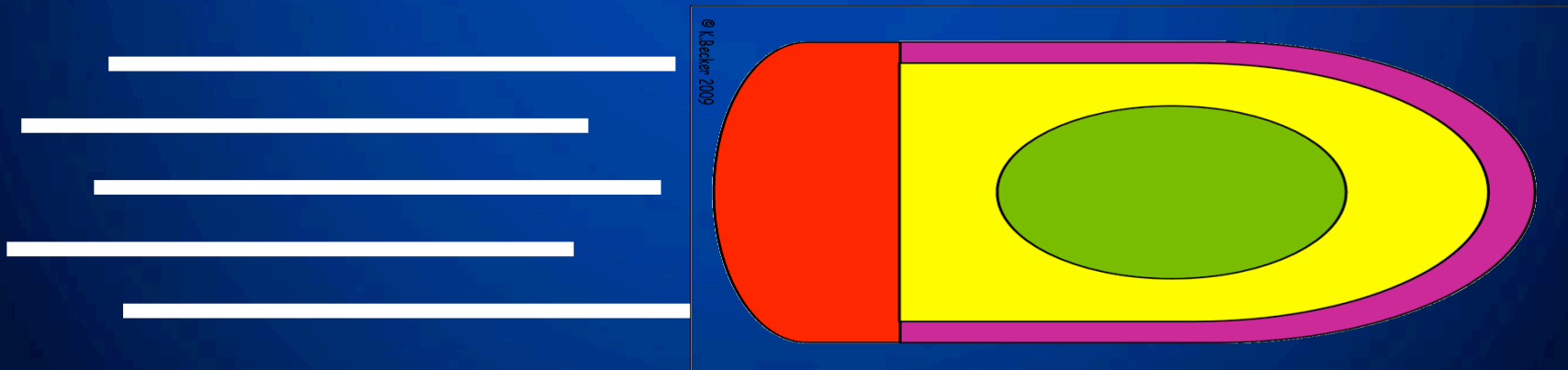# Evaluating Educational Videogames:

A Magic Bullet

My Background

- B.Sc., M.Sc. In Computer Science
- Taught CS 1982 - 2008
- Ph.D. in Ed. Tech 2003 - 2008
- Have taught in Science, Education, Art, Engineering
- Have taught: Programming, Data Architecture, CAL, DGBL, Game Design, Technical Writing, General Science & Math
- Using games since 1998
- Maintain extensive websites & course sites
- Hatching Program since 1989

Backstory

- What attracted me to CS
  - What I could do w/ it
- What got me into ID
  - What I could make w/ it
- My end goal:
  - Can we **teach** Ed game design… ?
    - Understand Ed game design →
    - *Understand game design* →
    - *Understand Ed design* →
    - Understand software design / understand entertainment design….

What I'm Playing Now
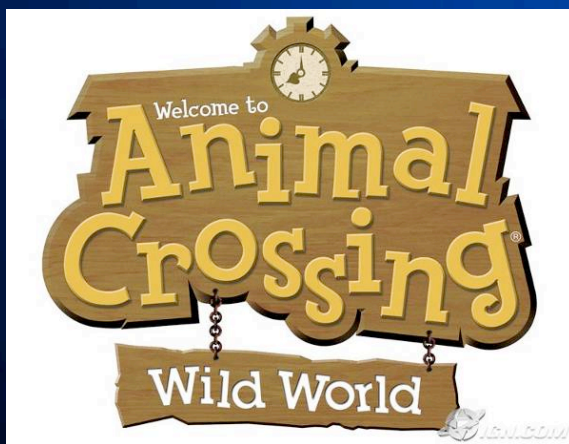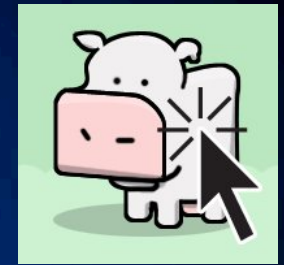
The Current Landscape

- Games are hot.
- But are they a good fit for Education?
- Are they better than....?
  - Little hard data.
  - Barriers to adoption remain high
    - administration, support, time, tech requirements, security concerns, *support*

What Do Educators Want?

- Engaged Learners
- Authentic & Relevant Learning
- High ROI
- Low cost
- Low entry barriers

IMPORTANT:
 – MUST avoid repeat of Edutainment Era

Mass Effect 2

The Great Debates

In Games for Learning:

Learning vs. Fun

Instructional Design vs. Game Design

Game as Receptacle vs. Game as Method

Blood Magic

© Becker 2010   © GameWallpaper.com   *Magic Bullet* 7

Educational Game Debates

Instructional designers suck all the fun out of games.

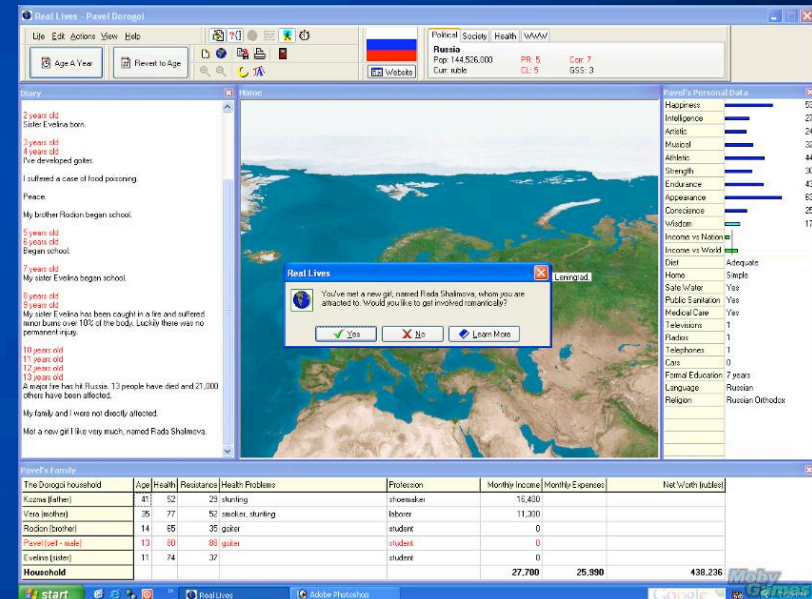**Game designers drive all the learning out of games.**
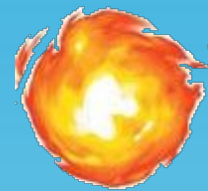
Educational Game Debates

Games Design is all we need. ←———————————→ **Instructional Design is all we need.**

Grim Fandango

Real Lives

Practicalities: Removing Barriers

- Easy to run & maintain.

