

# Technology-enhanced Learning, Serious Games and Gamification

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Technology-Enhanced Learning and Innovation, Open Universiteit Nederland

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# Introduction



# TH Köln



- Germany's largest University of Applied Sciences with 26.000 students
- Strong research focus in Technology, Arts, and Science
- Research mainly focuses on future-related issues, including climate change, energy supply, health and food safety as well as demographic changes



# Cologne Game Lab, TH Köln

- Institute of TH Köln, part of Faculty of Cultural Sciences
- Bachelor and Master Programmes in Digital Games
- Interdisciplinary focus on Media Studies, Design, Art & Technology of Digital Games
- Research on all aspects of Digital Games
  - Educational Games
  - Societal Impact Games
  - Games Technology
  - Mixed Reality Games
- Cologne Game Incubator as Start-up Environment for Student Teams



# Technology-enhanced Learning (TEL)



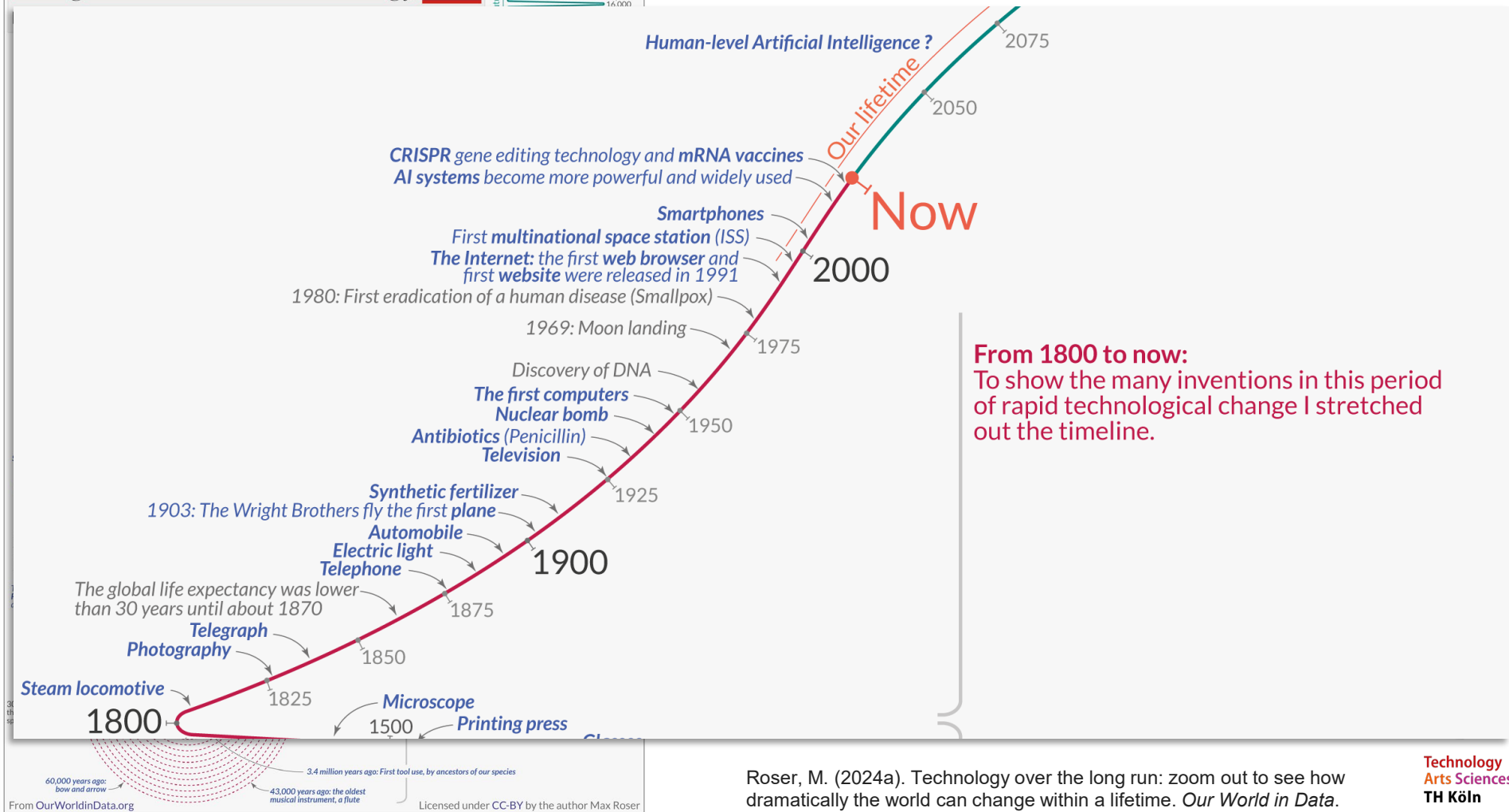


Where are we?



Technology  
Arts Sciences  
TH Köln





Roser, M. (2024a). Technology over the long run: zoom out to see how dramatically the world can change within a lifetime. *Our World in Data*.



# What's ahead of us?



Technology  
Arts Sciences  
TH Köln



# Current World Population

## 8,113,484,067

These People need to be educated!

