

AAA Game Mechanics Inspiring Learning and Assessment Mechanics

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Game Mechanics

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Relevance

PISA:
We are falling behind

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Games for Learning Institute

- Members
 - NYU (Ken Perlin, Jan L. Plass, Co-Directors, Katherine Isbister)
 - TC Columbia University (Chuck Kinzer)
 - CUNY Graduate Center (Bruce D. Homer)
 - Parsons, Dartmouth, RIT, PUC
 - Total of 11 faculty from 7 universities and their labs

Game designers, computer scientists, engineers, educators, learning scientists, psychologists

Microsoft
Research

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Collaborators

Ken Perlin	Anna Brady	William Meyer
Bruce Homer	Meagan Bromley	Paul O'Keefe
Chuck Kinzer	Jennifer Case	Martin Pusic
Catherine Milne	Anand Chandrasekaran	Darshanand Ramdass
Katherine Isbister	Yoo Kyung Chang	Adina Kalet
Trace Jordan	Dixie Ching	Mubina Khan
Joel Wein	Jonathan Frye	Ruth Schwartz
Mary Flanagan	Elizabeth Hayward	Hyuksoon Song
Andy Phelps	Charles Hendee	Murphy Stein
Miguel Nussbaum	Tsu-Ting Huang	Tzuchi Tsai
Colleen Macklin	Yolanta Kornak	Yan Wang
Juan Barrientos	Helen Kwah	Steve Yavner
Melissa Biles	Susan Letourneau	Helen Zhen Zeng

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Games for Learning Institute

- Mission
 - Design Patterns for Games for Learning
 - Guide for Designers
 - Embedded Assessment
 - Evidence of Effectiveness of Games for Learning
 - Focus on STEM, Language, Literacy

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Why use Games for Learning?

Highly Contextualized, Situated Problem Solving Spaces

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Why use Games for Learning?

Highly Engaging, Individualized Learning

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Why use Games for Learning?

Bridge in-school and out-of-school learning

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Why use Games for Learning?

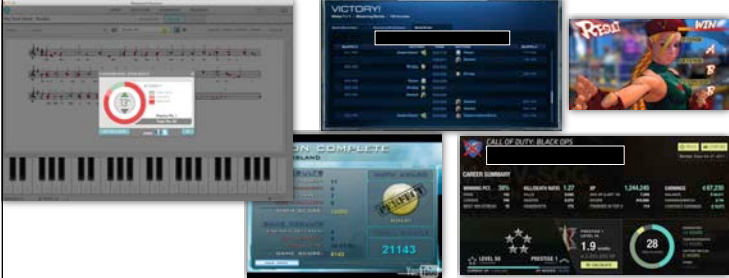


Emotional Impact by Design

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Why use Games for Learning?

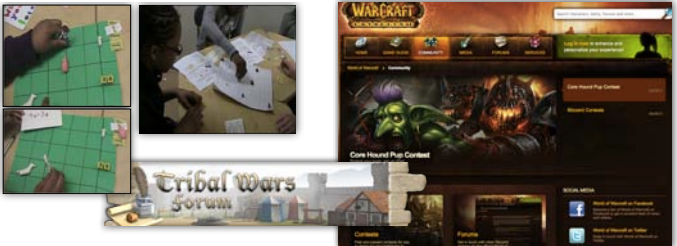


Embedded Assessment (learning, learner variables)

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Why use Games for Learning?



Community of Practice, Participatory Learning Culture

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Games for Learning Institute

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Games for Learning Institute

- Research Methods
 - Playtesting
 - Design Research
 - Experimental Research
 - Using a variety of measures:
 - Physiological** (biometrics, eye tracking)
 - Behavioral** (in-game assessment, video observations)
 - Self-reports** (think-aloud, interviews, surveys)

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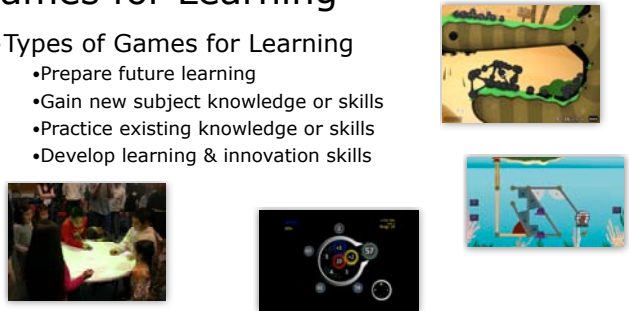
Why do so many Educational Games fail?