- Clear connections to accepted pedagogy.

- Shallow learning curve.

- Internally supported orientation.

- LOTS of support materials
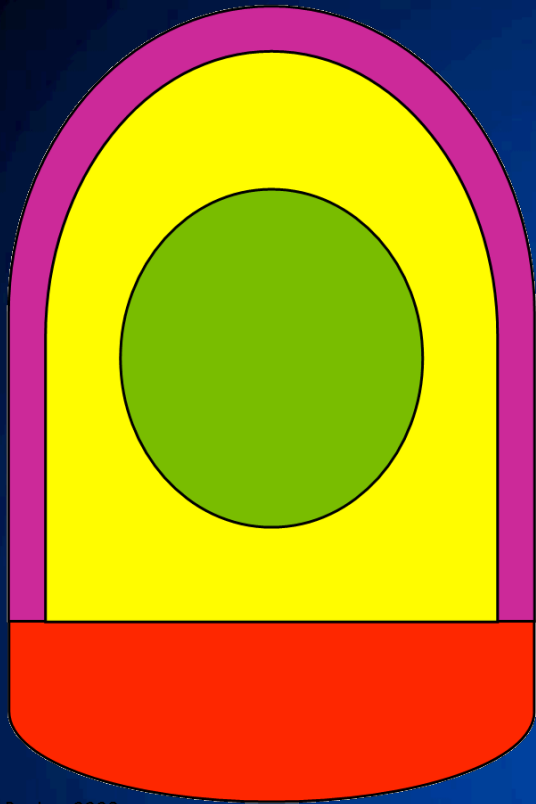 - Manuals
  - Tutorials
  - Lesson Plans

Heavy Rain

Practicalities: Removing Barriers

**Clear connections to accepted pedagogy.**

Heavy Rain

© K.Becker 2009

- Need to talk about the learning in a game.

- Need tools for examining games
  - Existing Ed. software reviews insufficient
  - Existing commercial game reviews insufficient

A Magic Bullet?

What?

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- Model for evaluating and assessing games (COTS & Ed)

- Subjective tool

- Currently developed for single-player games

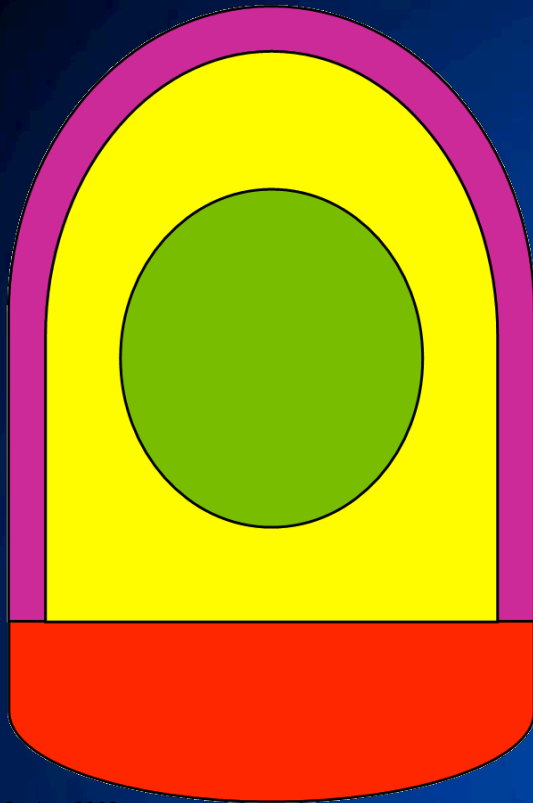- A means of categorizing the learning that happens in a game.
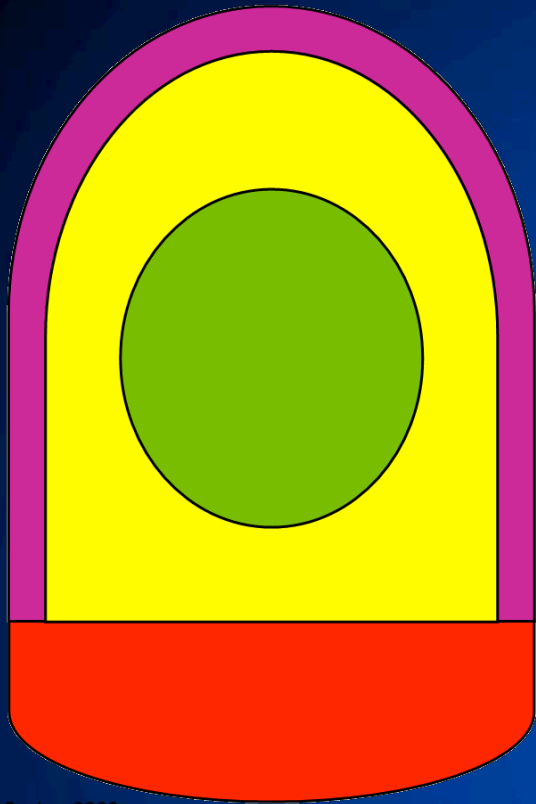
How?

- All learning in a game can be classified in one (or more) categories

- Learning NEED NOT = Education

- Relative proportions are informative

- General learning in a game and *Serious Learning* in a game are *different* conversations.
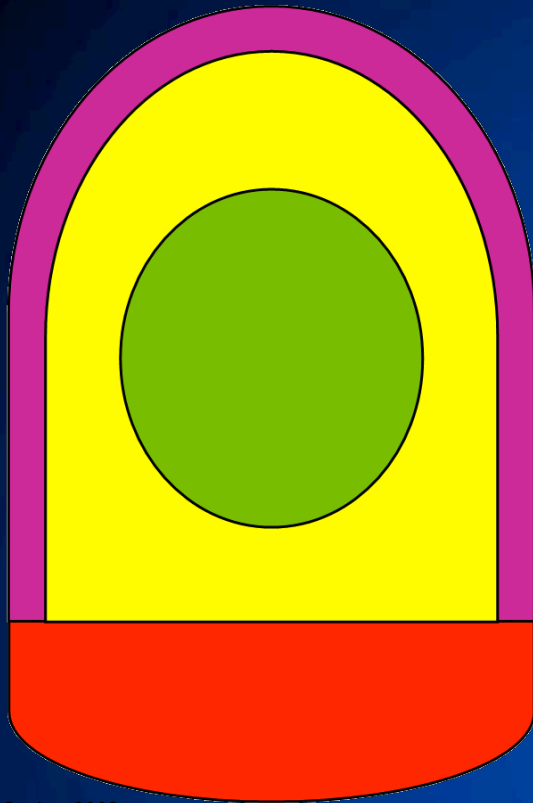
© K.Becker 2009

Learning vs Education

© K.Becker 2009

| Learning	Education
Value-Neutral	Value-Laden
Can be Coincidental	Deliberate
Natural	Coerced / Persuaded
Internally Motivated*	Externally Motivated*

Why?

