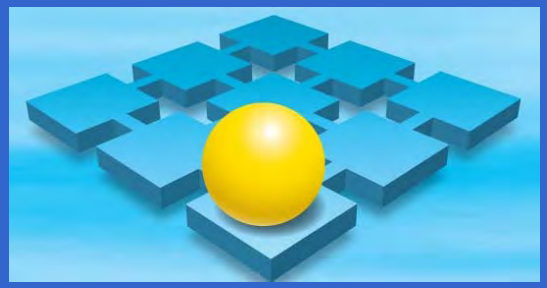
New Tools, New Views: Evaluating Games and Simulations from Multiple Perspectives



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ISAGA 2007, Nijmegen, The Netherlands

SAGE Project Groups

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SAGE Project Overview

- $3 million, 4-year, SSHRC INE Collaborative Research Initiative (2003-2008)
- bilingual Canadian research network with more than 30 researchers, 14 universities, 30 partners
- studying how new-technology games and simulations can support learning

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Some Research Questions

- How do people learn through new-technology SAGEs?
- What makes SAGEs engaging, motivating, effective for learning?
- How do we create better SAGEs for learning by applying theory and new technologies?
- How do we improve our research and evaluation methods and tools?
- Can we develop effective platforms and tools for developing and delivering SAGEs for learning?

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Health Applications

- Focus on health-related learning
- Medical education (UG, PG, CME)
- CPD for health professionals
- Health promotion
- Public health education
- Health education in schools
- Health in communities

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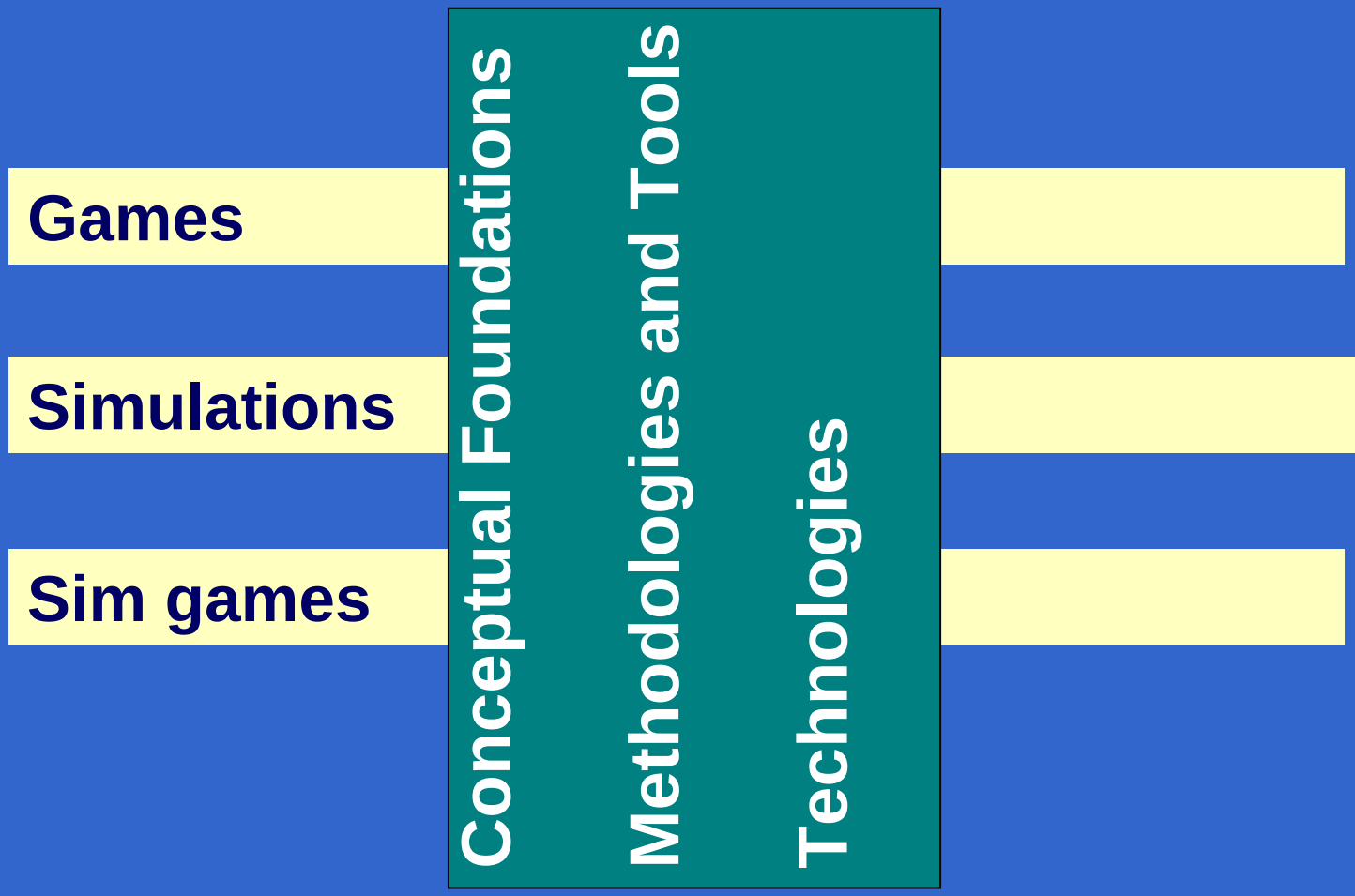
Research Domains



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Educational Games Central

- frame games: generic shells for creating games
- … a repository built for and by the members
- … a community for dialogue and learning
- … and many other uses