197,223

Deaths today

89,241

Population Growth today

107,982

30,837,133

Deaths this year

25,718,204

Population Growth this year

31,118,935

World Population

9000000000

8000000000

7000000000

6000000000

5000000000

4000000000

3000000000

2000000000

1000000000

300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100

# Life Expectancy of the World Population

⌚ BOTH SEXES

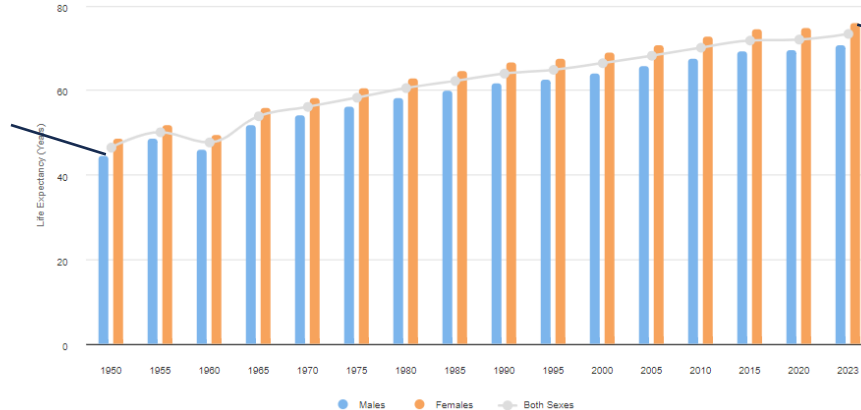
👤 FEMALES

👤 MALES

They need to be educated for longer!

Life Expectancy in the World from 1955 to Present

Males, Females, and Both Sexes combined



46,5 yrs in 1950

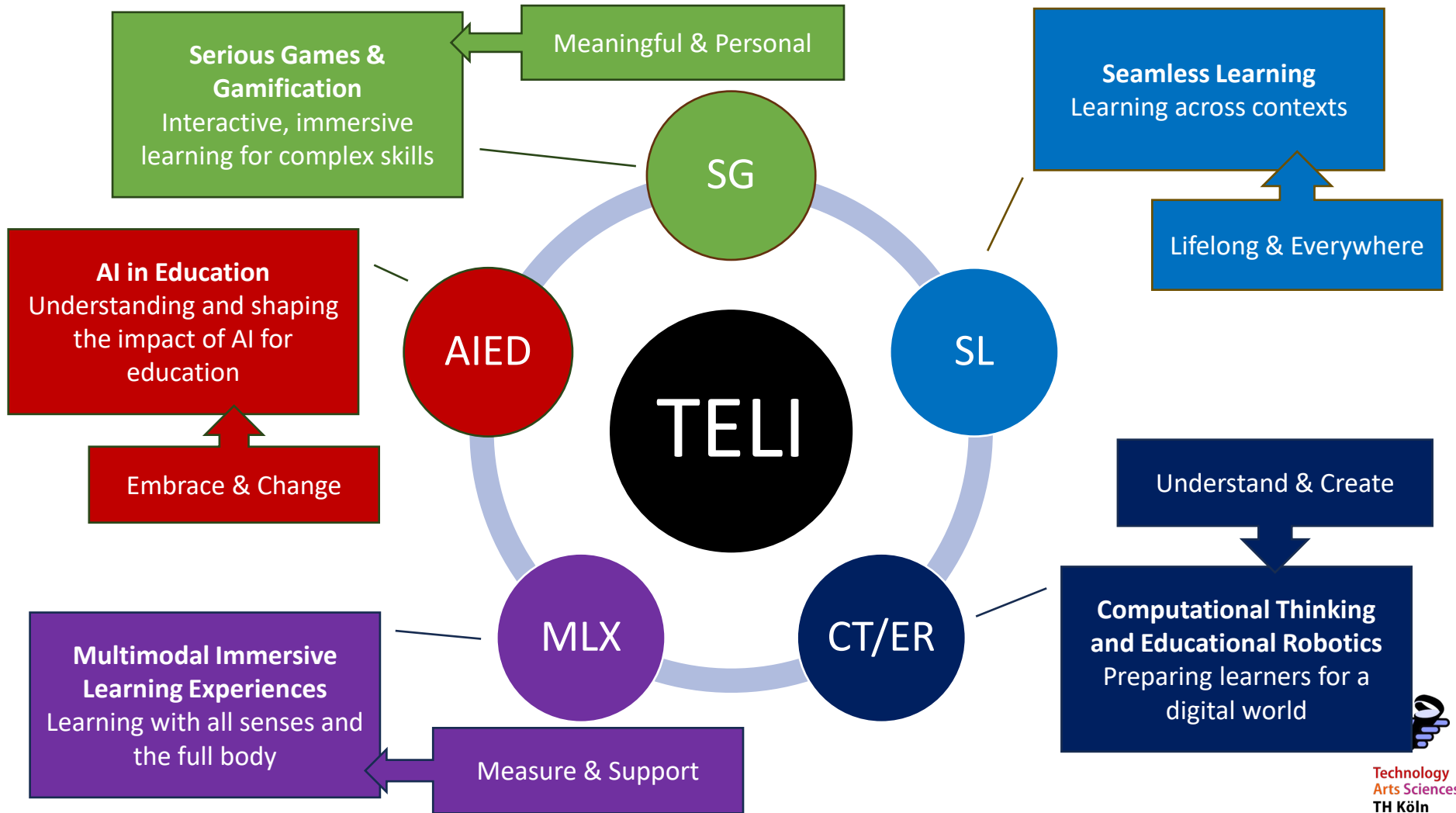
73,4 yrs in 2023





The diagram shows a globe with 15 numbered points connected by lines, representing global challenges. The points are: 1. Sustainable development and climate change, 2. Clean water, 3. Population, 4. Global foresight and decisionmaking, 5. Global convergence of IT, 6. Rich - poor gap, 7. Health issues, 8. Education and learning, 9. Peace and conflict, 10. Status of women, 11. Transnational organized crime, 12. Global ethics, 13. Science and, 14. Sustainable development and climate change, 15. Education and learning. A large blue box is overlaid on the globe, containing the text 'They need to be educated better!'. The box is semi-transparent, allowing the globe's grid lines to be seen through it.