© K.Becker 2009

- Educators & Game Designers come from different cultures.

- Instructional Design and Game Design are different.

- Serious Game Design is NOT regular game design. (It's all about the message.)
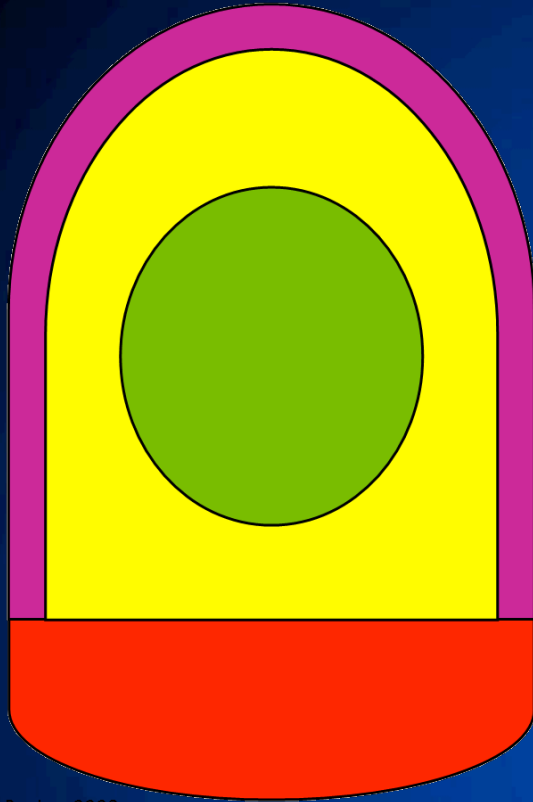
Paradox: GD vs. ID
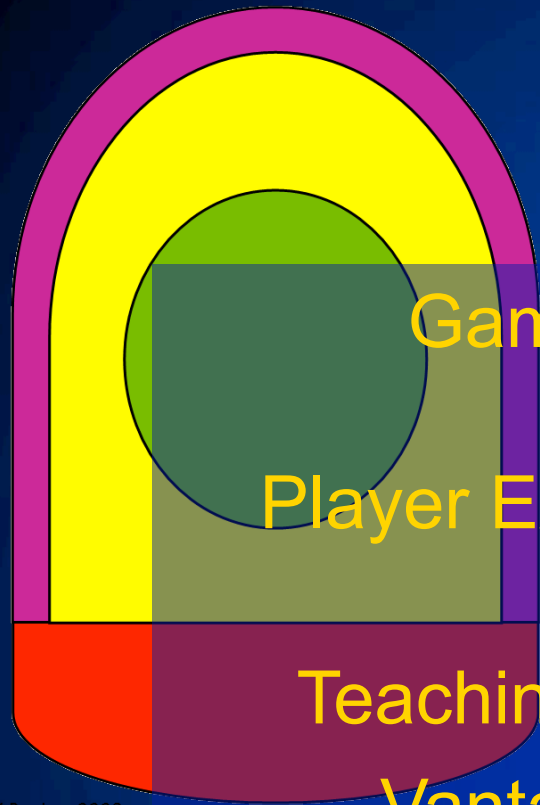
© K.Becker 2009

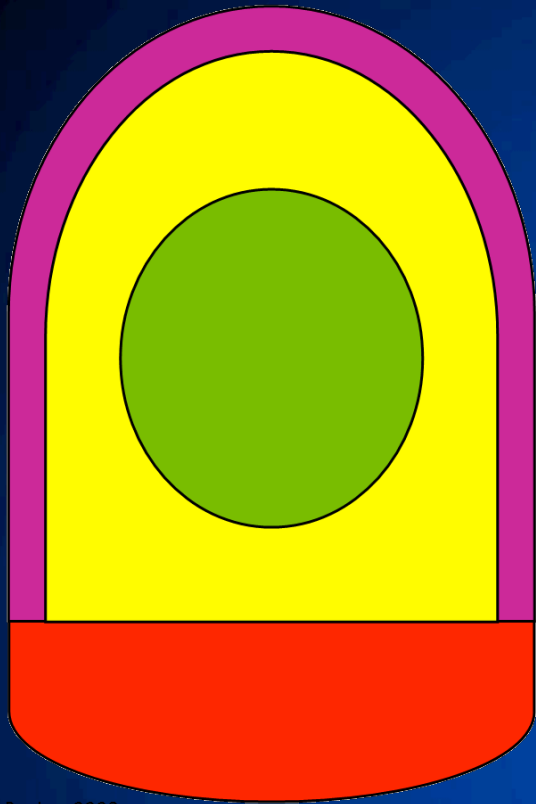|	
Game Design	Instructional Design
Player Experience (how)	Content (what)
Teaching Method	Receptacle for content
Vantage Point: Entertainment (SENG?)	Vantage Point: Formal Education
Industry Credentials	Ed. Credentials

© K.Becker 2009

Why?

- ***Learning*** is how we get through a game. Always.

- Evaluate BEFORE use or development.

- Assess potential for learning.

- Structured analysis of game (without the people).

Colour Code

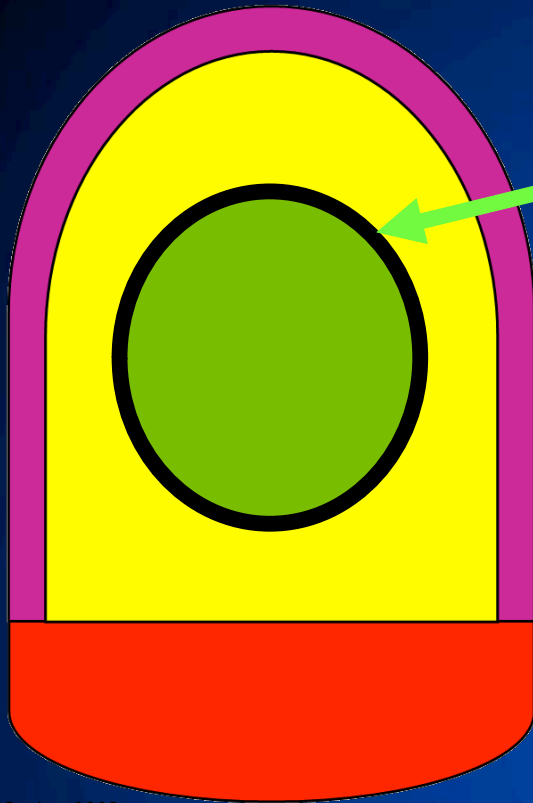| Things I CAN learn. |
| Things I MUST learn |
| Collateral Learning (emergent behaviour) |
| External Learning (cheats & community) |

