

# Learning Theories and Serious Games

Dr Aristidis Protopsaltis  
Serious Games Institute

[aprotopsaltis@cad.coventry.ac.uk](mailto:aprotopsaltis@cad.coventry.ac.uk)

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[www.seriousgamesinstitute.co.uk](http://www.seriousgamesinstitute.co.uk)



# Overview

- History
- Background
- Serious Games and Pedagogy
- Assessment
- Examples

# History

- Applied Research Group
  - 5 researchers
  - Erasmus students / placement students
  - 19 funded projects
  
- MSc in Serious Games and Digital Content



# Background: definitions

- Serious games as a term has been around for over 40 years. in 1968 Clark Abt called his book “Serious Games”.

His definition of such games was that they:

- “have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining.” (Abt 1970, p9).
- Serious game: a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives” (Zyda, 2005, p.25).

# Background: definitions

- Serious Games are defined as digital games and equipment with an agenda of educational design and beyond entertainment (Sorensen & Meyer 2007, p.559).
- “there is no one single definition of the term “serious games”, although it is widely accepted that they are games “with a purpose”. in other words, they move beyond entertainment per se to deliver engaging interactive media to support learning in its broadest sense.” (Stone 2008, p.9).

there is no agreement in definition.

- However, there is a consensus around serious games:
  - having a learning objective (whether explicit or not),
  - being an engaging interactive media,
  - having some game element.

# Background

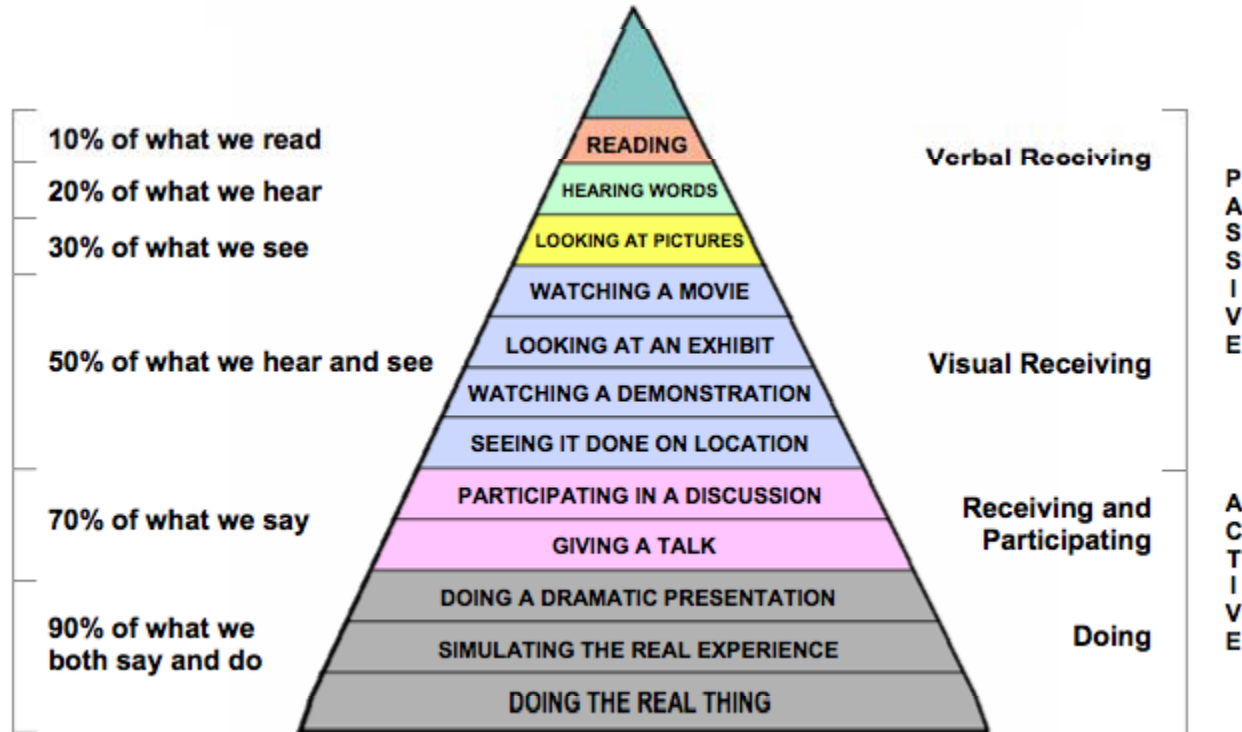
it is argued that digital games, including simulations and virtual worlds, have the potential to be an important teaching tool because they are:

