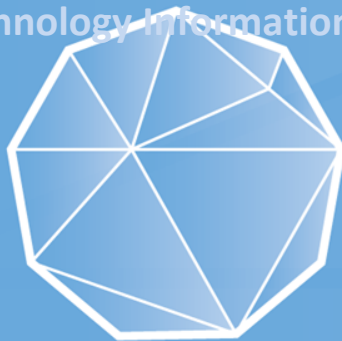


RISE Research Centre on Interactive Media Smart Systems and Emerging Technologies

Cyprus University of Technology Informational Event – 2 April 2019 - Limassol



RISE

Research Centre on Interactive Media
Smart Systems and Emerging Technologies

Immersive Technology and Design for Humans
Dr. Andri Ioannou, Cyprus Interaction Lab, RISE EdMedia Team Leader

PROJECT PARTNERS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 739578



This project has received funding from the Government of the Republic of Cyprus through the Directorate General for the European Programmes, Coordination and Development



Δήμος Λευκωσίας
Nicosia Municipality



University
of Cyprus



Cyprus
University of
Technology



OPEN
UNIVERSITY OF
CYPRUS

RISE 2018-2024



RISE

Research Centre on Interactive Media
Smart Systems and Emerging Technologies

Local Authority: Nicosia Municipality (coordinator)

Public Academic Institutions:
Cyprus University of Technology, University of
Cyprus, Open University Cyprus

Advanced Partners: Max Planck Institute for
Informatics (Germany), University College London
(UCL)



H2020-WIDESPREAD-Teaming Calls

- 2-stages highly competitive H2020-TEAMING call (11 proposals funded out of 169, for “innovation followers”)

Budget:

~50million euros seed funding (EC, Cyprus Government, Partners contributions, companies etc.)

Project duration:

7 years - Set up a self-sustainable CoE - Operate beyond 7 years

RISE Principal Investigator @ CUT: Dr.
Despina Michael-Grigoriou,
despina.michael@cut.ac.cy

RISE in a nutshell



How is RISE relevant to ASKFOOD?

Applied multidisciplinary research within S3CY



energy



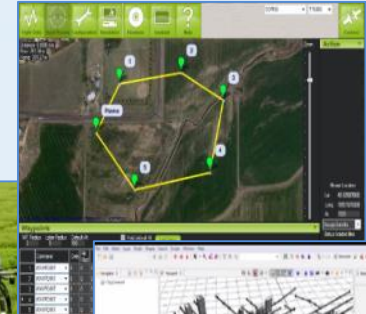
health



tourism



agriculture/food industry



construction



Education & Training and ICTs as horizontal priorities - EdMedia Group

RISE Philosophy and Pillars

Inspired by Humans, Designed for Humans

Not 'blue sky' research

Technologies to be used 'In the wild'

