

# 50.033

Foundations of  
**Game Design**  
and Development

# SERIOUS Games

# DEFINITION

## ● What is “serious games”?

- The application of gaming **technology, process, and design** to the **solution** of problems faced by **businesses** and other **organizations**.
- Serious games **promote the transfer** and cross fertilization of **game development knowledge** and techniques in traditionally **non-game markets** such as training, product design, sales, marketing, etc.

# DEFINITION

## ● What is serious games?

- Also known as: Game-based learning
- The content and skills that need to be taught are not put across face-to-face in class or through book and videos (passive), but rather through games (active)
- Serious games are games whose primary objective is NOT fun or entertainment, rather learning or practicing a skill.

# APPLICATION AREAS

- Military
- Government
- Education
- Corporate
- Healthcare
- Aeronautics
- Science / Research

# DIFFERENCE BETWEEN SERIOUS AND ENTERTAINMENT GAMES

Area	Serious games	Entertainment games
General game direction	Task-based	Rich experience is preferred
Focus	Important elements of learning	To have fun
Simulations	Assumptions (training) necessary for workable instructions	Simplified simulation process
Communication	Should reflect natural, non-perfect situation	Communication is often perfect

# 5 ELEMENTS OF SERIOUS GAMES

- Most serious games tend to have these five elements to ensure effectiveness and that they are working properly, as intended:
  1. Story
  2. Gamification
  3. Immediate and individualised feedback
  4. Simulation
  5. The goal: to learn

# STORY

- A hero to save a princess?
- A nurse to save dying patients
- Soldiers to prevent the end of humanity, etc
- In serious games, story is one of the essential elements to drive players to do certain “tasks”
- *The more sophisticated the argument (and the characters), the easier it will be to motivate the players and for them to get into the game.*

# DRAGONBOX ELEMENTS

- Build an army to defeat the evil dragon, Osgard and save Euclid's island — for kids aged 9+
- Behind each level are the properties of shapes, with each move you are interacting with geometric proofs.



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# DRAGONBOX ELEMENTS



# GAMIFICATION

- *Accomplishment and development:*
  - The game dynamics, which include the rankings, rewards, badges or points systems.
  - We all love to get more *coins*, obtain more *lives* or pass through to the next level
- Classifications or rankings are also very important in serious games: creating healthy **competition** to **encourage** us to try that bit harder and to do everything possible to beat our rivals.
- Like entertainment games, serious games also have to be **balanced**

