



GSGS'21

6TH INTERNATIONAL CONFERENCE ON GAMIFICATION & SERIOUS GAME

HEALTH

TRAINING

EDUCATION

CULTURE

SOCIETY

LEARNING

URBANISM

ECONOMY

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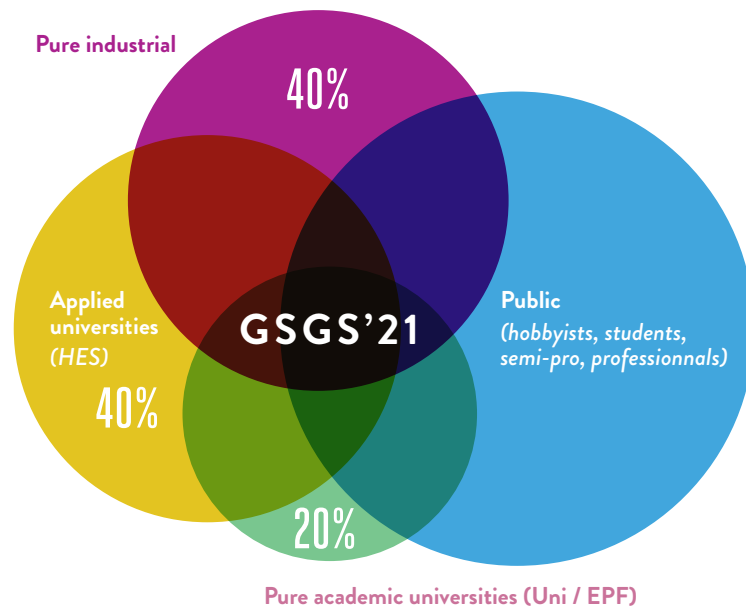
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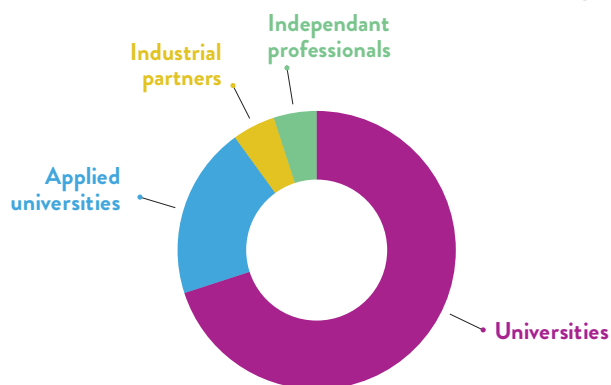
GSGS'21: AN INTER-PROFESSIONAL OPPORTUNITY FOR THE SWISS INDUSTRY

The GSGS'21 conference aims to be a bridge between industrial needs and original academic answers in the domain of Gamification and Serious Gaming. It highlights the playful perspective to tackle technical, training, ecological, management and communication challenges. Bringing together the strengths of academy and industry, this event provides an exchange and networking platform through the intervention of national and international actors.

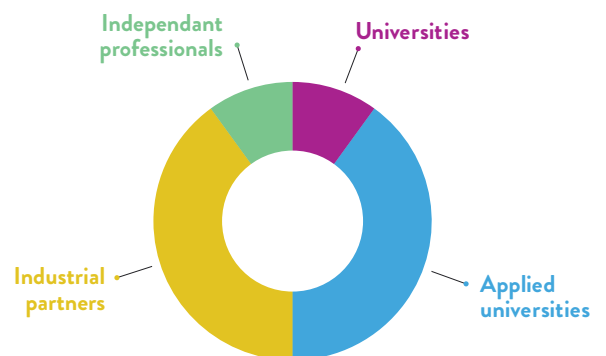


Four categories of people interacting to rise innovation.

WHAT CAN BE EXPECTED AT...



...A CLASSICAL CONFERENCE



...GSGS'21

MONDAY 28 JUNE

14:00–14:10 Introduction speech

14:10–14:20 **1** The Lake

Maylis d'Hautfoeuille | HEAD | Switzerland

[Discover >](#)14:20–14:30 **2** Amani, my friend

Alejandra Oros | HEAD | Switzerland

[Discover >](#)14:40–14:50 **3** VR dilemma to study emotion regulation as a function of social cues availability

Teerawat Monnor | UNIGE | Switzerland

[Discover >](#)

14:40–15:30 Question & Discussion

Julien Schekter | Switzerland

THURSDAY 1 JULY

14:00–14:10 Introduction speech

14:10–14:20 **4** Play with your emotions: board games to support and train emotional competences

Alexandra Zaharia | UniDistance | Switzerland

[Discover >](#)14:20–14:30 **5** SPRING Controller

Tomás Henriques | CoreHaptics LLC | United States

[Discover >](#)14:30–14:40 **6** Agile Boosters: gamification can help software development teams get better

Oliver Liechti | Avalia Systems | Switzerland

[Discover >](#)

14:40–15:30 Question & Discussion

Julien Schekter | Switzerland

MONDAY 5 JULY

14:00–14:10 Introduction speech

14:10–14:20 **7** The Diner: Gamified response training intervention for behavioral change

Najberg Hugo | UNIFR | Switzerland

[Discover >](#)14:20–14:30 **8** Gamification & Patients' Rights: a Serious Game for students in Healthcare

Dominique Correia | HESAV | Switzerland

[Discover >](#)14:30–14:40 **9** Ça fait plaiz!? A tabletop games kit for youths on addictions & risk behaviours

Johan Jaquet | Entrée de Jeux | Switzerland

[Discover >](#)14:40–14:50 **10** Nursing students perception's using serious games during the confinement

Guillaume Decormeille | University of Toulouse Jean Jaures | France

[Discover >](#)

14:50–15:40 Question & Discussion

Julien Schekter | Switzerland

THURSDAY 8 JULY

HEALTH II | ONSITE SESSION

10:00–10:20 Welcome speeches

10:20–10:35 **11 Games for the Cognitive Assessment of Older Adults**

Fernanda Oliveira | University of Technology Sydney | Australia

[Discover >](#)10:35–10:50 **12 AR Gamified Solution for Human Skills Training**

Yassin Rekik | HEPIA | Switzerland

[Discover >](#)10:50–11:05 **13 A new concept of simulation in health gamification : the simcup**Mohammed Mouhaoui
Faculty of medicine & pharmacy of Casablanca | Morocco[Discover >](#)11:05–11:20 **14 Creation of a board game in intensive care and emergency medicine**Mohammed Mouhaoui
Faculty of medicine & pharmacy of Casablanca | Morocco[Discover >](#)

11:20–12:30 Round table I - Fiorentino Assunta

What can gamification or serious games bring to the development of health professionals' skills compared to more traditional learning approaches?

12:30–14:00 Lunch Break

14:00–14:45 Keynote Speaker I

Serious games and gamification practical examples for health

Aur lie Turot | My-serious-game S.A | France

[Discover >](#)

HEALTH III | ONSITE SESSION

15:00–15:10 **15 Gamifying to improve face-to-face interview on latrine use in rural India**

Alice H. Aubert | Eawag | Switzerland

[Discover >](#)15:15–15:25 **16 Emotional intelligence of doctor / patient communication in medical consultation**

Alberto Parada | University of Liege | Belgium

[Discover >](#)15:30–15:40 **17 A Game Platform for the Cognitive Stimulation of Elderly with MCI**

Christos Goumopoulos | University of the Aegean | Greece

[Discover >](#)15:45–15:55 **18 Epilepsim**

Lo c Berthod | HEVS | Switzerland

[Discover >](#)

16:00–17:00 Round Table II - Stefano Carrino

Drawbacks and limitations of serious games and gamification in health:
Are serious games and gamifications always suitable solutions for health?

17:00–22:00 Social Event - Visit & Dinner | for attendees

FRIDAY 9 JULY

10:00–10:30 Meta Review

Improving the Future of Digital Game-based Learning by Examining the Past

Björn Berg Marklund | University of Skövde
Department of game development | Sweden

[Discover >](#)

SOCIETY, URBANISM & ECONOMY | ONSITE SESSION

10:30–10:45 **19** PROJEKT CH+ Games for Democracy: Third Iteration Project Report

Sophie Walker | ZHDK | Switzerland

[Discover >](#)

10:45–11:00 **20** MurGame – A playful debris flow simulation

Ralf Mauerhofer | Koboldgames GmbH | Switzerland

[Discover >](#)

11:00–11:15 **21** A Logistics Serious Game

Ela Pustulka | FHNW | Switzerland

[Discover >](#)

11:15–11:30 **22** The Spark-it project: How to implement a brainstorming with gamification?

Corentin Barman | HES-SO | Switzerland

[Discover >](#)

11:30–12:30 Round table III - Yassin Rekik

Are we moving toward a Gamified Society?
Injecting Serious Gaming and Gamification in all processes?

12:30–14:00 Lunch Break

14:00–14:45 Keynote Speaker II

Learning through play. Myth or reality?

Eric Sanchez | University of Geneva | Switzerland

[Discover >](#)

EDUCATION & TRAINING | ONSITE SESSION

15:00–15:10 **23** Comparing a Game v. Non-Game approach for plant provenance public education

Craig Docherty | The University of Stirling | United Kingdom

[Discover >](#)

15:15–15:25 **24** Spark-It project: using gamification in the creative process

Xavier Lince | HEP Valais | Switzerland

[Discover >](#)

15:30–15:40 **25** PHEW! or how to develop an everyday superpower for education

Mela Kocher | ZHDK | Switzerland

[Discover >](#)

15:45–15:55 **26** Content Agnostic Game Based Stealth Assessment

Vipin Verma | Arizona State University | United States

[Discover >](#)

16:00–17:00 Round Table IV - Christian Moreillon

Gamification and serious games in education & training,
a must-have for better learning or a playground for better teaching?

17:00–18:00 Conference closing ceremony: rewards and farewell speech



SPEECH & SHORT PAPERS

ROUNDTABLES, QUESTIONS & DISCUSSIONS



Julien Schekter

Responsable de la communication
DFJC (Département de la formation, de la jeunesse et de la culture)
État de Vaud, Lausanne, Suisse

MONDAY 28 JUNE

14:40 – 15:30

Education | Online – Questions & discussions

THURSDAY 1 JULY

16:30 – 17:15

Training | Online – Questions & discussions

MONDAY 5 JULY

16:30 – 17:15

Health I | Online – Questions & discussions



Stefano Carrino

Professor and Serious game expert
Data Analytics group
HE-Arc, HES-SO, Neuchâtel, Suisse



Fiorentino Assunta

Lecturer
La Source, School of nursing
HES-SO University of Applied Sciences
and Arts Western, Lausanne, Switzerland

THURSDAY 8 JULY

11:20 – 12:30

Health II | Onsite – Round table I

What can gamification or serious games bring to the development of health professionals' skills compared to more traditional learning approaches?

16:00 – 17:00

Health III | Onsite – Round table II

Drawbacks and limitations of serious games and gamification in health:
Are serious games and gamifications always suitable solutions for health?



Yassin Rekik

Professor and expert
in augmented and virtual reality
Data sciences & computational
intelligence
HEPIA, HES-SO, Genève, Suisse



Christian Moreillon

CEO and Co-founder,
Visual and Design thinker,
Visual facilitator,
Creative lead at Brozermo
Brozermo, Lausanne, Suisse

FRIDAY 9 JULY

11:30 – 12:30

Society, Urbanism & Economy | Onsite – Round table III

Are we moving toward a Gamified Society? Injecting Serious Gaming and Gamification in all processes?

16:00 – 17:00

Education & Learning | Onsite – Round table IV

Gamification and serious games in education & training,
a must-have for better learning or a playground for better teaching?



EDUCATION | ONLINE SESSION

MONDAY 28 JUNE

14:00-15:30



MAYLIS D'HAULTFŒUILLE



ALEJANDRA OROS



TEERAWAT MONNOR

1 | THE LAKE

Chiste Lison², d'Haultfœuille Maÿlis¹, Magnin Maxime¹, Amaiza Cindy²

¹: HEAD, University of Art and Design, HES-SO, Geneva, Switzerland

²: Kenyan Network of Adolescents and Youth of Africa

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ABSTRACT

"The Lake" was created for #GenEndIt to prevent HIV. The story begins in Muthoni's bedroom, a 16-year-old girl. The player embodies Muthoni. From her window, she sees a puddle in a vacant lot that soon grows into a lake overlaying all her neighbourhood. She gets out and starts exploring the place. Guided by the lake, she meets several characters, such as Willy, Fungi or Gloria. She also falls in love with Aasir. Muthoni discovers her limits and her body throughout the story. The Lake changes colours and discloses more paths as she evolves. The demo describes the last date with Aasir at the Lake. He proposes her to swim. The player must choose to have sex or not with him. The scene examines the sensuality but discomfort that results from a first sexual intercourse. It tackles the issue of consent and disillusionment. Following this encounter, Muthoni sends a message to Gloria. The player must write it, as an encouragement to formulate the fears and desires she might feel in such a situation. At the end, the lake overflows. Muthoni finds refuge in her room. When she comes back outside, she is ready to discover the real world, strengthened by her experiences at the Lake.

KEYWORDS

Prevention; teenagehood; consent; exploration; parallel and possible world.



THE LAKE

together on the Lake

2 | AMANI, MY FRIEND

Bellon-Serre Paul, Michel Chloé, Oros Alejandra

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Contact: alejandra.oros@etu.hesge.ch

ABSTRACT

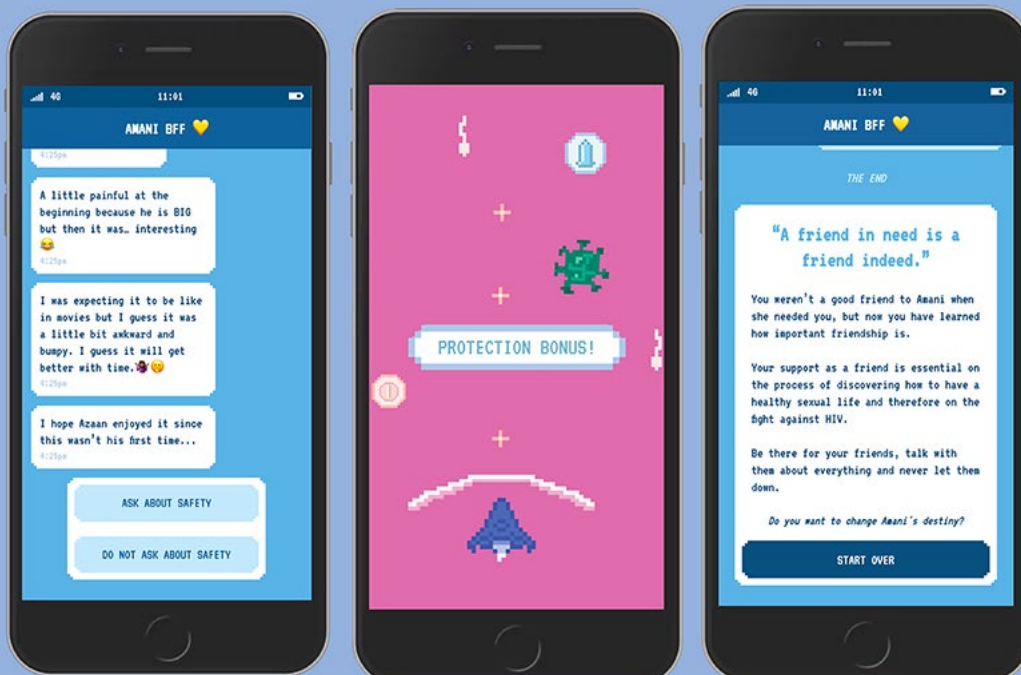
“Amani, my friend” is a mobile game created by Alejandra Oros, Paul Bellon-Serre and Chloé Michel, Media Design master students at HEAD, with the help of Josephine Odhiambo, sexual health activist in Kenya. The game was designed as a response to #GenEndIt necessity to address, in an innovative and interactive way, HIV prevention and sexual health matters targeting 15-to-24-year-old women living in Nairobi.