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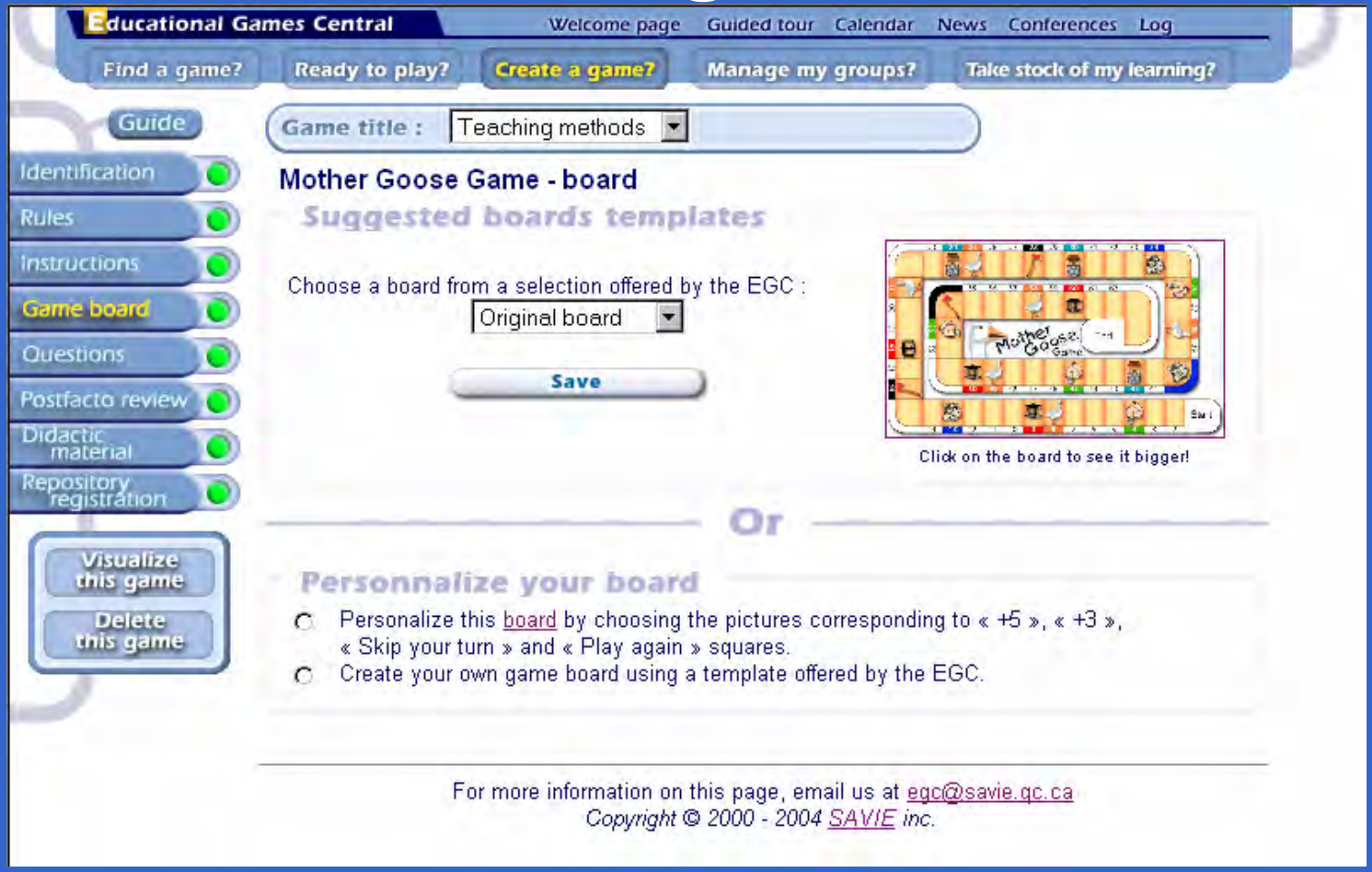
EGC Web Design Environment



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COMPS
(Collaborative Online Multimedia Problem-based Simulations)

- application prototypes
- designed for teaching reasoning skills
- in a collaborative, online, problem-based learning environment

