Comp 388/488 - Game Design and Development

Spring Semester 2019

Dr Nick Hayward

course details

Lecturer

- Name: Dr Nick Hayward
- Office: Doyle 307 (LSC)
- Office hours
  - *Monday afternoon by appointment (LSC)*
- Faculty Page

Course schedule

Important dates for this semester

- Project outline and mockup
  - *presentation & demo: Friday 15th February 2019 @ 2.45pm*

- Spring Break: Monday 4th to Saturday 9th March 2019
  - **n.b.** *no formal class: Friday 8th March 2019*

- DEV week: Friday 15th to Friday 22nd March 2019
  - *presentation & demo: Friday 22nd March 2019 @ 2.45pm*

- Final class: Friday 26th April 2019
  - *presentation & demo: Friday 26th April 2019 @ 2.45pm*

- Exam week: Monday 29th April to Saturday 4th May 2019
  - *Final assessment due on Friday 3rd May 2019 by 2.45pm*

Coursework outline

- assessment will include a combination of semester's exercises, project outline and mockups, DEV week, and final demo and report

- project outline & mockup
  - *brief group presentation of initial concept and mockup*

- DEV Week demo
  - *brief group presentation or demo*

- final demo
  - *presentation, online demo, video overview...*

- final report
  - *clearly detail design and development process*
  - *explain implemented differences from DEV week*
  - *where and why did you update the game?*
  - *benefits of updates*
  - *...*

- work may be conducted individually or in groups (max. 5 persons per group)
  - *group report must clearly define each student's work and contributions, where applicable*
  - *no attribution, no mark*

Exercises & discussions

Course total = 20%

- exercises, playtesting...
  - *help develop course project*
  - *test course knowledge at each stage*
  - *get feedback on project work*

- discussions
  - *sample games, game concepts...*
  - *design topics, UI and UX concepts*

- extras
  - *code and game reviews*
  - *various other assessments*
  - *peer review of demos*

Development and Project Assessment

Course total = 80% (Parts 1, 2 and 3 combined)

Initial overview

- combination project work
  - *part 1 = project outline & mockup (15%)*
  - *part 2 = DEV Week development & demo (25%)*
  - *part 3 = final demo and report (40%)*

- group project (max. 5 persons per group)

- design a game, which may be played by at least one person

- create project mockups, paper prototypes...

- DEV Week prototype available for playtesting...

- final, working game for class demo

Project outline & mockup assessment

Course total = 15%

- begin outline and design of a game
  - *built from scratch*
  - *desktop, mobile, web, console...*
  - *game mockups, paper prototypes*
  - *builds upon examples, technology outlined during first part of semester*
  - *purpose, scope &c. is group's choice*
  - *presentation should include mockup designs, concepts or paper prototypes*

Project mockup demo

Assessment will include the following:

- brief presentation or demonstration of current project work
  - *~ 5 to 10 minutes per group*
  - *analysis of work conducted so far*
  - *presentation and demonstration*
    - outline current state of game concept and design
    - show prototypes, designs...
  - *due Friday 15th February 2019 @ 2.45pm*

DEV Week Assessment

Course total = 25%

- design a game, which may be played by at least one person
- choose a game genre
  - *why did you choose this genre?*
- outline game theme and story
  - *what is it about?*
  - *what is the purpose of the game?*
  - *outline script for the game*
- outline mechanics of game play
  - *detail options, logic...*
- show storyboards and initial designs
  - *storyboards, mockups, prototypes...*
- show working example
  - *where applicable...*
  - *detail what does and does not work...*

n.b. please contact me to discuss your chosen programming language for this game's design and development.

DEV Week Demo

DEV week assessment will include the following:

- brief presentation or demonstration of current project work

- ~ 10 minutes per group

- analysis of work conducted so far
  - *eg: during semester & DEV Week*

- presentation, demonstration, or video overview...
  - *outline current state of game*
  - *show prototypes and designs*
  - *explain what works & does not work*
  - *...*

- due Friday 22nd March 2019 @ 2.45pm

Final Assessment

Course total = 40%

- final design of game from DEV Week...
  - *continue to develop your group's game concept*

- working game (as close as possible)

- explain choices made in the design and development
  - *initial choices*
  - *final implementation choices, options, patterns...*

- show and explain implemented differences from DEV Week
  - *where and why did you update the game?*
  - *how did playtesting influence your updates and designs?*
  - *perceived benefits of the updates?*

- how did you respond to feedback from DEV Week and onwards...