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Games for Learning

- Types of Games for Learning
 - Prepare future learning
 - Gain new subject knowledge or skills
 - Practice existing knowledge or skills
 - Develop learning & innovation skills



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Game Mechanics


- Essential Game Play
- Different when goal is learning
 - Fun and Engaging
 - Engage player in meaningful learning activities
 - Elicit relevant behaviors that can reveal player's thinking

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Learning Mechanics → **Game Mechanics**

Patterns of behavior or building blocks of learner interactivity



Assessment Mechanics → **Game Mechanics**

Patterns of behavior or building blocks of diagnostic interactivity




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Learning Mechanics → **Game Mechanics**

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Assessment Mechanics → **Game Mechanics**

Patterns of behavior or building blocks of **diagnostic** interactivity

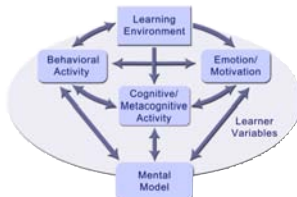


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Learning Mechanics

- Design Process
 - Describe desired outcomes
 - Apply a learning approach
 - Design meaningful interaction with the specific subject
- Select Game Mechanic



Domagk, Schwartz, & Plass, 2010

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Learning Mechanics

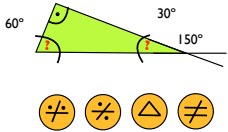
- Example
 - Desired outcomes: Geometry rules
 - Learning approach: Reciprocal teaching
 - Learning Mechanic: Learner solves problems by identifying the correct rule to apply

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Learning Mechanics

- Learner solves problems by identifying the correct rule to apply



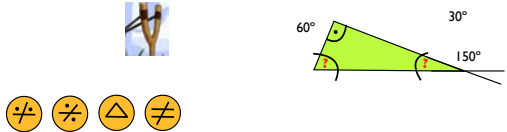
Select the correct rule and drag it to the corresponding angle

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Learning Mechanics

- Learner solves problems by identifying the correct rule to apply
- Game Mechanic: Sling-shot




Select the correct rule to and shoot it to the corresponding angle

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Learning Mechanics

- Learner solves problems by identifying the correct rule to apply
- Game Mechanic: Jet Pack




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Learning Mechanics

- Learner solves problems by identifying the correct rule to apply
- Game Mechanic: Object search**



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It couldn't be *that* simple?

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Game Mechanics

- Requirements
 - Don't introduce excessive demands by irrelevant tasks



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Game Mechanics

- Requirement
 - Keep it challenging—don't make it too easy

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Game Mechanics

- Requirements
 - Don't introduce unnecessary confounds
(fine motor skills, content knowledge or skills, etc.)

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Learning Mechanics Library

Learning Mechanic	Game Mechanic
Learner places icons representing key concepts to solve problems	
Learner creates authentic problems to solve by other players	
Reciprocal teaching: Learner teaches concepts to game characters	
[your ideas here...]	[your examples here...]

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Learning Mechanics → **Game Mechanics**

Patterns of behavior or building blocks of **learner** interactivity

Assessment Mechanics → **Game Mechanics**

Patterns of behavior or building blocks of **diagnostic** interactivity

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Assessment Mechanics

- Design Process (Evidence-Centered Design, Mislevy et al.)

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Assessment Mechanics

- Learner applies rules to solve problems

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Assessment Mechanics

- Requirements
 - Consider item dependencies
 - Allow for multiple observations
 - Don't rely on unrelated skills (e.g., fine motor skills)
 - Don't introduce confounds - other content knowledge/skills
 - Consider Emotional Response (Bird Anger)

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Learning Mechanics Library

Assessment Mechanic	Game Mechanic
Learners apply rules to solve problems	
Learner arrange items in space and time to solve problems	
Learner show which items belong to each other in time or space	
[your ideas here...]	[your examples here]

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Conclusion

- Game Mechanics are different for learning games
- Clear process to effective mechanics
- In line with specialization areas of designers
- Step closer to educational games that don't fail

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NEW YORK UNIVERSITY create GAMES FOR LEARNING INSTITUTE

Thank you!

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Microsoft Research NSF EDUCAUSE

motorola foundation BILL & MELINDA GATES foundation THE WILLIAM AND FLORA HEWLETT FOUNDATION

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