# DUOLINGO

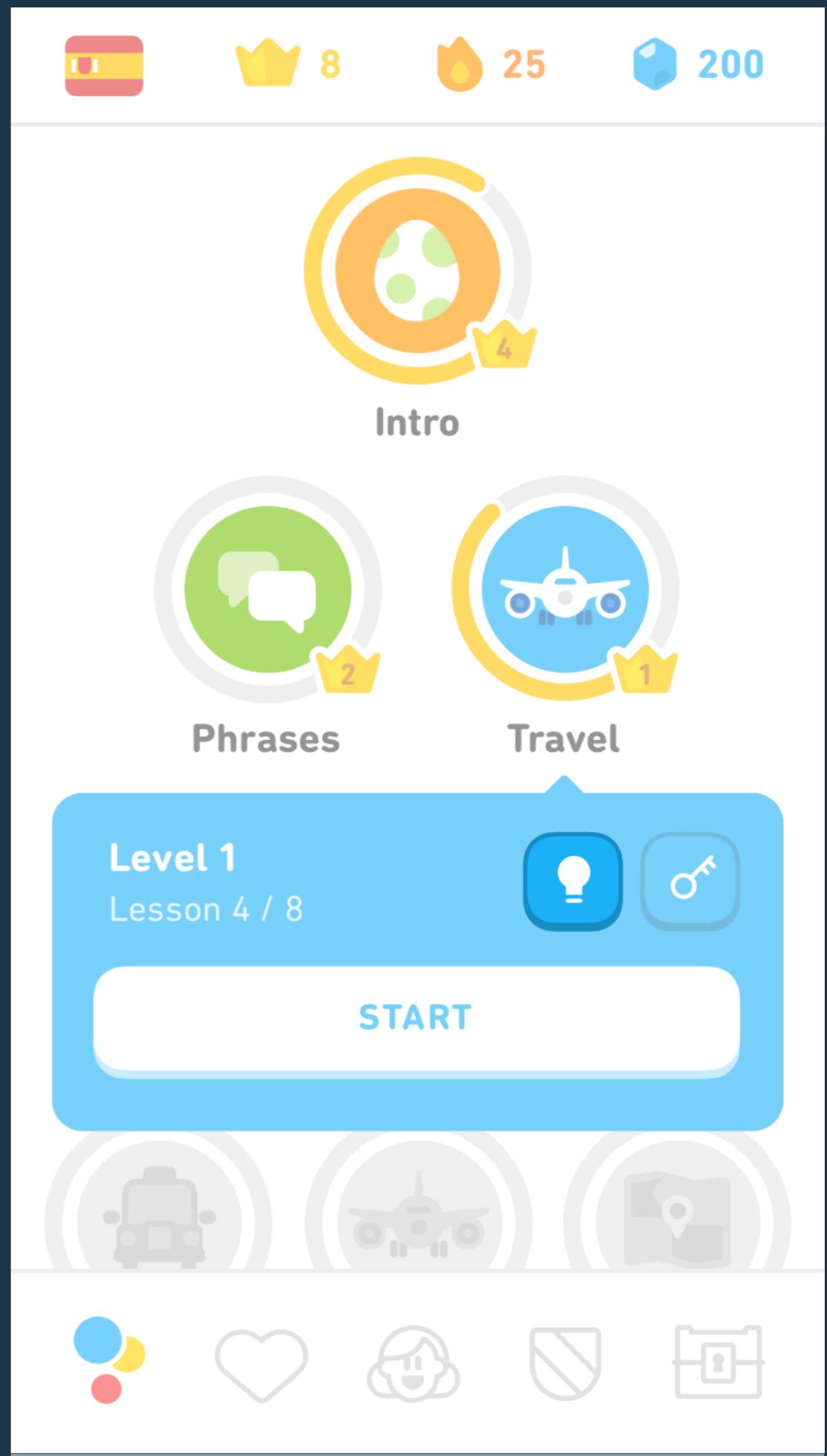
- Learn Spanish, English, French, or German for all ages
- Receive **points**, go up to the next **level**, lose **lives** or outdo friends and relations.
- Each lesson we learn has a **reward**.
- Alright, Duolingo is not *strictly* speaking a serious game, but it is one of the most successful applications when it comes to using **gamification elements for learning**.



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# DUOLINGO

- Gamify the process of learning languages
- Lets you know in what categories are you lacking
- Learn phrases by topics