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COMPS Video Cases

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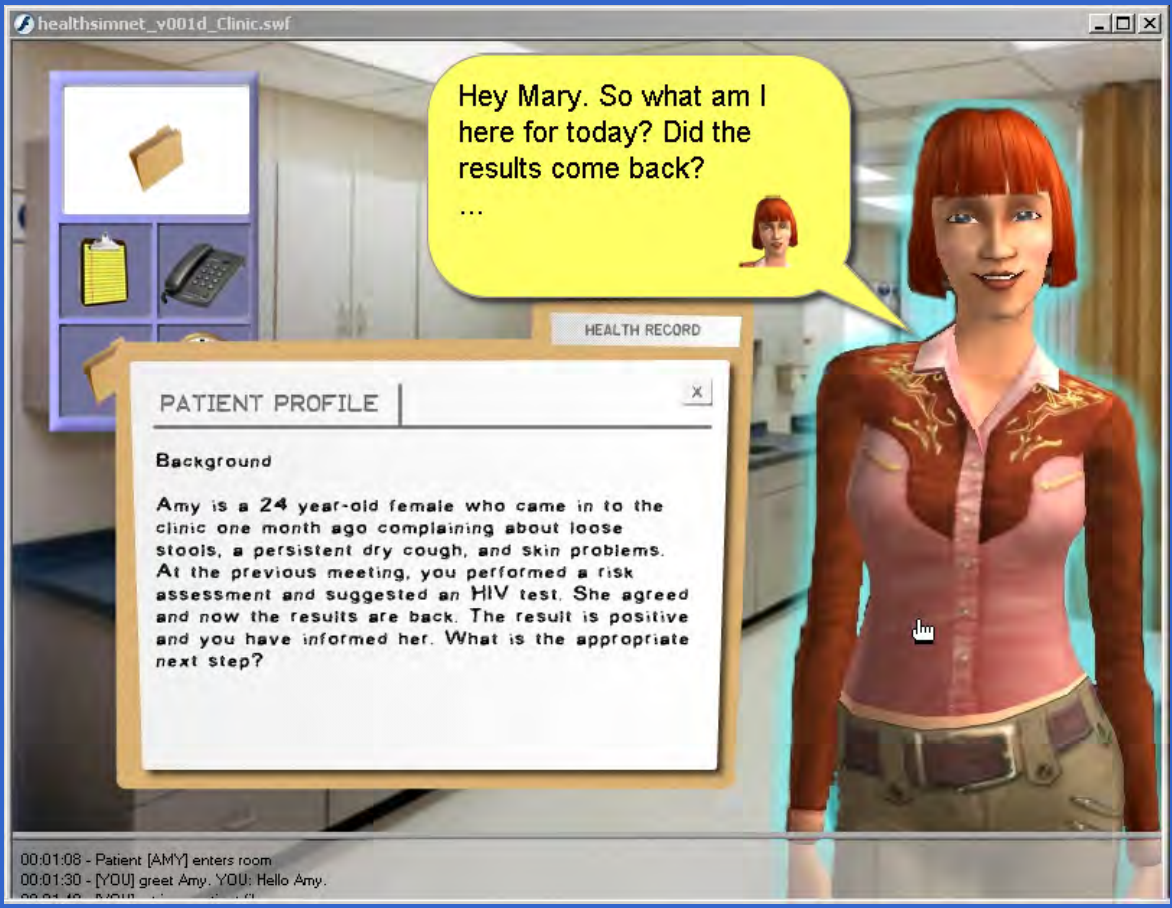
HealthSimNet



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Contagion! Simulation Game

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Games for Kids with LT Disorders

- Increase engagement in process of disease management
- Increase motivation to self-monitor
- Distraction
- Social
- Examples: Pain, IBD, asthma

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Content-Neutral Architecture

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Technology: ENJEUX Project

- Funded by CANARIE for two years ($370K)
- Online SAGE platform
- Allows players to:
  - see each other (webcam)
  - talk to each other (VOIP)
  - play on a shared screen
- Also an online meeting tool

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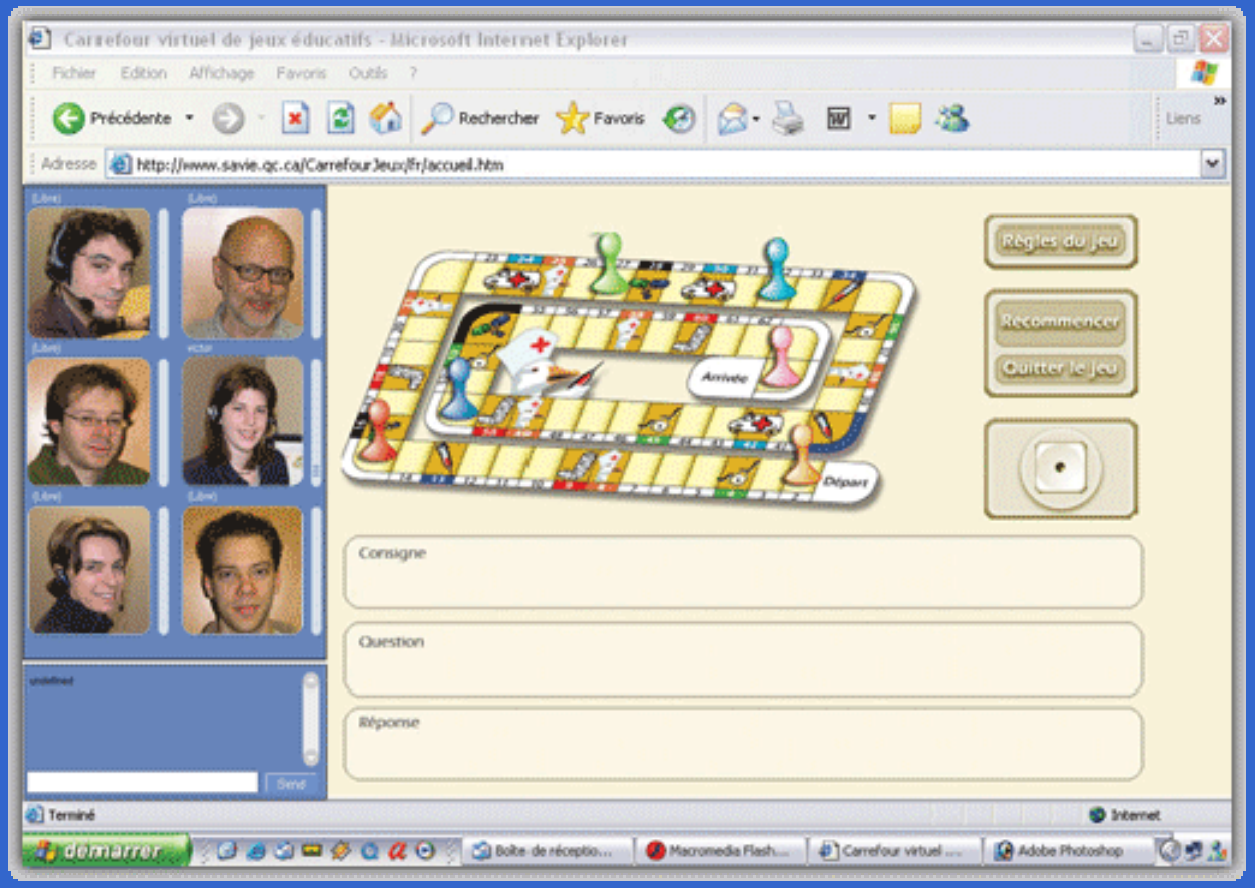
ENJEUX Multi-user Gameplay