# They need to be educated better!



# Defining games



# What are games?

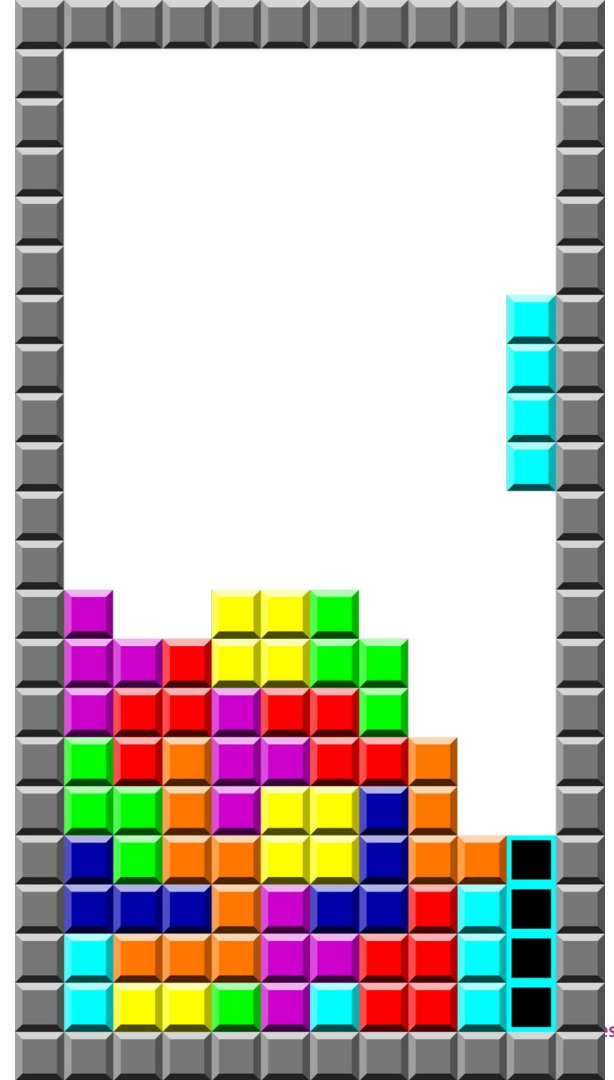
According to Mayer (2014) games have

- Space
- Mechanics
- Goals
- Rules
- Challenges



# What are (digital) games?

- Closed world (finite state)
- Interactive medium
- Self sufficient





# Non entertainment games



# Games Vs simulations

- *Intersection between serious games and play*
- Devoted to seriousness



# Play and games

- “Play can exist without games; games cannot exist without play.... With games there are rules, with play there may be rules”

Petridis and Traczykowski



# Why games?

- Games foster **play** Gary (2017)
  - v/s Ludification
  - meaningful
  - intrinsically motivating
  - engaging, voluntary etc....



# Why games?

- Games help you master a skill
  - active learning
  - persevere
  - learn from mistakes
  - authentic (deliberate) practice

*I came to see games as "deliberate practice" machines.*



# Why games?

- Games are stealth
  - stealth learning
    - hidden learning objectives in game play
  - stealth assessment
    - Boss fight
    - game analytics



# Serious games & gamification





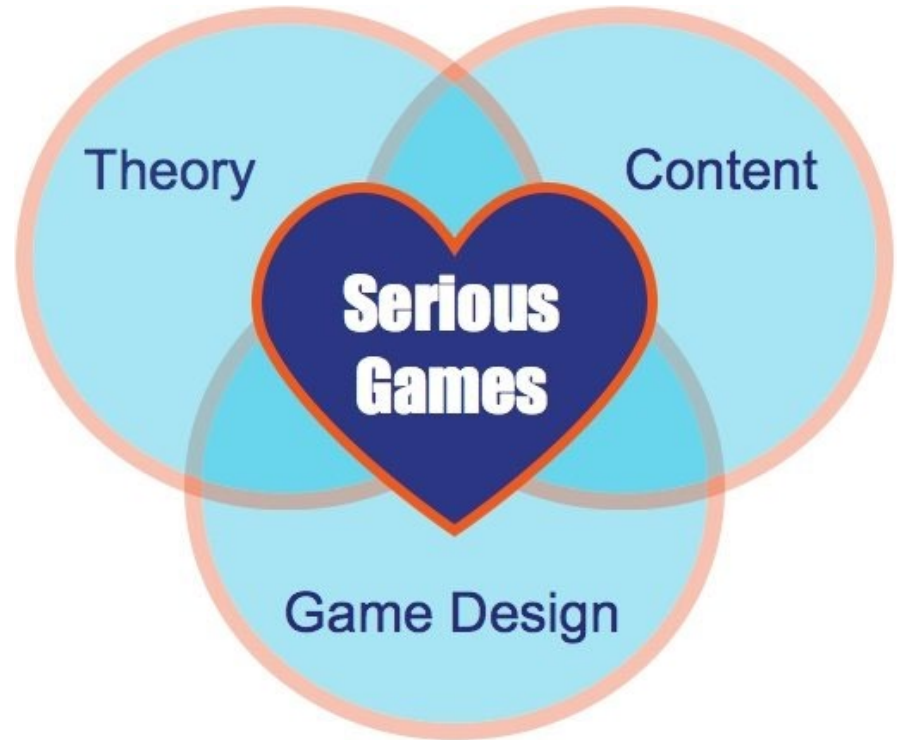
# What are serious games?