“Amani, my friend” tackles the taboos among friends as an obstacle to knowledge about sensitive sexual health-related subjects. Through an interactive narration and a series of arcade-inspired mini-games, the story highlights the importance of communication and support in one’s ability to have a healthy sexual life. The player’s choices will take Amani into different story paths that could have long-lasting consequences on her life.

The game has the potential of referring to various subjects such as abortion, sexual orientation or pleasure thanks to new narrations. Conceived as a safe space for the player, it allows to keep track of local health resources which can be found in the game and are only accessible with a password thus avoiding gatekeepers’ surveillance.

KEYWORDS

HIV; SexEd; Prevention; Taboo; Friendship; Relationship; SafeSpace; Kenya; WomenHealth; SexualRights; HumanRights; empowerment.



Amani,
my friend.

An interactive
narration that shows
the power of friendship
on Sexual Safety.



3 | INVESTIGATING THE ROLE OF THEORY OF MIND ON STRESS AND ADAPTIVE BEHAVIOR WITH VR

Monnor Teerawat^{1,2}, Vaillant Adèle², Barre Maxime², Hamon David², Tisserand Yvain^{1,2}, Rudrauf David^{1,2,3}

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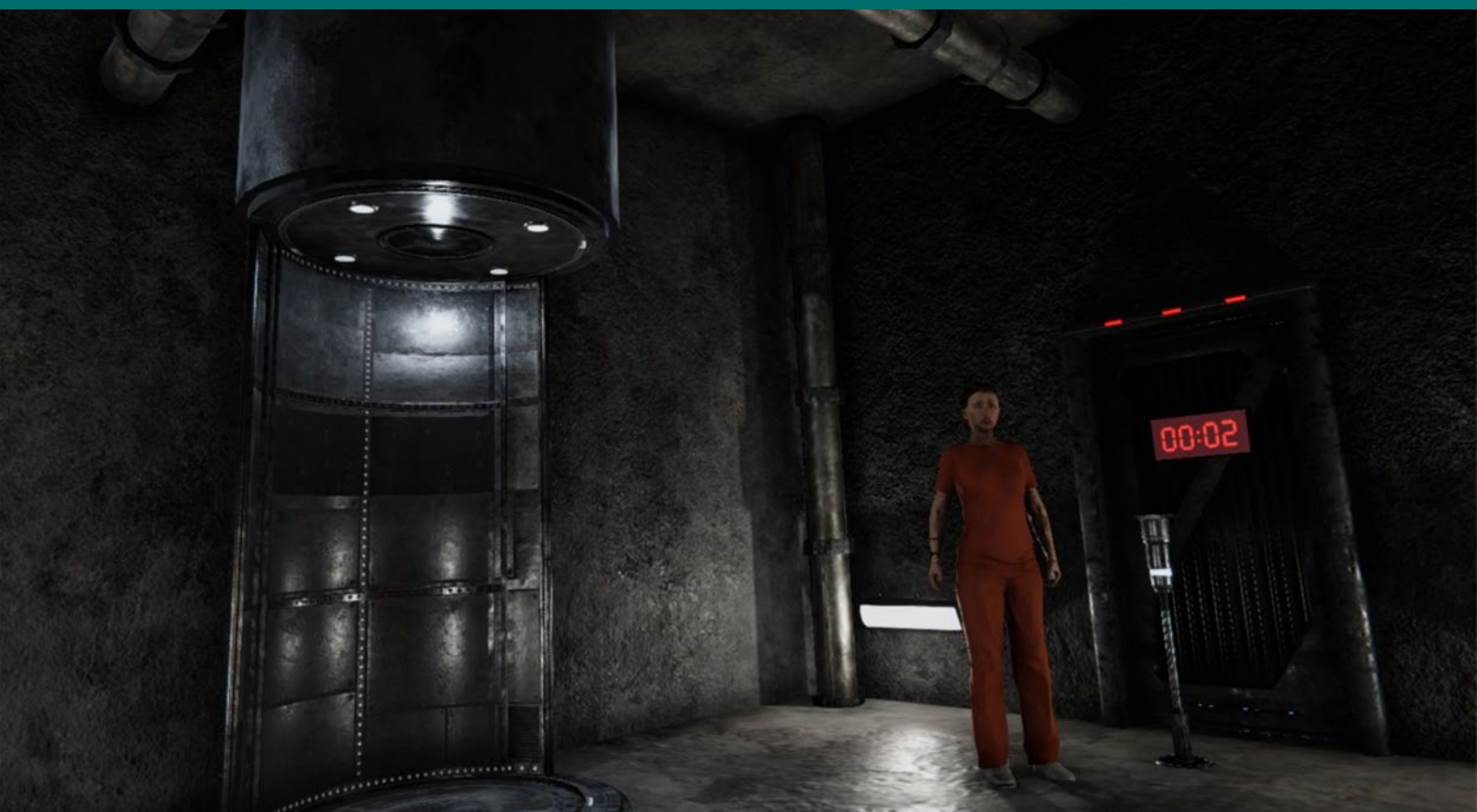
Contact: teerawat.monnor@unige.ch

ABSTRACT

We develop a VR protocol for psychological research to assess how the use of contextual cues (given by another person) can help regulate emotions and program action. The player must go through multiple rooms to deactivate bombs and consequentially rescue hostages. Different means and number of cues helping identify the right switches to deactivate the bomb are differently provided across the rooms. The hypothesis is that an individual with a better capability to acquire information through social necessary cues to perform theory of mind (ToM) demonstrates a better performance. Better performance is defined along/by two dimensions: a better emotion regulation (quantified through subjective ratings and physiological data) and a higher success rate. The results provide insights into mechanisms which underly the role of social-cognitive abilities that regulate emotion in stressful situations.

KEYWORDS

Theory of mind; emotion regulation; appraisal; stressors; stress.





TRAINING | ONLINE SESSION

THURSDAY 1 JULY
14:00–15:30



ALEXANDRA ZAHARIA



TOMÁS HENRIQUES



OLIVER LIECHTI

4 | PLAY WITH YOUR EMOTIONS: BOARD GAMES TO SUPPORT AND TRAIN EMOTIONAL SKILLS

Zaharia Alexandra^{1,2,3}, Sander David^{3,4}, Samson Andrea C.^{1,2,3}

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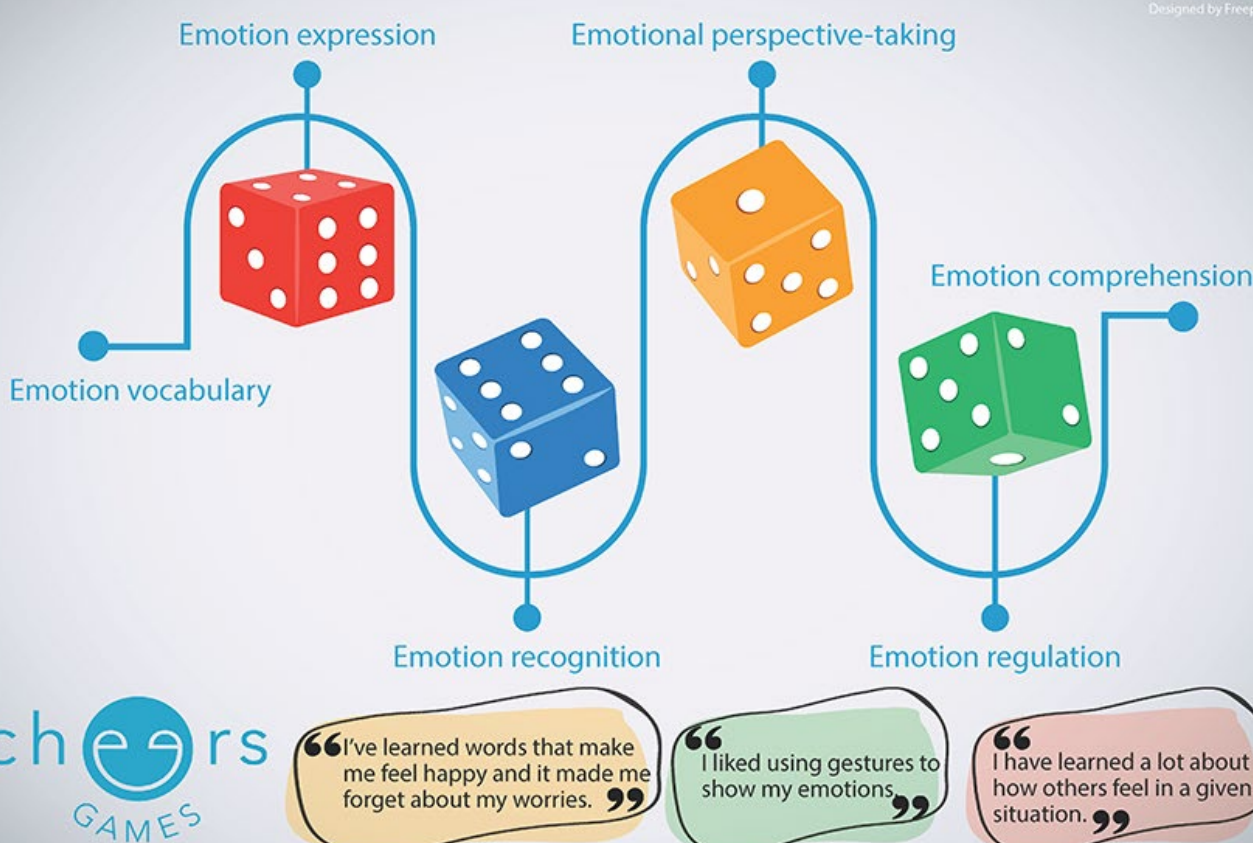
Contact: Alexandra.Zaharia@unidistance.ch

ABSTRACT

Board games have a powerful learning value through design and mechanics. They have the potential to promote emotional competence (EC). However, research in this field is scarce. Two board games, focused on EC (e.g., emotion recognition, expression), were designed to support EC and provide new tools for practitioners. Seventy-five children (10-12 y/o) have tested the board games. The players' game experience was marked by high positive emotions, flow and immersion. The performance on emotion recognition was positively associated with players' EC levels as measured with standardized tasks. The performance on emotional perspective-taking was predicted by the frequency and enjoyment of playing board games in their free time. Players' feedback indicates that the games dug through the emotional vocabulary and helped them understand others' perspectives. The games are currently tested in an intervention study aiming at reinforcing teenagers' EC and helping their transition into professional life. The demo will show the advanced board game prototypes and the mechanics challenging the players' EC. Our game design and edition collaborator is "Entrée de Jeux" (La Chaux-de-Fonds, CH).

KEYWORDS

Board games; emotional competence/skills; emotions; education; psychology; affective sciences; psycho-educational intervention.



5 | SPRING CONTROLLER

Henriques Tomás

CoreHaptics LLC, corehaptics.com, Williamsville, United States

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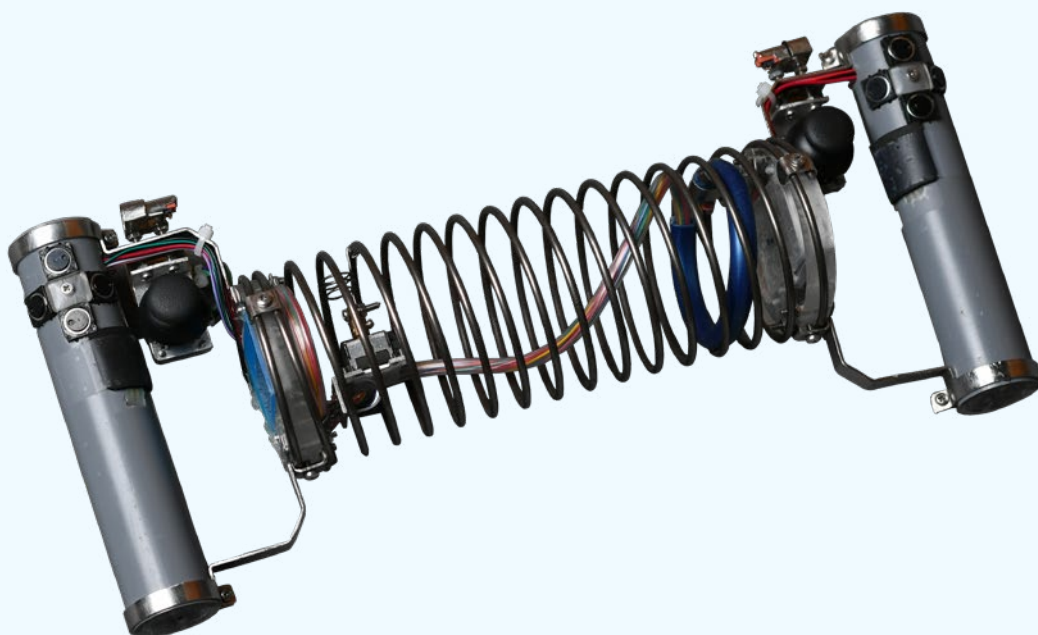
ABSTRACT

The SPRING Controller is a new interface for spatial manipulation of 3D objects. It offers intuitive, hyper realistic mimetic control, ideal for character-animations, creative game design, as well as applications in VR and training-simulations. The controller combines force feedback with hand- and wrist-driven motion, being built around a spring placed between its two handles. The interface design introduces a new, hand-linked paradigm where the spring embodies the physicality of the virtual or real object to be manipulated. The user of the SPRING Controller feels as if he/she was actually holding and manipulating three-dimensional objects, where changes in the spring's physicality – its shape, are intuitively translated into their physical and motion change. The spring can be stretched, squeezed, bent and twisted in many different ways. The kinesthetic and visual elements at play share the same two-handed manipulation origin, whose simplicity and directness are strong attributes as a device for Human Computer Interaction.

