Making Discovery Visible

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Games are models that represent ideas as interactive worlds.
We build more robust models of scientific ideas through cycles of perceiving and doing.
But unlike sims & models, games pique our interest in new domains & embrace the aesthetics of experience.
This is especially important in an attention economy.
big bird & kid watching tv
Games are about solving problems. Through game play, we develop skills.
We develop those skills in communities that assess our performance.
Through participating in these communities we can become new kinds of people.
Wisconsin Institutes for Discovery

Pharmaceutical Informatics

Regenerative Biology

Medical Devices

Computational Technology

Educational Research

Systems Biology

Optimization

Bionates

Epigenetics

Living Environments

Wisconsin Institutes for Discovery
Educational Games that Make Discovery Visible
Experience the thrill of scientific discovery.
Participate in the Making of Science
Games based on cutting-edge discoveries
Virulent

iPad
Initial Findings

- High interest in content
- Players use images to scaffold material
- Context for interdisciplinary collaboration
An endangered Harpy Eagle sighting has been reported at a neighboring plot of land. The witness has asked to remain anonymous so the credibility of the report is not something that can be verified as of this time.

Would you like to travel to this plot of land and investigate this report?

INVESTIGATE  IGNORE
Game World

Vilas County, WI
963,976 square single acre tiles
(1,352 x 713 grid)
TRAILS FORWARD
GAME CONCEPTS
ROLES

Ranger
Enforces Law
Cares for the Land

Developer
Builds Properties

Timber Co.
Harvests Forest
CORE GAME CYCLE

Buy & Sell Property
Lobby the State for Roads
Lobby the State for Zoning Changes
**ENDANGERED SPECIES SIGHTING**

An endangered Harpy Eagle sighting has been reported at a neighboring plot of land. The witness has asked to remain anonymous so the credibility of the report is not something that can be verified at this time.

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INVESTIGATE  IGNORE

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Rangers
Build Parks
Open Land for Hunting/Birdwatching
Import Wildlife
Check for Endangered Species
Developers

Bulldoze land
Build Homes
Build Factories
Enhance Properties (e.g., Solar Panels)
Loggers
Clearcut Forest
Plant Seeds
Selectively Harvest Wood
Open Land for Hunting/Birdwatching
TRAILS FORWARD
GAME CONCEPTS
LAND MODEL

3x3 acres
1 Megatile
Architecture

TRAILS FORWARD

Game Client

Game Server

Database

New Clients & Bots
Games that let you discovery the joy in helping someone.
What if You Had Cancer?
Symptoms
Imaging
Diagnosis
Treatment
“Cut Poison Burn”
Imaging
Breast Cancer

17.5% variation

Hurkmans et al. (2001)
Lung Cancer

Factor of 2

Senan et al. (1999)
Cervical

3-4x variation

Treatment
This is not good for patients.
Imagine instead....
Diagnosis
Diagnosis
Imagine getting not a second or third opinion, but a doctor working with 2 million opinions.
Radiologists & Doctors

Medical Training

General Public

Children & Youth
Could anything mentioned in my notes on Mr. Rey have contributed to his cancer?
Would kids play this?
Will they learn anything?
Exploratory Study

- Participants:
  - 69 students (12 to 20)
- Format:
  1. Pre-test
  2. Oncology
  3. Post-test
What does a radiologist do?
Open-ended, \( \chi^2 (1, N = 69) = 38.03, p < .001 \)

Pre Correct: 28, Post Correct: 68
Contouring a cancerous tumor

$\chi^2 (1, N = 69) = 17.46, \ p < .001$

Pre Correct: 14, Post Correct: 39
What is difficult about radiotherapy?

