The Power of Fun: Bringing Games into the Classroom

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Themes
- and sub-themes

• Real-world: games and classrooms
  • *some specific focus on North Carolina*

• Newest advances in game-based learning
  • *fun + educational = difficult*

• Pragmatic advice
  • *getting started, getting help*
Outline

• Why “people” keep thinking games belong in the classroom

• Why many educators remain skeptical

• Recent, diverse, success stories

• Points of departure
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Why games?

• “Digital natives”, “twitch-speed” and other inter-generational sociological pandering?

• Economic success? $15 Billion Industry

• Technological intoxication?

• or...obvious intrinsic value
Why games?

Can you name the game? The city?
Assassin’s Creed 2: Geography

- Tuscany:
  - Florence
  - Moneriggioni
  - San Gimignano
- Apennine Mountains
- Romagna
- Venice
- Rome
Assassin’s Creed 2: > Art & Architecture

- Basilica e Palazzio San Marco
- The Grand Canal
- Rialto Bridge
- Santa Maria del Fiore
- Sistine Chapel
- Palazzo Vecchio
- Santa Maria Novella
Assassin’s Creed 2: History, Literature, Religion...

- Leonardo da Vinci
- Niccolo Machiavelli
- Caterina Sforza
- Lorenzo de’ Medici
- Pope Alexander VI
Why use games?

• There can be **intrinsic**, **deep** associations between gameplay and **constructive** acquisition of academically-relevant knowledge, even in commercial games.

• **Off-the-shelf!**, AC2 provides **indirect** instruction in history, geography, art, architecture, religion, government...
  • It’s a field trip **and** a video!
Pragmatism #1: OTS

• “Off-the-shelf” - AC2 budget was “well over $20 million”. How could it be used in the classroom “as-is”?
  • Homework: students use FRAPS or similar software to record video/stills of examples relevant to class subject
  • Analysis: discuss both accuracies and inaccuracies in Ubisoft’s world and that of accepted scholarship
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Why skeptics?

• Games lack proven learning results
• Many educators have first-hand knowledge of earlier, failed efforts
• Games often lack any concept of integration with existing curriculum or classroom instructional techniques
• Game often come with unrealistic computing requirements
Answering skeptics?

... you be the judge ...
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Pragmatism #2: DIY

- Amazingly comprehensive tools:
  - Unity: http://unity3d.com
  - Epic’s UDK - http://www.udk.com/
  - Google, Apple phone apps SDKs
- Game design is itself educational:
  - scratch.mit.edu
  - CMU: www.alice.org
- Labor costs are negotiable - talk to your community college’s CS department!
DIY: Dr. Jeff Sarbaum

- UNC-Greensboro - ECON 201
- http://web.uncg.edu/dcl/econ201/
- On-line only, game-based class
- Leverages virtual world to explore microeconomics through experimentation
UNC-G: ECON 201

• (Trailer available at the following link:)
  • http://web.uncg.edu/dcl/econ201/
Pragmatism #3: DIFT

- **DIFT**: Doin’-It For Themselves!
- NCSU CSC 482 Design Class
  - Dr. R. Michael Young
  - CMU: Randy Pausch
Blackbeard’s Escape

Student-team - one semester:
http://blackbeardEscape.mike-winters.com/
Dryad
Spectral Assault

Student-team - one semester:
http://www.piradicalstudios.com/
Terraform

- http://www.terraformgame.com
- http://www.sgschallenge.com/
Keenan Fellows: Game Designers

http://ced.ncsu.edu/hifives/
Immersion

- Modern games - players do NOT read the instruction manuals even though gameplay is complex (e.g., Pokemon Black/White)
  - Game industry is VERY competitive
  - Hard to learn = hard to sell
  - Dumbed down = hard to sell

- Game industry extremely innovative in constructive learning techniques
Games-Based Learning

![Diagram showing the relationship between difficulty and time, with zones labeled as Frustration, Optimal Gameplay Corridor, Golden Path, and Boredom.](Image)
Constructivist Learning: Exploration/Discovery

