DePaul University

Learning Principles in Teaching and Video Games

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Intro

- Requirements for learning
  - Multiple viewpoints
- Assessment of the learning opportunities I provide
- Assessment of learning via games

What works for learning?

Back to basics

What Affects Learning?

- Need empirically proven principles of effective learning
  - Theories of Motivation
  - Theories of Emotion
  - Learning Sciences

Motivation Theories

- Flow: (Csikszentmihalyi)
  - Total absorption in activity
  - Balance of demands and capabilities
- Self-determination (Deci and Ryan)
  - Intrinsic motivation from inherent need to be active
  - Influenced by needs for competence, autonomy, relatedness
  - External motivation can be internalized
- Terror-management theory (Greenberg et al)

Emotion Theories

- Appraisal theory (Scherer)
  - 16 dimensional appraisal frame represents emotion (reaction to event)
  - Ditto for mood
  - Combine to get feeling
  - Current effort to include in Soar (Marinier)
  - Connection to motivation?
- Also: Ahn and Picard's Affective Cognitive Learning and Decision making (ACLD)

Learning Science

Learning Science Principles

- Connect to prior knowledge
- Information delivery? NO!
- Constructivism
- Active learning
  - Learner's active involvement with info to be learned
  - Metacognitive level

distilled from Bransford, Brown, and Cocking (eds), “How People Learn: Brain, Mind, Experience, and School”, 2000.

LS Principles 2

- Reflection
- Zone of Proximal Development
- Assessment: Can't connect to what students know if you don't know what they know.
- Facts are important
  - –base for further knowledge
  - –but not all-important

LS Principles 3

- Experts vs novices
  - –Qualitative differences in:
    - Perception
    - Knowledge retrieval
    - Choice of action
  - –Expert blindsight
- Transfer
  - –Horizontal, vertical, near and far
  - –"Efficiency" of learning -> cheats, shortcuts, etc

LS Principles 4

- Learning is hard work!
  - –It takes time.
  - –Practice / rehearsal.
- Motivation is key!

LS Report Card

Principle	Grade
Connect to prior knowledge	
Minimize info delivery	
Support constructivism	
Active learning	
Metacognition	
Reflection	
Zone of proximal development	

Principle	Grade
Assessment/feedback	
Facts and how to use them	
Training perception	
Mastery Learning	
Transfer	
Practice	
Motivation	

LS Report Card: My teaching

Principle	Grade
Connect to prior knowledge	B
Minimize info delivery	C-
Support constructivism	B
Active learning	C
Metacognition	C-
Reflection	C
Zone of proximal development	B-

Principle	Grade
Assessment/feedback	B-
Facts and how to use them	B+
Training perception	C
Mastery Learning	B-
Transfer	B+
Practice	B+
Motivation	C-

Games

Reasons for caution

Games

“Educational” Games

Reasons for hope

Games

Gee's principles for learning in games

1. Active, critical learning
2. Design
3. Semiotic
4. Semiotic domains
5. Metalevel thinking about Semiotic domains
6. Psychosocial moratorium
7. Committed learning
8. Identity
9. Self-knowledge
10. Amplification of input
11. Achievement
12. Practice
13. Ongoing learning
14. Regime of competence
15. Probing
16. Multiple routes
17. Situated meaning
18. Text
19. Intertextual
20. Multimodal
21. Material intelligence
22. Intuitive knowledge
23. Subset
24. Incremental
25. Concentrated sample
26. Bottom-up basic skills
27. Explicit info on-demand and just-in-time
28. Discovery
29. Transfer
30. Cultural models about the world
31. Cultural models about learning
32. Cultural models about semiotic domains
33. Distributed
34. Dispersed
35. Affinity group
36. Insider

LS Report Card: GAMES

Principle	Class	Games
Connect to prior knowledge	B	**A**
Minimize info delivery	C-	**A**
Support constructivism	B	**C**
Active learning	C	**A**
Metacognition	C-	**A**
Reflection	C	**B**
Zone of proximal development	B-	**A**

Principle	Class	Games
Assessment/feedback	B-	**A**
Facts and how to use them	B+	**A**
Training perception	C	**A**
Mastery Learning	B-	**A**
Transfer	B+	**A-**
Practice	B+	**A**
Motivation	C-	**A**

The Big Question

- Once we've identified a deficit, what do we do about it?