Outside research laboratories

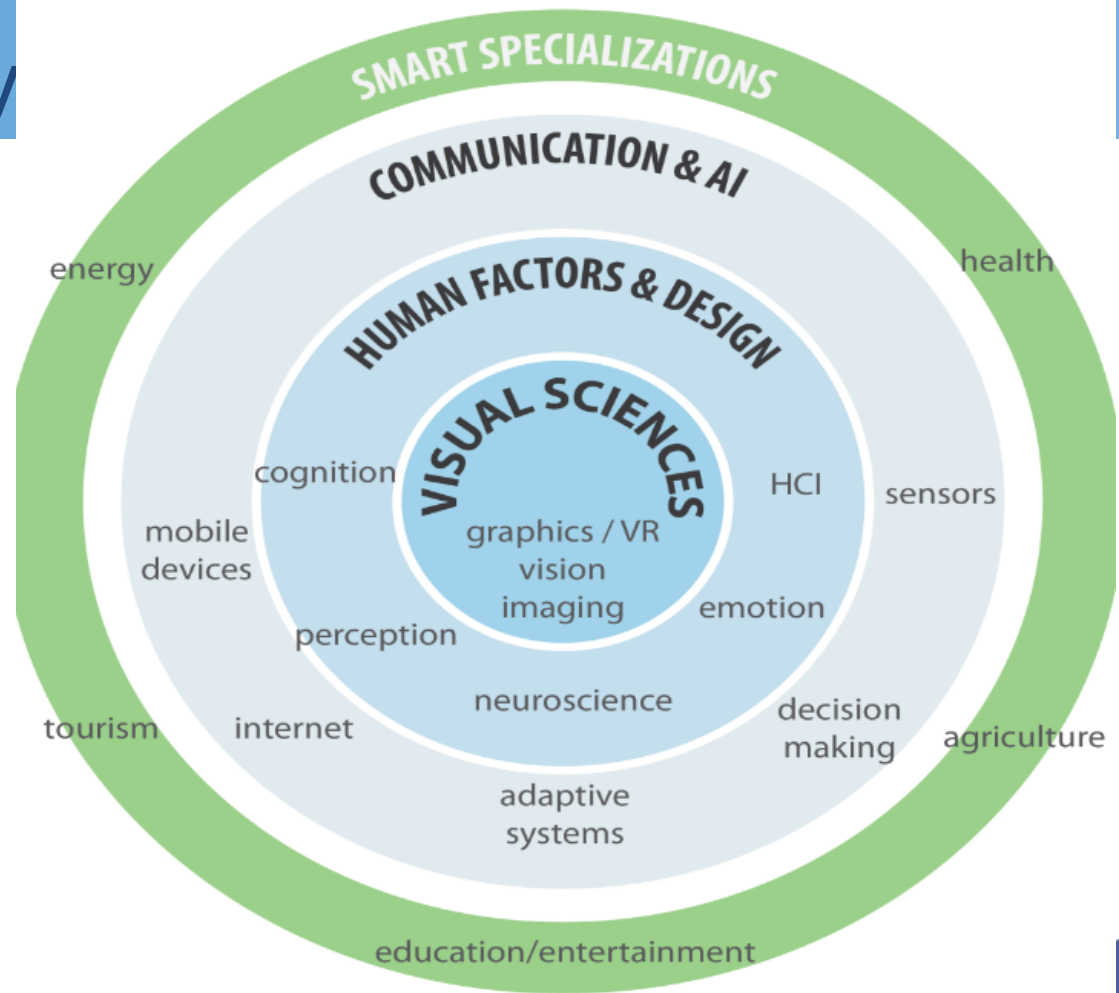
Tackling real-world problems

Critical mass of researchers for R&D projects

Different backgrounds

Complementary expertise

Multidisciplinary research

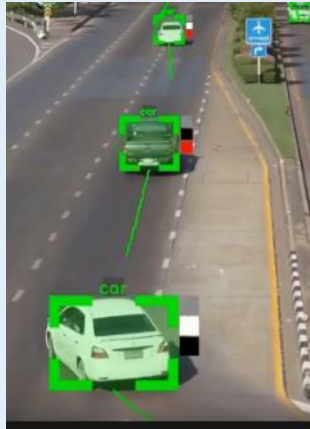


Expertise in the *Visual Sciences* Pillar

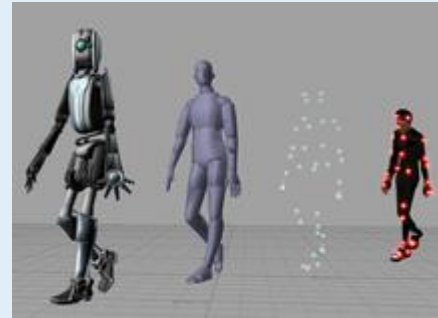
Imaging



Computer Vision



Computer Graphics



Virtual & Augmented Reality



Would ASKFOOD be interested in exploiting VR & AR in food science education?

Expertise in the *Human Factors & Design* Pillar

EdTech

UCD (User
Centered Design)

Museum Studies

Cognitive Science



Would ASKFOOD be interested in some tech-enhanced education & training?

Expertise in the *Communication* & AI Pillar

Machine Learning



Transparency in Algorithms



Networks



Would ASKFOOD be interested in some Citizen Science projects (public participation in scientific research)?



RISE

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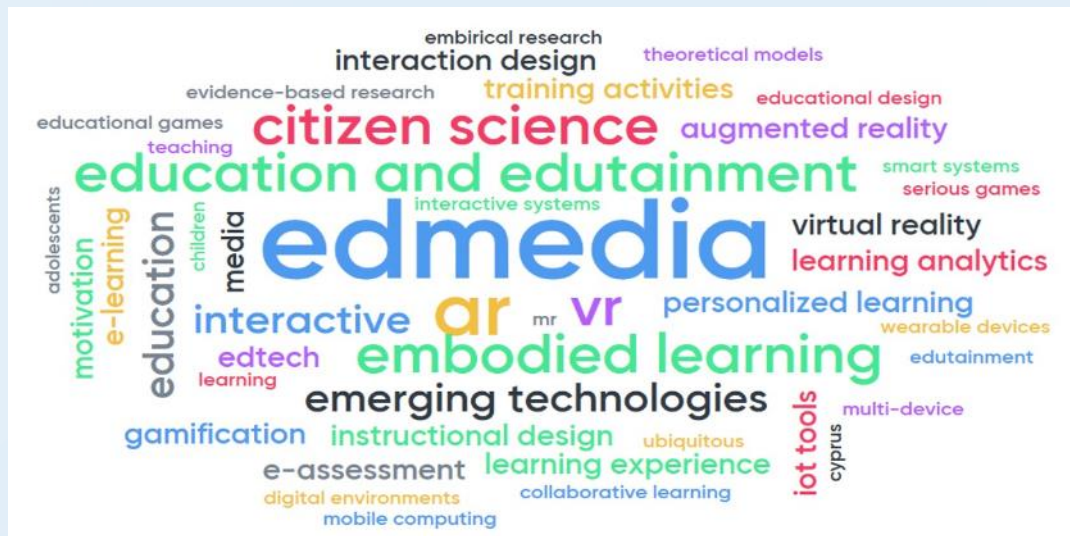
Immersive Technology and Design for Humans

ASKFOOD: Upgrading and modernizing training and educational methodologies in the food-related sectors



The EdMedia Group of RISE

Research and innovation related to Interactive Media as applied to the domains of **Education & Training** and **Edutainment** (i.e., experience that is both educational and enjoyable).