Two games – “Shape Fitter” and “DragonFly Space”, created to showcase the new controller features, will be used to demo it.

KEYWORDS

Human-computer interface; tangible interaction kinesthetic feedback; 3D motion; simulation; game design.



6 | AGILE BOOSTERS: GAMIFICATION CAN HELP SOFTWARE DEVELOPMENT TEAMS IMPROVE

Liechti Oliver

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ABSTRACT

Software engineering is often described as a craft, which highlights the importance of human factors in this domain. Driving the behaviour of teams has a huge impact on innovation, quality and speed.

Hence, software development is a collaborative activity that can greatly benefit from gamification. This resonates with agile methods key principles: feedback, continuous improvement and experimentation.

In this session, we demonstrate gamification tools and techniques that we have developed and deployed in the field for the last 10 years, in several countries and organizations. We explain how these systems have had a measurable impact on software development teams.

We use these interactive systems to describe the anatomy of "Agile Boosters", which rely on the data extraction, domain-specific modeling and appropriate representations. This work draws on extensive research in "awareness", a key concept in Computer Supported and Cooperative Work.

KEYWORDS

Software engineering; software analytics; agile methods; awareness.

Agile Boosters: gamification can help software development teams improve

Olivier Liechti, Avalia Systems SA
olivier@avalia.systems



Trigger change
The team sets improvement goals



Provide feedback
Progress is visible in abstract views



Celebrate success
Short, focused campaigns are effective



HEALTH I | ONLINE SESSION

MONDAY 5 JULY

14:00-15:40



HUGO NAJBERG



DOMINIQUE CORREIA



JOHAN JAQUET

7 | THE DINER: GAMIFIED RESPONSE TRAINING INTERVENTION FOR BEHAVIORAL CHANGE

Najberg Hugo, Rigamonti Maurizio, Spierer Lucas

Neurology Unit, Faculty of Science and Medicine, University of Fribourg, Switzerland

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ABSTRACT

We present 'The Diner', an online intervention for behavioral change delivered through videogame. Our software implements motor inhibitory control and attentional bias modification tasks, whose repeated practice results in the devaluation and in turn a reduction in the consumption of the trained visual food items. Playing our game results in a diminution of the liking of the unhealthy items without even being aware of these changes. Our approach thereby circumvents the self-control effort required by traditional restriction-based approaches. Gamifying the tasks at a professional level was used to improve adherence to the intervention. We included: multiple rewarding (aesthetics, feedbacks, social features, extended gameplay), full logging, adaptive configuration, and progressive difficulty levels. Preliminary results on 100 players demonstrate a 20% reduction of the target item liking in 95% of the players after a total of 6 hours of practice over one month.

KEYWORDS

Inhibition; health habit; training; valuation; food; videogame.



0 | GAMIFICATION & PATIENTS' RIGHTS: A SERIOUS GAME FOR STUDENTS IN HEALTHCARE

Correia Dominique¹, Jaccard Dominique², Songuel Yavavli¹, Bonnard Delphine¹, Bielser Félicia¹, Monaco Pierre-Benjamin², Monnier Sandra², Audrey Huguenin²

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ABSTRACT

Digitalisation leads to new caring modes but as well as teaching and learning ones. The “Patient's Rights & Innovative Teaching Strategy” (PRITS) project aims at developing a Serious Game to support students in learning about patient rights. Thus, the law must be more accessible for those future healthcare professionals who will apply legal rules in their daily lives. This serious game should raise awareness, increase student motivation, facilitate the capacity development to apply knowledge as well as broaden the pedagogical options for patient rights education. This project is taking shape through a multidisciplinary design and development team bringing together health, law, pedagogy and engineering. From a methodological point of view, an authoring system allows the whole team to develop the serious game simultaneously, thus facilitating co-creation. Patient rights issues are implemented in the game as scenarios and are illustrated by dialogues between a health professional and a patient. By offering possibilities such as interactive narrations and direct feedback, the simulation allows students to be immersed in professional situations that are relevant to patients' rights.

KEYWORDS

Healthcare; Law; Serious Games; Gamification; Pedagogy.



9 | CA FAIT PLAIZ!? A TABLETOP GAME KIT FOR YOUTHS ON ADDICTIONS & RISK BEHAVIOURS

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ABSTRACT

Over the past decades, serious games have gained credibility as education and communication tools notably in the field of health promotion. The present project aims at helping social workers of “Addiction Neuchâtel”, a specialized institution, to address addictions and risk behaviours. Members of the prevention team are using a kit of tailor-created games to discuss these themes with class-sized groups of adolescents. One of the objectives was to address a wide range of youth activities - including screen-driven activities - with a non-digital approach, namely tabletop games. We will present a prototype of the kit named “Ca fait plaiz!?”, containing one standalone board game and one narrative game facilitated by social workers. These games represent teenagers’ choices of activities, as well as concepts such as pleasure, popularity, motivations, balance, risks, addictions, consequences, as well as internal and external resources. Our kit is appreciated by users as a novel and accessible means of discussing those concepts and their complex interactions.

KEYWORDS

Serious game; Tabletop game; Health promotion; Education; Prevention; Addiction; Risk behaviours; Adolescents.



10 | NURSING STUDENTS' PERCEPTIONS DURING THE LOCKDOWN AT HOME

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ABSTRACT

Serious games (SG) were at the heart of the educational system to ensure continuity in the training of French nursing students (NS) who were teleworking during the COVID-19 pandemic. SG are represented by this collection of 35 virtual care situations (VCS) (figure 1) addressing all promotions, was set up free of charge to ensure pedagogical continuity for all French nursing willing schools. During each VCS, that follows the patient's clinical pathway, learners converse virtually with the patient, mobilize knowledge to elaborate their clinical reasoning, perform clinical examinations and solve different quiz-based tasks and questions that will constitute an overall score through computer traces. An anonymous online questionnaire was set up to assess the perception, the motivation to learn on SG and the satisfaction of the students who used this collection during the lockdown. 1363 NS were included in the study (85%) and only 493 students declared using SGs (36.2%) during the lockdown at home, the others were in clinical practice. Independently of NS who used SG, all responding NS were motivated to learn on SG: $M=65.2\%$ ($SD=22.4$) $p<.001$ ($n=1363$). 88% of NS ($n=119$) declared "agree" to "totally agree" that using SG would help to reinvest knowledge in clinical practice and would reduce the stress before arriving at the clinical practice. SG is well perceived as an additional pedagogical tool to nursing education independently of the students who used tested this collection of VCS during the lockdown at home.

KEYWORDS

Nursing student; remote learning; Perception; Serious game; Motivation; Educational continuity.





HEALTH II & III | ONSITE SESSION

THURSDAY 8 JULY
10:00–17:00



FERNANDA OLIVEIRA



YASSIN REKIK



MOHAMMED MOUHAQUI



ALICE H. AUBERT



ALBERTO PARADA



CHRISTOS GOUMOPOULOS



LOÏC BERTHOD

11 GAMES FOR THE COGNITIVE ASSESSMENT OF OLDER ADULTS

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ABSTRACT

Cognitive Screening Instruments (CSIs) are used to diagnose neurocognitive disorders. Previous studies have investigated the potential of games as alternative tools to perform a cognitive assessment. Correlation with traditional methods shows promising results; however, challenges to design and develop fun and engaging games while focusing on accurate diagnosis remain open. This article introduces CogWorldTravel, a game-based CSI focusing on the attractiveness to older adults.

KEYWORDS

Serious games; healthcare; cognitive assessment; cognitive screening instruments; older adults.





CONTEXT

Over the past 45 years, several Cognitive Screening Instruments (CSIs) have been developed and extensively researched. Among many other reasons, instruments variants were proposed to facilitate quicker administration, assess a broader range of cognitive domains, adapt to different target groups, translate to other languages, improve screening performance, and address omissions [1]. With the increasing technological advances, tests also evolved to electronic versions. Many advantages are associated with the use of digital tests: reduced staff time and cost, higher reliability and clinical efficiency thanks to the adoption of automatic scoring, the possibility of remote administration, and suitability for frequently repeated assessment [2]. Ultimately, serious games have been investigated as a promising approach to improve cognitive screening. Beyond sharing the same advantages as electronic versions of classical CSI, the use of game elements can encourage (and persuade) to undertake the assessment by offering a “gameful” experience while collecting precise data [3].

TARGET ISSUE

Using games for cognitive assessment is still a new field of research. Most previous studies have adopted an exploratory approach and investigated the feasibility of using such a tool for cognitive screening purposes. A mix of well-known and non-conventional games was used in the studies [3]. However, both game types are associated with great challenges. On the one hand, commercial or well-known games designed for other purposes do not address CSI requirements. In addition, they do not necessarily take into consideration the age-related changes of older adults. Older adults, who are at a higher risk for the onset of neurocognitive disorders, are the ones who CSI need mainly to target.

On the other hand, bespoke games offer the freedom to include any design requirements but often at the cost of fun and engagement. The design and development of ideal games remain an open challenge. Identifying the factors that increase adherence and make the game more attractive to older adults while keeping a strong focus on accurate diagnosis is still worthy of investigation.

PROPOSED SOLUTION

We propose CogWorldTravel, a serious game that screens for the early signs of neurocognitive disorders in older adults. The game approach is twofold:

- Designing an engaging and appealing game for older adults,
- Satisfying the requirements of an effective CSI [1].

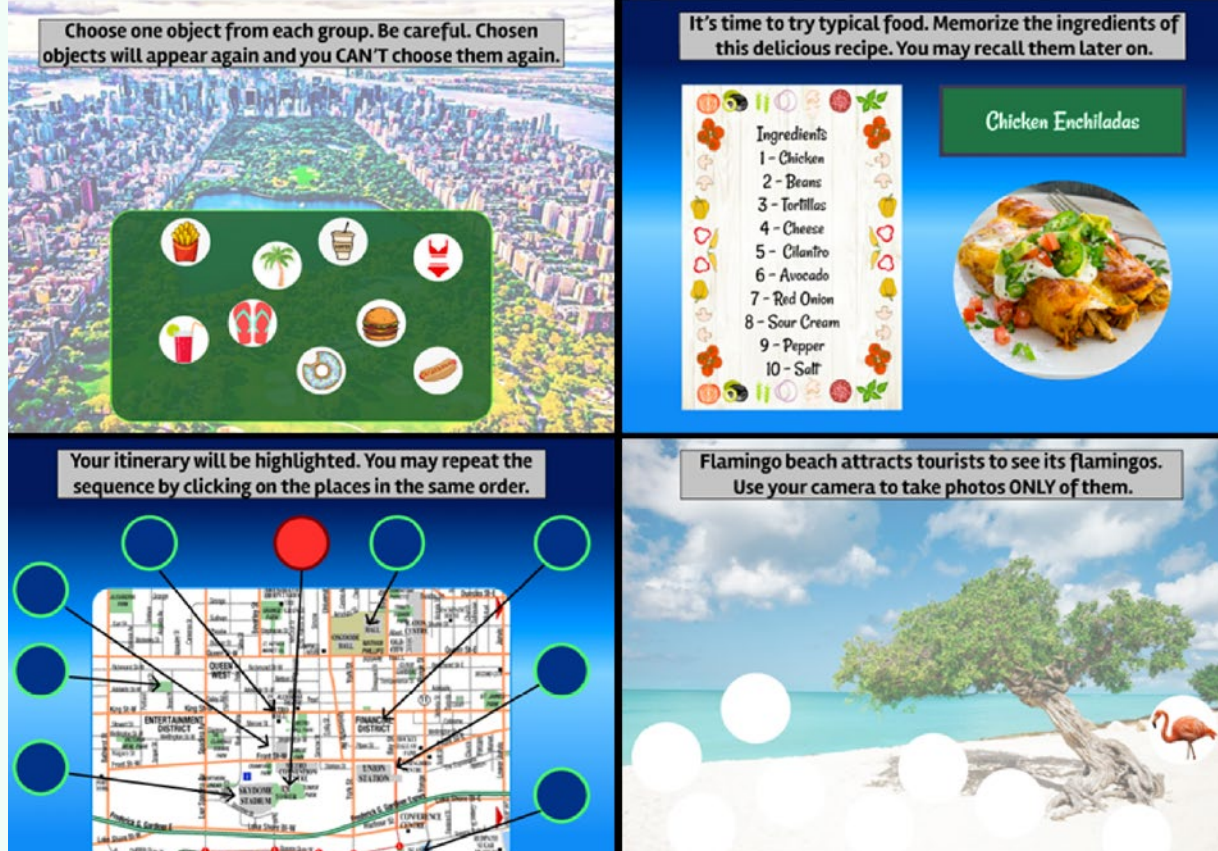
We chose slower-paced game mechanics with some intellectual challenge. As many older adults present difficulties in their hearing, vision, cognition, or mobility, the game is designed using great color contrast, adapting the font size, reducing movement control complexity, and avoiding cognitive load. The proposed game also includes samples from major cognitive domains: Complex attention, executive function, learning-and-memory, language, and perceptual-motor are all addressed by at least one of the mechanics included in the game.

RELEVANT INNOVATION

CogWorldTravel is a serious game as an alternative CSI with an original story. The game has Linda as main character, who just retired after 30 years as a successful accountant. After so many years of dedication to her career and beloved family, she feels it is the good time to look after herself, and she plans to travel around the world. Linda invites the player to come along in this adventure. Traveling is a theme most people enjoy and accept. The connection that the player might feel with the character's story and its

*We propose
CogWorldTravel, a
serious game that
screens for the early
signs of neurocognitive
disorders in older adults*





valued traits can increase engagement. CogWorldTravel goes beyond the infusion of game-like mechanics in digital tests; it is a full-blown game with a story progression that includes traveling within 46 countries on six continents. Traveling around the world is fun but nevertheless expensive. The travelers must watch out for the budget, plan the next moves, and solve challenges to make money and be able to carry on with the trip. The design focused on the elderly preferences and age-related changes to provide a pleasant experience while measuring cognitive functions.

