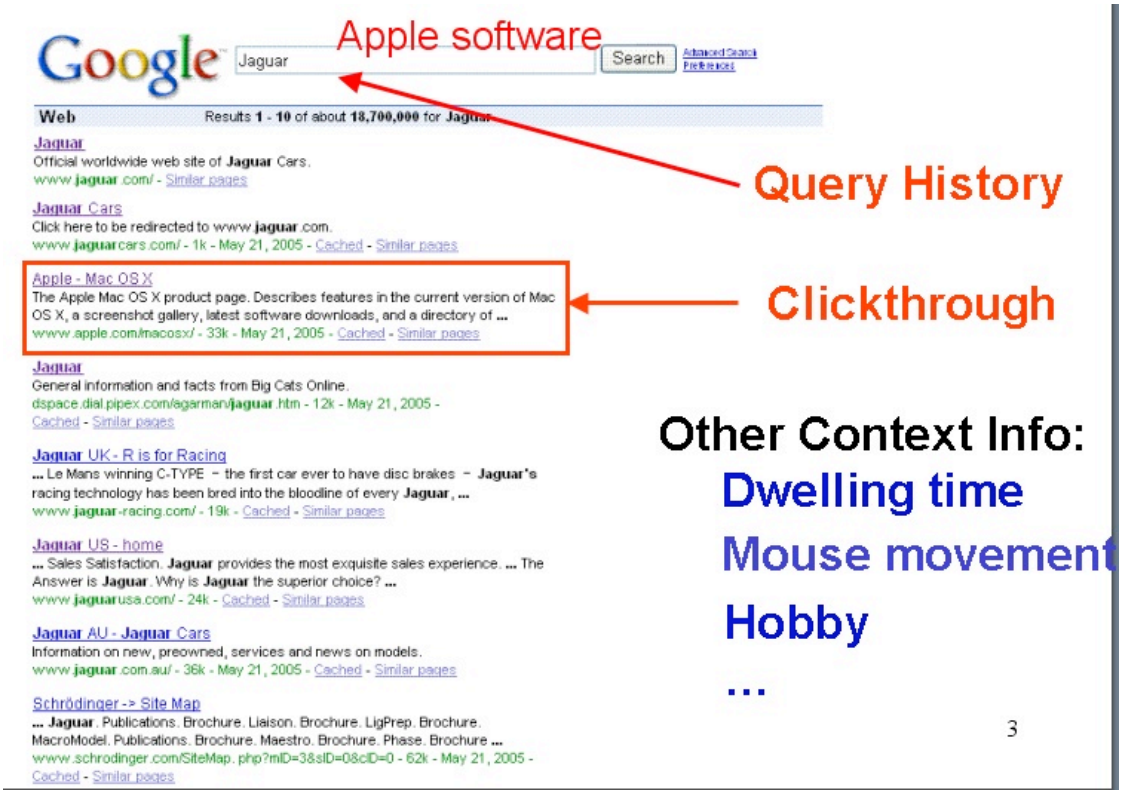
- Different users may use the same query to search for different information
- A user's information needs may change over time
- ∴ an optimal retrieval system must incorporate both user information and search context
- UCAIR: (1) treat information seeking process as a system-user dialogue; (2) capture user information and search context and optimize system actions accordingly; (3) personalize search results and the way to present the results; (4) respond immediately to a user's interest shift; (5) leverage user similarities to support collaborative search; (6) based on Bayesian decision theory and language models; (7) systems for searching the Web and bioinformatics literature

—ChengXiang Zhai

Problem of context-independent search



Put search in context



Task-dependent search result presentation

- Infer a user's "task need" (beyond "content need"): assume that a user wants to see the novel information when he/she enters a "recurring query" and a user wants to see an overview when entering a novel query
- Present search results accordingly. For someone unfamiliar with the topic, present an overview, while for someone very familiar with the topic, present only the novel information

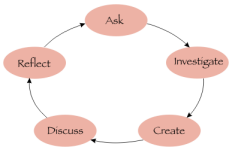
Design of ICT's for problem-solving

- Fundamental inconsistency between top-down approaches and authentic inquiry
- What happens when users are not merely recipients of a design for inquiry, but take an active role in creating that design?
- Design refers procedures for information-seeking and problem-solving, as well as to ICT's

Emergence of the inquiry cycle

Genuine intellectual integrity is found in experimental knowing.