Ref: WordCloud by Mentimeter

Learning Design:

intersection between design and development phases with emphasis on the learner

Technology Integration:

conventional + emerging technologies

Pedagogy:

PBL, inquiry learning, 21st century skills, assessment

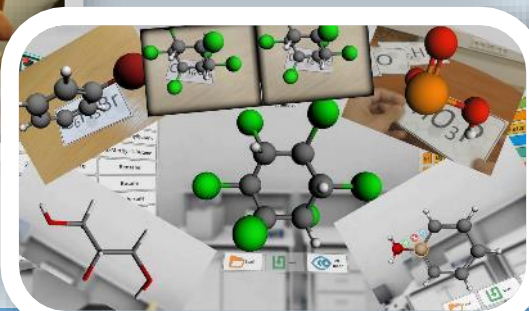
Framing:

embodied & immersive learning, gameful learning

Why integrate technology and interactive media?



- Learning should be playful, gameful and fun.
- Use of interactive media can have a transformative role in learning, in and out of formal education settings in K-20+
- Rapid development of enabling educational technologies
 - Natural interfaces (e.g., Wii, Xbox Kinect, Leap Motion)
 - Immersive interfaces based on mixed or virtual reality
- Lack of truly multidisciplinary projects



Embodiment: Motion, physicality and interactivity

*Gestures or full-body movement
into the act of learning*

	Level 1	Level 2	Level 3	Level 4
motoric engagement	stationary	stationary	partial-body locomotion	whole-body locomotion
gestural congruency	no congruent gestures no manipulations	congruent gestures possible tangible manipulations	congruent gestures tangible manipulations	congruent gestures tangible manipulations
immersion	not immersive	not immersive	semi-immersive	immersive
example	observation on small screen	interaction with small screen	motion sensors and large display	mixed-reality with motion sensors and locomotion

← Continuum on three variables: motoric engagement, gestural congruency, immersion →



Embodiment Taxonomy by Johnson-Glenberg, Megowan-Romanowicz, Birchfield, and Savio-Ramos (2014)

Apps for Interactive food science modules on basic laboratory techniques training



An exer-game designed to teach youth about nutrition in common foods.



<https://www.embodied-games.com/>



Chemistry titration using embodied learning in SMALLab



An overview of a recent study



- **Goal:** investigating the added value of motion-based technologies in embodied learning in the context of health elementary education.
- **Research design:** An explanatory sequential design ($n=42$ in 2 groups): an experiment (questionnaires investigating students' engagement and learning gains) followed by qualitative post-intervention interviews.
- **Findings:**
 - No statistical differences in the student's knowledge gains
 - Factors influencing students' experience: Content-related factors, Interface-related factors, Activity-related factors, Context related factors

An overview of a recent study



- **Goal:** investigating the added value of motion-based technologies in embodied learning in the context of geometry elementary education.
- **Research design:** An explanatory sequential design ($n=31$ in 2 groups): an experiment (questionnaires investigating students' engagement and learning gains) followed by qualitative post-intervention interviews.
- **Findings:**
 - Students in the digital intervention outperformed their counterparts in the non-digital intervention, in terms of learning gains and emotional engagement.
 - Analysis of the interviews showed that the integration of motion-based technologies positively affected the students' learning experience (feedback, interactive and immersive nature of the embodied digital app).



VR headsets and hand-controls

“room scale” VR...

**“Creating virtual realities helps
bring to life aspects of the curricula
and learning objectives in a more
engaging manner”**

TJ – Training Journal

VR Headset: Oculus, HTC Vive

VR Controllers: Oculus
touch, Vive Controllers



3D Organon VR Anatomy by Medis Media



Can you describe a VR learning scenario in food science & technology?

1. Basic concepts in food preservation and heat transfer (12 hours).
2. Blanching and Pasteurisation (12 hours).
3. Sterilisation (15 hours).
4. Chilling and Freezing (9 hours).



Imaging being in a VR factory learning all about pasteurization...

Microsoft Introducing Microsoft HoloLens 2



Virtual Reality via Google Expeditions

Google Expeditions (GEs) are guided tours (field trips) of places that students experience on a smartphone through a VR viewer called Google cardboard.