- Games developed for non-entertainment purposes
  - Serious objective
- Intrinsic motivation
  - Objective is achieved with play
  - reward is the activity itself



# Core of serious games

- Types of Serious games
  - Education
  - Persuasive
  - Marketing....etc



# Gamification



# Gamification



*Is often defined as „the application of game elements in non-gaming contexts“*



*Is in practice often reduced to using **points**, **badges**, and **leaderboards** and thus too often fails.*



# Meaningful Gamification

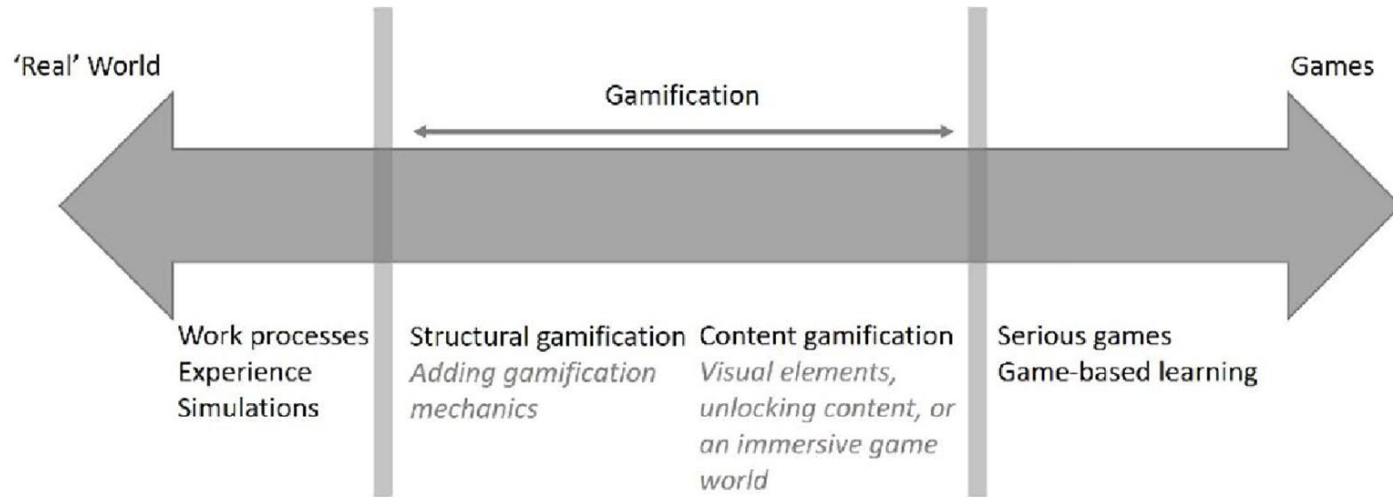


Gamification that is ***thoughtfully integrated*** with the ***learning process***, using a composition of ***game elements***, supporting the ***desired effects*** according to ***selected theories***, can be ***beneficial to learners***.

(Antonaci et al., 2018)



# Serious games & gamification

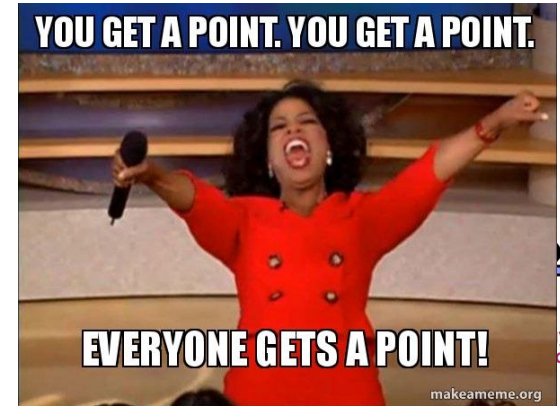


The Gamification Continuum (de Croon et al., 2018)



# Criticisms of gamification

- Replaces real incentives with fictional ones
  - Pointification (Robertson, 2010)
  - Gaming the system
- Chocolate covered broccoli problem (Klopfer et al., 2009)





# Criticisms of serious games

- Designing a good game is already complicated
  - Need game design, instructional design and domain knowledge
- A bad game is inherently a bad serious game
- The balance between play and learning is often muddy



# Game-based Learning

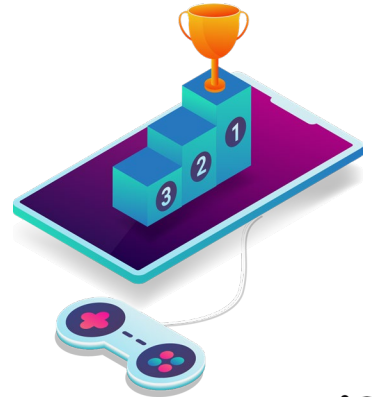
The use of games (or game elements) to enhance (or ludify) the learning experience." (Sheldon, 2011)



Use Existing Games



Develop Games  
Serious Games

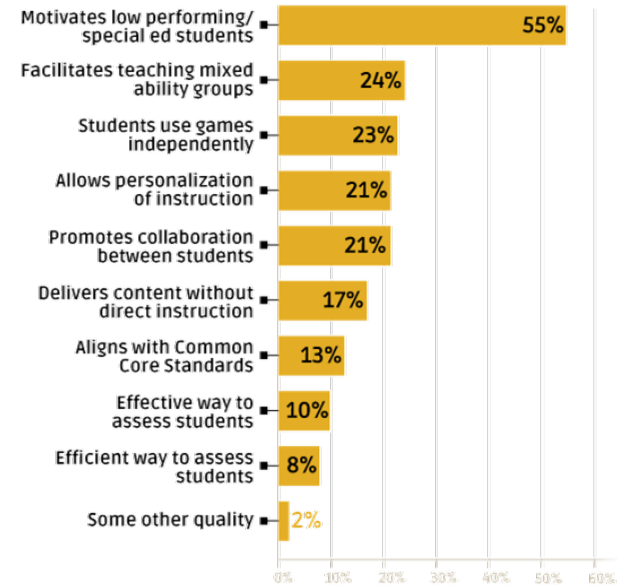


Use game elements  
Gamification

# Why game-based learning?

- Teachers say that...