© K.Becker 2009

Things I Can Learn

- deliberately designed by those who created the game

- Includes things designers *hope* people will take up

- Includes game-specific objectives as well as general ones
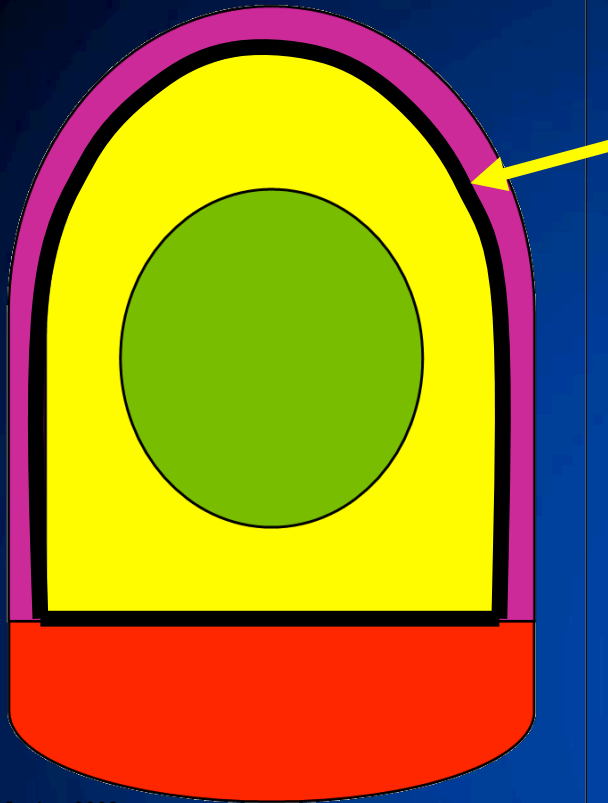
Things I MUST Learn

© K.Becker 2009
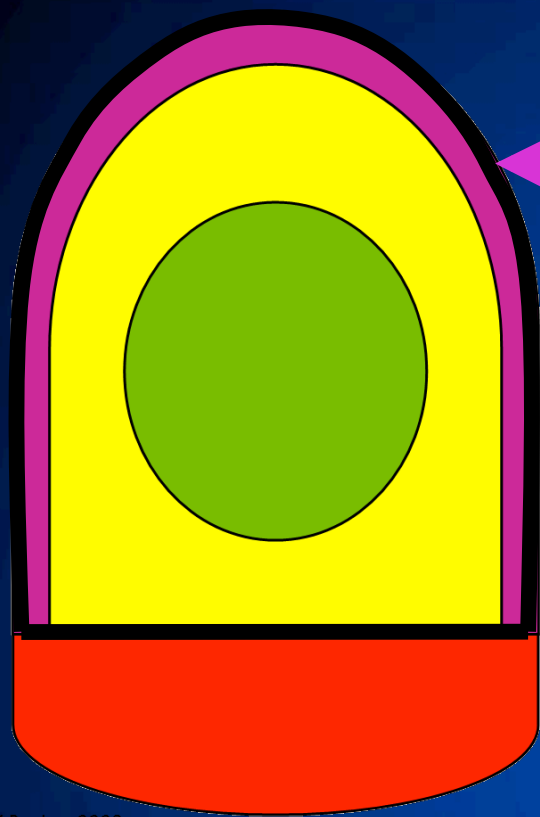
Colour Code

Things I CAN learn.
Things I MUST learn
Collateral Learning (emergent behaviour)
External Learning (cheats & community)

- Should be a subset of the first category

- Required in order to achieve a specific goal or to win

- Includes strategies, skills, facts,...

External Learning

Colour Code

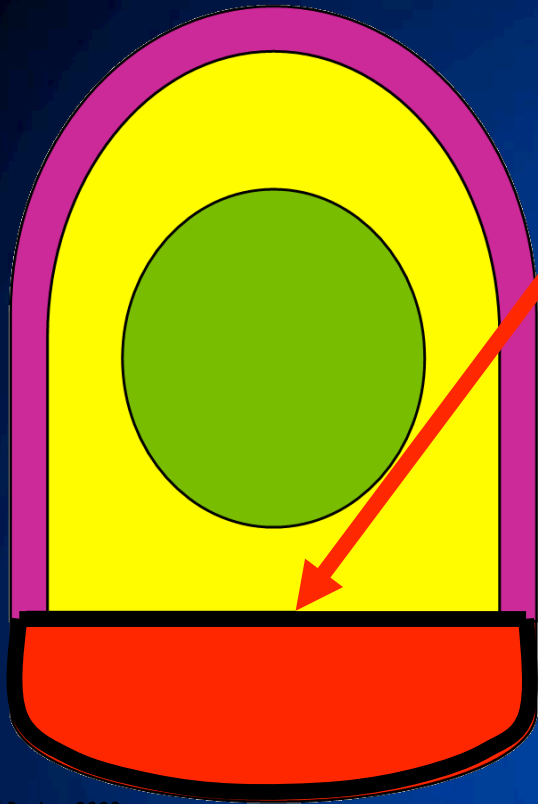| |
|---|
| **Things I CAN learn.** |
| **Things I MUST learn** |
| **Collateral Learning (emergent behaviour)** |
| **External Learning (cheats & community)** |

© K.Becker 2009

- Includes social learning and outside communities
  - Not *technically* considered part of the normal gameplay
  - *CAN impact on our success in the game.*
- Also includes Cheats
  - Typically designed into the game for testing purposes
  - Often left in the game once it ships
  - Deliberate design elements on the part of the designers

Collateral Learning

- Other things we can learn
  - These are not necessarily designed into the game, although sometimes designers may hope that players choose to take these up

  - Includes emergent behaviors

  - Not part of the game

 - _Does not impact on our success in the game_.

Colour Code

Things I CAN learn.
Things I MUST learn
Collateral Learning (emergent behaviour)
External Learning (cheats & community)

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Colour Code

Things I CAN learn.
Things I MUST learn to get through the game or meet my goals
Collateral Learning
Things I DID learn.
Cheats.