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Summary of SAGE Plan

- Review and summarize what is known
- Test learning with today's simulations and games
- Build conceptual frameworks
- Build and evaluate simulation and game prototypes
- Build a web portal to the world of simulations and games
- Distribute our new knowledge widely through various media, eg, SAGEtv

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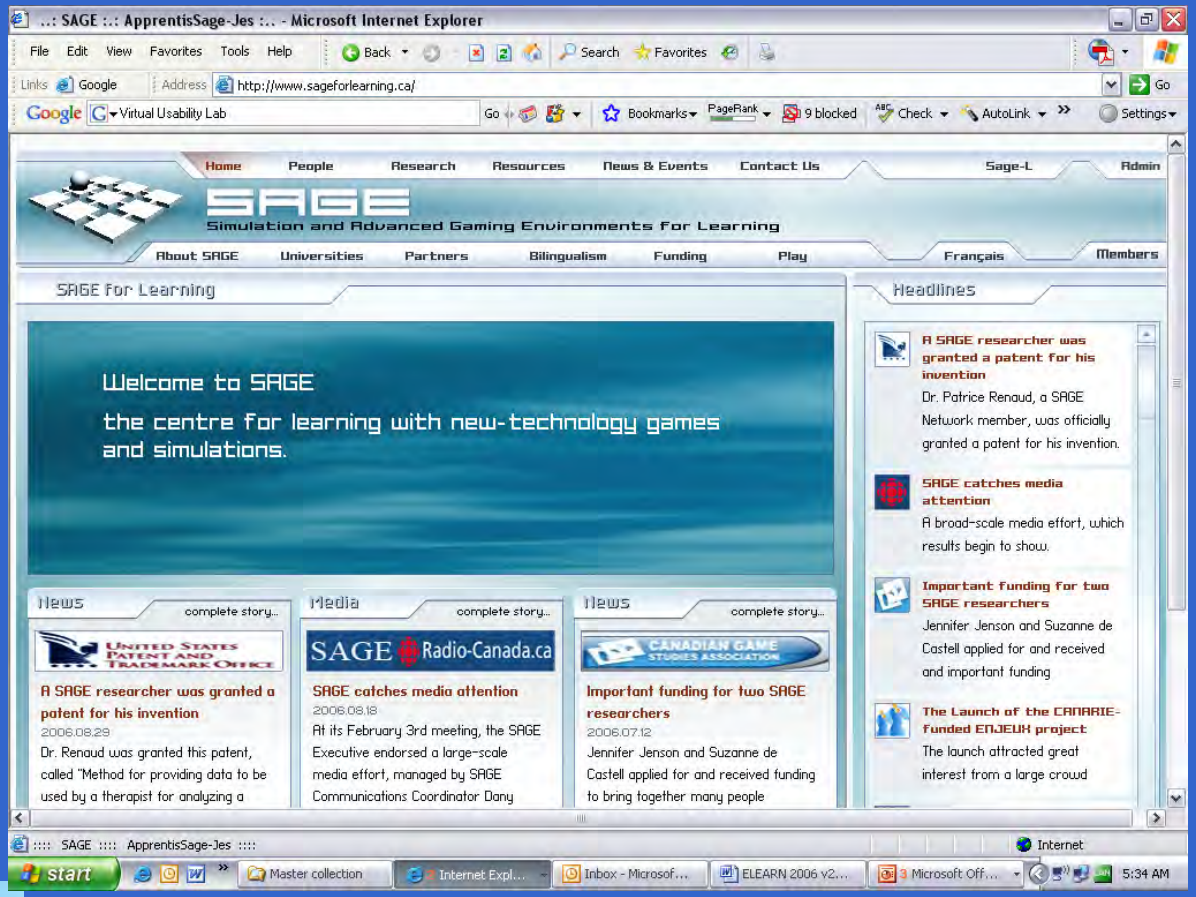
www.sageforlearning.ca or www.apprentissage-jes.ca



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Evaluation Challenges

- Many case studies
- Small samples
- Self-reported perceptions
- Few randomized controlled trials
- Varying definitions, poor comparison
- Need to capture and evaluate process AND outcomes

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Evaluation in the SAGE Project

- Systematic reviews of the literature
  - Clarify terminology and distinctions
  - Find factors related to positive learning outcomes
- Transcript analysis of COMPS to assess impact on critical thinking skills
- Capture performance data in EGC
- VULab to study gameplay

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Systematic Reviews of the Literature

- Objectives
  - Build a conceptual framework for SAGE projects
  - Assess impacts of games, simulations and sim games on learning
- Methodology: structured literature analysis
  - Broad literature search (1998-2006; 524 articles)
  - Analytical grid to describe articles
  - Separation into three SAGE categories (games, sims, sim games)
  - Analysis within each category of specific impacts identified in published papers