PROJECT OUTCOMES & RESULTS

Eight game mechanics were designed to measure cognitive performance. “Local Culture” is inspired by the Warrington Recognition Memory Test and assesses discrimination between old and new culture-related items [4]. “International Cuisine” is based on Verbal Learning List Tests, where the player learns a typical recipe to be recalled later in “Family Call”. Delayed recall and recognition memory are two important parameters of episodic memory [5]. Language Lesson tests language abilities in a contextualized word generation activity. “Touristic Attractions” is inspired by the Corsi Blocks Test and involves memorizing the order in which places are shown on a map. It is used to measure visuospatial short-term memory. Executive control is required when sequences are in reversed order. The “Native Fauna” is inspired by the “Whac-a-mole” arcade game and the Wisconsin Card Sorting Test. While the player takes pictures of wild animals as they pop up in the scenario, reaction time is recorded as it measures the information processing speed and is used in a variety of mental activities to provide important information about cognitive efficiency [6]. “Packing Time” involves visual-spatial problem-solving and motor coordination skills as the player organizes Tetromino-shaped clothes. “Luggage Tracking” is designed to boost scoring and unlock other destinations while testing selective visual attention, which is the ability to select information among other visual inputs.

CONCLUSION

This article presents an original game that collects important information about older adults’ cognitive performance while offering them a fun activity. Game mechanics are adapted from validated and well-researched neuropsychological tests and immersed in an engaging trip around the world.



PERSPECTIVES & NEEDS

Continuing this research includes experimental studies to evaluate CogWorldTravel validity as a CSI. To incorporate the game in practices detecting neurocognitive disorders, we still need to define the psychometric properties. In addition, analyzing the game acceptance by older adults is of paramount importance for us to identify what motivates them.

ACKNOWLEDGEMENTS

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12 | AR GAMIFIED SOLUTION FOR HUMAN SKILLS TRAINING

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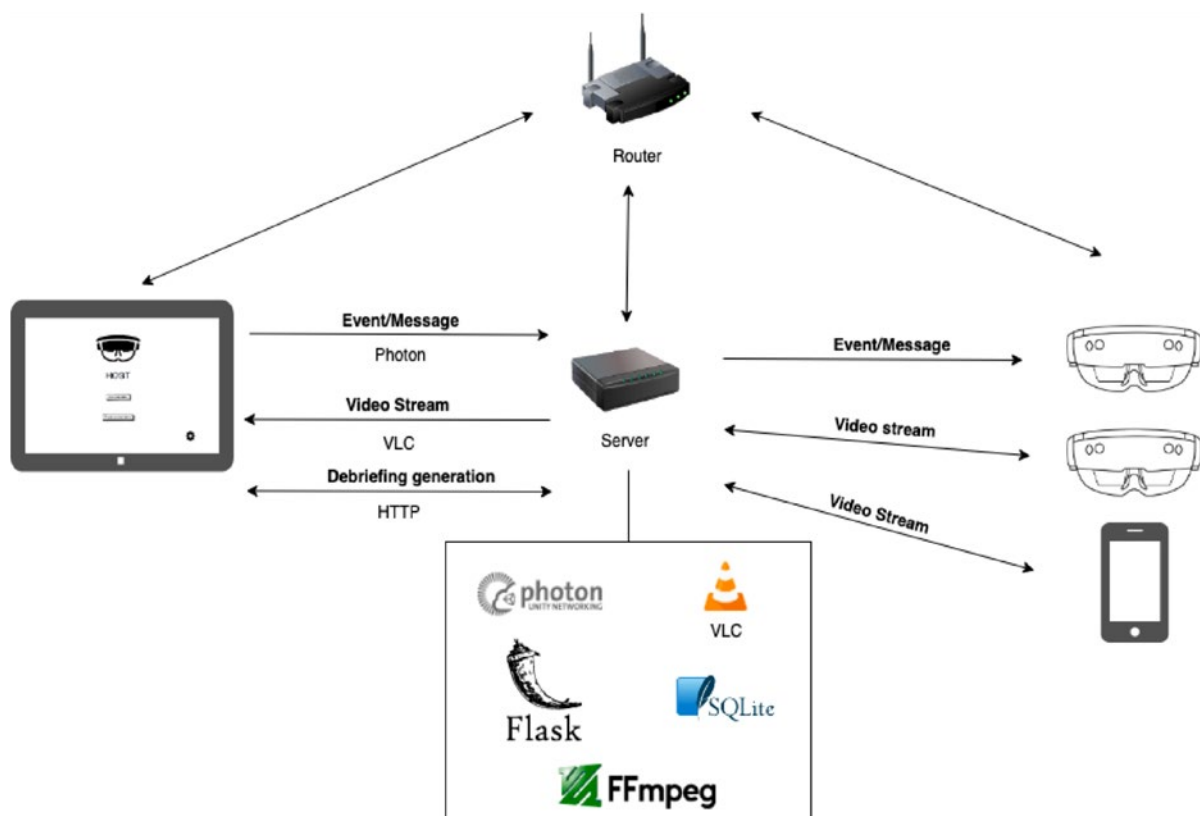
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ABSTRACT

This paper presents the intermediate results of the HOST project (Human & Organizational Skills Training) which transforms an existing gamified training method for medical staff, into a richer, more efficient and more immersive version. The initial method is based on simulating childbirth in an airplane, with a real setting, real actors, and real puzzles to be solved in a stressful situation. The HOST project transforms the decor, the actors, and the puzzles into their virtual equivalents, using Unity game engine, augmented reality and Hololens glasses. We also added monitoring and debriefing capabilities, which did not exist at the start.

KEYWORDS

AR; Escape room; Hololens; Human Skills; Training.





CONTEXT

In recent years, a team at the HUG (Hôpitaux Universitaires de Genève) has implemented an innovative training method to strengthen the human aspects of medical staff. This method is largely inspired by the concept of “Crew Resource Management” used in civil aviation and is based on 2 pillars, an operational and a relational one. This second aspect works on the analysis of the conditions for success through the composition of teams and their personal characteristics. The operational aspect is enhanced by the presentation of practical tools which can be used to strengthen communication and interdisciplinary collaboration. Finally, the method simulates childbirth in an airplane, with a real setting, real actors, and real puzzles to be solved in a stressful situation.

Despite the good results and the very encouraging feedbacks about this method, two main limitations have been detected. The first one are the logistical constraints due to setting a training session: The installation of the decor, the selection of actors, and the elaboration of the puzzles represent a significant investment, difficult to reproduce at high frequency. The second limitation is linked to the participants’ immersion level in the training scenario. Indeed, the rudimentary decor and the frequent interventions of the moderators break the immersion and reduce the training efficiency.

TARGET ISSUE

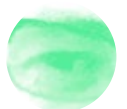
The objectives of HOST project is to tackle the limitation detected by moderators during last training sessions. The main limitations can be enumerated as follows:

- › Lack of autonomy: The participants don’t discover the situation on their own. They watch a video that explains the context and what they need to do. In a more realistic situation, participants would discover the problem on their own and try to come up with a solution.
- › Not realistic enough decor: The current decor consists of tables and chairs, which is not very realistic and doesn’t bring enough immersion.
- › Regular interruptions: The moderators often interrupt the game to guide the participants and thus considerably reducing game immersion.
- › Moderators can’t enter in direct contact with the actors to direct them without interrupting and giving away their inputs.
- › Moderators don’t have a contextualized way to take notes. The debriefing is oral. Participants might have issues remembering or relating to a specific point.

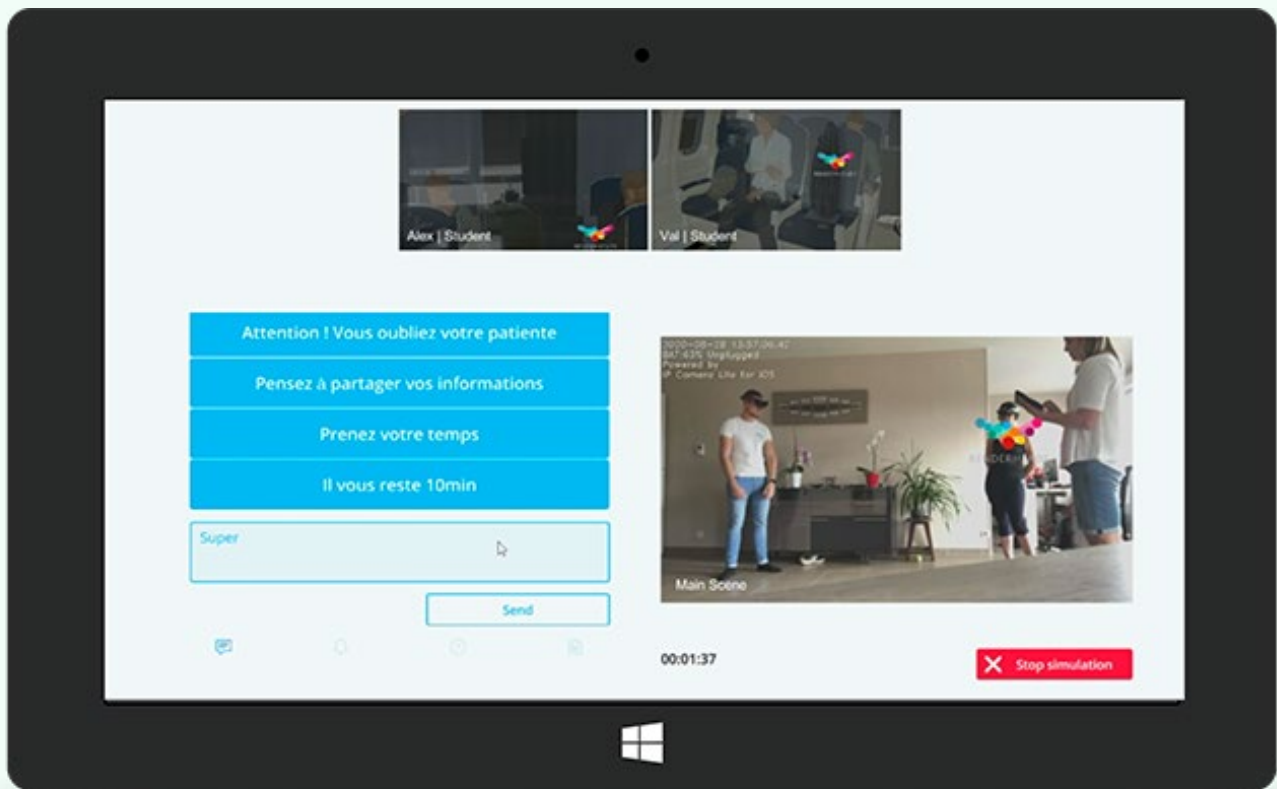
PROPOSED SOLUTION

In order to enhance the participant immersion, the project HOST aims at developing a multi-user augmented reality app allowing to substitute the decor and the actors by virtual ones. With this app, participants will still be able to see each other and communicate directly, but with enhanced view through the use of Hololens headsets. The Hololens allows participants to visualize the plane, the passengers, the patient, and virtual enigmas to be solved.

The HOST project aims at building Augmented Reality solutions for human skills training based on gamified scenarios involving puzzles and enigmas



The second aspect of HOST project is to enhance immersion by avoiding the animators’ interruptions and direct interventions. To achieve this goal, we developed a tablet-based monitoring app allowing any monitor to supervise participants by sending them text messages, audio messages, displaying hints and indicators, and activating predefined events within the scenario (passenger moves, captain messages, etc.).



Finally, the monitoring app will be able to record important events and comments during the training session and generate PDF files and/or a video listing all these significant moments. PDF and video files can then be used during debriefing sessions or later for personal training.

RELEVANT INNOVATION

The HOST project integrates several innovations. The training method is the first: The aerospace-inspired method has been adapted and extended so that it can be used for the training of hospital staff. Based on an “escape room” approach, this method is a gamification of a stressful situation simulation that allows training on important aspects such as communication, organization, prioritization, task distribution and coordination. The second innovation is technological with the transformation of the whole real training environment into its virtual equivalent reinforced by rich communication and supervision functions. Finally, the whole solution has been designed and developed in a generic way so as to ease the extension of other decors, the integration of new puzzles, and the addition of new supervisory functions.

PROJECT OUTCOMES & RESULTS

Currently, HOST solution is composed by three main components. First, a Unity app running on Hololens and allowing participants to view virtual decor, virtual actors and virtual enigmas as well as to view messages and animations sent and activated by moderators. This app communicates using Photon API with the moderation app as a second component, which is a Unity app running on tablet and enabling moderators to visualize the whole training setting by watching the video streams of all connected Hololens and acting on the training session by sending text messages or audio messages, triggering animations and hints on the Hololens app, and pointing important events or actions. Finally, a media server runs on a distant server and is responsible for encoding and sharing all the video streams as well as all the exchanged information. The whole solution is running on a local network independent of any external API or services, which eases its use and deployment in any context.

This solution is currently used and is being tested within the HUGs. We aim to assess its acceptability by users. Our short-term goal is to use the test feedback to develop a new improved version in terms of robustness, realism, immersion and scalability.



CONCLUSION

The HOST project aims at building Augmented Reality solutions for human skills training based on gamified scenarios involving puzzles and enigmas. The project involves several conceptual and technical challenges. Currently, an integrated solution has been developed and is tested with real end users at HUG. A request to the HUG foundation was formulated and submitted to finance a second version of HOST solution, based on the current evaluation and testing.

PERSPECTIVES & NEEDS

We are currently waiting for our application review of the HUG Foundation. In case of a positive answer, a second version of HOST will be developed to reach a high level of robustness, a total packaged solution with an easy deployment and a better acceptability level.

ACKNOWLEDGEMENTS

Many thanks to the HUG, and especially to Dr Marie Saint-Faust.

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13 | A NEW CONCEPT OF SIMULATION IN HEALTH GAMIFICATION: THE SIMCUP

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ABSTRACT

We no longer need to demonstrate the interest of simulation in health, especially in emergency medicine as it allows the acquisition of technical and non-technical skills. In order to better spread this technique throughout Morocco, we created a competition in the form of a health simulation championship between medical students, which allowed the adoption of this educational technique as a reference in all universities.

KEYWORDS

Simulation in health; Competition; Evaluation; Training.





CONTEXT

Simulation in health is an innovative teaching technique that complements traditional teaching techniques. It allows the learner to immerse himself in a real situation, of course, but without endangering the patient; this can be done with a high-fidelity manikin or a standardized patient. The scenario is divided into three parts: briefing, scenario and debriefing. The simulation in health knew a craze from the students but reluctance persists. In order to remove this apprehension, we created a game that simulates a health competition, opposing different teams from different Moroccan universities: the Simcup. The Simcup makes it possible to compete on increasingly difficult scenarios and allows the acquisition of all the necessary skills to manage a potential real situation. The Simcup was first imagined in a single university, but after its incredible success, it included regional and then national qualifiers.