## What qualities of games do you find most valuable?



[gamesandlearning.org](http://gamesandlearning.org)

Source: The National Survey of Digital Game Use Among Teachers is a project of the Games and Learning Publishing Council and produced by the Joan Ganz Cooney Center, with support from the Bill and Melinda Gates Foundation. See [gamesandlearning.org](http://gamesandlearning.org)

Among K-8 teachers who use digital games in teaching (N=513)

Participants were asked to select up to two qualities



# How GBL “views” serious games?

- Constructivism
  - experiential learning
- Exploratory learning
  - Safe space to explore
- Criticism: Behaviouristic learning
  - Reward and punishment
  - More often in “bad” gamification/games



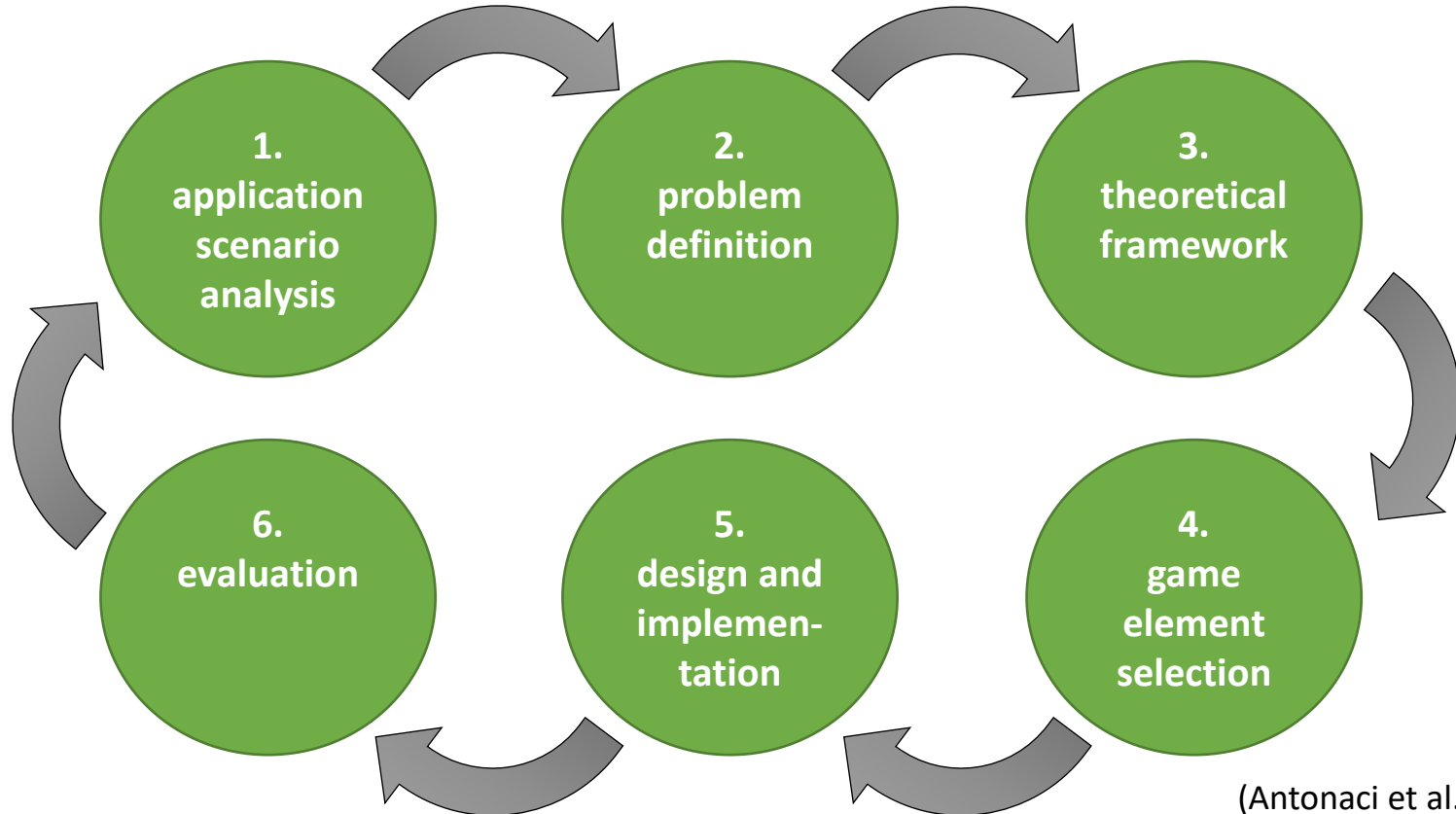
“A good (serious) game teaches everything before the player stops playing.” (Koster, 2013)



# Designing Gamification

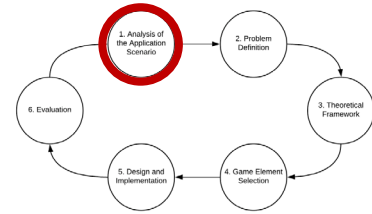


# Gamification Design Process (GaDeP)





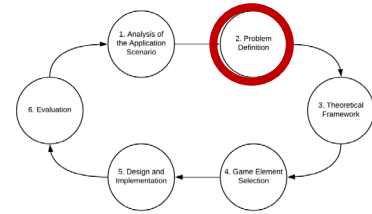
# 1. Analysis of the Application Scenario



- To understand characteristics of the application context
- Analyse the application domain: specific aspects, requirements, target groups and other contextual parameters
- **Example:** online courses attract many people for learning processes. Learners use their webbrowsers to learn.



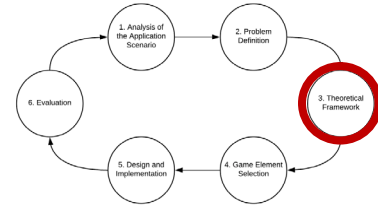
## 2. Problem Definition



- To analyse specific problems within the application domain.
- Select problems, where behavioural change could be part of the solution.
- **Example:** learners suffer from a feeling of isolation in their online learning environment, even if they are online with many other learners at the same time. This may lead to drop-outs.