- final demo
  - *due on Friday 26th April 2019 @ 2.45pm*

- final report
  - *due on Friday 3rd May 2019 @ 2.45pm*

Coursework schedule

- project outline & mockup
  - *due Friday 15th February 2019 @ 2.45pm*

- DEV week demo
  - *due Friday 22nd March 2019 @ 2.45pm*

- final team demo
  - *due Friday 26th April 2019 @ 2.45pm*

- final team report
  - *due Friday 3rd May 2019 @ 2.45pm*

Goals of the course - part 1

- a practical introduction to Game Design and Development
- underlying concepts introduced and demonstrated
  - *particular focus on working examples*
  - *focus on playtesting games...*

- gain practical experience of design and development
  - *applied weekly*
  - *part of project-based assessment*

- exposed to many and various types of games and gaming
  - *different environments*
  - *across multiple genres*

- offer a combination
  - *technical concepts and development*
  - *awareness of aesthetic requirements*
  - *cultural perspectives*

- how to create
  - *well-rounded games*
  - *performant games and gaming environments*

Goals of the course - part 2

- introduction to concepts and work roles in game design and development
- introduction to history of game design and development
- leading designers and examples
- practical methods for design...
- review games, stories, characters...
  - *classic and retro*
  - *genre examples*
  - *game franchises and stories*
- **play and test lots of different games...**

Course outcomes

- introduction to world of game design and development
- preparation for further specific game study and development
- ...

Course structure

Course will include

- weekly bibliography and reading (where applicable)
- weekly notes, examples, extras...
- sample games
- suggested playtesting
- discussions...

Course resources

Website

- course website is available at https://csteach488.github.io
  - *timetable*
  - *course overview*
  - *course blog*
  - *weekly assignments & coursework*
  - *bibliography*
  - *links & resources*
  - *notes & material*

n.b. No Sakai

GitHub

- course repositories available at https://github.com/csteach488
  - *weekly notes*
  - *examples*
  - *source code (where applicable)*

Slack

- Slack group available at https://csteach488.slack.com/
  - *https://csteach488.slack.com/*

- course updates, information on weekly assignments, general news, discussions...

Trello group

- Trello group available at https://trello.com/csteach488
  - *https://trello.com/csteach488*

- project groups, weekly assignments, organise research and development...

Group project

- add project details to course's Trello group
  - *Week 1 - Project Details*
  - *https://trello.com/b/P8M8lACF/week-1-project-details*

- create channels on Slack for group communication

- start working on an idea for your project

- plan weekly development up to and including DEV Week
  - *Friday 15th to Friday 22nd March 2019*
  - *presentation & demo: 22nd March 2019 @ 2.45pm*

Group project - game requirements

- **NOT** a simple clone of an existing game...

- examples of innovative gameplay
  - *does not have to be unique or original*
  - *might be an interesting twist or variant on an existing mechanic, option, concept...*

- might use elements from various other games, genres...

- must be realistic and feasible in one semester
  - *focus on core concept for DEV week*
  - *refine concept, design, gameplay for Final project*
  - *expand game if time permits*

- **Must** have a single player option
  - *playtesting requirements...*

- genre, theme, story &c. are your choice

- game may target different devices - your choice
  - *e.g. desktop, mobile, web, console...*
  - ***Must** be playable in class environment for testing &c.*

- code for game **must** be available for download, testing
  - *i.e. we **must** be able to read, edit, and **play** the game*

n.b. programming language for game development is open to negotiation

Game milestones

- aim for milestones in project development
  - *correspond to weekly Trello assignments*
  - *help guide development of game*
  - *provide structured progression to development, testing...*

- milestones to DEV Week include:
  - *outline of game concept, story, characters...*
  - *initial storyboards for path through game level, world, environment*
  - *gameplay prototype, technical prototype*
  - *alpha code demo*

- milestones to Final demo include:
  - *refine alpha code demo*
  - *beta code demo*
  - *final playtesting*

Playtest sessions

- various sessions throughout semester

- sample games, demos, storyboards...