\( \chi^2 (1, N = 69) = 9.03, p < .001 \)

“It is hard to keep from exposing healthy tissue to radiation beams”
Playing APA taught me about treating cancer

\[ \chi^2 (2, \ N = 69) = 38.17, \ p < .001 \]

Observed: 46, Expected: 23
Playing APA taught me about contouring cancerous tumors

$\chi^2 (2, N = 69) = 37.13, p < .001$

Observed: 46, Expected: 23
Students indicated a **highly significant increase in interest medical professions** ($M = 2.93, SD = 1.38$) compared to pre-gameplay ($M = 2.58, SD = 1.25$), $t(69) = 4.11, p < .001$. 
With training, I could be a good doctor.

Females’ indicated a significant increase in future medical/professional confidence ($M = 3.89$, $SD = 1.16$) as compared to pre-game-play ($M = 3.48$, $SD = 1.37$), $t(27) = 2.28$, $p < .0125$
• How might we assess learning?
100 Year’s WAR Background QUIZ
(try to give your best answer, it’s okay if you do not know the answer)

Name: Josh

1. Who were the main countries involved in fighting the Hundred Years’ War?
   a. England and Germany
   b. France and the Holy Roman Empire
   c. Sweden and Denmark
   d. England
   e. France and England

2. Who was the King who was the main reason for the war?
   a. King Henry VIII
   b. Queen Isabella
   c. King William I
   d. King Edward III
   e. There was no King involved.

3. When did the Hundred Years’ wars take place approximately?
   a. In the 1500’s
   b. After the Middle Ages
   c. During the 14th and 15th Century
   d. In the 15th and 16th Century
   e. Never, Liv made them up

4. What was the black death?
   a. Horse

5. What was the name of Krista?
   Don’t know

6. Why did the 100 years’ war happen?
   People hated people

7. What were each side’s advantages in the Hundred Years’ war? Why?
   One side had good weapons, one did not

8. How was the Holy Roman Empire in the middle ages different from the ancient Roman Empire?
   The Holy Roman Empire was too involved in Rome and the Roman Empire was not.
• What assumptions are in this model?
1. Who were the main countries involved in fighting the Hundred Years' War?
   a. England and Germany
   b. France and the Holy Roman Empire
   c. England and France
   d. America and England
   e. France and England

2. Who was the King who was the main reason for the war?
   a. King Henry VIII
   b. Queen Isabella
   c. King William I
   d. King Edward III
   e. There was no King involved.

3. When did the Hundred Years' War take place approximately?
   a. In the 1500's
   b. After the Middle Ages
   c. During the 14th and 15th Century
   d. In the 18th and 19th Century
   e. Never, it made them up

4. What was the Black Death?
   a. Horse

5. What was the source of the Black Death?
   Don't know

6. Why did the Hundred Years' War happen?
   a. People hated people

7. What were each side's advantages in the Hundred Years' War? Why?
   a. Side had good warriors, one did not

8. How was the Holy Roman Empire in the middle ages different from the ancient Roman Empire?
   The Holy Roman Empire was too involved in Rome and the Roman Empire was not.
Knowledge Recall

Learners as “little doctors”

Expertise as regurgitation
Solving Problems

Learning as engaged action

Distributed Expertise
Engaged Action

Problem solving
Participation

Distributed Expertise
• How do we do this?
1. Technical “Achievements”

II. Records of Decisions

III. Peer ratings
What did they do?

What choices did they make?

How did others view their work?
What did they do?
What did they do?
Enoys, slyone

**Statistics - Multiplayer 1v1**

- Career Wins: 132
- Most Wins: Zerg
- Most Wins Against: Protoss
- Current Highest Rank: 24th
- Highest Rank Achieved: D16 13th

**Achievements**

- Overall Progress: 390/670
- Campaign: 51/55
- Skirmish: 53/72
- Challenge: 18/95
- Multiplayer: 72/80
- Mods: 6/42
- Combat: 75/200

**Match History**

- 1v1 Defense of the Ancients
  - Match Date: 05/24/2009
- 2v2 Lost Temple
  - Match Date: 05/25/2009
- 1v1 Char Broiled
  - Match Date: 05/25/2009
- 1v1 Char Broiled
  - Match Date: 05/25/2009

**Recent Achievements**

- Icon 1
- Icon 2
- Icon 3
- Icon 4
• Choices are chokepoints to test understanding
“Yeah?