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Systematic Reviews of the Literature

- Analytic grid was created by research team (4 pages)
- Graduate student RAs were trained in its use
- Fields were filled in verbatim from articles reviewed with no/little interpretation
- Articles in PDF format and completed grids were placed in a closed repository
- Systematic analysis of the grids was conducted (Broad literature search -1998-2006; 524 articles)
- Opinion articles were excluded from the analysis (research/evaluation data had to be included)

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Key Definitions

- Game
  - Does not attempt to replicate reality
  - Has clearly defined rules, scoring system
  - Has competition and winners
- Simulation
  - Model of aspects of reality
  - Involves exploration, practice
  - No competition, scoring, winners
- Simulation game (aspects of both)

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Systematic Reviews of the Literature: Early Results

- Games (207 articles)
  - Activity in artificial situation involving goals, rules, and competition
  - Analysis not limited to digital games
  - Positive impacts on:
    - Knowledge structuring
    - Information integration
    - Problem-solving skills
    - Cooperation, communication and interpersonal skills
    - Motivation to learn
    - Active participation, reflection, changes in attitudes and behaviours

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Systematic Reviews of the Literature: Early Results

- Simulations (109 articles)
  - Activities in model of aspects of reality that involve practice but not conflict or competition
  - Distinguished from *Simulation games*
  - Positive impacts on:
    - Learner confidence
    - Knowledge structuring
    - Problem-solving skills
    - Integration of information through experience
    - Motivation, active participation
    - Cooperation, communication and interpersonal skills
    - Transfer of knowledge
    - Self-evaluation, reflection

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Systematic Reviews of the Literature: Early Results

- Simulation games (102 articles)
  - Activity in model of aspects of reality involving goals, rules, and competition
  - Positive impacts on:
    - Learner confidence
    - Knowledge structuring
    - Problem-solving skills
    - Information integration
    - Learner motivation, active participation
    - Cooperation, communication and interpersonal skills
    - Knowledge transfer
    - Self-evaluation, reflection

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Repository of article analysis grids

Search :

Welcome

My grids

Advanced search

Index

Index of article analysis grids by types of activity

Click on one type of activity to view all the grids related to that category.

Types of activity
Games : (247)
Simulations : (132)
Simulation games : (77)
Undefined activities : (207)

663 Object(s)

SAVIE

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w an article analysis grid

Methodological Variables

- Type of methodological framework
- Data-gathering instruments
- Experimentation theorical framework
- Sample
- Type of data-processing
- Research bias (limits)
- Other

ain more information about the content of a field, click on the ? on the left side of the field.

Back

Transcript Analysis

From MA thesis of Robyn Schell
Faculty of Education
Simon Fraser University
Senior Supervisor: Dr. David Kaufman

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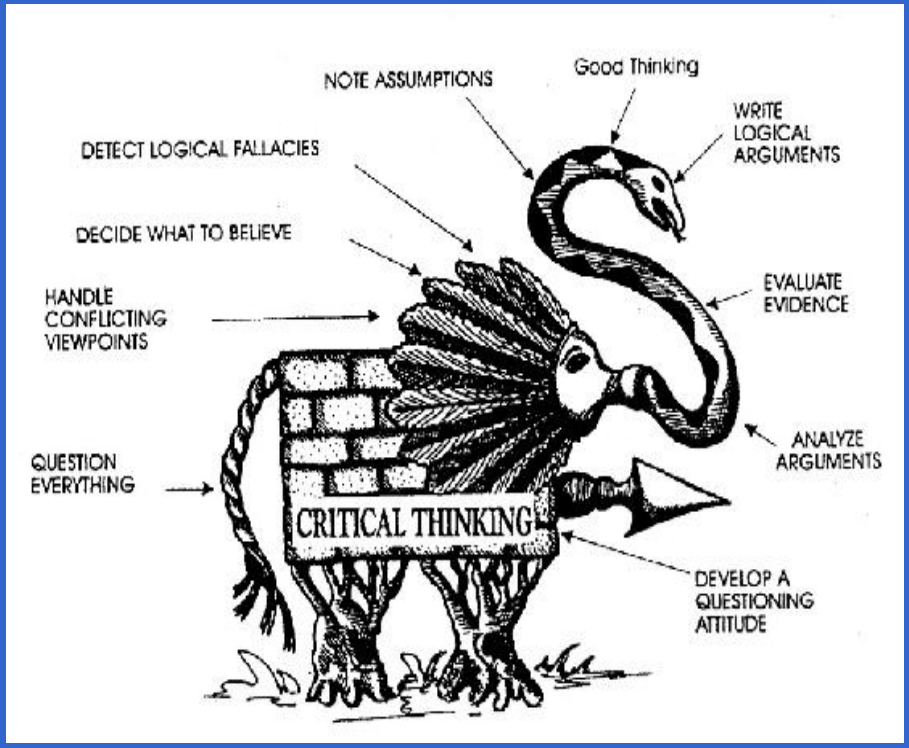
Critical Thinking and PBL

- Critical thinking is considered an attribute of PBL
- Critical thinking and clinical reasoning are closely related
- Decision-making is at the heart of clinical medical practice



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Kamin's Codes

- Developed 32 indicators of 5 critical thinking stages and 4 group process issues
- Compared different ways of delivering PBL tutorials

- **Deep thinking**
  - New problem-related information. Example: he was fine when mother left for work.
- **Shallow thinking**
  - Repeating information that has already been said. Example: yeah, he's fussy.