Consequently, learning takes place in a competitive, but pleasant framework, .

Finally, each year, a sports theme is given to this competition, such as football, taekwondo or judo, thereby increasing the level of gamification.

TARGETED ISSUE

This study objectives are:

- › The creation of a health simulation competition, where the format, teams, moderators, judges, clinical cases and winner were defined;
- › The definition of the necessary logistic to develop the different scenarios, for example the manikin nature, the judges and hearing location, the audio-visual aspects and the accessories;
- › The study of the Simcup professional impact on the development of the participants' career, their technical and non-technical skills acquisition as well as the degree of realism and satisfaction.

PROPOSED SOLUTION

The Simcup is a health simulation competition on the topic of emergency medicine. It is organized on two main phases: the regional phase and the national phase. The regional phase takes place at the level of each university, seven in total. Each regional competition brings together 8 teams, which play knockout matches: quarter-final, semi-final and final. Each regional competition winning team is qualified for the national tournament, with 8 teams. In fact, the city hosting the national competition has the privilege of participating with two teams. The national competition first goes through a phase of two groups, four teams per group, then the first two of each group meet in the semi-finals and the final. A match is a scenario played by two teams successively, without one seeing the other. Once both teams have competed, a public debriefing is carried out: a moment of much learning. The jury finally decides to give 3 points to the team that wins the match, 1 point for a draw and 0 points for the losing team.

RELEVANT INNOVATION

The gamification concept in health simulation is very innovative, Morocco being among the first countries to adopt this approach. The Simcup makes it possible to alleviate or even suppress the apprehension that young students have vis-a-vis simulation in health, because they always feel evaluated or judged. The competition concept puts students

in contact with their peers, in a very friendly setting, around a very sporty theme, making the competition more attractive (Figure.01). The choice of scenarios is not made at random, it is done according to a growing

The Simcup makes it possible to compete on increasingly difficult scenarios and allows the acquisition of all the necessary skills to manage a potential real situation





logic and in connection to each other. In fact, at the end of the competition, students will have the feeling of having followed a long emergency medicine show but in several episodes.

PROJECT OUTCOMES & RESULTS

The Simcup started in Morocco in 2014, first in a single university (Casablanca). In the first two editions (2014 and 2015), there were 16 teams of 3 students, 48 for each edition who competed around 18 different scenarios. For the 2016, 2017 and 2018 editions, there was first a regional competition in each university, comprising 8 teams of 3 students, i.e. 24 students and 8 different scenarios. For the national competition, there were 8 teams of 4 students and 18 emergency medicine scenarios (figure.02). In 2019, there was just one regional competition in one university, and due to the students' protracted strikes, the competition did not continue. In total, we have more than 384 participants and more than 154 emergency medicine scenarios. Finally, out of this group of students, 78% passed their medical internship vs 24% in the group of non-participants, the realism degree got 9.1/10 and satisfaction, 9.4/10.

CONCLUSION

- › The concept of Simcup has shown a threefold impact on:
- › The health simulation followers but also the reluctant ones, by insisting on the ludic scenario character and their applicability in real life,
- › The participants, because the Simcup helped to demystify their embarrassment and stress in front of their peers but also the audience,
- › Finally, on their own technical and non-technical skills and their future career.

PERSPECTIVES & NEEDS

Finally, we recommend the adoption of this gamification technique in health simulation in all specialties, as well as the creation of benchmarks and protocols to manage the competition, notably on the debriefings, which remain the key of this competition.



ACKNOWLEDGEMENTS

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- › Pr. Ahmed Rhassane El Adib, faculty of medicine and pharmacy of Marrakech
- › Dr. Mohamed Anass Fehdi, faculty of medicine and pharmacy of Casablanca
- › All my students and participants

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14 CREATION OF A BOARD GAME IN INTENSIVE CARE AND EMERGENCY MEDICINE

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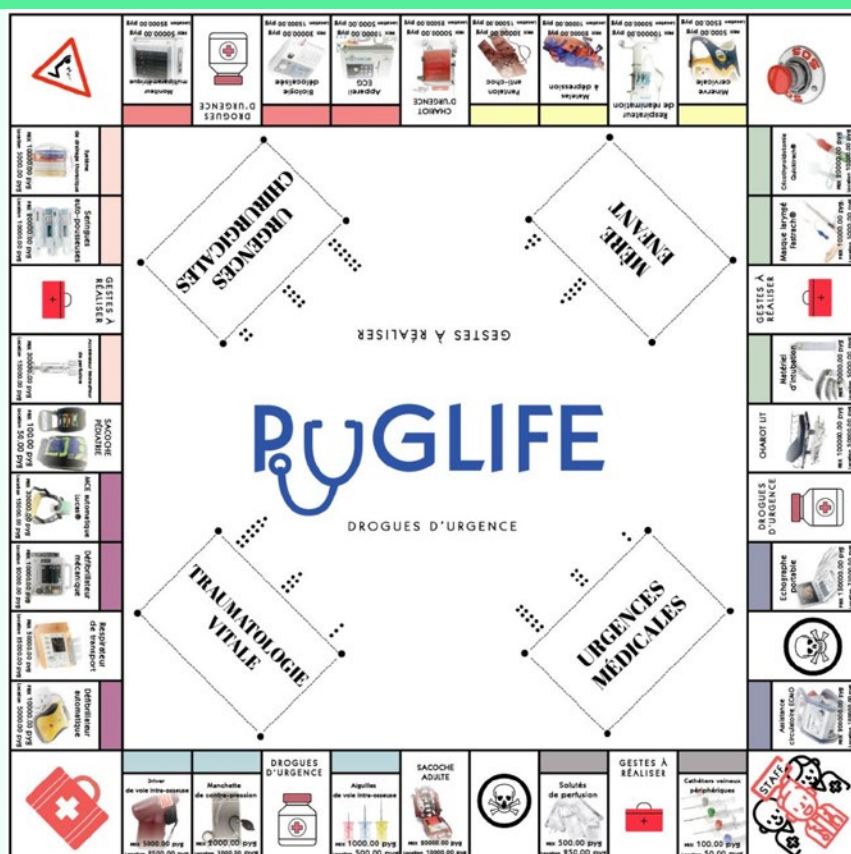
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ABSTRACT

Playing board games is a pleasant activity to reach specific objectives. This study was divided into two stages, the creation of the board game “The Pyglife” and the study of its impact. Over the 64 learners, the pre and post-test results were different, with an average gain of 4.81 points. 100% were satisfied and wanted to participate again. The goal was to create a learning game by a gamification process; “The Pyglife” is thus a motivating game that keeps its educational interest.

KEYWORDS

Board game; gamification; intensive care; emergency medicine; training; evaluation.





CONTEXT

In an unconstrained setting, games can stimulate decision-making processes and enrich teaching strategies. That is why games are increasingly used, not as a standard medical education tool, but above all as a supplement following the classic theoretical course, because these do not always reflect the complexity levels of the practical application in a real situation.

The current trend that using board games in medical education takes its primary advantage on the ease of their production and use compared to high fidelity simulators and serious games, also less time spent on instructor training and while giving the possibility to several students to join the same game, in order to promote inter-activities between the players, who once structured and guided by rules, and by adding a narrative and simulation aspect will have a positive impact in learning.

TARGETED ISSUE

The main objectives of this study were:

- › Create a new board game specialising in intensive care and emergency medicine while explaining the modalities of the game and the different phases of its preparation and creation,
- › Study its educational impact in terms of scientific relevance and contribution as well as different learners' satisfaction,
- › Propose practical recommendations adapted to our local context, regarding the use of board games in medical studies, and in different specialties,
- › Finally, propose intrinsic and extrinsic evaluation methods.

PROPOSED SOLUTION

Significant effort has been made to find questions of real interest to the learners. Often, they offer short clinical cases to resolve or describe technical skills or drugs that future practitioners will have to manage. The goal is not that students master the complexity of emergency situations, but to have the right foundations to start their professional life. To obtain a game as complete as possible, the modules were divided in themes: life trauma, medical emergency, surgical emergency, mother/child emergency, emergency drugs and technical skills (figure.01). Finally, and in order to familiarize future doctors to the different elements and materials of intensive care and emergency medicine, we chose the most relevant by giving them their importance in the course of the game. The course of a part of "the Pyglife" is relatively important, so we preferred implementing direct and short questions: questions related to severity scores or classifications, the result interpretation of paraclinical examinations and the definition of pathology or semiological signs. The questions falling under the theme "emergency drugs" are identical and relate to the main indications and dosage of the most used molecules in an emergency department. As for the last theme "technical skills", the questions are, as the title suggests, on describing the steps of a routine technical skill in intensive care or emergency medicine.

*The Pyglife is...
a motivating game,
that doesn't lose its
educational interest*



RELEVANT INNOVATION

The cooperation mechanics want to provide users with the solution of a common problem. The goal being to share their knowledge and skills to outdo themselves. As we know, cooperation is an active teaching method (group work, discussion ...), and we will discuss its advantages in the first part of this manuscript methodology chapter. Moreover, it is an activity that strengthens the relationship between the participants and helps to improve the atmosphere in the group. Finally, with cooperation, the strongest pupils can help the weakest,



who will not be inhibited by a lack of skills. Furthermore, with the competition mechanics we want to encourage the participants' performance. It has several advantages: it improves team motivation, pushes players to excel and it promotes intra-team cooperation; so, players exchange even more to defeat the opposing team.

PROJECT OUTCOMES & RESULTS

Our sample includes 64 learners, medical students, with a 100% participation rate in the results of this study. The average age of our participants was 24.19 years, with a median age of 24 (a minimum of 23 and a maximum of 27). The majority of our participants (73.4%) were women versus 26.6% of men, with a sex-ratio of 0.36. The mean of the pretest was 9.25 out of 20 with a standard deviation of 3.55. These values are in the range between a minimum score of 3 out of 20 and a maximum score of 19 out of 20. The post-test average was 14.06 out of 20 with a standard deviation of 3.21. These values are in the range between a minimum score of 7 out of 20 and a maximum score of 20 out of 20. The difference in mean between the pre-test and post-test results in our sample shows a gain of 4.81 points. The progression between the pre-test and the post-test calculated from a bivariate correlation gave us a significant result ($p < 0.001$). Regarding the overall satisfaction with the teaching of intensive care and emergency medicine through the board game "The Pyglife", 100% of the participants were satisfied with the training (figure.02), all of them indicated that they wanted to attend other sessions of our game, 98% wanted to play extension versions of the game, also said that the simulation should systematically be a part of the initial training program as well as of the continuing learning of doctors.

CONCLUSION

This study objective was to create a learning game while respecting a rigorous gamification process. The method "GAME", developed by Muletier and coll., was chosen and adopted during the game creation process. "The Pyglife" is therefore a motivating game, that doesn't its educational interest. Certainly, very promising, and very complementary and even essential for medical pedagogy, they are not intended to replace bedside learning, nor theoretical teaching.



PERSPECTIVES & NEEDS

Our study allowed us to make some recommendations:

- › Promote the integration of the board game into the university curriculum.
- › Promote the creation of games in different departments and specialties.
- › Organize local or national competitions around this board game.
- › Organize training sessions through multidisciplinary games between different specialties.
- › Encourage teachers and students with gamification projects.
- › Promote gamification on a large scale in health promotion.

ACKNOWLEDGEMENTS

- › Dr. Salim Mazouz, Casablanca, Morocco
- › Faculty of medicine and pharmacy of Casablanca, Morocco
- › All of my medical students
- › Mr. Hafss, the designer

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SERIOUS GAMES AND GAMIFICATION PRACTICAL EXAMPLES FOR HEALTH

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ABSTRACT

Leader in tailor-made digital learning in France, My-Serious-Game has numerous references in the medical field. Some of these have been award-winning successes, such as its virtual simulation for nursing students, “IFSImulation”. During this conference, My-Serious-Game will present some of its best-case studies, from immersive 3D serious games to adaptive learning solutions and virtual reality simulators!

SHORT BIO

My-Serious-Game develops the technique of your employees, enhances their soft skills, facilitates the onboarding of newcomers and makes them aware of your values and goals. To achieve your objectives, we offer a wide range of innovative services and products: Serious Games, realistic 3D simulations, e-learning, rapid-learning, mobile applications, videos, gamification, adaptive learning, collaborative training, classroom solutions and even virtual or augmented reality... Established in 2014, My-Serious-Game has grown from an innovative and award-winning start-up to an international player realizing the vision of its customers in France and abroad.

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Sanofi, Bouygues, Vinci, Carrefour, the French Ministry of the Defense, Laboratoires Servier, the French Railroad Company, Fnac / Darty, Groupama, Crédit Agricole.

15 | GAMIFYING TO IMPROVE FACE-TO-FACE INTERVIEW ON LATRINE USE IN RURAL INDIA

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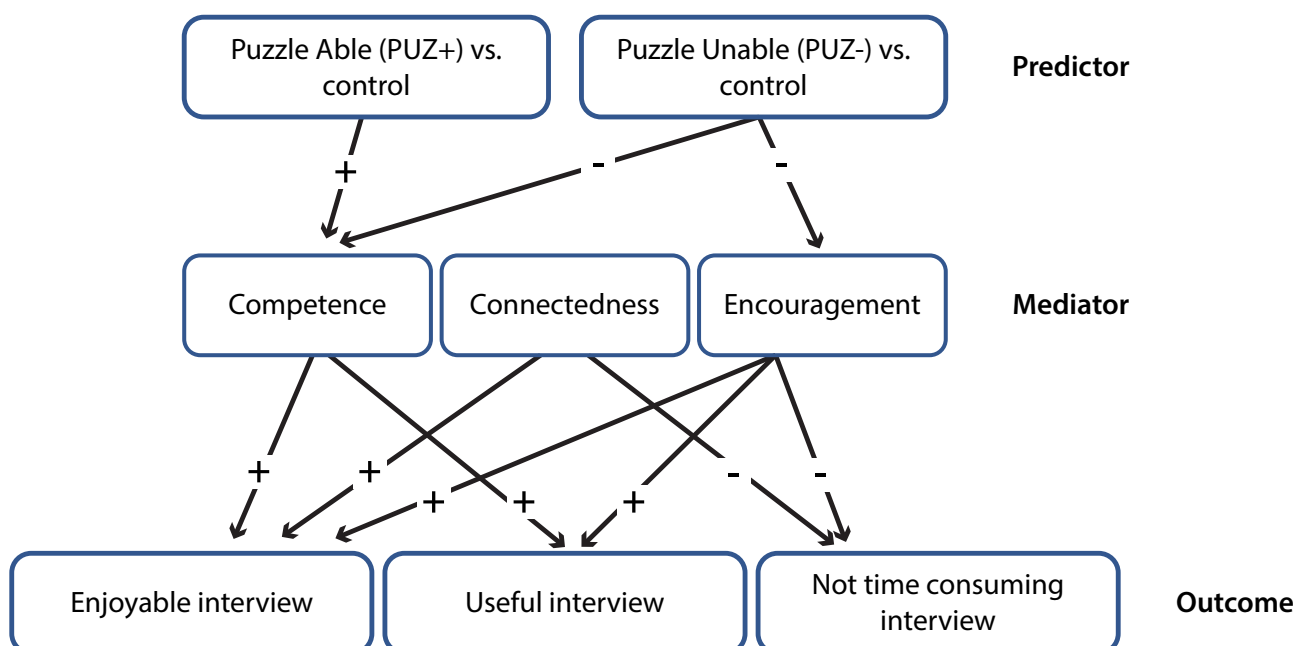
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ABSTRACT

Interviews are common to collect data e.g. in health research. Usually, these interviews are face-to-face standardized interactions between a data collector and a respondent. They can be lengthy and tedious, specifically if the topic is emotionally charged (e.g. defecation practice). To improve the respondent experience, we gamified such an interview by intertwining it to a puzzle. We share our experience and assess the gamified interview. Individual characteristics (e.g. ability to complete the puzzle) influenced the experience of the gamification, which otherwise had no effect.