History of scientific discovery “can be dramatically recounted as a set of almost heroic narratives in problem-solving” (Bruner)

“Our instruction in science from the start to the finish should be mindful of the lively processes of science-making, rather than being an account only of 'finished science' as represented in the textbook” (Bruner)

Learning should be assessed by ‘changing participation in changing practices’ (Lave)
Learning in games
Guidance building blocks

James Gee: 36 Learning Principles

#14: Regime of Competence Principle
#24: Incremental Principle
#27: Explicit Info On-Demand Just-in-Time Principle
#4: Semiotic Principle
#28: Discovery Principle
#16: Multiple Routes Principle
#11: Achievement Principle
#12: Practice Principle
#29: Transfer Principle
#14: Regime of Competence Principle

**Tasks being neither too easy nor too hard**

The learner gets ample opportunity to operate within, but at the outer edge of, his or her resources, so that at those points things are felt as challenging but not "Undoable".
Learning in games
Guidance building blocks

#27: Explicit Info On-Demand Principle

RECEIVING INFORMATION JUST WHEN IT IS NEEDED

The learner is given explicit information both on-demand and just-in-time, when the learner needs it or just at the point where the information can be best understood and used in practice".
#28: Discovery Principle

**TRYING RATHER THAN FOLLOWING INSTRUCTIONS**

Overt telling is kept to a well-thought-out minimum, allowing ample opportunities for the learner to experiment and make discoveries.
Computer-Based Learning? ("You must mean ITS!")

ITS = Intelligent Tutoring Systems

**Tutors:** 2+ “Sigma” advantage over classroom

**ITS:** 1-2 “Sigma” over classroom

**Disadvantage:** $$$, time, limited exploration

**Examples:**
- ATLAS
- Andes
- Cognitive Tutor
- Design-A-Plant
- AutoTutor
- Sherlock
- Smithtown
Similar Design Goals

**ITS:** Murray, Arroyo 2002

**Games:** Masuch 2008; Barwood 2005

- Bruner
- Csikszentmihalyi
- Lev Vygotsky
Integrating ITS with Digital Games

NCSU Intellimedia Lab

✓ Crystal Island: Outbreak
✓ Medical mystery
✓ Based on NC standards for 8th grade biology
✓ In-narrative hinting

3-C Institute for Social Development, Cary, NC

✓ Social skills tutoring
✓ Based on proven social skills training program
✓ Performance shown to correlate with real-world
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Point of Departure #1: Jim’s Dissertation

- Computer Science
  - Artificial Intelligence
    - Intelligent Tutoring Systems
    - Automated Planning
    - Knowledge Representation

Annie is a computer system that automatically generates learner guidance in arbitrary, but well-described, digital games.
Planning in Games

Story plan is for bank owner to steal (embezzle) from vault

System *intervenes* to prevent shots from killing owner prior to dramatically vital theft

The system needs to prevent the premature death of the bank owner.
Automated Planning  
Actions, Preconditions, Effects

- Put On Pants
- Left Sock
- Left Shoe
- Leave House
- Right Sock
- Right Shoe
Plan Reasoning
Goal Proximity Analysis

Partial Plan Space

Plan 3

Plan 2

Plan 1

Tier 1

Tier 0

Tier 2

Action History

B
Games are all about Causes and Effects

Meaningful play “emerges from the relationship between player action and system outcome”
– (Salen and Zimmerman)

The core mechanic of a game is:
“an intrinsically interesting rule set into which content can be poured” (Kostner)

“one or more causally linked series of challenges in a simulated environment” (Adams and Rollings)
Summary

• As academic games continue to evolve so will their use in the classroom:
  • Off-the-shelf commercial games
  • Non-commercial learning games
  • DIY games
  • Next-gen ITS/Games
• Keep an open eye and an open mind
Reference Points

After this presentation, I will post all the references on my NCSU home page:

www4.ncsu.edu/~jmthoma5