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Adapting the Codes

Description of shallow coding:

- Information not linked to the problem
- Repeating information
- Irrelevant or noncommittal comment
- Agreeing without adding any comments

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Transcript Analysis Results

Code	Group 1 (n=3)	Group 2 (n=3)
Critical thinking codes	148	102
Non-critical thinking codes	44	71
Group process codes	53	91
Technology codes	5	6
Total coded statements	250	270

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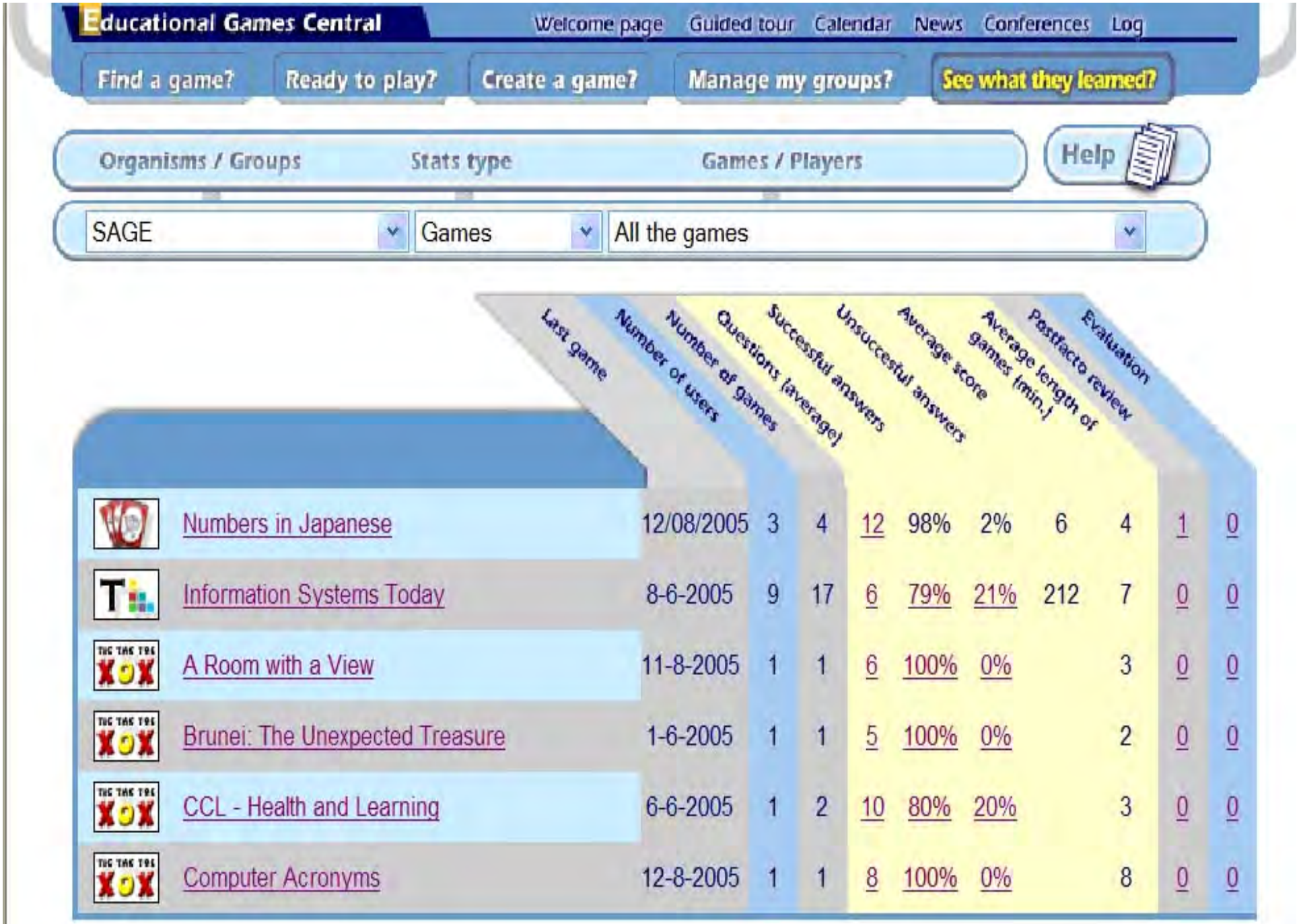
Educational Games Central
Welcome page
Guided tour
Calendar
News
Conferences
Log
Find a game?
Ready to play?
Create a game?
Manage my groups?
See what they learned?
Organisms / Groups
Stats type
Games / Players
Help
SAGE
Games
All the games
Last game
Number of users
Number of games
Questions (average)
Successful answers
Unsuccessful answers
Average score
Average length of games (min.)
Postfacto review
Evaluation
Numbers in Japanese 12/08/2005 3 4 12 98% 2% 6 4 1 0
Information Systems Today 8-6-2005 9 17 6 79% 21% 212 7 0 0
A Room with a View 11-8-2005 1 1 6 100% 0% 3 0 0
Brunei: The Unexpected Treasure 1-6-2005 1 1 5 100% 0% 2 0 0
CCL - Health and Learning 6-6-2005 1 2 10 80% 20% 3 0 0
Computer Acronyms 12-8-2005 1 1 8 100% 0% 8 0 0

Educational Games Central (EGC)

- Can report results at the level of:
  - ✓ Game
  - ✓ Group (e.g., a class of students)
  - ✓ Individual student
  - ✓ Individual question
- Can collect self-report data from players after the game
- Developed by Dr. Louise Sauve (Univ Quebec - Teluq)