- chance to play and test various games

- break, critique games
  - *published*
  - *project games*

- offer feedback, comments on each other's games

- prepare examples during the semester
  - *outlines, flowcharts...*
  - *storyboards*
  - *prototypes*
  - *playable components*
  - *demo levels and features...*

Trello - documentation

- weekly assignments to help guide documentation and preparation

- documentation for each stage of game development
  - *pre-production and concepts*
    - initial outline and concept for game and play
    - succinct breakdown of game concept
    - helps to get started quickly, & then iterate...

  - *gameplay specification*
    - detailed outline and concept of gameplay
    - include formal design elements outlined throughout the semester
    - updated throughout the semester...relative to course material

  - *report updates on general progress*

  - *development architecture and specifications*
    - various outlines of software, requirements, general organisation

  - *gameplay manual and guide*
    - final description of game and gameplay
    - general instructions on gameplay
    - any required story outline, background information...

  - *final report*
    - opportunity to finalise documentation
    - report on project successes, failures...
    - what works, doesn't work
    - future developments and improvements
    - final report on testing
    - summary of project

Intro - games and simulations

changing the brain game

> *"The immense amount of time spent with games during a child's formative years has led them to be literally 'hardwired' in a different way than those who came before"*

Carstens, A., and Beck, J. 2005. "Get ready for the gamer generation." Tech Trends 49. PP.22-25.

> *"Immense changes in technology over the past thirty years, of which video games are a major part, have dramatically and discontinuously changed the way those people raised in this time period think, learn, and process information...The change has been so enormous that today's younger people have, in their intellectual style and preferences, very different minds from their parents and, in fact, all preceding generations"*

Prensky, M. 2001. "Digital game-based learning." McGraw-Hill. P.17.

changing the brain game

Prensky (2001) recommends,

- fast-paced to exploit 'twitch speed' information processing capabilities

- emphasis on high player control and multiple tracks
  - *leverage greater multitasking abilities*

- actively engage participants
  - *highly visual environments*
  - *encourage learning by exploration*

Intro - games and simulations

what is a simulation in a gaming context?

what are simulations?

- linear interactive tutorial versus a simulation
- model of a real world system
  - *respond in dynamic and rule-based ways to user responses*
- two basic types of simulation
  - *operational and conceptual*
- operational primarily used to teach procedural skills
- conceptual simulations

Intro - games and simulations

what are games?

- games include a broad array of formats and features
- common elements such as
  - *competitive activity with a challenge and goal*
  - *set of rules and constraints*
  - *specific context*