KEYWORDS

Gamification; interview; sanitation; basic psychological needs theory; randomized controlled trial.





CONTEXT

In low- and middle-income countries, face-to-face interviews are common to collect data in social science and health research. Interviews are preferred as they bypass e.g. sometimes low literacy rates, or technological constraints. However, such interviews can be complex, long, on uneasy topics, for instance when measuring the achievement of sustainable development goal n°6 on the availability and management of water and sanitation for all.

Such 45-minute-long interviews were planned in the project Promoting Latrine Use in Rural India Using the Risks, Attitudes, Norms, Abilities, and Self-regulation (RANAS) Approach to Systematic Behavior Change [1]. A trained local data collector asked the questions on latrine use and RANAS approach, and entered directly the answer in a database. To improve the respondents experience during these 45 minutes, we gamified the interview.

TARGET ISSUE

The main purpose of the gamification was to improve the experience of the long interview on the uneasy topic of latrine use [2]. Importantly, in this work, gamification should not interfere with the interview's content about behavior change and latrine use. The interview main aim remained collecting the relevant data. Practically, the gamification should not relate to the topic of latrine use and should be punctual (not having long-lasting effects). In addition, it should not increase the interview length, be low cost, be easy to implement for the data collector, be accessible for all respondents (e.g. not requiring a minimum literacy level).

At the same time, we aimed to assess systematically the gamification. Based on the literature, we used the basic psychological needs theory. It suggests that fulfilling (resp. thwarting) the needs of autonomy, competence and relatedness increases (resp. decreases) the well-being and performance at tasks [3].

Specifically, our research questions read as follows:

1. Did respondents experience the interview positively (more positively than when it is not gamified)?
2. Was the gamification effect mediated by fulfilling competence and relatedness needs?
3. Was the gamification effect moderated by respondents' ability to complete the puzzle?

PROPOSED SOLUTION

Given the above-mentioned constraints and following Morschheuser's method for gamification [4], we proposed to intertwine the interview to the completion of a puzzle. After each section of the latrine use and RANAS approach questionnaire, the data collector gave a piece of an image to the respondent, thereby creating a break in the interview, and an exchange (relatedness) between the data collector and respondent. As the interview proceeded through the twenty sections, the image built up, thereby giving a sense of progress (competence). Finally, upon completion (competence), the image displayed a couple in a greeting/thanking pose, symbolizing the end of the interview.

After validation of the concept with the Indian partners of the project, the image was color-printed on A4 cardboards and cut into 20 regular square pieces of similar size. During the pre-test, we observed that some respondents faced difficulties – completing a puzzle for the first time. Instructions to the data collectors were adapted: they should help the respondents facing difficulties. The image was also adapted, adding a bird in a corner of the picture, i.e. on the first two pieces of the puzzle, to indicate that an image was building up as respondents received the pieces.

*... improve the experience
of the long interview on the
uneasy topic of latrine use*





RELEVANT INNOVATION

The gamification itself may not sound innovative: puzzles have existed for a long time, and their completion along with learning sequences as well. However, the innovation is the context of use: we transposed this educational practice to conducting interviews.

In addition, the assessment of the gamification was based on a randomized controlled trial. Gamification is rarely assessed with such big sample and against a control treatment. 1124 respondents from 120 villages in Raichur district, rural Karnataka, India took part in the gamified interview, and 142 in the control one. Details of the experimental design can be found in Aubert and Friedrich [2].

PROJECT OUTCOMES & RESULTS

First, respondents taking part in the gamified interview did not have a more positive experience than the respondents of the control interview did. The results of the mediation and moderation analyses carried out with SPSS showed the following. The gamification that we proposed did not have much effect on the feelings of competence and relatedness, contrarily to our expectations. However, fulfilling the competence and relatedness needs explained well the perceived experience (enjoying the interview, among others), supporting further use of the basic psychological needs theory. Finally, the effect of the proposed gamification on competence and relatedness depended on the ability of respondents to complete the puzzle. Not being able to complete the puzzle had negative effects on the competence and relatedness needs, which in turn had negative effects on the perception of the interview.

CONCLUSION

The proposed gamification of interview was promising yet should be optional: its effect depended on respondent ability, and could backfire. Specifically, if the puzzle completion challenges a respondent too much, despite the data collector support, the gamification should not be used further. Else, it might be counterproductive, as in our case for 16% of the respondents. This was also reported by others [5]. Easy improvements could be adapting the image and cutting it into irregular shapes.



PERSPECTIVES & NEEDS

We would like to highlight the prototype pre-testing usefulness, and the importance of cultural considerations for effective gamification design.

Further research is needed and we have proposed some ways forward [2]. For instance, targeting the need for autonomy and revising the questions used for the assessment. Measuring the experience of the data collectors, the quality of the collected data and testing the effect of another image are also interesting perspectives.

ACKNOWLEDGEMENTS

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16 | EMOTIONAL INTELLIGENCE: A SERIOUS GAME FOR BETTER PATIENT/DOCTOR'S COMMUNICATION IN MEDICAL CONSULTATION

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ABSTRACT

Medical training is a process that combines knowledge, know-how and interpersonal skills. Experience and expertise are necessary for doctor's medical training, but not sufficient.

Serious games allow experimentation, exercise and training. The serious game provides a safe and reflexive training, allowing repetition with simulated characters or avatars. "Never vital, on a real patient".

Emotional intelligence is a necessary skill.

Serious playing is dynamic and scalable. Flexible, it allows to define new (learning) goals and develops abilities by involving players (in developing game issues through their avatar and their own emotional intelligence, which is transposable and usable in their real medical consultation situation).

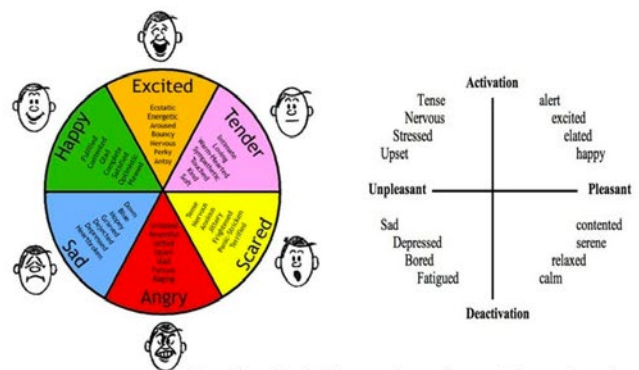
KEYWORDS

Emotional intelligence; doctor/patient communication; medical consultation; serious game; medical training; interpersonal skills; communication skills; immersive avatar.

brief overview of the relationship between the 5 facets of emotional intelligence and the 25 emotional skills identified

EMOTIONAL INTELLIGENCE	PERSONAL COMPETENCE	EMOTIONAL COMPETENCE IDENTIFIED
The way we behave ...		
1 / Self-awareness: knowing one's own inner states, preferences, intuitions and resources.		- accurate self-assessment; - Self-confidence.
2 / Self-control: knowing how to manage internal states, impulses, resources.		- self-control; - reliability; - professional awareness; - adaptability; - innovation.
3 / Motivation: the emotional tendencies that help us achieve our goals.		- the requirement for perfection; - commitment; - initiative; - optimism.
How to manage our relationships with others ...	SOCIAL COMPETENCE	
4 / Empathy: awareness of the feelings, needs and concerns of others.		- understanding others; - passion for service; - the enrichment of others; - the exploitation of diversity; - political sense.
5 / Social skills: induce favourable responses in others.		- the ascendant; - Communication; - Management; - crystallize changes; - the meaning of mediation; - forging relationships; - a sense of collaboration; - the sense of cooperation - mobilize a team or create a group synergy in the service of common goals.

observation and interpretation of simulated emotions



Emotional Intelligence Domains and Competencies

SELF-AWARENESS	SELF-MANAGEMENT	SOCIAL AWARENESS	RELATIONSHIP MANAGEMENT
	Emotional self-control		Influence
	Adaptability	Empathy	Coach and mentor
	Achievement orientation		Conflict management
Emotional self-awareness	Positive outlook	Organizational awareness	Teamwork
			Inspirational leadership



CONTEXT

While intelligence (IQ) finds its sources in knowledge and know-how, emotional intelligence (EQ) is expressed in interpersonal skills through a complete set of capacities.

The pedagogy of serious game is learning with simulated people and safety training in realistic conditions. The aim is “never on the real patient the first time”.

We will not develop a theoretical approach to serious play, we remember some principles.

The neurocognitive basis of learning uses brain plasticity (use, complexity and emancipation of neural circuits) and the consolidation of knowledge (mastering a “basic” function allows it to be automated, carried out in a transparent manner, freeing up access to a finer and more integrated analysis)

The four pillars of learning are fundamental to all learning (and are found in serious games):

1. Watch out
2. Active engagement
3. Information feedback
4. Consolidation of what has been learned and reflexivity notion

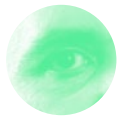
The outcome of learning is reasoning (the art of combining knowledge, experiences and contexts with information extracted from the problem itself, in order to reach a solution). The reasoning process has two phases; intuitive and then analytical. The error is necessary for training.

In the serious game (beyond the stakes), the error is omnipresent and without risk!

We could define “serious games” as “interactive applications, motivating and fun to use, incorporating a scoring system, and providing the player with techniques and/or knowledge that will be useful in reality”.

We illustrate this by a few videos from our serious game “Immersive Medical Interview Simulator” under construction.

This serious game aims to be dynamic and scalable by enabling the definition of new (learning) objectives and by involving the players

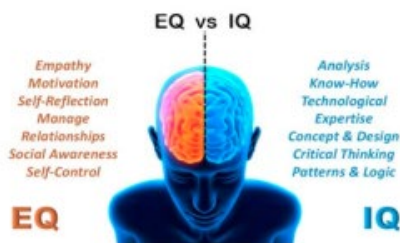


TARGET ISSUE

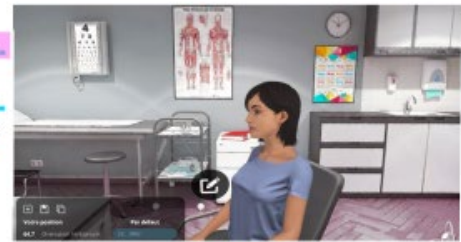
The brain works best through repetition. Each “played game” equips and improves mastery (emotions and context), which could materialize in the game through levels (difficulty), scores, patents or rewards. The serious game allows this capacitation, personalized training in a controlled way.

Let us pin down other necessary and useful concepts to serious game:

- › Deliberate practice (voluntary training/learning practices): When you start in a task that is complex, you are not innately good at it, but thanks to practice you master it. The trial / error / correction / new loop equips the progressive mastery, allows advancement and development in the game. The player advances, crosses step, overcomes challenges or obstacles, finds solutions, completes goals and finalizes the game. While having fun, the player acquires, develops and masters abilities, personal skills or learning goals.
- › The notion of reflexivity and reflexive practice allows the practitioner to adjust his beliefs and improve his practice while basing this evolution on a well-founded argumentation and well-established theoretical foundations. The adoption of a reflexive and critical posture enables medical learners to reflect and position their (clinical) practice.



IMIS
Immersive Medical Interview Simulator
Harness the Power of Emotional Quotient (EQ)
an immersive medical interview **SIMULATOR**
to **improve** patient-doctor **COMMUNICATION**
and **develop** **EMOTIONAL INTELLIGENCE**



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- › Socio-cognitive interactions to further set or enhance knowledge (“all information is socially connoted, cognitive activity is triggered, facilitated or inhibited by social variables, socio-cognitive processes are cognitive processes whose implementation implies the existence of a representation of the social conditions of their development. Socio-cognitive processes are specific processes of knowledge because: a) they relate to values; b) they are conditioned by social structures, such as the process of internalization”). Interaction is the matrix of cognitions.
- › The personalization of learning (each learner is different and unique, has his own rhythm, his pace, his abilities, ...) is allowed by serious game. Everyone plays/learns at his own level.

The game is an imaginary space of freedom. Serious games are virtual and thus offer an invaluable advantage over real-world learning (“secure” real-simulated-world learning).

In game design, we are very attentive to the knowledge and skills we present the learner. We identified seven skill categories:

1. Basic communication skills
2. Collection of information (anamnesis, interview)
3. Explanation of information
4. Building a long-term relationship
5. Time control
6. Conflict management
7. The management of external disturbances

PROPOSED SOLUTION

IMIS: Immersive Medical Interview Simulator

What is the connection between emotional intelligence and emotional competence?



RELEVANT INNOVATION

- › We want to emphasize the communication skills to be developed rather than the doctor's ability to make a diagnosis.
- › We are working on a serious game that simulates the medical consultation with the perspective of emotional skills. At first, the player (using his immersive avatar) takes on the doctor's role.
- › The scenario is based on the five phases of the medical consultation. Each scenario "profiles" a patient and a doctor in close connection with the expected emotional skills and in a defined context and environment.
- › Verbal and non-verbal language are used (studies and impact of emotions).
- › Actions and interactions variably overlapping and influencing each other or reciprocally with effects and impacts on the various medical required skills.
- › The interface, in the long term, should allow the player to give clear indications on the effect of his actions and on his overall progress in the game.