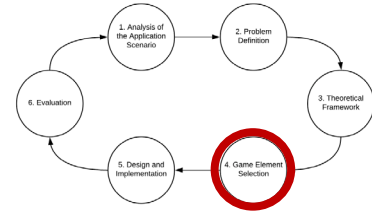
# 3. Theoretical Framework



- This step is essential: the solution to the problem is addressed by a theoretical framework.
- The framework uses existing theories related to the application domain and the selected problem and guides the design steps.
- **Example:** the theory of social presence states that certain social cues help to reduce the feeling of isolation



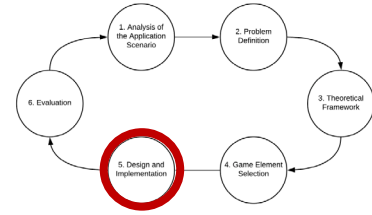
# 4. Game Element Selection



- To find suitable game elements matching the theoretic framework.
- The game element selection is based on the theoretical considerations of the previous step but also keeps the feasibility of its implementation in mind.
- **Example:** organise large groups of learners in smaller „clans“, that have a visual representation with avatars and a visible online/offline status



# 5. Design and Implementation



- To realise the selected game elements.
- In this step the gamified solution is realised.
- This step bridges theory and design.

- **Example:**

You can submit your input here until Sun Jan 27 12:00:00 UTC 2019

Clan Poll

Vote for your preferred clan names. You may select more than one.

The Ethical Hackers

Anonymous

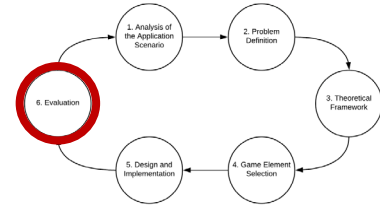
Ghost Squad

The Unknown

Prev Next Submit





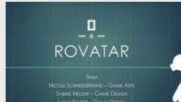
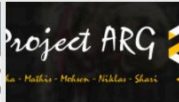
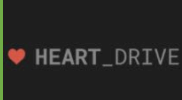

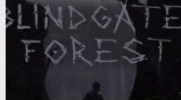









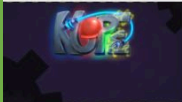






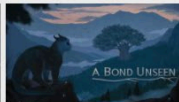



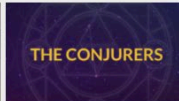
## 6. Evaluation



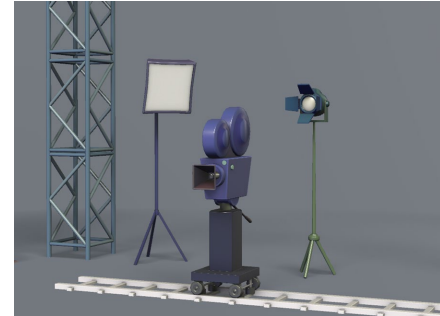
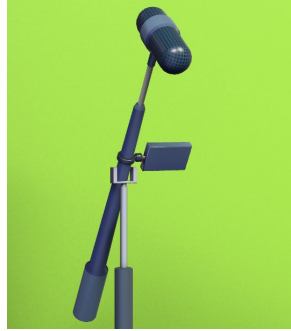
- To measure the resulting effects and continuously improve the approach.
- This step refers back to the theoretical framework and the problem definition: does the implementation address the problem as expected?
- Evaluation outcomes serve as input for further improvement of the gamified solution.
- **Example:** measure number of interactions and activities and duration of online sessions



# Examples

			
<b>Papercut (WT 2016/2017)</b> AboutPapercut takes you on a jourm...	<b>Fallen Hero (ST 2017)</b> AboutThe fallen hero's core concept is...	<b>Rovatar (WT 2017/2018)</b> AboutThe player becomes the operat...	<b>Project ARG (ST 2018)</b> AboutProject ARG is an alternate reali...
			
<b>HEART_DRIVE (ST 2018)</b> Aboutin HEART_DRIVE, you will assu...	<b>Blue Moon (ST 2018)</b> AboutA story of people being in a tou...	<b>Blindgate Forest (ST 2018)</b> AboutBlindgate Forest was once a po...	<b>Blind Archer (ST 2018)</b> AboutHunted by the corrupted horde...
			
<b>All Watched Over by Machines of L...</b> AboutAll Watched Over by Machines ...	<b>Zero Damage (WT 2018/19)</b> AboutZero Damage is an Coop Action...	<b>Zentry (WT 2018/19)</b> AboutA mysterious Zen master living...	<b>The Bridge (WT 2018/19)</b> AboutThe Binde is an app that has be...
			
<b>Tukki &amp; Champ (WT 2018/19)</b> Aboutin "Tukki & Champ" a chameleo...	<b>On And On We Ran Away (WT 2018...</b> AboutOn and On We Ran Away is a si...	<b>The Laurel &amp; Hardy Murder Case (...)</b> AboutTwo mutants sharing a single, s...	<b>L.A.M.E. (WT 2018/19)</b> AboutL.A.M.E. is a unique mix of diff...
			
<b>K.U.P.E. (WT 2018/19)</b> About"We live in a universe of freedo...	<b>Gabors Gambit (WT 2018/19)</b> AboutIn the near future, where holo...	<b>Future of Yesterday (WT 2018/19)</b> AboutExplore an exemplary apartme...	<b>Forget Me Not (WT 2018/19)</b> AboutThe game is envisioned as a pu...
			
<b>Enotita (WT 2018/19)</b> AboutAs Zeus looked upon earth he s...	<b>Eden (WT 2018/19)</b> AboutEden is a mobile multiple choic...	<b>AETHER (WT 2018/19)</b> AboutAether is a two player local co...	<b>A Bond Unseen (WT 2018/19)</b> AboutA family of fantasy creatures liv...
			