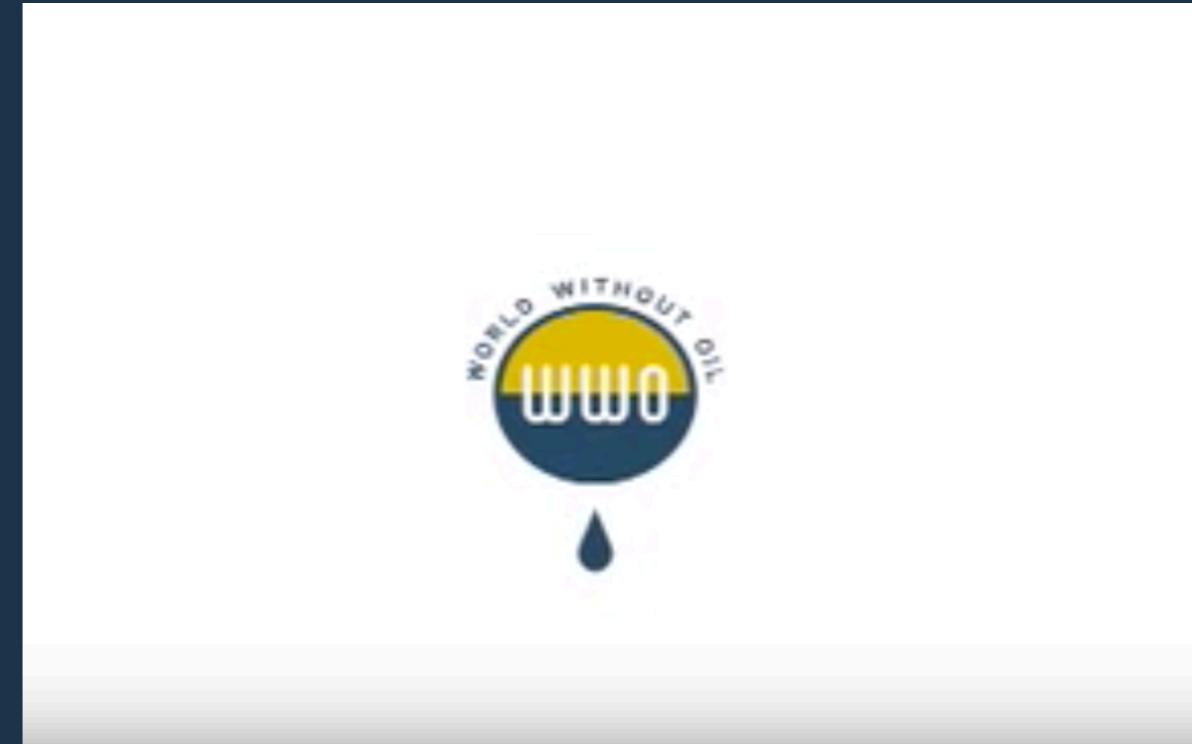


# FEEDBACK

- *Immediate and individualised feedback:*
  - Users can be instantly rewarded for correct things they have done
  - Users can know where they have gone wrong and can try to do better next time.
  - Afterall, we are trying to **encourage** people to learn in the most fun way possible and **engage** their **attention**
  - This is what distinguished serious games with traditional classroom — one teacher with dozens of people in the class, minimal feedback

# WORLD WITHOUT OIL

- *Play it — before you live it*
- An alternate reality game that sketched out the overarching conditions of a realistic oil shock — price of oil skyrocketed, then called upon players to imagine and document their lives under those conditions.
- Compelling player stories and ideas were incorporated into the official narrative, posted daily