—John Dewey, *Essays in experimental logic,* MW.10.365



- web-based means to articulate and engage in inquiry
- virtual plus place-based communities
- uses: courseware, online journals, community groups, individual inquiries
- international connections

The Inquiry Page (1997)

Inquiry Page™

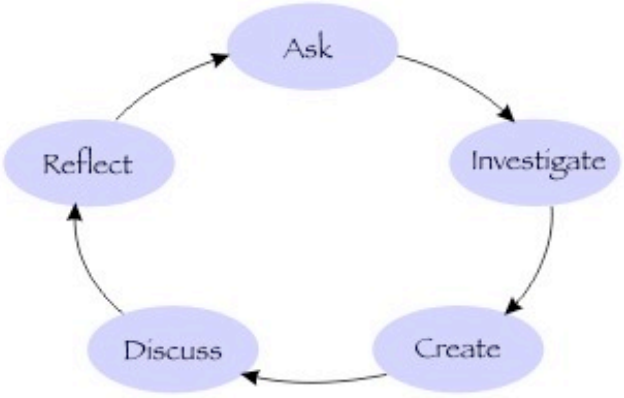
Learning begins with questions

Site Map / Search
Help
Feedback Form
Join in | Log in

- Home
- Inquiry
- Inquiry Units
- Inquiry Action
- Events
- Dialogue
- Evaluation
- iLabs ver. 3
- Other Resources
- What's New
- About Us

Welcome! The Inquiry Page is more than a website. It's a dynamic virtual community where inquiry-based education can be discussed, resources and experiences shared, and innovative approaches explored in a collaborative environment.

Here you can search a growing database of inquiry units, and you can also build your own inquiry units. You can see pictures of inquiry-based activities and learn more about some of our partners who use inquiry methods. Learn how to assess and evaluate inquiry-based education or look for more inquiry resources to support what you're doing. Or you can simply find out more about what inquiry and The Inquiry Page are all about.