<b>Would You (ST 2019)</b> About"Would you...?" revolves arou...	<b>Tomorrow Never Knows (ST 2019)</b> It's just a normal Sunday in the summ...	<b>The Orange Cube (ST 2019)</b> The Orange Cube was created by a gr...	<b>The Conjurers (ST 2019)</b> Aboutin The Conjurers, you will take o...

# Boom Mike Operator



Get to know job profiles, also the parts not in the job profile





# Job Description

- Students and young adults
- Insight into possible occupation

Minimum small brain

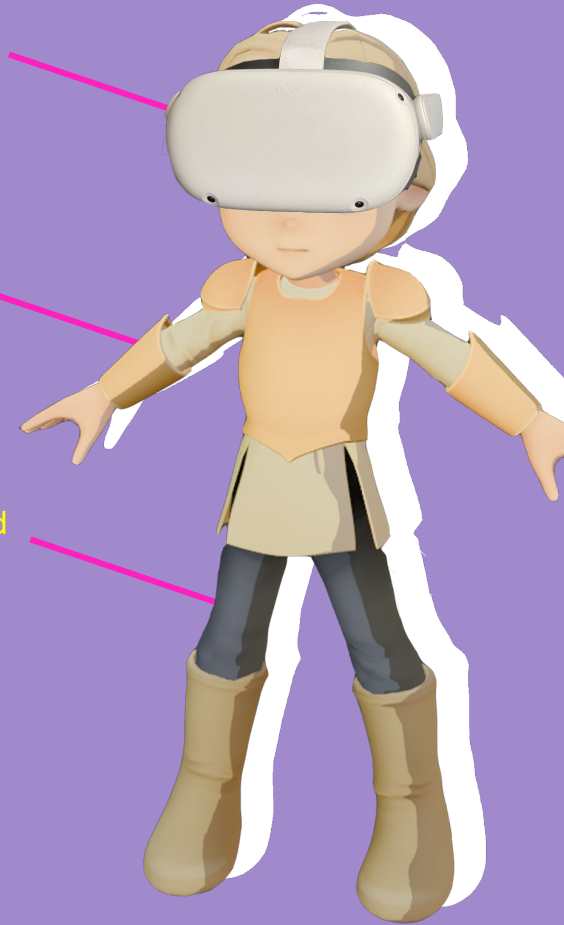
At least two arms

Likes to move around

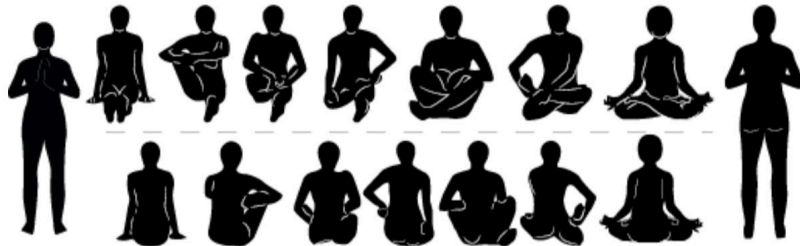
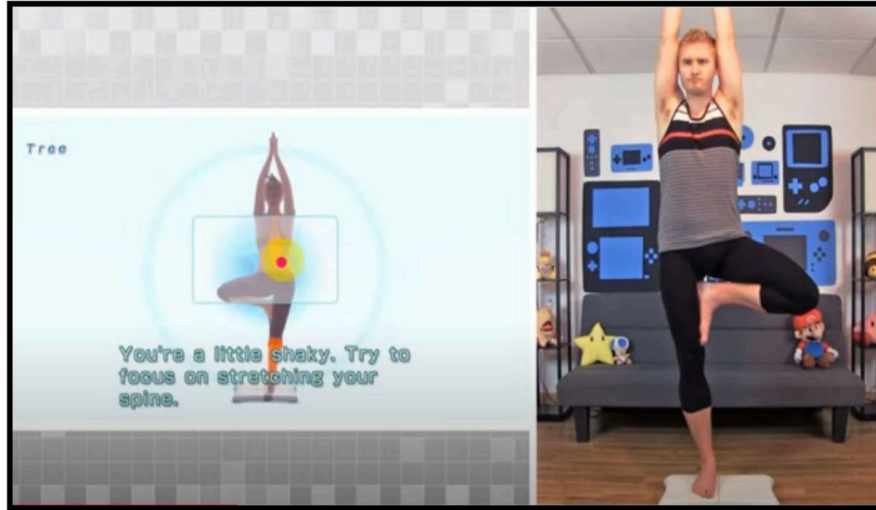
Accuracy

Hectic Fun

Humor



# Become a (remote) Yoga Tutor



Prepare for the required skills in your job



# Learning to Juggle in VR



Experience challenges of a circus performer, including the immersive environment

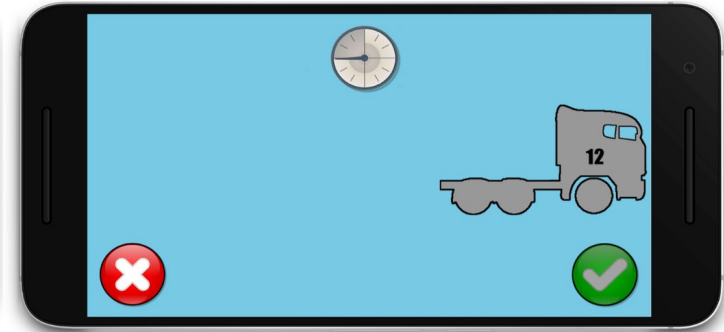
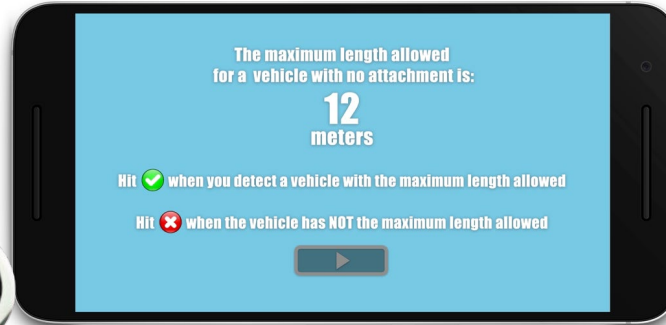
# Speakers Notes: Presentation Training