The Answer

Serious Games Class

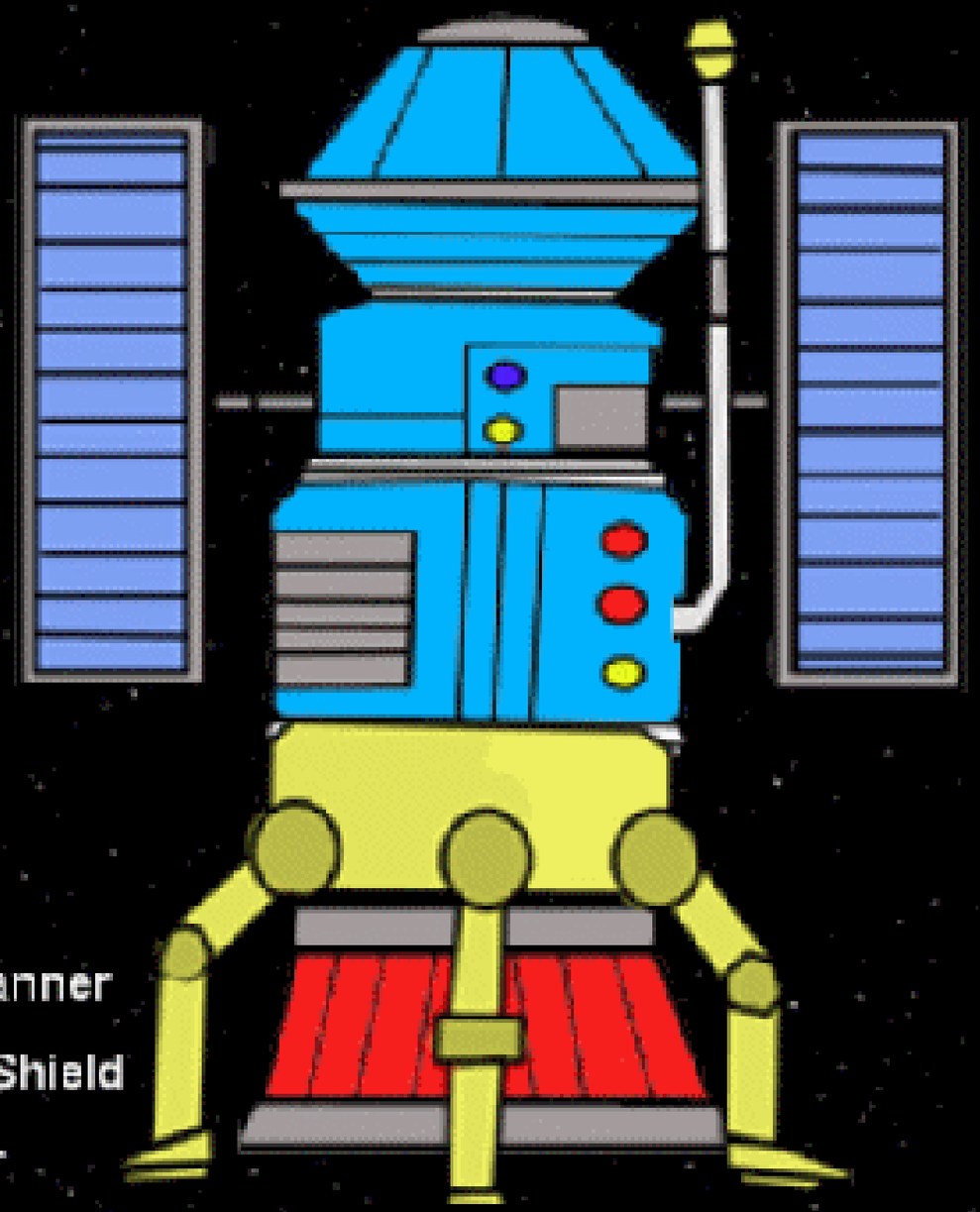
- In 2010, 14 CDM students developed two different games for a 7th grade CPS class
  - –Planetary science
  - –Used Illinois state learning standards
  - –Tested before and after using games
  - –They actually learned!

PlanetaryScience

Build a probe for Uranus

Engines
Landing Gear
Sensors
Temperature Shield

Cold Resistant Shield
Cost: $200
A shield thats repels extreme cold.



Launch!

Current Engine: Super Engine
Current Sensor: Low Grade Scanner
Current Shield: Cold Resistant Shield
Current Lander: Ground Lander
Current Cost: 1100

Planetary System Builder

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Current research

- Two PhD students: Brian Grey and Ali Alkhafaji
  - –Focus on motivational aspects
  - –Factors that affect motivation: (Garris et al, 2002)
    - –Fantasy: Context, themes or characters.
    - –Rules/Goals: rules, goals, and feedback
    - –Sensory stimuli: Visual, auditory
    - –Challenge: Level of difficulty
    - –Mystery: Information complexity
    - –Control: by player over directions, outcomes

Further research needed

Issues:

- Johnson: General cognitive capabilities?
- Refining principles for games
- Operationalizing
- Music?
- What DOESN'T MATTER for learning?
- Cheating / gaming
- Learning objectives and outcomes
- Injecting games into ed tech?
- Evaluation???!!! (more below)

Game simulates RW?

- Test in RW?
- MC tests measure RW abilities?
- Would anyone believe test embedded into learning game?
- Is the best eval (without testing real-world abilities) just whether they've "won the game" or what their skill level is?

Conclusions

- Games hold much promise for education
- Also huge potential for hype
- More research is needed!