http://inquiry.uiuc.edu

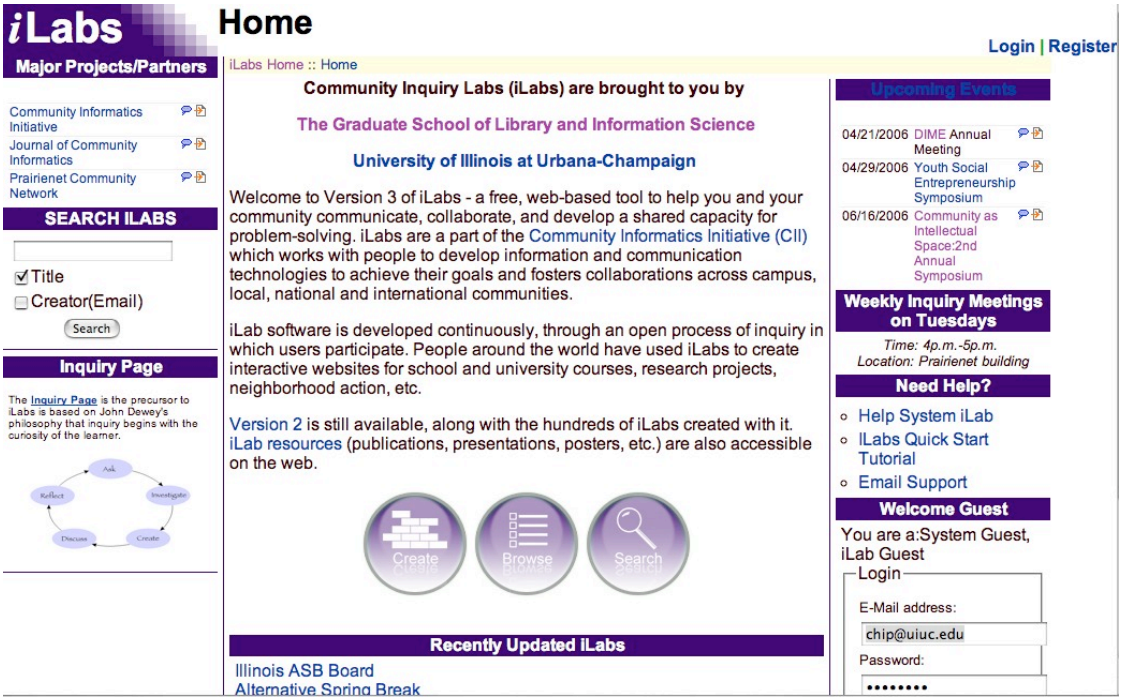
—Mihye Won, Jenny Robins

Community Inquiry Laboratory

- Community: Collaborative activity around creating knowledge that is connected to people's values, history, and lived experiences
- Inquiry: Open-ended, democratic, participatory engagement
- Laboratory: Bringing theory and action together in an experimental and critical manner

—Cameron Jones, Bertram C. Bruce, Ann Bishop

iLabs



http://ilabs.inquiry.uiuc.edu

(3) Problem-solving and learning

Information literacy evolves in the course of realizing specific work-related tasks and mundane activities, which usually involve a complex system of social relationships, sociotechnical configurations, and work organization.

From the perspective of a situated understanding of learning and learning requirements, *information skills cannot be taught independently of the knowledge domains, organizations, and practical tasks in which these skills are used.*

—Kimmo Tuominen, Reijo Savolainen, Sanna Talja, 2005

Web Searching, Information Literacy and Learning

- clarify the interplay of information literacy and learning in the Web-dominated information environment
- intensify the flowering of information literacy as a part of basic education

—Eero Sormunen, et al.

What does the university know?

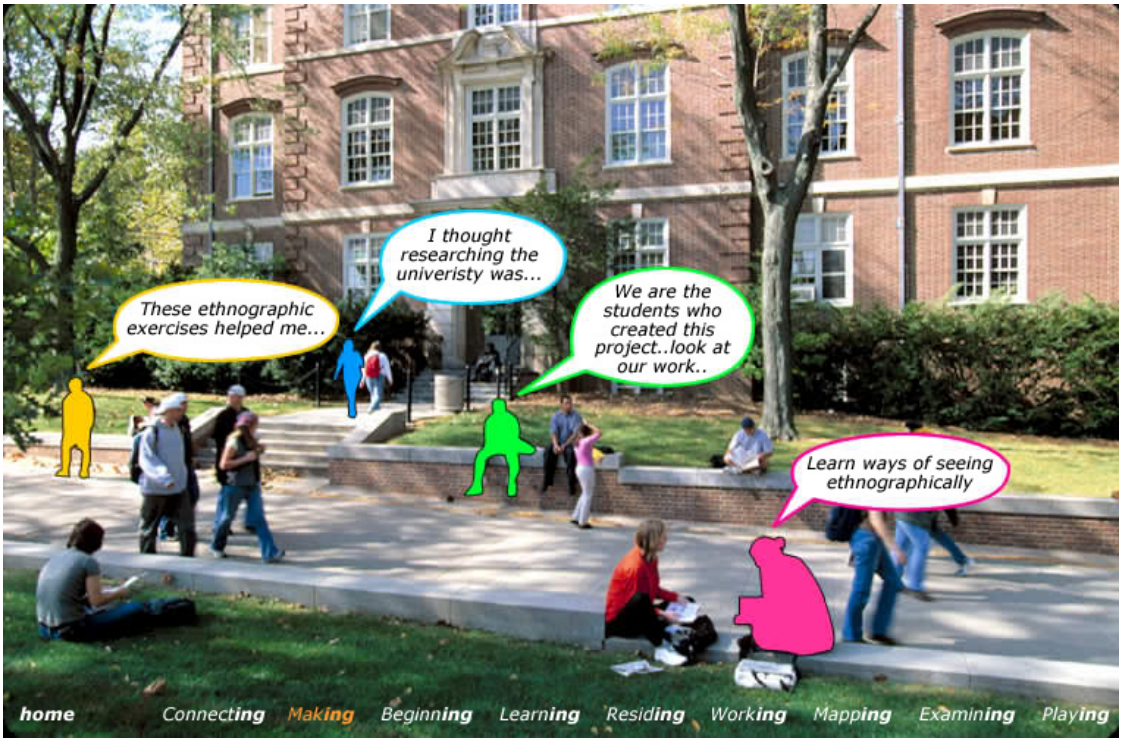
- √ diverse disciplines
- X about itself (the "learning community")
- X about its relation to the communities in which it participates
- X how to inquire within and beyond its walls