Concepts and events

- | | |
|-----------------------------|--------------------|
| 1. Astronomy | 10. Nervous System |
| 2. Auditory System | 11. Photosynthesis |
| 3. Earthquakes | 12. Pollination |
| 4. Electromagnetic Spectrum | 13. Pregnancy |
| 5. Extinction | 14. Solar System |
| 6. Fertilization | 15. The Eyes |
| 7. Human Anatomy & | 16. Viruses |
| Respiratory System | 17. Volcanoes |

8. Hydrosphere
9. Muscular System

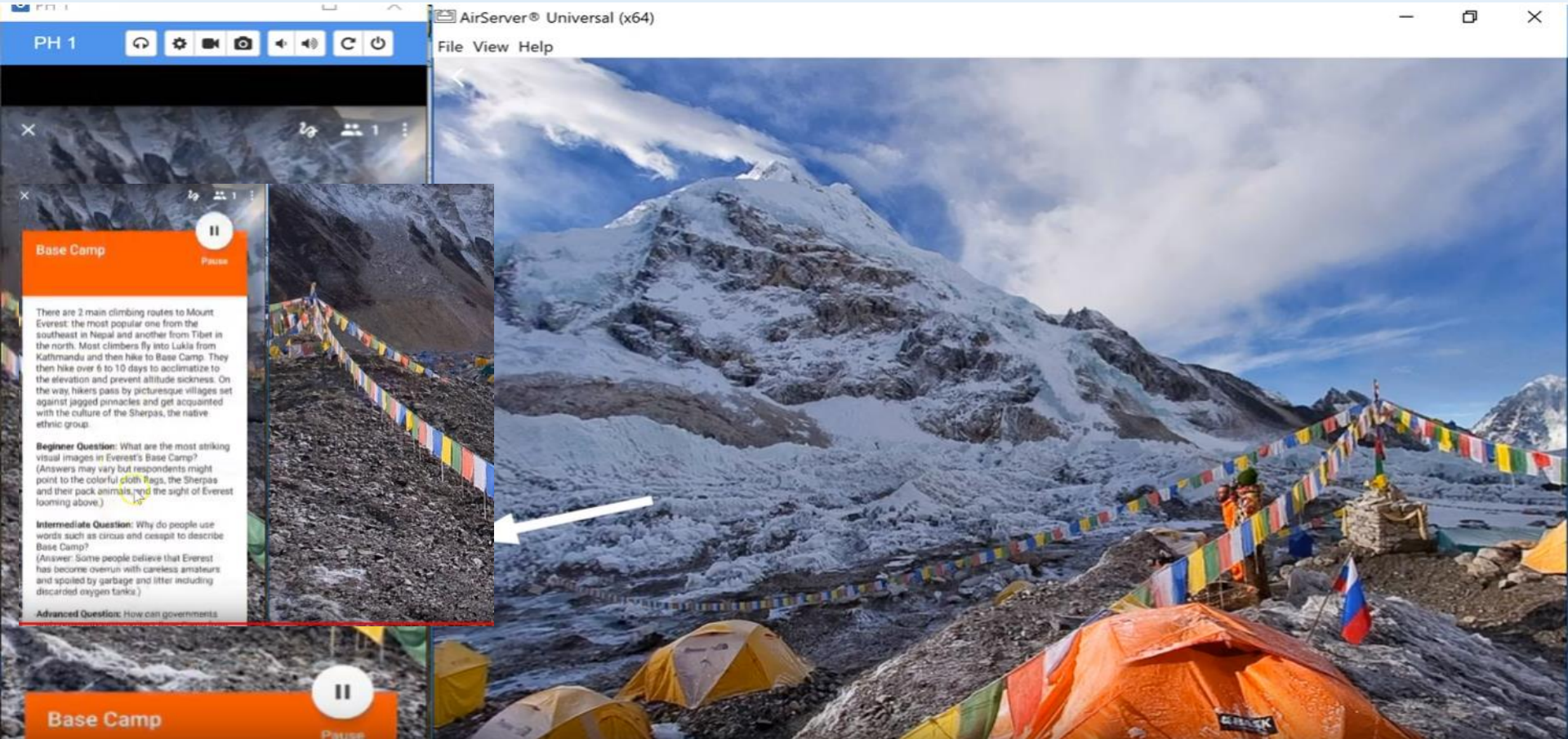
over 900 VR Expeditions from Mount Everest to the Louvre + simulations (e.g. respiratory or the circulatory system) + create your own



A guided tour to Mount Everest



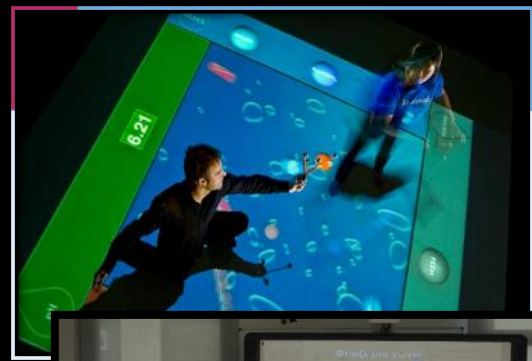
A guided tour to Mount Everest



Value of embodied and immersive learning

- **Physical representations** facilitate the understanding of abstract concepts
- **Multimodal interactions** allow deeper levels of processing of the educational content
- **Movement and physical action** help to dynamically offload parts of mental operations

Leveraging the affordances of gaming technologies for learning is important work for research and practice!