- interactive,
- engaging and
- immersive activities

# CONE OF LEARNING

## WE TEND TO REMEMBER OUR LEVEL OF INVOLVEMENT

(developed and revised by Bruce Hyland from material by Edgar Dale)



Edgar Dale, *Audio-Visual Methods in Teaching* (3<sup>rd</sup> Edition). Holt, Rinehart, and Winston (1969).



# Serious Games and Pedagogy

- there is no uniform pedagogy within serious games;
  - earlier games tended to be based on a behaviourist model.
  - later games try and incorporate experiential, situated and socio-cultural pedagogical models.

# Serious Games and Pedagogy: behaviourism

Behaviourism:

- **learning occurred through conditioning with the game element typically being a reward for the correct response to the stimuli. these games are often called edutainment.**
- For example, in Mathblaster! the player's reward is to shoot balloons if getting a sum correct – the sum itself is separate from the reward. Brain training games would fall into this category. Edutainment games tend to be based on tests, formats can include:
  - an objective test game
  - a subjective test game
  - a selective test game
  - a drag-and-drop test game
  - a memory-like game
  - an arcade game

# Behaviourism: Math Blaster



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# Serious Games and Pedagogy: cognitivism

Cognitivism:

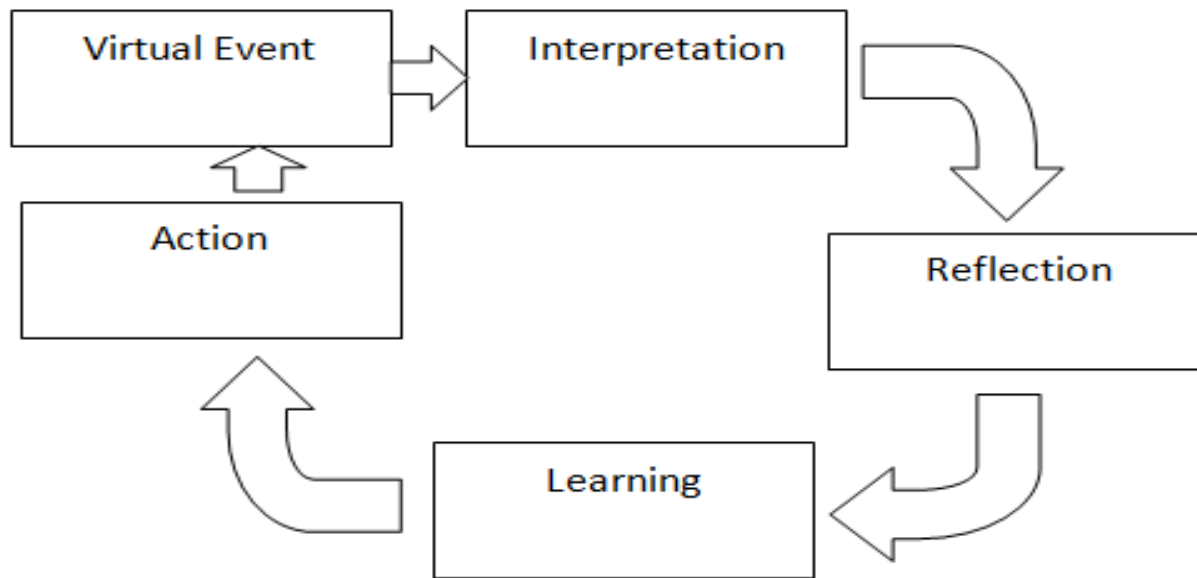
- **The learner became the centre of attention** and acquires knowledge through a variety of different modalities (e.g. text, pictures, sounds). these enable the player to identify and analyse problems and apply past learning. learning is the process of connecting symbols in a meaningful and memorable way.
- the player is immersed in a world that enables them to include feelings and emotions with the social, the player can interact with fellow participants in the virtual environment as well as acquiring and using knowledge gained.