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Things I DID Learn

- "Your results may vary"

- Will often be specific to the goal
  - if there is more than one way to win
  - if there are multiple goals that can be achieved

- Not included in analysis models

A Good Game

Things I CAN learn.

Things I MUST learn to get through the game or meet my goals.

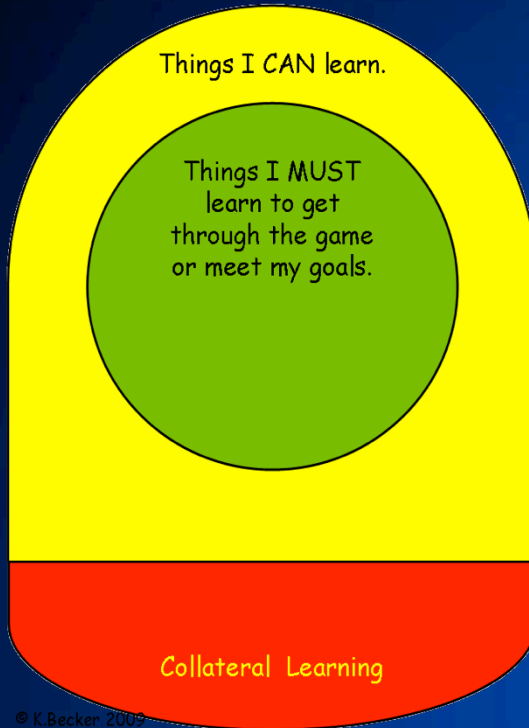External

Collateral Learning
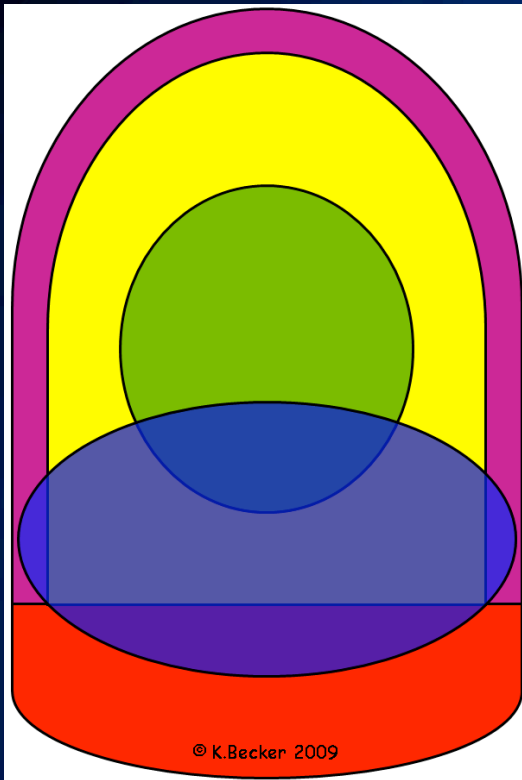
© K.Becker 2009

- Good balance

- Nothing I **MUST** learn that is outside of what I **CAN** learn.

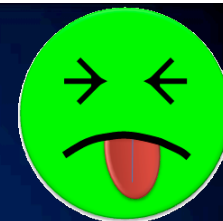- Allows for learning outside of game and from cheats and community.

A Good Game

Things I CAN learn.

Things I MUST learn to get through the game or meet my goals.

Collateral Learning

© K.Becker 2009

- Things I MUST learn < ½ of what I CAN learn

- External learning not necessary

- Collateral learning possible

Some Examples

Things I MUST learn to get through the game or meet my goals.

Things I CAN learn.

MATH BLASTER
MASTER THE BASICS
☆ Play
☆ Manual
☆ Exit
Knowledge Adventure®
DISCOVER. LEARN. EXCEL.

MUST learn = CAN learn

- Nothing to learn that isn't part of the 'goal'.

- Often edutainment fits in here.

- Lack of collateral learning opportunities implies a single-purpose game (or an impoverished one).

Some Examples

Things I MUST learn to get through the game or meet my goals.

Things I CAN learn.

Collateral Learning

© K.Becker 2009

MUST learn ≈ CAN learn

- Challenging → for some, frustrating.

- Often requires players to repeat plays and levels many times.

The more one MUST learn of the total set, the fewer choices players may ultimately have.
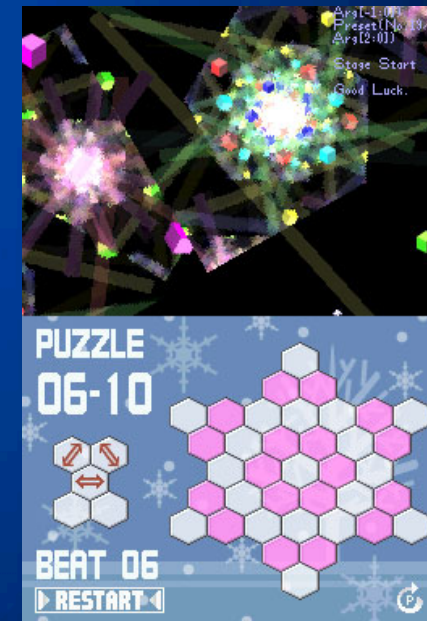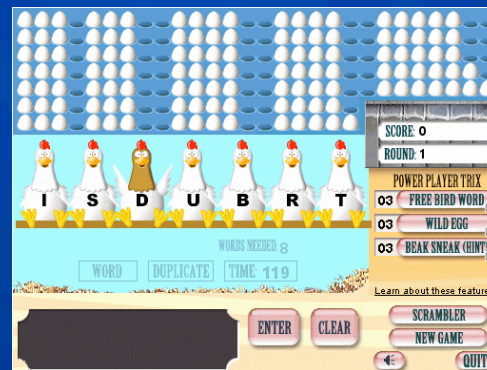
Some Examples
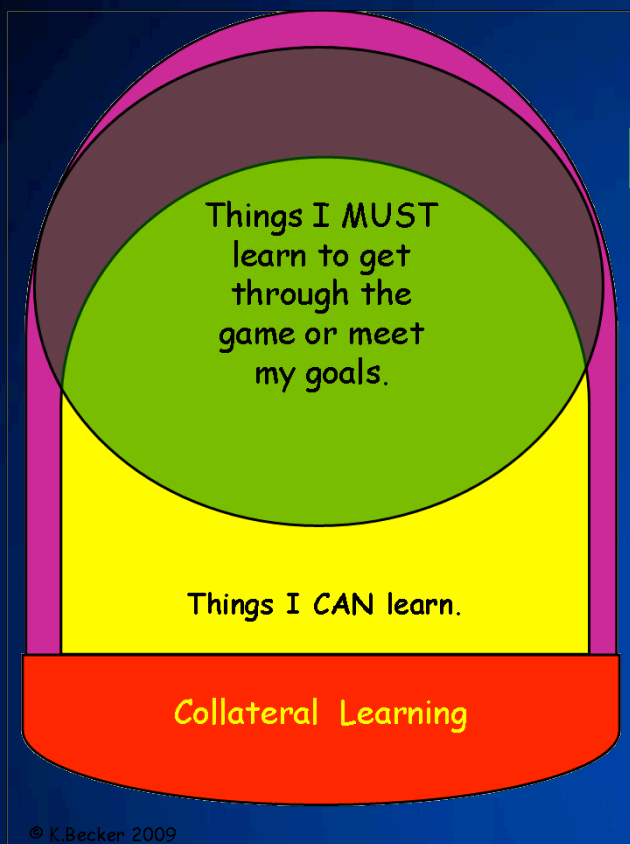
MUST learn ≈ CAN learn