Hey again... So, about your boat...

Drop your argument item here:

NEVERMIND CONFIRM

Turbidity: Limnology Building 1969
Turbidity at the Limnology Building in 1969

Evidence

DISCARD
• What evidence do players choose for arguments?

• Which characters do they talk to?

• Is there a difference between experts & novices?

• Do players make different choices after playing?
What decisions do players make in authentic contexts?
Performance data is used for formative feedback all the time.
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Rank</th>
<th>Equipped</th>
<th>Base Score</th>
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<tbody>
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<td>Helm</td>
<td>Helmet 1</td>
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<tr>
<td>Bloodfang Hood</td>
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<td>Helmet 2</td>
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</tbody>
</table>

Players can model their own learning
• Assessment is social
Jolene, Level 19, American, Female

**Physician Ratings**
- Collaboration: 80
- Feedback: 55
- Persistence: 68

**Composite Scores**
- Friends: Region 1: 55
- Film Editors: Region 2

**Network Map**
• cross institutional
• embedded diagnostics
• social & technical assessments
Transforming public participation in science.
- Sangtae Kim, Director, Morgridge Institute of Research
- Susan Millar, Director, Educational Research & Development
- Richard Halverson, Associate Co-Director
- Post-Docs
  - Nathan Patterson
  - Ben Shapiro
- Graduate Students
  - Matt Gaydos
  - Sarah Chu
  - Kevin Harris
  - Adam Mechtley
  - Dennis Paiz-Rameriz
  - Belinda Guiterrez
- Developers
  - Allison Salmons
  - Mike Beall
  - Erin Robinson
  - Jake Ruesch
  - Greg Vaghan
home schools

shrinking

state

funding

virtual schools

charter schools

new

hardware
HIRE ONE POSTDOCTORAL STUDENT

JAMAL
I hope to make a difference at your lab.

NEIL
Nice to meet you!

INTERVIEW THIS CANDIDATE
INTERVIEW THIS CANDIDATE
GRANTS

Please pick a Grant to apply for.

<table>
<thead>
<tr>
<th>Grant</th>
<th>Award Amount</th>
<th>Reputation needed</th>
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<tbody>
<tr>
<td>Heart Disease Prevention</td>
<td>$10000</td>
<td></td>
</tr>
<tr>
<td>Depression and Anxiety</td>
<td>$10000</td>
<td></td>
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<tr>
<td>Treating the Aging Population</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
WRITING THE GRANT PROPOSAL

"I CAN'T WAIT TO SHOW MY BOSS!"

PAGES 3

CITATIONS 2
JAMAL

Nice! Your latest study spearheaded by Jamal is getting all sorts of circulation. Word of your increasing reputation has already traveled through the department.

A PA from a neighboring lab steps in to congratulate you. “Who wrote the proposal for this?” she asks, and Jamal smiles and says he did. Then she laughs and says, “No, who really wrote it?” When you assure her that it really was Jamal, her smile falls and she quickly excuses herself from the lab.
Mistaken Identity

Jamal was in the building’s mail room when he ran into the mail deliveryman. “Morning Darnell,” he said before Jamal had a chance to correct him, he said, “I think you better do something about those overdue tuition notices - there’s a new one every week.” And then he handed him a letter. Finally Jamal said, “I’m not Darnell...” to which the mailman quickly replied, “Am I make sure he gets the letter, okay?"

You find this out when Jamal hands you the letter knowing what to do.
Mistaken Identity

What would you like to do?

- Talk to Darnell
- Talk to Jamal
- Do Nothing

Genetic factors in several symptoms of anxiety
Genetic factors in several symptoms of anxiety

YEAR 1: WINTER  REPUTATION: 1

RESEARCH COMPLETE

40%

49 56 38 9