# Serious Games and Pedagogy: multiple models for learning

Multiple models for learning:

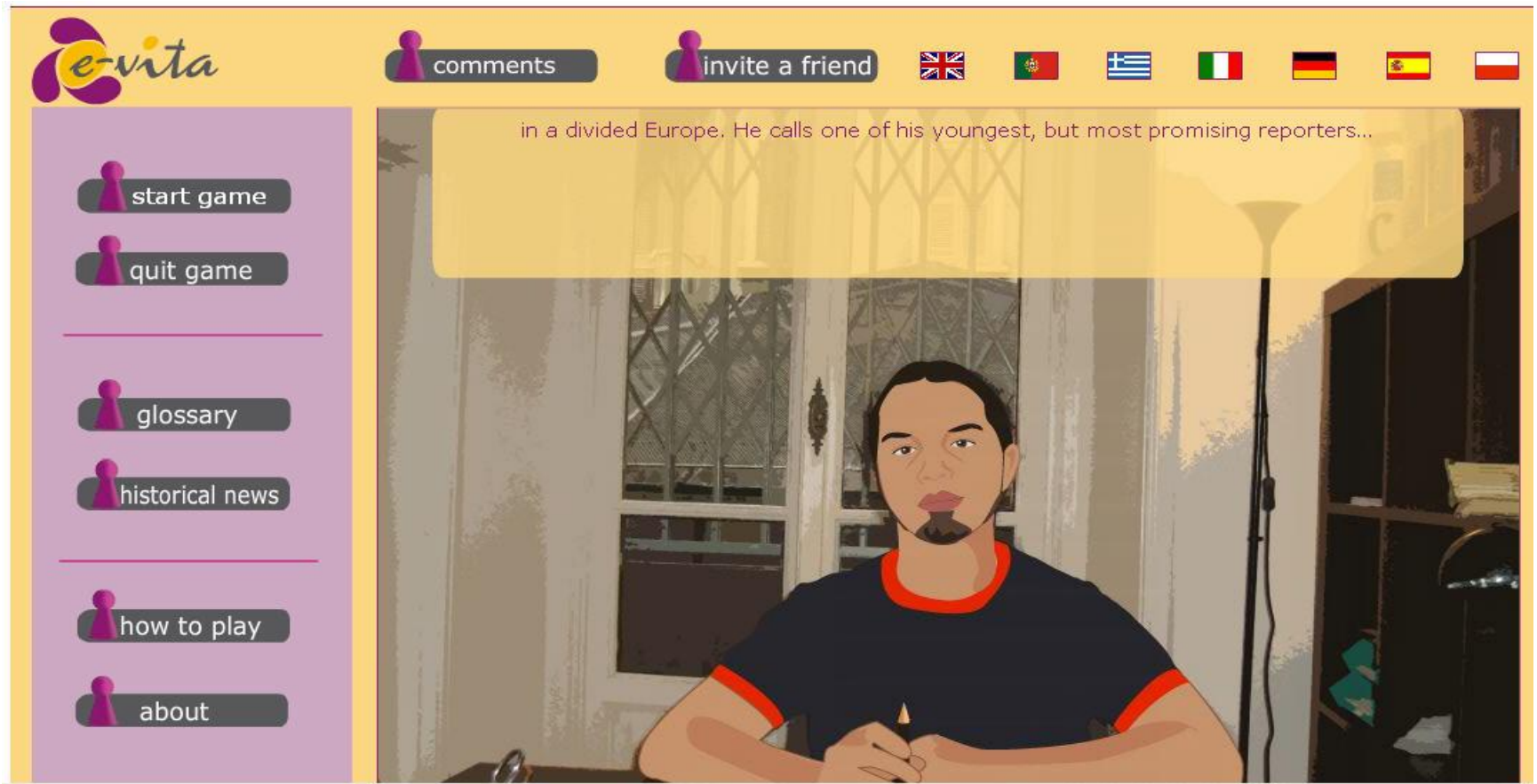
- Constructivism became **constructionism** – where learning is reinforced by having to explain it. learners construct mental models to understand the world around them.
- Others used the **experiential** learning theory, where one learns by doing (as well as seeing and hearing).
- Kolb's learning cycle relates to experiential learning as it consists of:
  - concrete learning,
  - reflective observation,
  - abstract conceptualisation (forming a theory based experience) and
  - active experimentation – the decision and problem solving stage. this can be illustrated by games such as ventureSim and Global Conflict: Palestine .