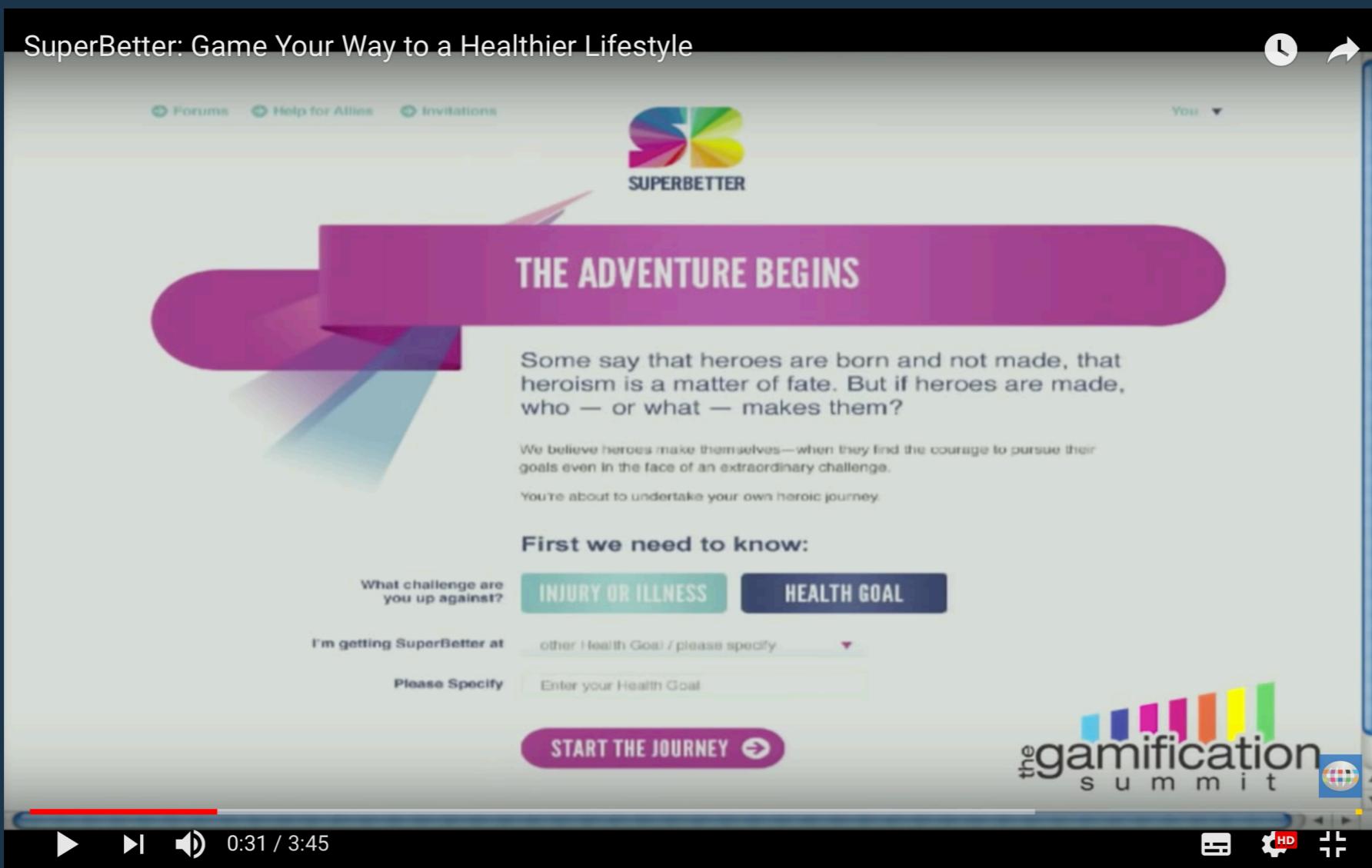
# SUPERBETTER

- SuperBetter — a game made to build **resilience**, achieve goals, and tackle challenges including anxiety, depression, stress, chronic pain, concussion recovery



# SUPERBETTER

- Enable you to customize your own goals, so the challenges would reflect your own values and hence — the game is adaptable



# SIMULATION

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## US DEFENSE DEPT - VIRTUAL INTERACTIVE COMBAT ENVIRONMENT

- Providing the most **realistic** weapons-based individual and collective training experience available to Military and Law Enforcement Professionals around the world.
- By producing high fidelity, **fully immersive training/gaming** software complete with streamlined hardware that is easy to setup and use.



# ALIGN THE END GOAL

- *The goal of serious games is always to learn*
  - We don't play these games for fun
  - At least, it's not designed for so
  - All the elements mentioned can be found in commercial video games, but in serious video games, we need to do one more step by ensuring that the end **goal** — which is **learning** — is fulfilled
  - The purpose is not recreational (and it's ok not to have goal here) but is **always educational**



# BENEFITS

How does serious game promote learning?

# INCREASE ENGAGEMENT AND MOTIVATION

- Traditional education can be boring sometimes because we become passive learners
- Video games are necessarily interactive and users have to make decisions throughout the game

**The more the learner interacts with other learners, the content, and the instructor, the more likely it is that learning will actually occur.”**

# OUR CITY

- Serious game on Facebook, made in Jordan to encourage interaction between millennials
- 15 - 24 people involved in local communities
- Enhance social behaviour and invite them to take part in the life of the city
- Similar to The Sims (used as foundation)



# FACILITATE REAL AND SAFE PRACTICE

- As opposed to face-to-face training, game-based learning is a form of learning that is based on **practice** — in a **risk-free** environment
- Very apparent in simulation-based game
- Important in high-risk situations: operating a surgery, flying a plane, rescuing hostages, fire-fighting, crucial negotiations between countries or companies

# MERCHANTS

- To sharpen negotiation skills in difficult situations



# IMPROVE MEMORISATION AND RETENTION

- Since we have to do something while we learn, it increases memorisation and retention — we can **remember** stuffs we learned through games **longer**
- As you probably have heard, learning by doing is scientifically proven to be more effective and carries long-lasting impact on our brains

# FOOD FORCE



- Created by the United Nations World Food Programme to **raise awareness** on food distribution and famine issues
- Players put themselves in the shoes of a UN rookie, who has to handle a crisis involving *famine and civil war* on an island in the **Pacific**
- **Goal:** to distribute food among the populace and help the country to be self-sufficient in the future

# ? | BENEFITS

Are serious games really beneficial?

# PROS & CONS OF VIDEO GAMES

- Before we dive into benefits of serious games, we can analyse the impacts of normal video games (for entertainment) first
  - Health issues (headaches, fatigue, mood swings, etc)
  - Psycho-social issues (depression, social isolation, gambling, less positive behaviour in general)
  - Violent behaviour
- Analytical and spatial skills
- Learning and recollection capabilities
- Psychomotor skills
- Visual selective attention
- Increased awareness

*Bear in mind that its not easy to prove all these concretely, some are conclusion made based on a small group of people*