Gamification & Gameful Design

all of the above-mentioned experiences ...

ASKFOOD: Upgrading and modernizing training and educational methodologies in the food-related sectors

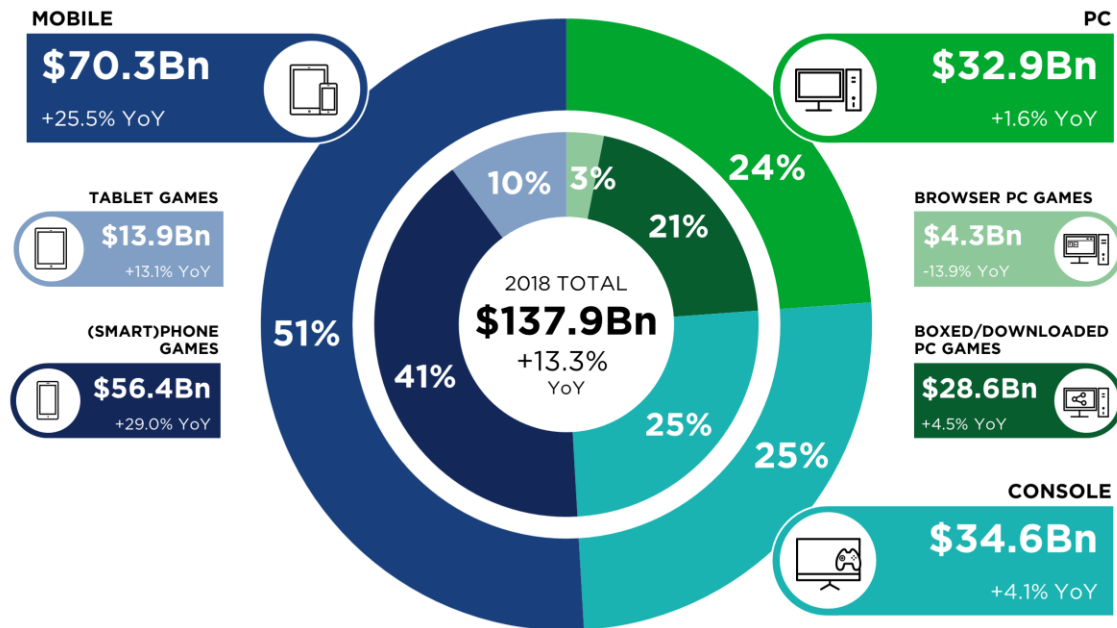


newzoo

2018 GLOBAL GAMES MARKET

PER DEVICE & SEGMENT WITH YEAR-ON-YEAR GROWTH RATES

©2018 Newzoo



In 2018, mobile games will generate

\$70.3Bn

or **51%** of the global market.

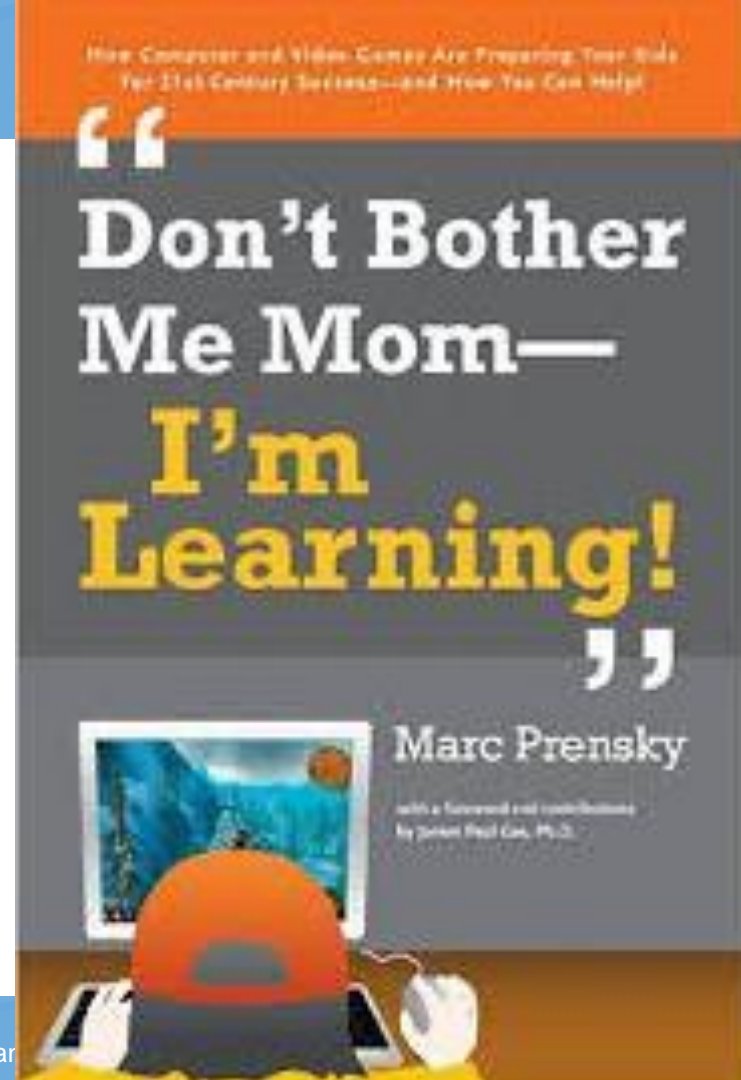
Source: ©Newzoo | April 2018 Quarterly Update | Global Games Market Report