# Multiple models for learning: Examples



Experiential learning in a virtual environment

# Multiple models for learning: Examples



# Serious Games and Pedagogy: multiple models for learning

- **experience-based learning** is well-suited to games. **Situated learning** has been incorporated, that is, information used in context through a creation of a setting close to reality can easily be transferred to the real world.
  - Simulations such as that used by the military often use this model.
- **Socio-cultural theory** describes how games can be used as tools to mediate learning through discussion, reflection and analysis – with learning facilitated by the culture and identity of the learner.



# Serious Games and Pedagogy: multiple models for learning

- the final model is the **full-learning cycle**. learning starts with an initial understanding, that knowledge is tested, and the feedback results in a refined model (binSubaih et al. 2009).

# Assessment

- “Designing ways to collect data on learning in simulation and gaming is particularly difficult because of the open-ended nature of these activities” (Chin et al. 2009).
- Some pedagogies incorporate testing. there are explicit scoring mechanisms that can be used in edutainment; the number of correct answers, and possibly time taken to complete a game are measures.

# Assessment

- James Gee and David Shaffer argue that games are good assessment engines, which is why they are good learning engines.
- Gee and Shaffer focus on skills such as the ability to innovate, collaborate, think critically, produce digital media, perform system thinking (i.e. to recognise the relationship between elements) and enhance civic engagement.

# Assessment

- Measuring how well these skills are demonstrated is complex, multiple choice tests are an inappropriate measurement. Their conclusion is that there needs to be a rethink about what is assessed, a shift from the factual to the process.
- assessment could be informal, where the attitude and appreciation of others indicates achievement.