Image - Dragons and Genetics 1
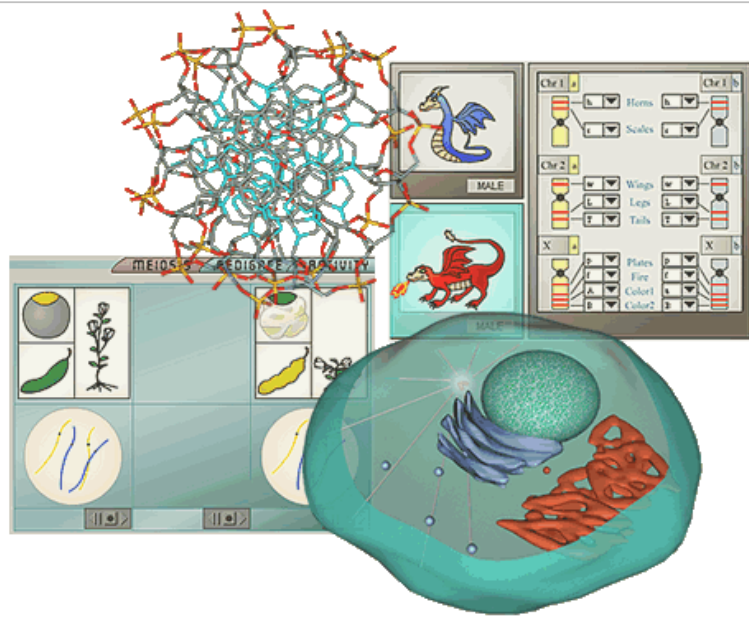
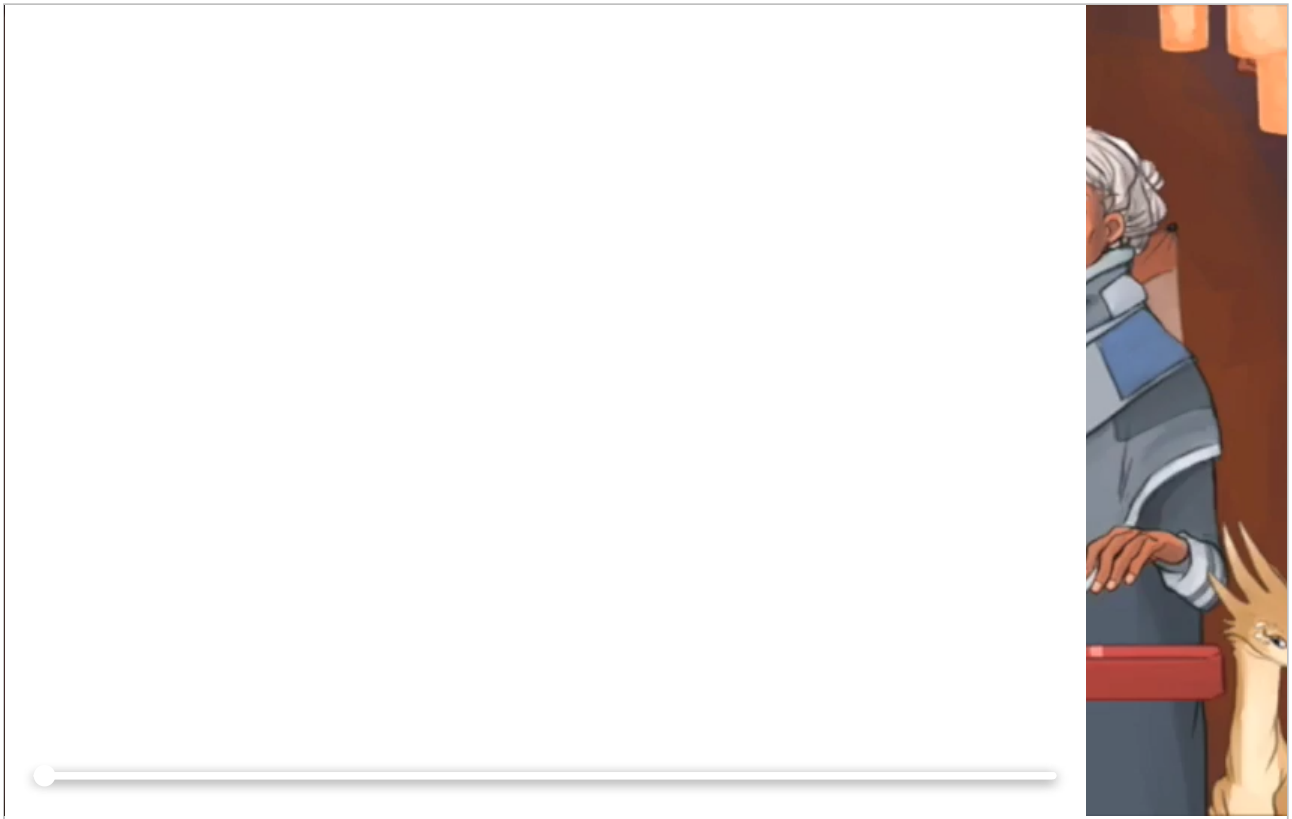Games and learning with dragons