During the medical consultation process, for example, the patient's facial expressions (simulated on the patient's avatar face) are used for the player (doctor's avatar) to assess the patient's mental state or physical suffering. When facial expression is not enough (or not explicit enough), the interface can present additional indicators representing the overall level of confidence of the virtual patient towards his or her doctor. And vice-versa since the roles (avatars) and players are interchangeable. Other scenarios, situations, environments and contexts of medical consultation will later enrich and complicate (potentialize) this serious game.

PROJECT OUTCOMES & RESULTS

- › The game is on development.
- › The player can choose the role (doctor or patient) and the position (sitting/standing) of his avatar.
- › The environment and context of game is currently predetermined.
- › The scenario is currently framed and delineated.
- › The interaction is done by the exchange (written or verbal dialogue) and the observation (or even the control) of language (verbal and non-verbal).
- › The interface mainly uses facial expressions.

The goal is to explore the emotional quotient (attitudes and behaviours; adaptability and self-confidence) of the player and emancipate his emotional intelligence (perceive and express emotions; integrate them to facilitate thought, understanding and reason with emotions; regulate emotions at home and in others). Emotional intelligence is an ability developed through learning, practice and perseverance.

CONCLUSION

This serious game aims to be dynamic and scalable by enabling the definition of new (learning) objectives and by involving the players (in the developing the game and their own emotional intelligence (usable in a real medical consultation situation)

PERSPECTIVES & NEEDS

Perspectives?

- › interoperability
- › Serious 'Escape' Game
- › Medical 'Escape' Space (treatment room /medical office)



Needs?

- › characterization of needs, precise definitions of pedagogical and didactic expectations
- › use of Artificial Intelligence and Machine Learning for avatar emotions and facial expressions, communication chatbot, appropriate and contextualized scenes, avatars and scenery animations, emotion's detection /. production system (recognition and interpretation of facial expressions, gestures, vocal intonation, choice of words, ...)
- › “dashboard” scoring the capabilities addressed
- › Adequate Learning Management System for reporting and feedback

ACKNOWLEDGEMENTS

Dr Alberto PARADA, Family Medicine

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17 | A GAME PLATFORM FOR THE COGNITIVE STIMULATION OF ELDERLY WITH MCI

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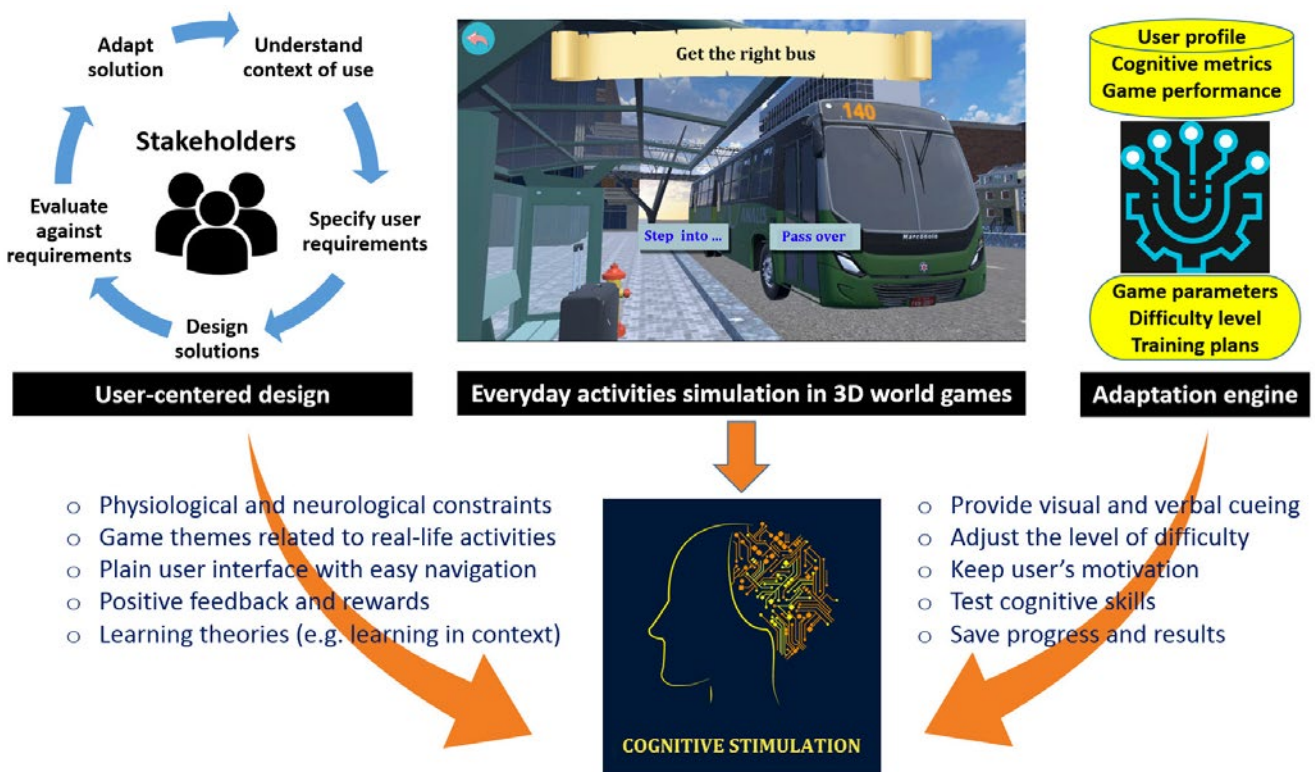
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ABSTRACT

The COGNIPLAT game platform aims to improve the cognitive health of elderly adults with mild cognitive impairment by modelling everyday tasks in 3D world games that trigger cognitive stimulation. The training games are designed following a user-centered-design approach involving relevant stakeholders such as game designers, seniors and domain experts specializing in sensory and cognitive aging to identify possible interaction activities and basic game screens relative to the intervention goals of each game.

KEYWORDS

Mild Cognitive Impairment (MCI); user-centered design; 3D world games; elderly, cognitive health; daily life activities.





CONTEXT

Mild cognitive impairment (MCI) is the state of a cognitive performance under what is expected for an age and an educational level, but above a pathological level [1]. MCI is one of the early symptoms of Alzheimer's disease characterized by significant memory impairment that does not, however, meet the criteria for dementia [2].

Given the increase of the older people proportion in the world population as well as the sharp rise in the survival rate of patients with acute diseases which, however, affect their cognitive functions, the importance of developing MCI prevention and rehabilitation tools is significant. The COGNIPLAT game platform aims at cognitive training, using principles that affect visual-spatial memory, attention, executive functions, problem solving and orientation.

TARGET ISSUE

The evolution of technology enables now cognitive interventions through computer programs, electronic games and mobile applications. These innovations seem to be gaining ground in the rehabilitation field compared to traditional methods, as they are cheaper, more flexible, and more accessible. In an attempt to use these results, serious games have been developed with the target of strengthening the brain and cognitive abilities. Serious games include focused activities derived from specific scientific measures of cognitive functions. This study's aim is to investigate the effectiveness of specially-designed serious games targeting everyday activities that are embodied in 3D world games as cognitive training tools for seniors living in the community.

PROPOSED SOLUTION

The game platform developed in the [COGNIPLAT project](#) provides a virtual environment representing familiar places where the elderly should perform various everyday tasks. The execution of such tasks encompasses diverse cognitive functions, as for example memory tasks (preparing a meal in a kitchen), attention tasks (selecting the right bus to commute), problem solving tasks (performing calculations while shopping in a supermarket) and executive functions (arranging clothes in a wardrobe). Each game screen is designed to bring a quite intimate feeling. As a result, by combining game screens we want to improve the targeted cognitive skills while adopting real-life scenarios.

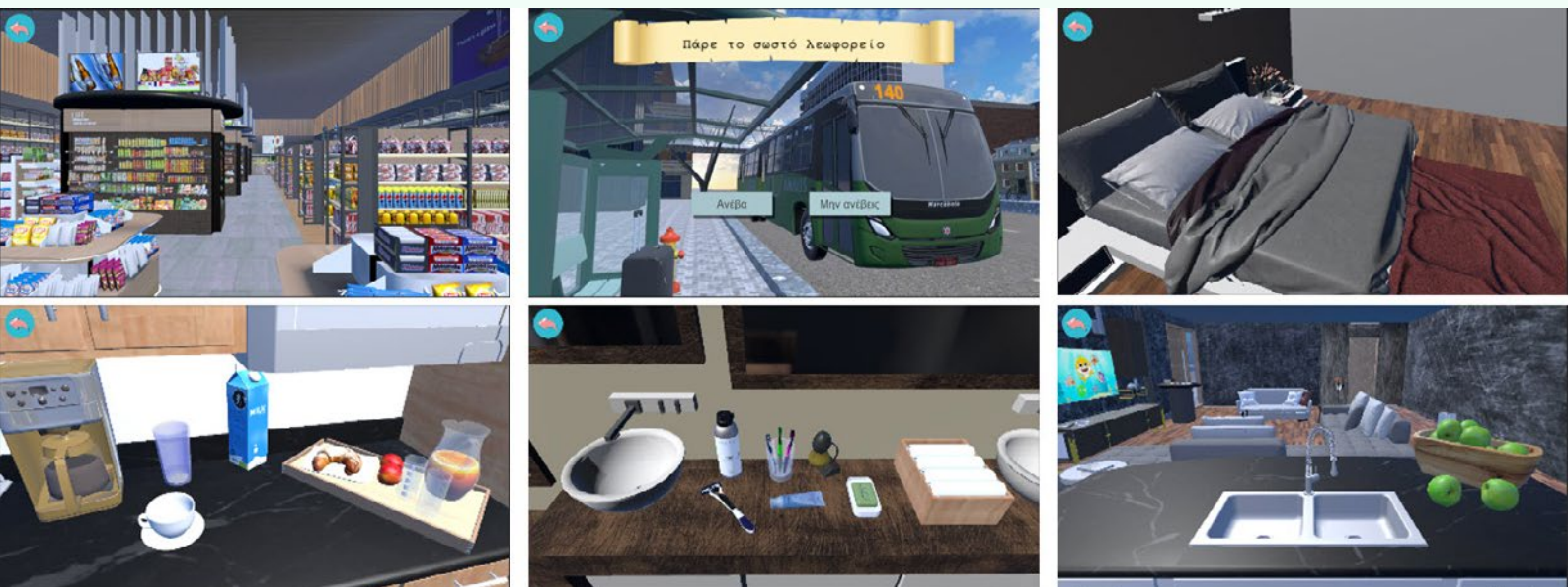
The game platform is developed using Unity 3d engine and can be played with the majority of portable devices as it incorporates Universal Render Pipeline (URP), a prebuilt Scriptable Render Pipeline allowing the use of optimized graphics in lower performance devices.

RELEVANT INNOVATION

The COGNIPLAT project aims to develop and evaluate an innovative gaming platform to enhance cognitive functions in the elderly with MCI. Thanks to machine learning techniques, the platform automatically regulates the exercises complexity and type by adapting the games' cognitive requirements to the characteristics of each individual. These games' design was carried out by a specialized multidisciplinary team, whose range of research activities extends to the scientific knowledge of neuropsychology, linguistics and speech therapy, as well as to theories of learning and designing digital games by adopting a user-centered design approach.

This research proposes to build on an existing software architecture called CAGE, which will allow game and assessment developers to develop a game-based learning assessment that can be used across several content domains





PROJECT OUTCOMES & RESULTS

An experimental evaluation was conducted to assess, by using both quantitative and qualitative data, the feasibility and technology acceptance of the game platform involving 10 elderly volunteers. All participants were seniors over 65 years old (7 men and 3 women, mean 76.1 ± 7.09 years). The evaluation process comprised the following steps performed by each participant: i) read and sign the consent form; ii) complete the demographic questionnaire; iii) complete the Montreal Cognitive Assessment (MoCA) test [3]; iv) make thorough use of the game platform once a week for 12 weeks; v) complete the SUS (System Usability Scale) questionnaire [4]; vi) attend a brief semi-structured interview session.

A significant performance improvement was observed in terms of successful game completion time thanks to practice between the first and last sessions. Overall, these measurements may indicate that the game screens and tasks were well designed for the elderly people and that they were also sufficiently demanding to engage them to put additional effort to achieve improved performance throughout continuous training.

The cognitive level, the familiarity with the technology and the educational level are factors that affect the acceptability of any computerized system. The design of the games and their user interface followed a user-centered design approach from the beginning of the development process targeting high usability and efficiency.

CONCLUSION

Given the growing need to implement more effective cognitive interventions in MCI patients or healthy groups of the population, research should focus on new technological developments, such as mobile applications, which combine cognitive training with fun, enjoyment, adaptation and easy access. This study confirms previous studies that properly designed serious games can be used as cognitive training programs for the elderly.

PERSPECTIVES & NEEDS

As the sample of the present study is small, we cannot draw safe conclusions. A larger, non-opportunistic sample would provide more consistent measurements on the feasibility of the approach. An extensive evaluation is underway in the context of COGNIPLAT project. The methodology includes a control group and an intervention group applying a randomized controlled trial



ACKNOWLEDGEMENTS

COGNIPLAT project has been co-financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation (project code: T8EPA2-00011).

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18 | EPILEPSIM: UNDERSTANDING THE LIFESTYLE OF AN EPILEPTIC ADOLESCENT THANKS TO A SERIOUS GAME

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ABSTRACT

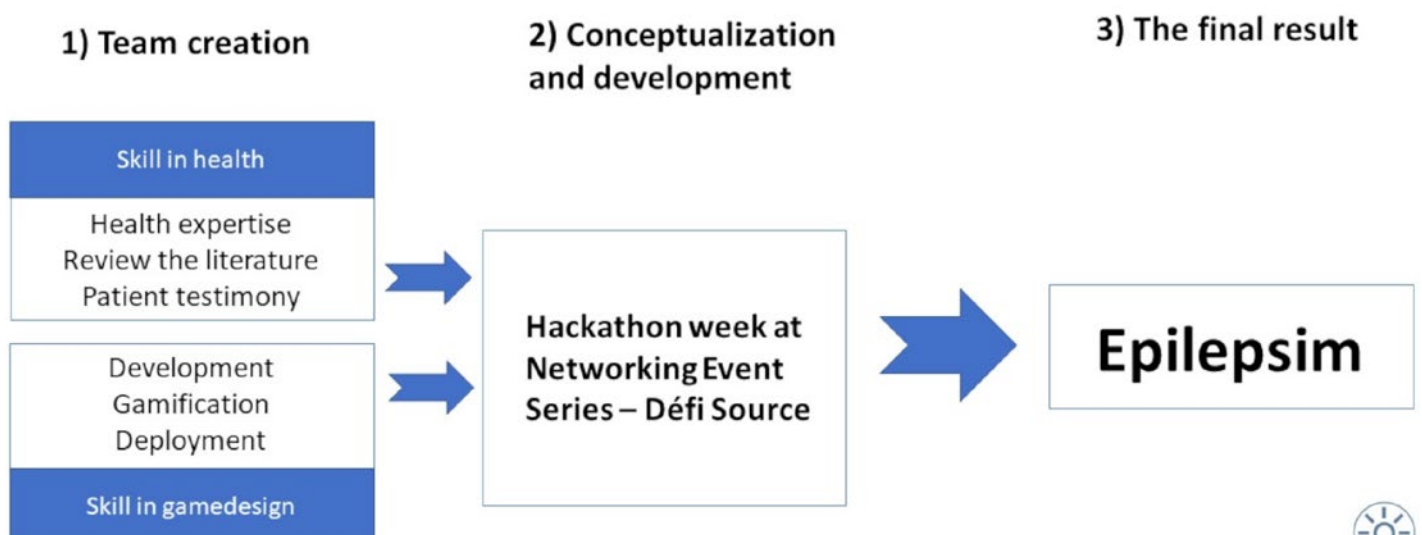
Beliefs about treatment or disease interact to create both adhesion and behavioral change, especially in the context of a life crisis and especially when symptoms can be visualized [1]. In 2021, one percent of the Swiss population has epilepsy, and despite the effectiveness of treatments for 80% of them, acceptance of the disease remains a complicated step [2]. Using a well-designed serious game can be as effective as traditional teaching in improving knowledge, skills, and beliefs about therapy [3].