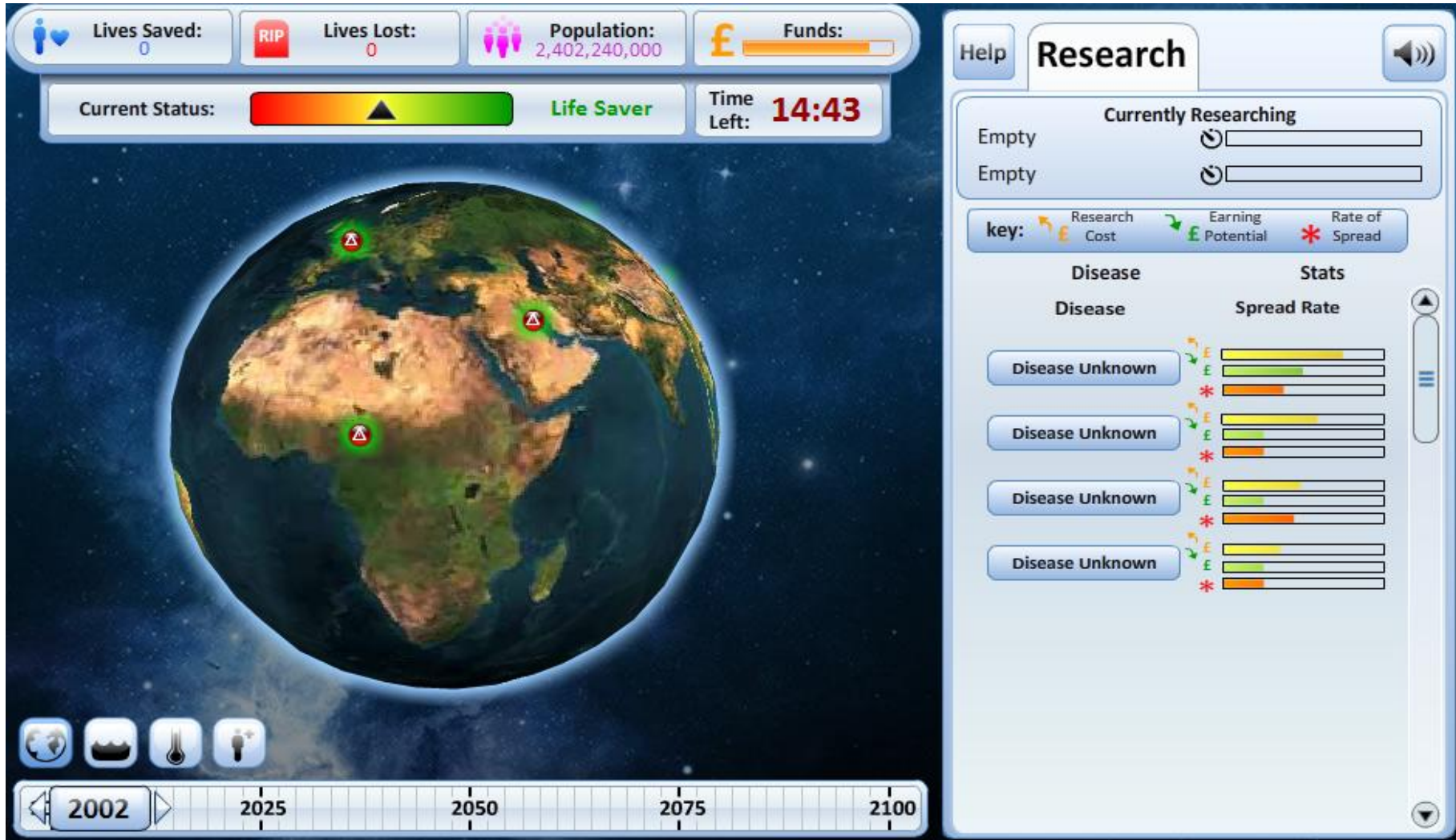
# Assessment

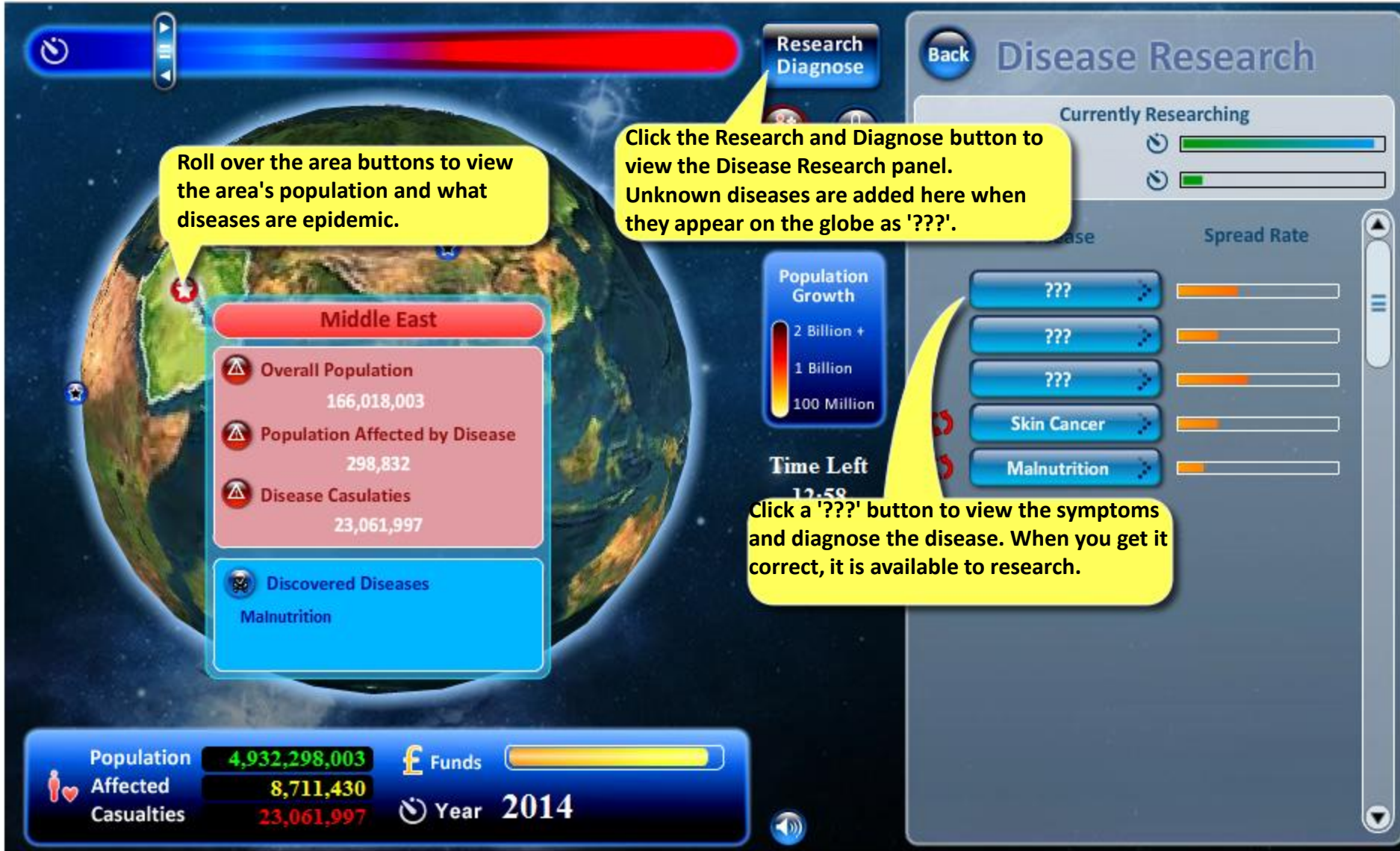
- Progress can be assessed through mechanisms such as high scores, leader boards, winning and losing a scenario, or completing a boss level. Although in formal education good work may be rewarded by a star, and is frequently assessed numerically, the idea of comparing scores and creating league tables of students is not commonly advocated.
- However, it is interesting to note that young people respond to such measures.
- Most existing assessment systems are bespoke to the game.