# RESULTS FROM RESEARCH

**Table 2.** Overview of examples on reported effects.

		Physiological	Social	
	Motor skill/ spatial	Educational/ Informational		
Backlund et al. (2006)	X			
Enochsson et al. (2004)	X			
Guy et al. (2005)	X			
Radford (2000)	X			
De Lisi and Wolford (2002)	X	X		
Navarro et al. (2003)		X		
Squire and Steinkuehler (2005)		X	X	
Baldaro et al. (2004)			X	X
Durkin and Barber (2002)			X	
Hong and Liu (2003)		X		

- Scientific studies on the benefits of video games on these aspects

# RESULTS FROM RESEARCH

*The reason games are effective, in the view of van Eck, is “not because of what they are, but **because of what they embody** and what learners are **doing** as they play a game”*

# RESULTS FROM RESEARCH

*One of the reasons why games are **effective** is that learning takes place within a **context that is meaningful to the game**; learning in a meaningful and relevant context is **more effective than outside that context**, a point long argued in situated cognition (cf. Rogoff, 2003; Gee, 2004).*

**Serious games**

# EXAMPLES

And differences from their entertainment video-games counterpart

# MILITARY GAMES

- There are commercial games used and adapted for military training as well:  
WarCraft, Doom, Close Combat, and Operation Flashpoint
- America's Army (Free download)
  - All weapons and vehicles are **strict** virtual models of the **real** objects
  - **Reducing** the cost of recruiting volunteers in early 90s by 85%
  - Found as a source of good information or knowledge about the Army
  - Tailored for soldiers to prepare for missions as well
  - Has **very realistic effects** (*violent* — such as in real war condition)