- Puzzles
- Mini-games

Some Examples

MUST learn > CAN learn

Things I MUST learn to get through the game or meet my goals.

Things I CAN learn.

Collateral Learning

© K.Becker 2009

- Need outside help / resources to get into the game or progress.

- CAN still be good, but this has serious implications for audience and support requirements.
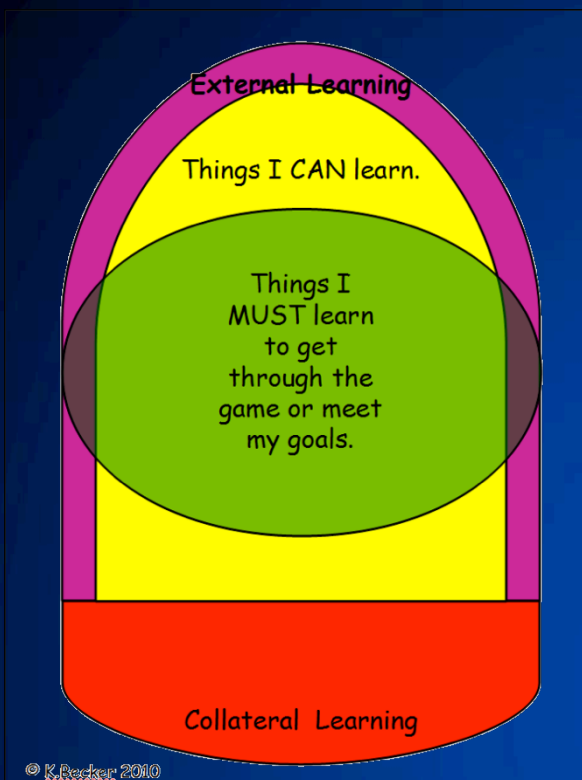 - Can be risky in serious games.

Some Examples

MUST learn includes external learning.

- Can make for great game

- Tends to worry traditional educators

- Can be very useful in serious games
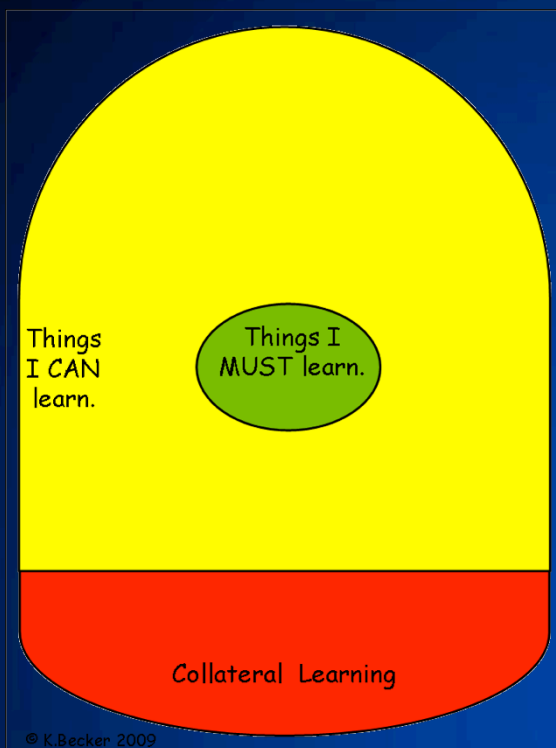
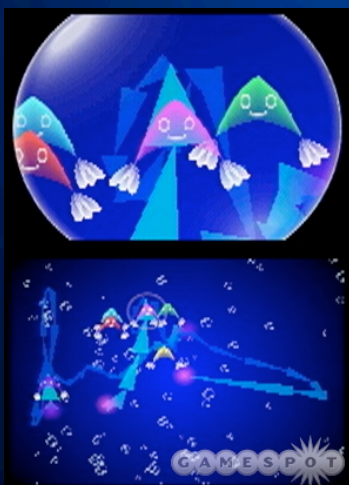- Games do not always need to be self-contained

Some Examples

MUST learn <<
CAN learn

Things I CAN learn.

Things I MUST learn.

Collateral Learning

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- Lacks direction

- Aimless

- Toy, not game ~OR~ straight sim.

- If there is not enough we MUST learn in order to win, there may be insufficient challenge.
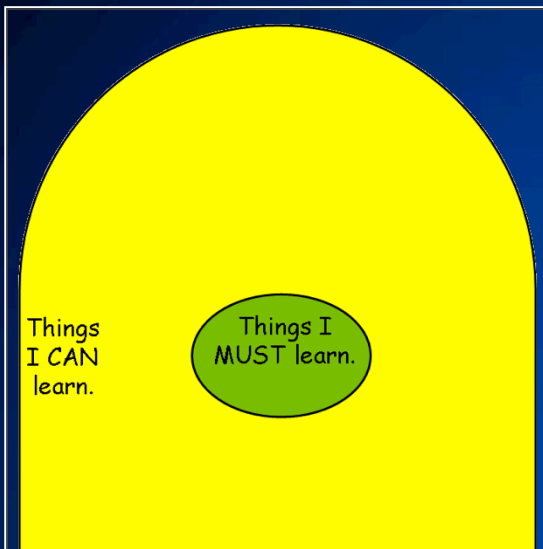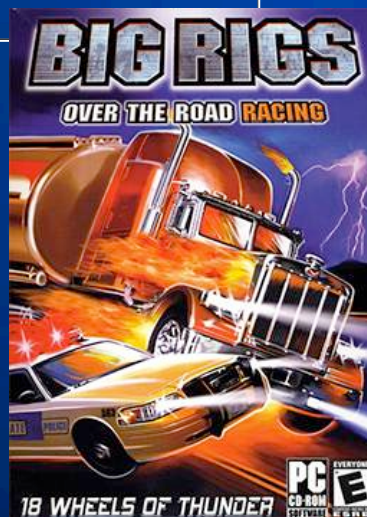
Some Examples