# Examples

- thus games need to address these areas. Games that align to the curriculum appear to have a wider take up than those that are pedagogically sound and engaging but have no clear relationship.

# Climate Health Impact





Roll over the area buttons to view the area's population and what diseases are epidemic.

Click the Research and Diagnose button to view the Disease Research panel. Unknown diseases are added here when they appear on the globe as '???'.

Click a '???' button to view the symptoms and diagnose the disease. When you get it correct, it is available to research.



When the time runs out you are given a breakdown of your score, including the amount of people you saved (or didn't save), your diagnosis ability, the policies you chose, and the diseases you successfully researched. All you need to do now is play again and try and beat that score.



### How Did You Do?

**Total Population:** 28,826,593,042  
**Total Affected:** 1,180,448,985  
**Total Casualties:** 3,783,355,224  
**Percent Killed:** 12%



### How Well Did You Do Diagnosing Diseases?

**Score:** 88%

**Rank:** Nobel Prize Winner

So smart that your head may just explode! Are you sure you even need to be in this class?



### Policies You Chose

New Hospitals ✓ 5	Drain Swamps ✓ 1
Medical Research Facility ✓ 5	Train New Psychiatrists ✓ 1
Sustainable Drainage ✓ 3	Plant GM Crops ✓ 1
Mandatory Vaccinations ✓ 5	Promote Sun Protection ✗
Use Pesticides ✓ 4	Door to Door Consultations ✓ 5
Domestic Vector Protection ✓ 4	Weather Warning Systems ✗
Vector Control Program ✓ 3	Use Public Media ✓ 4



### Diseases you Successfully Researched

✓ Malaria	✓ Cholera
✓ Dengue Fever	✓ Meningitis
✓ Plague	✓ Tuberculosis
✓ Lyme Disease	✓ Depression/Stress
✓ Trypanosomiasis	✓ Heatstroke
✓ Bluetongue	✓ Skin Cancer
✓ Leishmaniasis	✓ Malnutrition

Print >

Play Again >

- the real promise of games as educational and tools is in their ability to demonstrate the complexity and interconnectedness of issues. Games, like all media, can't ever really change behaviour;
  - a game about nutrition won't magically turn a player healthy,
  - just as a game about criminality won't magically turn a player criminal.

Thank you

Any questions?

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