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Virtual Usability Lab

- remotely tracks users' actions and pops up evaluation questions at appropriate points in games or web site interactions
- tool for testing and evaluating SAGE researchers' games and simulations
- Developed by Dr. Ron Owston (York Univ) and Dr. Andre Kushniruk (Univ Victoria)

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The Challenge

- To design a system to track and record relevant user actions when playing a game and ask them usability questions at key points.
- And to do this remotely without having to modify the game or install special software on the user's computer.
- Plus handle with a wide variety of graphics and programming languages used in games

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The Solution: The Virtual Usability Lab

2. Records the screens and audio conversation of remote users

3. Database stores all data collected about user interactions

4. Presentation of online questionnaire to assess the usability of web-sites remotely and at point of use

1.Central Tracking provides for remote tracking and logging of user interactions

5. Interface to allow evaluators to set up parameters for the evaluation

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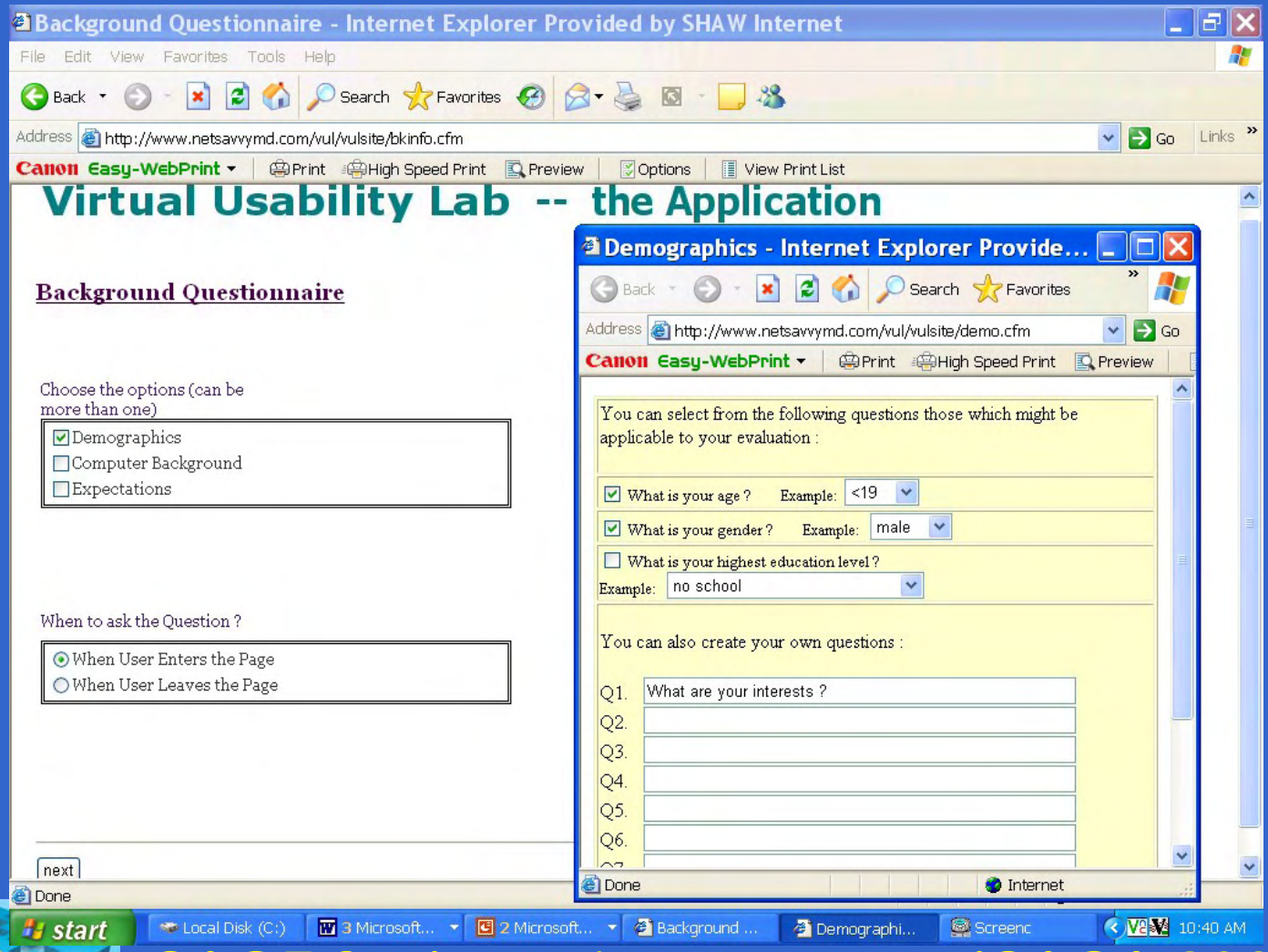
Researcher Interface