newzoo.com/globalgamesreport

newzoo

Clearly there should be a way to help people (school children, HE students, life-long learners) learn from what they like to do best – play!

This is why many educators and instructors are looking into a variety of tools and techniques for the Gamification of Education.








What is Gamification or Gameful Design?

“Broadly defined, gamification is the application of game features and game mechanics to a non-game context (Deterding, Dixon, Khaled, & Nacke, 2011). Gamification, or gameful design, comprises design for gameful experiences, that is, experiences which **incorporate the qualities of gaming, particularly play**, which is structured by rules and competing towards a goal. Therefore, gamified applications or activities do not typically include playing an actual game; they only **incorporate game mechanisms.**”

Ioannou, A. (2018). A model of gameful design for learning using interactive tabletops: enactment and evaluation in the socio-emotional education classroom. Educational Technology Research and Development, 1-26.

In educational praxis ...

- A long list of game mechanisms & variety of tools and techniques
- Introduces concept like **badges, levels, achievements and game points**
- Students are **rewarded** with these concepts when they succeed, but are **not penalized** when they don't.

Top 10		My Rank	
8th		Jason Rahm	★ 298
9th		Steven Mo	★ 265
10th		Joe Pruitt	★ 241
11th		Jeff Browning	★ 235
12th		April Spence	★ 232

Gamification Mechanics & Design Elements



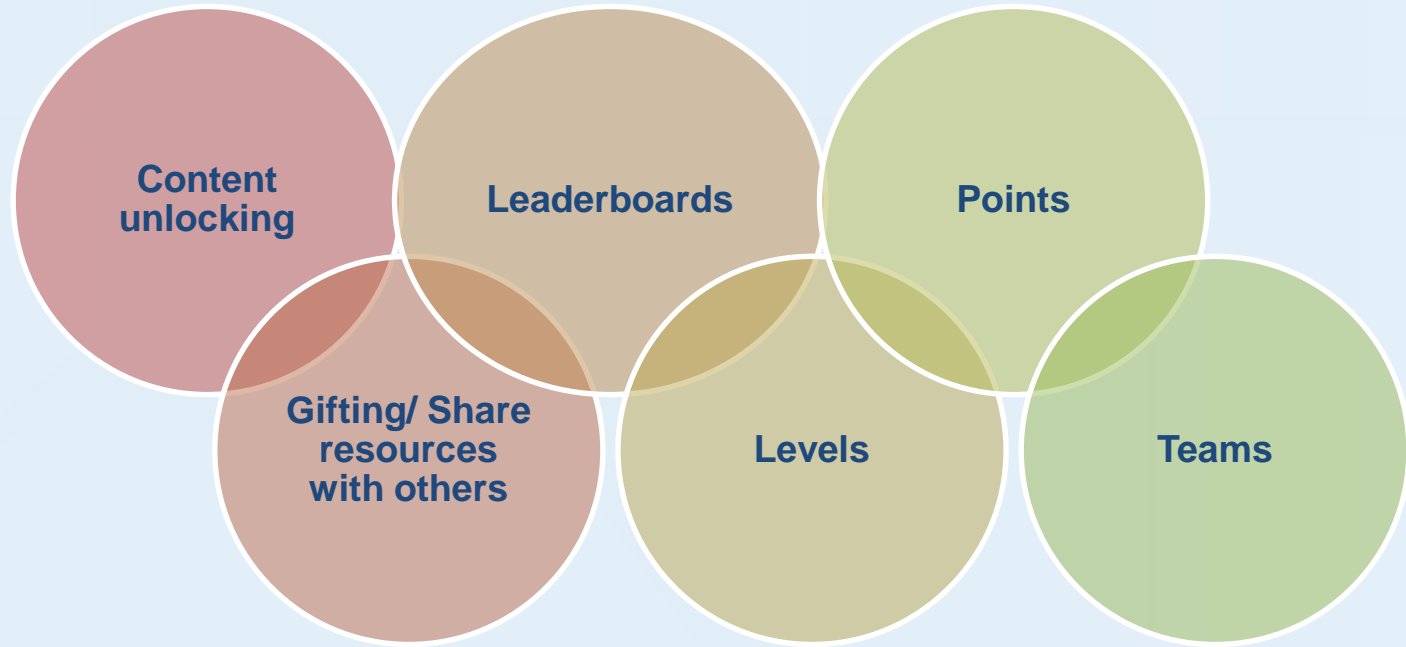
Gamification: *use of **game mechanics** and **game thinking** in non-game environments*

Gamification Mechanics & Design Elements



Gamification: *use of **game mechanics** and **game thinking** in non-game environments*

Gamification Mechanics & Design Elements



Gamification: *use of **game mechanics** and **game thinking** in non-game environments*

Gamification Mechanics & Design Elements













Gamification: *use of **game mechanics** and **game thinking** in non-game environments*

To summarize...