Prepare for required job skills: presenting to a virtual robotic alien audience

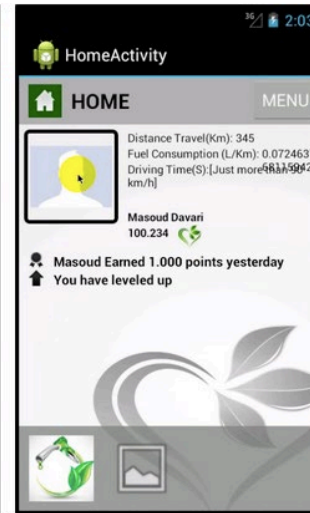
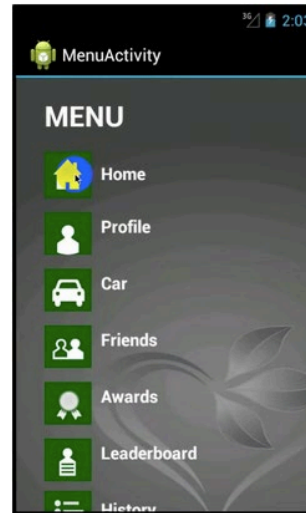


# Driver License Training

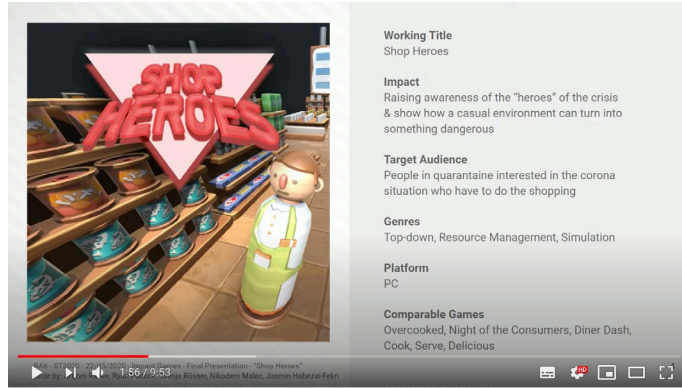


# Improve skills on the job: The TEGA Project

*A gamified driving app that encourages to drive economic and safe.*



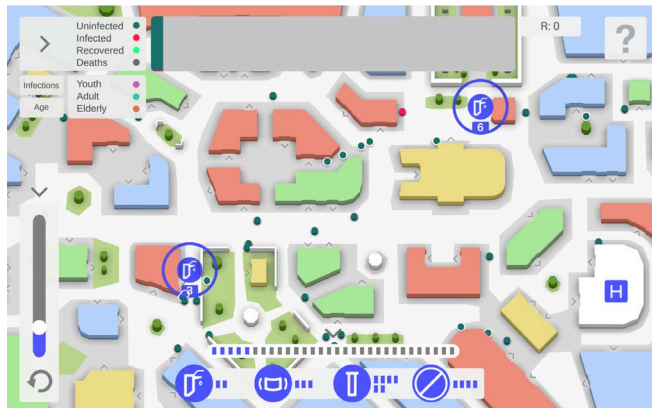
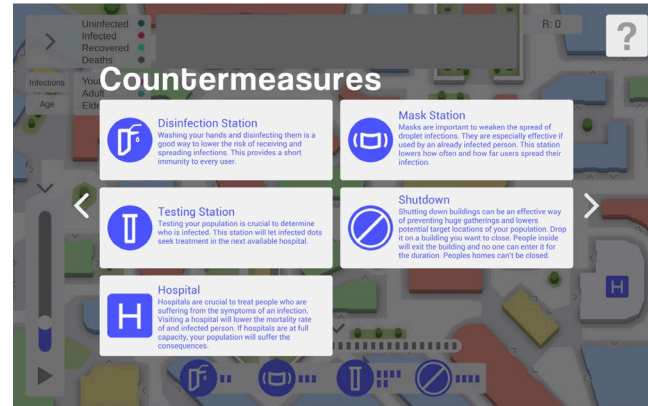
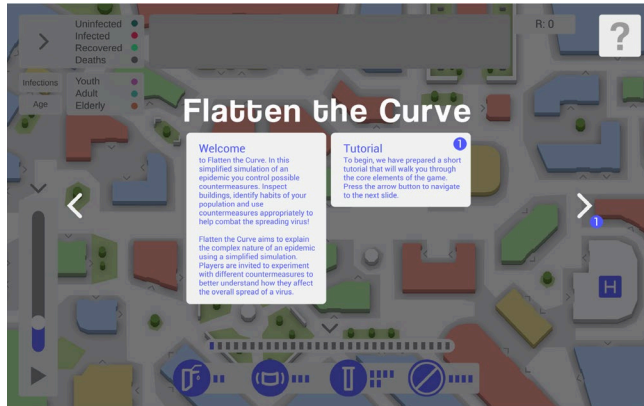
# Shop Heroes



Learn to handle chaotic challenges in a simulated job environment



# Flatten the Curve



Learn how to perform complex decisions in public administration

Example: simulating consequences of safety decisions in a pandemic





# VR Robot – A Trash Tale



Envision future perspectives on job profiles: human robot collaboration



Explore a complete world of (possible) future job profiles



10 minutes in 2050

- CGL develops VR exhibit for the Deutsches Museum Nürnberg

# Thank you!

Prof. Dr. Roland Klemke

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VR4VET, Trondheim, 26.11.2024