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# MILITARY GAMES

*America's Army*



# MILITARY GAMES

*America's Army*

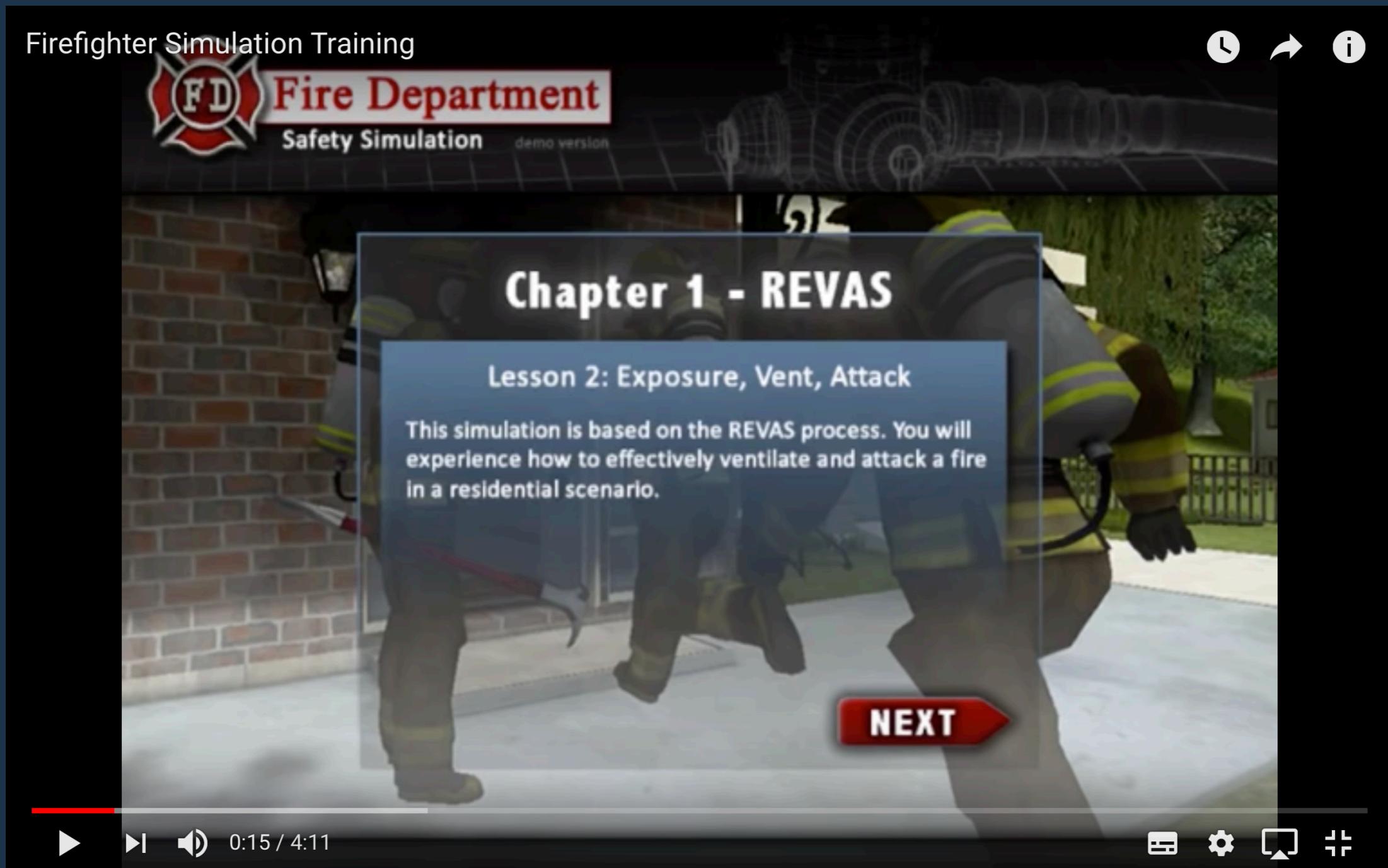
- **Reported advantages:**

- Improved hand-eye coordination,
  - improved ability to multitask,
  - Improved ability to work in a team using minimal communication,
  - And willingness to take aggressive action
- 
- Many previous simulations and games have concerned combat. More **recent efforts** also concern skills such as foreign languages and cultural training,
  - **Future** application areas for the military field include
    - massively multiplayer online games (MMOGs)
    - virtual reality trainers

# GOVERNMENT GAMES

- Governmental games may concern a number of different kinds of tasks and situations, usually something to do with **crisis management**,
  - dealing with terrorist attacks and defensive training
  - disease outbreaks, biohazards, health care policy issues,
  - city planning, traffic control,
  - fire fighting,
  - budget balancing,
  - ethics training
- Major **advantage**: allow crisis scenarios to be run repeatedly in these computer simulations

# FIREFIGHTER SIMULATION TRAINING



# EDUCATIONAL GAMES

- Games can support development of a number of various **skills**:
  - strategic thinking,
  - planning,
  - communication,
  - collaboration,
  - group decision making, and negotiating skills
- Educational games are the group of games that are made to satisfy some learning objectives in school or academic institutions
- Its use is still controversial, mainly concerned with **resources** and deciding **measurable outcomes** (how to test the students)

# CORPORATE GAMES

- Usually used to train their employees
- Computer-assisted training allowed corporations to **cut costs** for training staff, special equipment, locales, etc
- **Skills** taught include:
  - People & **communication** skills: teamwork, how to perform well within a department
  - **Job-specific** skills: how to operate machineries
  - **Organisation** skills: logistic management, time management
  - **Strategy** skills: weighing pros and cons, making informed decisions, setting goals and leveraging resources to reach them

# AMERICAN TRUCK SIMULATOR

American Truck Simulator launch trailer



- A truck driving simulator with business management elements.
- Rating of 9/10 on Steam
- Business and vehicle simulation game developed by the Czech company SCS Software and is the parallel video game sequel to Euro Truck Simulator 2 (10/10 on Steam), spiritual successor of 18 Wheels of Steel.



# HEALTHCARE GAMES

- Health, is a very common aspect in all kinds of games since “health” is used as a means of representing access to different kinds of **resources**
- Applications include:
  - To promote **exercise** and overall **healthier** lifestyle (nutrition skills and education on dietary requirements)
  - **Distraction** therapy: help chronically ill patients to deal with pain during uncomfortable treatments
  - **Recovery and rehabilitation**
  - **Surgery** trainings
  - **Cognitive** functioning: to enhance memory skills
  - **Diagnosis** and **treatment** of mental illness / mental condition

# FULL SPECTRUM WARRIOR (2004)

- A **real-time tactics** video game developed by Pandemic Studios
- Has been adapted by psychologists to assist veterans from Iraq to overcome the effects of post-traumatic stress disorder (PTSD) — resulting in insomnia, feelings of isolation, guilt, irritability
- The idea is to take a patient back to the memory of their trauma over and over again until their triggers no longer produce anxiety.
- Psychiatrists call this process **habituation** — through repetition, the memory is slowly robbed of its power.
- This method remains *controversial*



*As argued by Squire and Jenkins (2003), the outcome of game playing also **depends** on the goals the player sets for **her/himself**.*