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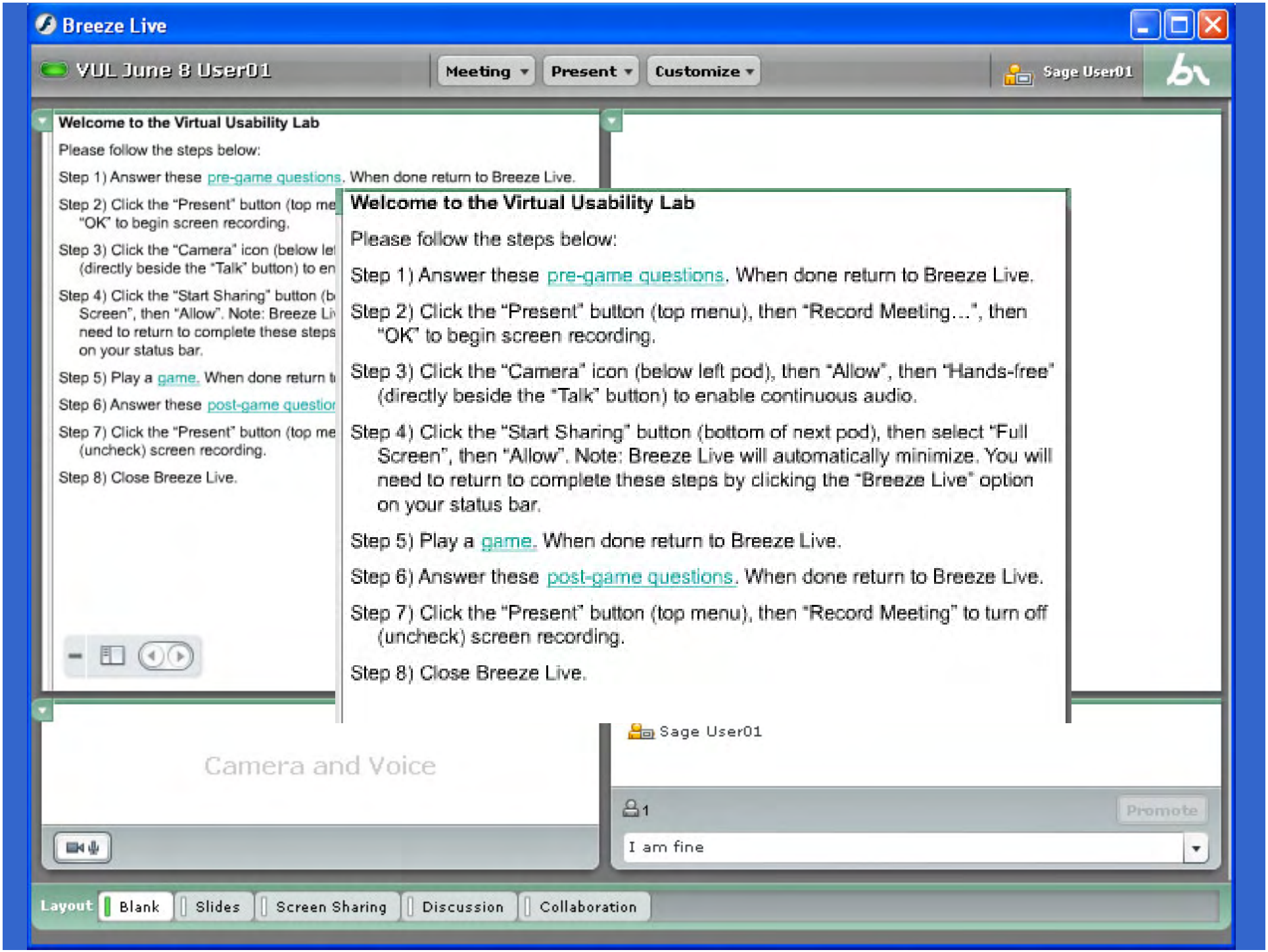
Breeze Live
VUL June 8 User01
Meeting
Present
Customize
Sage User01
Welcome to the Virtual Usability Lab
Please follow the steps below:
Step 1) Answer these pre-game questions. When done return to Breeze Live.
Step 2) Click the "Present" button (top menu), then "Record Meeting…", then "OK" to begin screen recording.
Step 3) Click the "Camera" icon (below left pod), then "Allow", then "Hands-free" (directly beside the "Talk" button) to enable continuous audio.
Step 4) Click the "Start Sharing" button (bottom of next pod), then select "Full Screen", then "Allow". Note: Breeze Live will automatically minimize. You will need to return to complete these steps by clicking the "Breeze Live" option on your status bar.
Step 5) Play a game. When done return to Breeze Live.
Step 6) Answer these post-game questions. When done return to Breeze Live.
Step 7) Click the "Present" button (top menu), then "Record Meeting" to turn off (uncheck) screen recording.
Step 8) Close Breeze Live.
Camera and Voice
Sage User01
1
Promote
I am fine
Layout
Blank
Slides
Screen Sharing
Discussion
Collaboration

Field Test Using VuLAB

- Field tested VuLAB with Education Games Central (Trivia Game)
- Participants (16) were students in an undergraduate business information technology course
- Atlas.ti used to analyze video recordings

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What was learned about the EGC Trivia game using VuLab

- Technical issues
  - Warning about popup blocking
  - Scripting error when user is allowed to “Choose a question category”
- Usability issues
  - “Start” button
  - Game Instructions
  - Screen size
- Player Opinions

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Evaluation in the SAGE Project (continued)

- Eye-tracking, GSR, heart rate, brain wave measures (i.e., Neuroeducational lab at SFU)
- Performance data analysis, e.g., capture on the web (WebCT Powersight module)
- Activity theory based graphical tool for reflection
- Traditional social science evaluation methods, e.g., surveys, interviews, focus groups

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The Final Year of the SAGE Project

- Complete prototypes
- Focus on evaluation studies
- Increase knowledge translation activities (Book, published articles, and SAGEtv)

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Enroll in EGC
(click Play on SAGE home page)

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ACKNOWLEDGEMENT

We wish to thank the Social Sciences and Humanities Research Council of Canada (SSHRC) and CANARIE for their financial support of the 'SAGE for Learning' project (2003-2008)

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THE END…

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QUESTIONS

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