MUST learn
too small

- ## Not much to hold interest

•no gameplay.
•No AI (the "opposing" truck just sits there!
•Winning is virtually guaranteed.
•game lacks collision detecting which means you can go through any objects like houses, boulders, trees, and bridges that you are required to cross.
•able to accelerate into infinite, even when going backwards.
•Traveling off of the edge of the map is possible in the game.
•NO police cars
•Source:
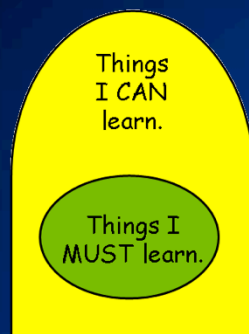http://www.mobygames.com/game/big-rigs-over-the-road-racing

Things I CAN learn.

Things I MUST learn.

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BIG RIGS
OVER THE ROAD RACING

PC
CD-ROM
SOFTWARE

18 WHEELS OF THUNDER

Some Examples

Little Game

- Short form game
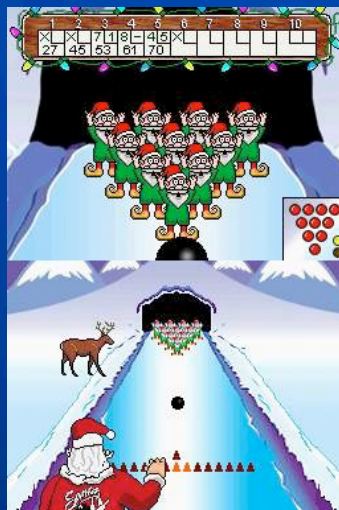
Some Examples

Drill Game

Things I MUST learn.

Things I CAN learn.

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- **Short form game**
  - Bad if not short

PERFECT00

Cc c

Me Me

K2 K2
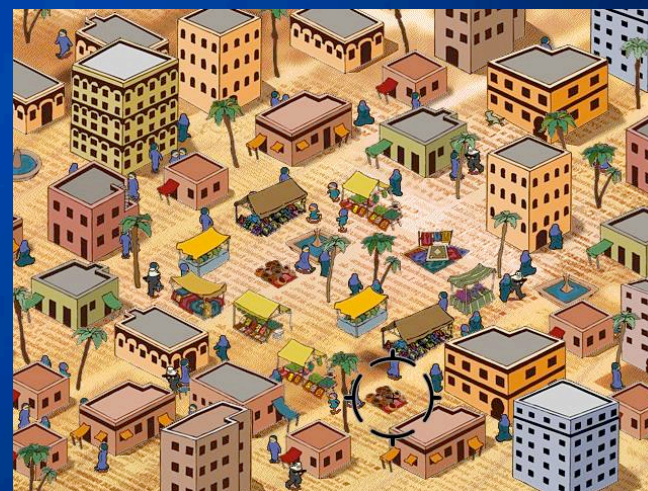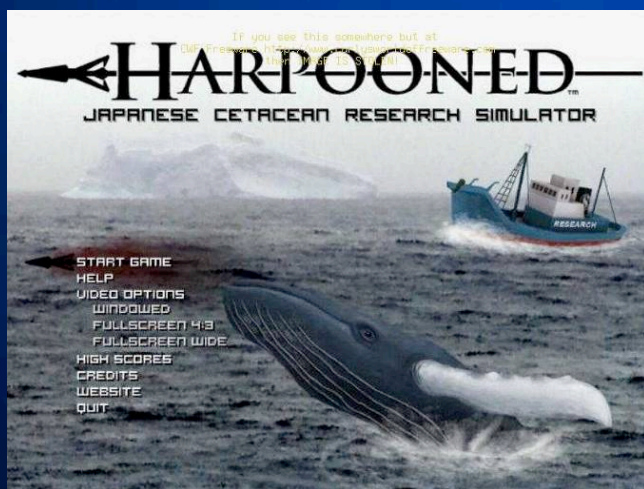
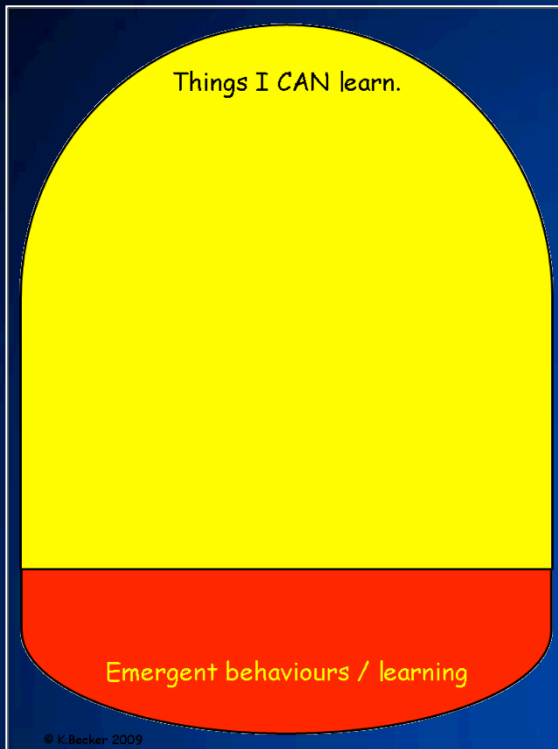Typing of the Dead

Some Examples

Short Form Game

© K.Becker 2009

- Can be great if carefully designed
- Must be designed as 5 minute game.
- Can include many puzzles.

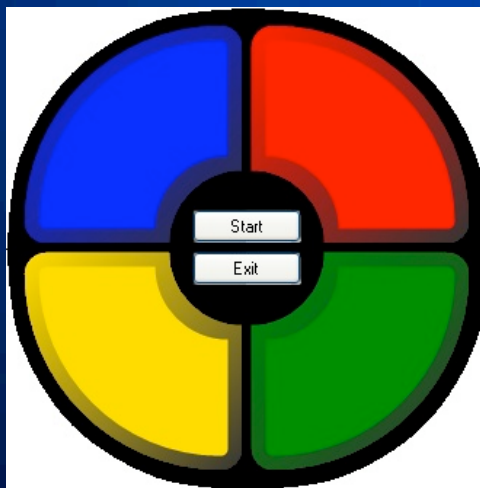Some Examples

MUST learn = 0

Things I CAN learn.