Gamification

game mechanics +
game thinking

*All of the above-mentioned
experiences in this presentation
include these elements!*

	Game Thinking	Game Elements	Game Play	Just for Fun
Game Inspired Design				
Gamification				
Serious Game / Simulation				
Game				

Gamification of a VR learning experience...



1. VR hands-on experience

Users are immersed ...solving a task through experimenting (e.g., in food science)

2. EXPERIMENTING + LEARNING + QUIZING

Solutions are under a predefined set of Testing Challenges allowing Users to play with a big range of Variables. Learning outcomes will be tested by quizzes, questions and challenges.

3. COMPETING

Solutions are placed in a joined users VR or social environment allowing connectivity and gameplay interaction.

Success stories...

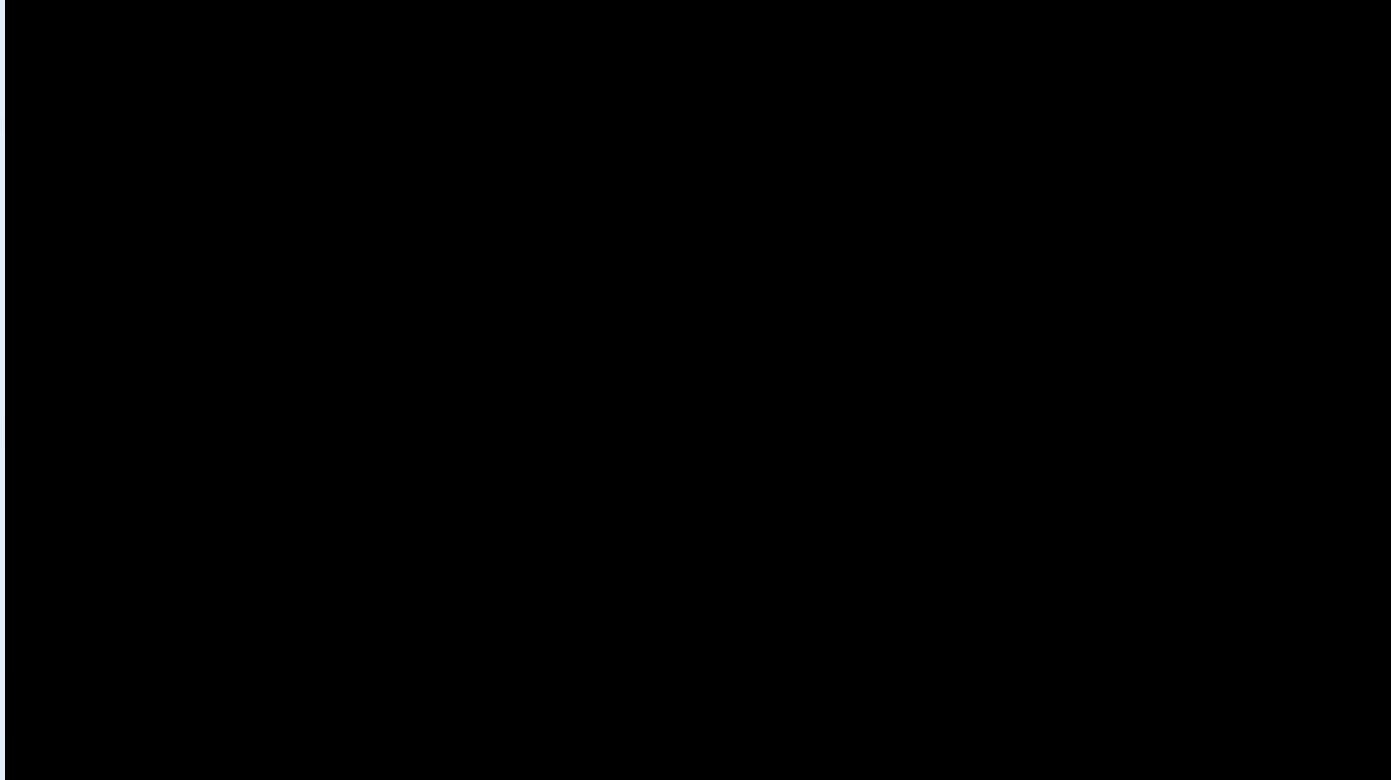
Example #1 –

DuoLingo: Using the
Wisdom of Crowds to
Translate Language

Education: Learn a
language while translating!