- BioLogica - Legacy

Image - Dragons and Genetics 2

Games and learning with dragons 2
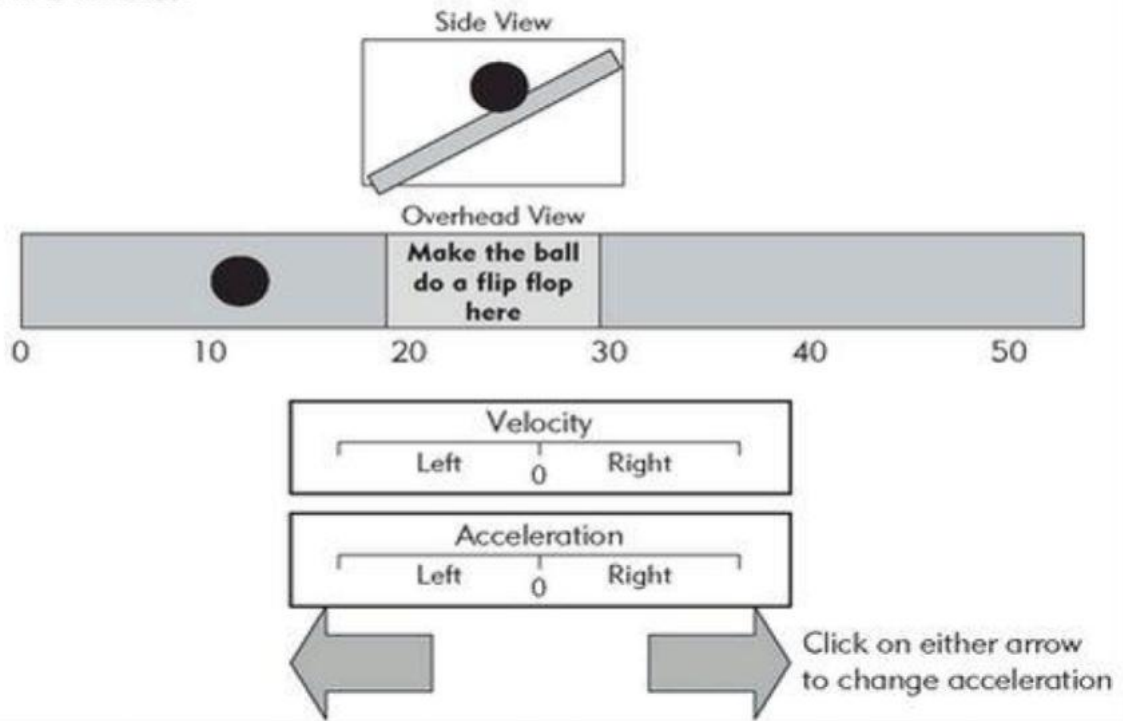
- BioLogica - Current

Video - Dragons and Genetics 3

- Geniverse - Explore heredity and genetics by breeding and studying virtual dragons

Image - Games, Teaching, Abstraction...

Activity goal: Explore the relationship between acceleration and velocity by changing the ball's direction (make it do a 'flip flop') inside the yellow box as many times as you can in 2 minutes.

Side View

Overhead View

Make the ball do a flip flop here

0   10   20   30   40   50

Velocity
Left   0   Right

Acceleration
Left   0   Right

Click on either arrow to change acceleration

Games - flip flop

- Rieber, L.P. 2005. "Multimedia learning in games, simulations, and microworlds." The Cambridge handbook of multimedia learning. Cambridge University Press.

- Hays, R.T. 2005. "The effectiveness of instructional games: A literature review and discussion." Technical Report 2005-004. Washington.

a bit of fun - The Oregon Trail

I need ONE leader, and FOUR volunteers

- The Oregon Trail - Wikipedia entry
- The Oregon Trail - Play Online

Intro - games and simulations

match game to learning goal

- Strategy, Family, Role Play, Adventure, Other...
  - *Entertainment Software Association*

- effective games and simulations for e-Learning should align features, goals...with desired instructional outcome

- Oregon Trail games appropriated by children

- Physics game counter-productive to the given physics principles

- is this inherently a bad thing?
  - *from a learning perspective - Yes*
  - *gaming perspective - No*

- transference not a bad thing...

- playtesting helps resolve many issues...
  - *shift in focus from developer and designer to players*

Intro - games and simulations

match game to learning goal

> "Jeopardy-style games, a staple of games in the classroom, are likely to be best for promoting the learning of verbal information (facts, labels, and propositions) and concrete concepts. Arcade-style games..." (P.22)

Van Eck, R.N. 2006. "Digital game-based learning." Educause Review 41. PP.17-30.

Intro - games and simulations

learning and game characteristics - guidance

- simulations and games that offer structure and sound learning support
- instructional explanations
- consideration and reflection on instructional content
- manage complexity
- offer instructional support

Intro - games and simulations

learning and game characteristics - explanations

- provide explanatory feedback instead of corrective only feedback
- try to provide brief instructional explanations between breaks in a simulation
- explanations, feedback available throughout games
  - *may be explicit guidance and examples*
  - *or subtle in its usage and intent*
- there to help the player learn about the game
  - *its gameplay, mechanics, goals...*
- guidance or nudging there to help reinforce game concepts
- when using a game or simulation lacking explanations or hints
  - *players and learners alike try to achieve the goals of the game*
  - *and learn at the same time*
  - *both activities may lead to mental overload*
- normally the game, and not the learning, that takes precedence
  - *may use this concept in our designs as well*
  - *design increasingly complex and challenging tests within a game*
- also need to be careful to encourage and help a user to reach this point
- we may consider this a way of progressing from
  - *easy to learn to difficult to master*
  - *a simple hook for the game itself*