Emergent behaviours / learning

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Start

Exit

- No direction

- Even SIMs has some MUST learn

- Game on rails

- This is a toy

Some Examples

No collateral learning.

- Imbalance between CAN & MUST

Things I CAN learn.

Things I MUST learn to get through the game or meet my goals.

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FARMVILLE
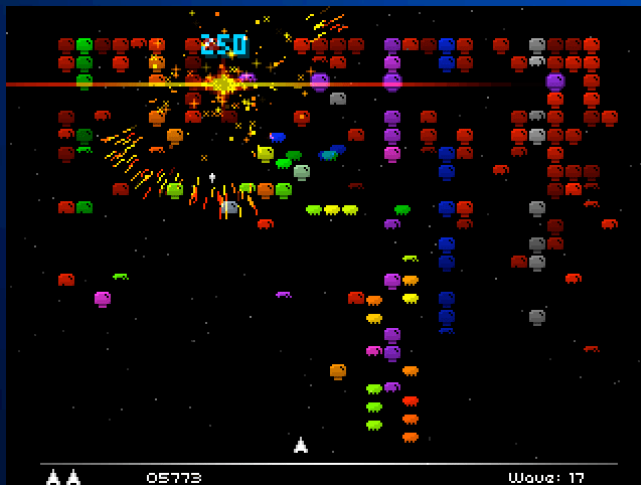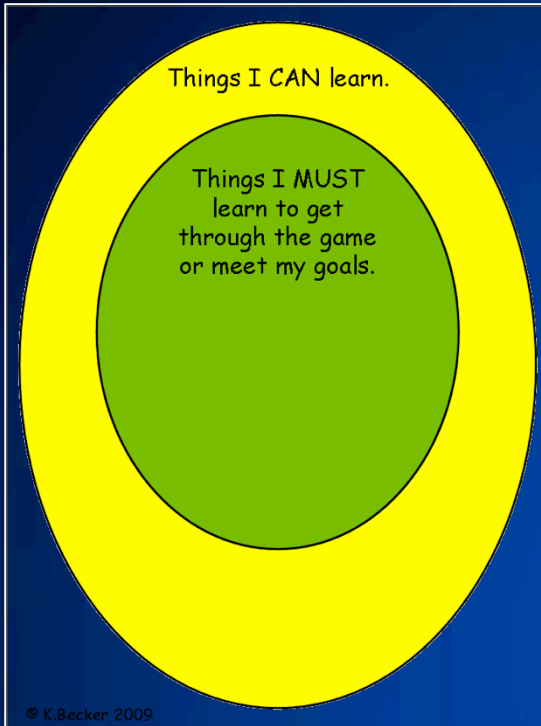
Some Examples

How: Instructional Decomposition

no, I think it looks fine!

- Create a list of objectives achieved
  - Done through play and observation
  - Looking at the behaviour of the program

- Categorize and classify the things learned
- Extrapolate back to an instructional design

This assumes an EXISTING design.

Re-cap

- No guarantees
- A useful lens
- Learning Profiles
- Can indicate where we need to make changes / additions / deletions
- Show where and how to support learners

The diagram shows nested shapes:
- **Cheats** (outer magenta band)
- **Things I CAN learn.** (yellow)
- **Things I MUST learn to get through the game or meet my goals.** (green circle)
- **Collateral Learning** (red base)

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Last Thoughts

- The process of generating the list of 'things learned' and classifying them into Can-Learn, Must-Learn, Collateral Learning, and External Learning is simple enough to be highly flexible yet structured enough to result in a thorough analysis.

- The idea of using games as learning objects is very attractive. However, without a thorough analysis of the tool, it is very difficult to take full advantage of the medium.

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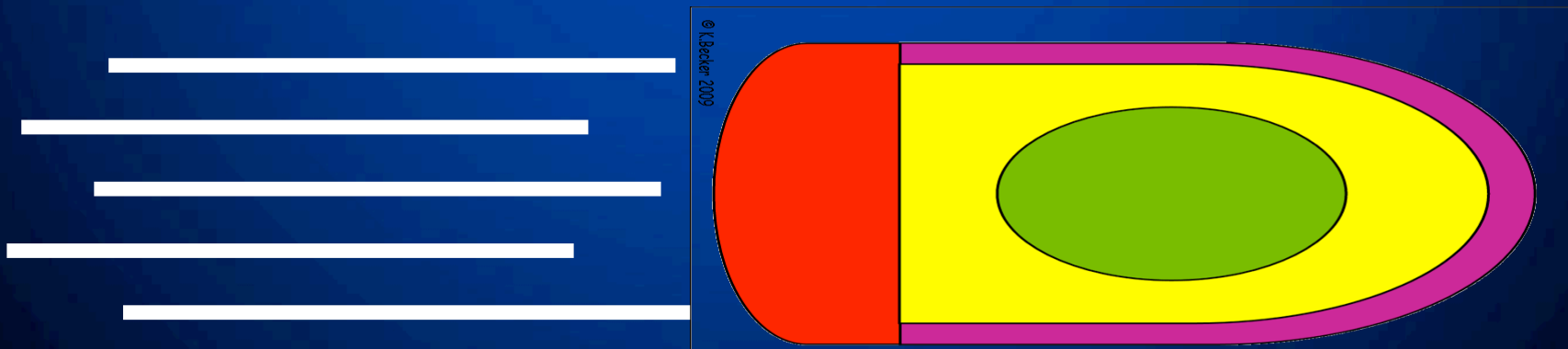
THANKS!
Image & Game Credits

- Cover Slide: Civilization, Food Force
- Mushroom Men
- Mass Effect 2
- Black & White
- Mathblaster
- Katamary Damacy
- Tetris, Honeycomb Beat, Chicktionary
- Metroid Prime, Civilization
- Carmen Sandiego
- Electroplancton, KORG DS10
- Big Rigs

- Pong, Elf Bowling, Warioware Smooth Moves
- Typing of the Dead, Add 'Em Up
- Harpooned, September 12
- Simon
- Space Invaders
- Façade

- Screenshots: IGN.com, Gamespot.com, Mobygames.com, Gamewallpapers.com