DuoLingo: Can you recognize the gamification Mechanics & Design Elements?



Success stories...

Example #2 – Coursera:
Interactive Education in Your
Home, MOOCs (massive
online open courses)

***One of the most popular courses on
Coursera is the Gamification course!***

<https://www.coursera.org/lecture/gamification/1-1-introduction-4h5k1>

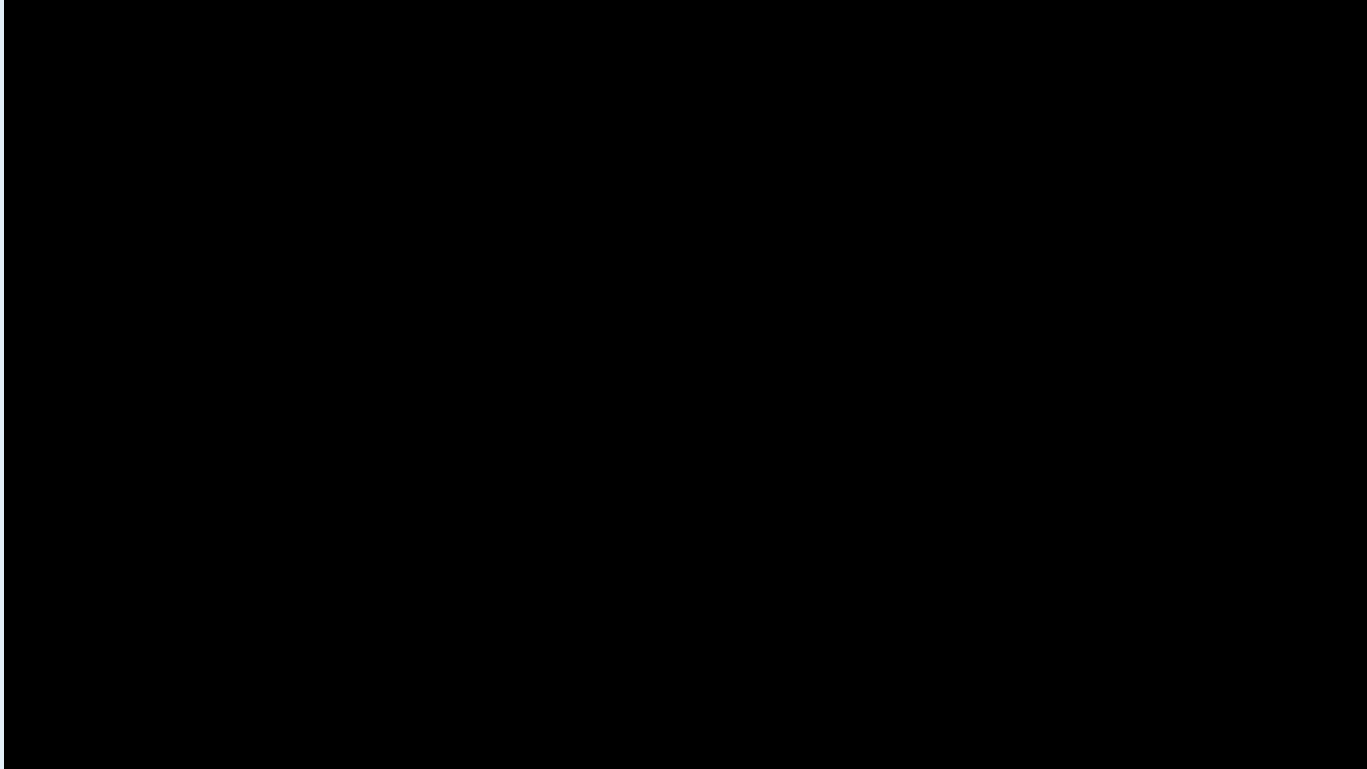


Success stories...

Example #3 - Socrative 101: In- Class mobile interaction between Teacher and Student



Socrative 101 : Can you recognize the gamification Mechanics?



Gamification in many recent Citizen Science Projects

What is Citizen Science? public participation in scientific research

- Gamification is an important tool to engage non-traditional audiences to the scientific process



QuestaGame: Can you recognize the gamification Mechanics?



Could it be Citizen Science for Living Soils and Growing Food?

Immersive Technology and Design for Humans



RISE

Research Centre on Interactive Media
Smart Systems and Emerging Technologies

*Possibilities of upgrading and modernizing training and
educational methodologies
in the food-related sectors in ASKFOOD*

Opportunities for Collaboration in RISE

- Vacancies @ <http://rise.org.cy>
 - Open posts for more Teams Leaders (PhD holders)
 - Upcoming research positions (PhD and MA/MSc holders)
 - Paid internships for UG students
- Cluster call on “Serious Games and Gamification”
- Co-organization of events (scientific conferences, Hackathons, innovation events)
- Grantwriting!

Dr. Andri Ioannou <andri@cypirusinteractionlab.com>