Intro - games and simulations

consideration and reflection

- achieving game goals or mastery of a simulation may preclude reflection
- reflection needed to abstract lessons and learning from a game or simulation

"The experiential nature of an educational simulation is very compelling - users often become very active and engaged in a simulation, similar to the experience of playing a video game. However, the intense and demanding interactivity of many simulations may not provide adequate time for the user to carefully reflect on the principles being modeled by the simulation"

Rieber, L.P., Tzeng, S.C., and Tribble, K. 2004. "Discovery learning, representation, and explanation within a computer-based simulation: Finding the right mix." Learning and Instruction 14. PP.307-323.

Intro - games and simulations

complexity in games

- ways to manage mental load in games
  - *manage complexity of the simulation or goal of the game*
  - *optimise the complexity of the interface*
  - *provide instructional support such as memory aids or activity guidance*

- general concept of progression within most games
  - *from text-based games to platformers, role-playing, racing simulators...*
  - *each provides the gamer with an opportunity to learn and progress*

- management of mental overload becomes a part of the game
  - *player learns, adapts, and improves within a game*
  - *game may progress without causing mental overload to the player*

- mental overload will simply cause the player
  - *to restart the game (or abandon in some cases)*
  - *learn and adapt*
  - *then oncemore try to progress*

Intro - games and simulations

managing complexity (goal progression)

- start with a relatively easy task or goal
- move gradually to more complex environments
- consider options to allow a player to manage their level of complexity
- consider learner, and gamer, experience levels
- dynamically adapt game complexity based on accuracy of responses

Intro - games and simulations

managing complexity - training wheels

- "training wheels" principle for software simulations
  - *Carroll, J.M. 2000. "Making use: Scenario-based design of human-computer interactions." MIT Press.*

- learners and players alike work with a simulation where only some of the functionality is enabled

- full interface may be visible
  - *only relevant elements of it work*
  - *players can't go too astray during early trials and tests*

- as more tasks are learnt and acquired
  - *functionality constraints are gradually released*
  - *until the player is working with a highly functional system*

- as the player gains experience, greater functionality is added

Intro - games and simulations

managing complexity - faded worked examples

- another option is to use faded worked examples
  - *might begin with a complete demonstration of the task*
  - *then, players view a demonstration of the first few steps of the task*
  - *and, finish it on their own*

- the player assumes more and more task responsibility
  - *until they are doing it on their own*
  - *all options become available...*

- a game or simulation may incorporate such a fading strategy
  - *a player can observe a successful game segment or level,*
  - *view accompanying explanatory commentary...*

- for example, use of a computer generated agent
  - *may demonstrate how to play the game or interact with the simulation*
  - *then, the agent completes some of the steps, assigning others to the player*
  - *players assume greater control*
  - *until they're able to complete all steps or actions alone*

Intro - games and simulations

managing complexity - control of pace

- pacing of game or simulation
  - *Mayer, R.E., and Jackson, J. 2005. "The case for coherence in scientific explanations: Quantitative details can hurt qualitative understanding." Journal of Experimental Psychology: Applied 11. PP. 13-18.*

- control of pace within a game or simulation
  - *also important to the potential outcomes*

- fast-paced games are likely to lead to greater overload
  - *fewer opportunities for reflection*

- may sound counter-intuitive for general game design...
  - *but it manifests itself in many different concepts*

- by pace, we may refer to different concepts, e.g.
  - *rate of introduction of gameplay concepts*
  - *such as options, difficulty of tasks, rewards...*
  - *the perceived actual pace of a game*
  - *often defined by game genre, player expectations, story...*

- consider how different games handle pace
  - *varying impacts on general gameplay*
  - *rate of adoption of a given title*
  - *longevity of gaming...*

- how we manipulate and use pace in our games
  - *may affect a player's rate of learning*
  - *their enjoyment of the game*

Games

- The Oregon Trail - Wikipedia entry
- The Oregon Trail - Play Online

Resources

- Carstens, A., and Beck, J. 2005. "Get ready for the gamer generation." Tech Trends 49. PP.22-25.

- Hays, R.T. 2005. "The effectiveness of instructional games: A literature review and discussion." Technical Report 2005-004. Washington.

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- Van Eck, R.N. 2006. "Digital game-based learning." Educause Review 41. PP.17-30.