Ethnography of the university (2002->)

- engage undergraduates in research
- 50 courses in various disciplines
- build a repository of knowledge from the inside
- use Inquiry Units for ethnographies
- participatory design

—Nancy Abelmann, Peter Mortensen

Making ethnographies —*EOTU Live*



—Anna Callahan

Student inquiries I

- Michael Cozza, The Introduction of a Neophyte into Gaming Culture
- Kaitlin Sulkowski, A Look into the Social Phenomenon of Facebook
- Aly Marchetti, The Daniels Street ATM on Wednesday Nights
- Jonathan Wassell, The Life of the Off-Campus Student
- Christina Miceli and Kari Schmehil, Two Tattoo Parlors
- Jennifer Mull, Unethical Treatment of Volunteers
- Amy Franco, Technology in the Illini Union Vending Room
- Ben Krop, Justin Meyer, and Nipa Patel, University Grading Issues and Policies

Student inquiries 2

- Kurt Rottunda, Chinese Students on the U of I Campus
- Louis Morton, Coffee Talk: Language in Cafes Across Campus
- Suzanne Perkins, Ethnography of the Language of Creative Writers
- Nate Harmann, Acting and Acting Myths
- Nicholas Murphy, The MTD 22 Illini
- Christine Travers, Ethnography of the Urbana Fire Department
- Andrew Meyer, Three Hours that Changed the World: T. K. Cureton
- Tiffany White, Student Workouts at WIMPE
- John Noble, The Canopy Club and Its Culture
- Bryan Calip and Laura Haning, Scott Hall and Video Gaming

Student inquiries 3

- Cole Cullen, Residents' Use of the Gregory Drive Computer Lab
- David Lai, College Gamers: Their Technology, Their Academics
- Allie Wyler, Technology Used in Special Education
- Angela Marconi, WPGU: Technology and Tension of Corporate Media
- Daniel Edgerton, The UIUC Account Billing Office
- Joe Bottalla, The Behavior of Aviation Students
- Maria Frias, Coming Out Stories at the U of I
- Lissette Uriostegui, The Technology and Creativity of the Metal-Smithing Community
- Andrea Henderson, Greenhouse Workers in the Plant Biology Conservatory and Their Technology
- Chris Manna, Those Who Work Out in the ISR Weight Room

Inquiries into the university

- √ creating tools for further inquiry
- √ learning about self and responsible action
- √ learning how to make positive social change
- √√ learning in the disciplines

Inquiry-based design

- *shared form of life:* "What do we as designers have to do to qualify as participants in the language-games of the users?" —Pelle Ehn, 1992
- technology as the outcome of problem-solving (*pragmatic technology*, —Larry Hickman, 1990
- reverse "design ⇒ build ⇒ use"
- "inquiry" defined by the participants
- users remain in the "process of authority" —John Dewey, *Democracy and education in the world of today,* LW.13.295

(4) Theory: Problems of education

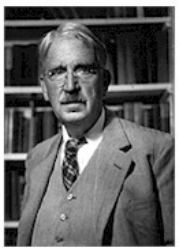
Not primarily in methods or content

But in the breakdown in connections between:

- knowledge and action
- individual and community
- formal schooling and lived experience
- means and ends of problem-solving

Definition of inquiry

Inquiry is the controlled or directed *transformation* of an indeterminate situation into one that is so determinate in its constituents distinctions and relations as to convert the elements of the original situation into a *unified whole*



—John Dewey, *Logic: The theory of inquiry*, LW.12.108

Implications: Re-connecting

- Integrated tools
- Inquiry-based design
- Integrated view of problem-solving, information seeking, learning
- Inquiry as both action and understanding
- Learning as lived experience

Awakening inquiry

The moment when understanding and action come into dynamic and reciprocal relationship with one another is the moment when inquiry for both students and teachers truly comes alive.

Kiitos paljon! Kysymyksiä?

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