KEYWORDS

Epilepsy; Serious game; Visualization; Health; Gamification.

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The different phases of the project





CONTEXT

Epilepsy can occur at any age of life. When it occurs at the age when a person builds his personality partly by interacting with his surroundings, the social consequences are inevitable. Seizures can be impressive for those who witness them, even becoming an unpleasant experience. It is not surprising that in the Middle Ages, this pathology and the seizures that resulted from it could be seen as cases of demonic possession, especially convulsive epilepsy. Biomedical progress has not erased the clichés of the past. Today, people with the disease pay a heavy inheritance, as can be seen from those who suffer from it. Our project “Epilepsim” is born from this reflection. A mobile application, where the player embodies his avatar similar to his epileptic and personal profile, allows him to understand, via the game, how to live pleasantly despite the diagnosis.

The goal is to show the experience of a young epileptic to any Epilepsim player who will then learn how to manage by virtually transcribing skills and knowledge in real life



TARGET ISSUE

The goal is to show the experience of a young epileptic to any Epilepsim player who will then learn how to manage by virtually transcribing skills and knowledge in real life. The player will have to avoid his avatar from having a seizure while enjoying life at best. He will have to choose history between actions favoring his crises and worsening his level of amusement and vice versa. The situations the character will encounter are inspired by daily activities adapted to the triggering factors of the crises. The skills mobilized by the player during the character’s evolution enable him to use his achievements during his activities.

PROPOSED SOLUTION

Epilepsim is a mobile RPG game. The player embodies a character that looks like him personally and epileptically; he configures his character look. He has the same sensitivities on the epileptic level as him, such as stress, lack of sleep, photosensitivity, etc.

Two gauges punctuate their parts: a fun one and an energy gauge. When the second reaches zero, it is the epileptic seizure. Activities available in the game, such as sleeping, playing video games, watching TV, going out, etc., will impact fun and/or energy positively or negatively. A “Tips” section is available to help him manage his virtual and real epilepsy. The advice is for educational purposes. Indeed, if the player masters them through the game, he will be able to apply them in his life more easily and share them with his loved ones.

The game’s storyline relies on the fact that the player must interact between the character and his world to have fun and be as happy as possible while having the minimum of epileptic seizures. Epilepsim’s goal is to teach the young player how to manage his epilepsy without feeling that she is just constrained and afraid. Relatives of sick people can also find a resource to understand this pathology.

RELEVANT INNOVATION

Epilepsim’s main innovation is using a serious game as a support for the adolescent diagnosed with epilepsy in the most playful way while having the most positive vision. The competition analysis we conducted shows that Epilepsim is positioning itself as a response to the lack in the current epilepsy ecosystem. The use of gamification proposed in this game allows this complex step in the life of a teenager diagnosed with epilepsy and offer him a means at your disposal to understand a different approach.



PROJECT OUTCOMES & RESULTS

The goal is not to treat, and in no way replace the work of a health professional. Epilepsim is a support for the user in her learning of the disease. It is intended to be educational and strengthen the patient's knowledge. The simulation offers the opportunity to recognize the everyday life actions that increase the risk of a crisis and the ones that protect against it. It also considers actions that improve her quality of life. This being a subjective aspect, the player can choose (in the game) the activities that really make her happy. Then, she can simply observe whether they are derogatory to her health. This double focal length is perfect for anticipating risky behaviors. To another extent, it allows to adapt activities that improve her quality of life by respecting the patient's health. This learning via the app is transposable into the user's life.

CONCLUSION

For now, the game was reserved for people with illnesses and develop their knowledge on their pathology. In addition, the project could be intended for the patient's entourage to understand, feel, or at least imagine what the person is going through. Family, classmates, or co-workers are very good examples. To go even further, the application could become a powerful educational tool.

PERSPECTIVES & NEEDS

The minimum viable product of Epilepsim was designed and developed by a multidisciplinary Valais team from collaborators and alumni of the HES-SO Valais/Wallis and students from the Nursing Team Academy. An award supported the project at the Source 2021 Challenge to support this drive for innovation in helping adolescents diagnosed with epilepsy. The Epilepsim project team has the vision to continue the project by finding the necessary investments.

ACKNOWLEDGEMENTS

HES-SO Valais/Wallis (HEdS, Cyberlearn) | La Source – SILAB | Transcend



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IMPROVING THE FUTURE OF DIGITAL GAME-BASED LEARNING BY EXAMINING THE PAST

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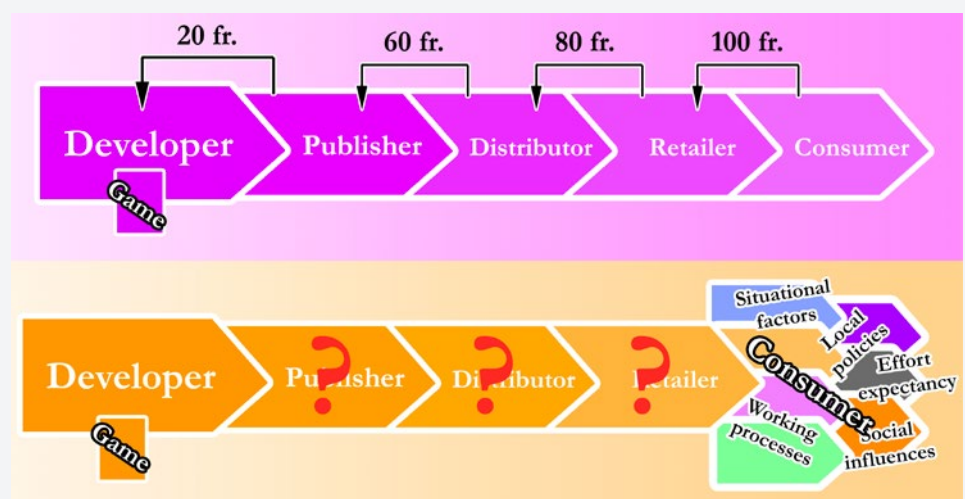
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ABSTRACT

In this short paper, I aim to elucidate issues that the digital game-based learning (DGBL) community, after two decades of work, has not been able to resolve - or been willing to scrutinize - some of its fundamental challenges. I will also briefly describe the ways in which a certain rhetoric has persisted in the field of research and praxis without being subjected to the scrutiny it deserves. The game-based learning community still displays a strange mixture of amnesia and myopia, where we focus on staying up-to-date with new technological innovations and moving onwards, without clearly having re-examined the fundamental concepts and principles we are basing our work on.

Entertainment game value chain



Digital Game-based Learning value chain

INTRODUCTION | PROBLEM STATEMENT

As a community, we tend to continuously examine the ways in which our established understanding of game-based learning can be “transferred” to new technologies. However, how certain are we that our understanding of game-based learning is sound to begin with? Many contemporary researchers in the community (myself included) were not present when the initial discourse regarding games’ potential as pedagogical spaces took place, and primarily base our work on knowledge that we have “inherited”, without thoroughly examining its origins. Do we know how digital game-based learning evolved as a field of work – and what types of disciplines and scholarly expertise built the groundwork for it?

It should be added that this is not something I present just to complain, or to declare DGBL a doomed concept. DGBL has potential and can provide immense value in situations where it is carefully woven into different contexts, but it needs to be done with an understanding of how game-based learning can have meaningful impact. Currently, designers’ and stakeholders’ intent is often a focal point – but, as I will also cover in this paper, impact and intent are two widely different concepts also worthy of more deliberation by the DGBL community.

FOUNDATIONAL CONCEPTS

The homogenization of ‘learners’

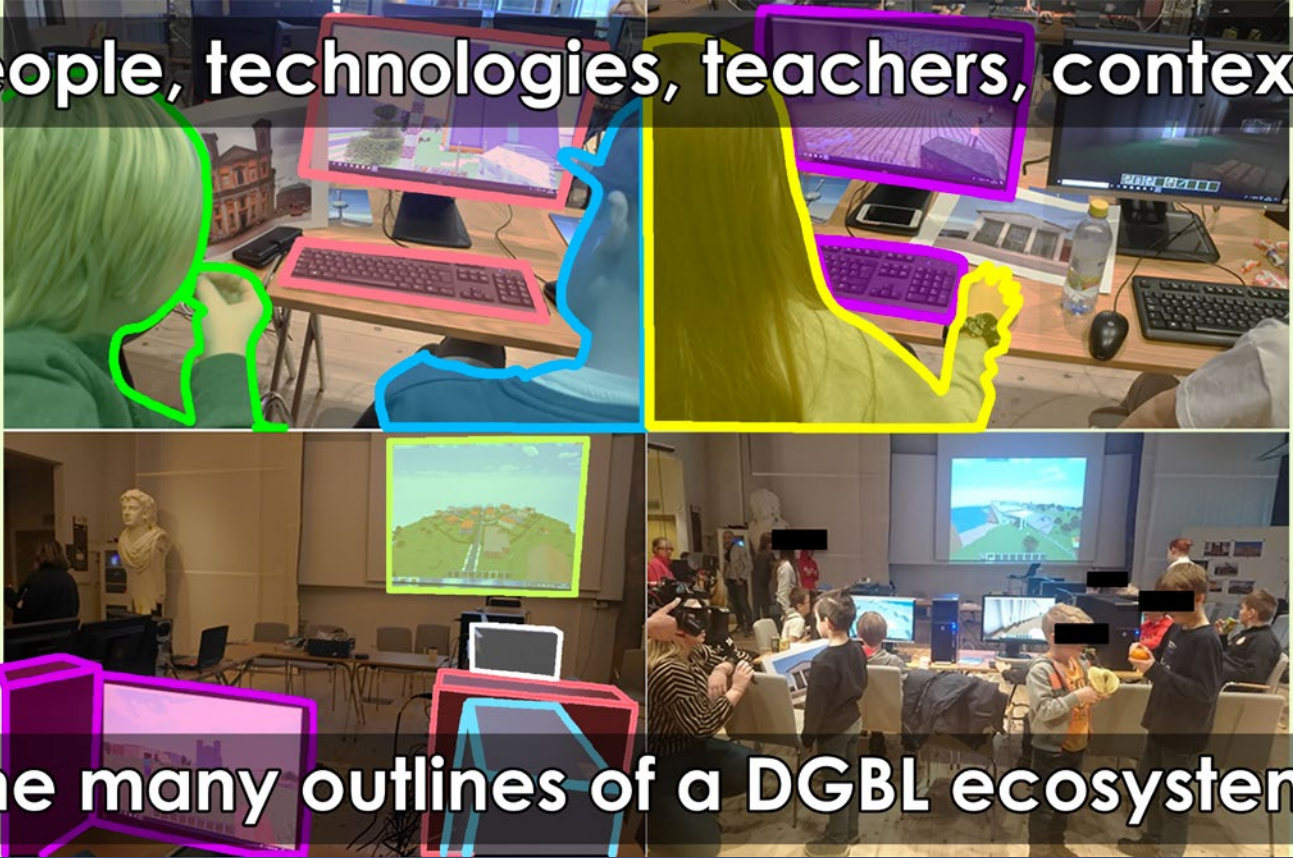
The concept that the ‘digital native’ as a descriptor of the “current generation of learners” (Prensky, 2001) is brought up more than any other in DGBL literature – by academics as well as pundits. I present here some information that might be pertinent to understand its origins. Marc Prensky, the author who popularized the term, is not a scholar – he is an entrepreneur. The text that is most often cited when discussing the term, and the potential of DGBL, is “Digital Natives, Digital Immigrants”, part 1 (2001). It is rarely pointed out that these works are not written as academic texts, even though the former does look like an academic paper in its reference format.

Prensky’s texts are, by far, the most cited works in DGBL research and have had a remarkable impact. You will be hard pressed to read a journal or attend a DGBL conference, without the term ‘digital native’ or the grandiose rhetoric describing DGBLs self-evident excellence being used. To validate this point, I ordered a summary report to the University of Skövde’s library services, which describes the Altmetric findings as: “in comparison with other publications in the same field, this publication is extremely highly cited.” Data from Scopus found ~4,500 citations made to the paper, and that it has been increasingly mentioned since its publication. For example, ~1100 of the quotations were made in 2018-2019 alone, hinting that the interest remains high for the ‘digital native’ concept.

There is plenty of literature from disciplines other than DGBL that have severely scrutinized the concept’s validity, and found it to be fundamentally flawed. In the aptly named paper “The Myths of the Digital Native and Multitasker”, Kirschner and De Bruyckere (2017) use empirical data as well as a comprehensive literature review to conclude that the ‘digital native’ is, indeed, a myth. They also follow this conclusion with discussions regarding the impact that this myth has on educational policies, and subsequently on students’ well-being and learning: “the research shows that these learners may actually suffer if teaching and education plays to these alleged abilities to relate to, work with, and control their own learning with multimedia and in digitally pervasive environments.” Similar conclusions are drawn by other researchers, that either state that the assumptions regarding the ‘digital natives’ are simply untrue, and/or that they lead to unsound policy changes in education (Koutropoulos, 2011). The last paragraph in Koutropoulos paper clearly lays out the importance of scrutinizing these terms and not perpetuating these myths: “Finally, we need to move away from this fetish of insisting in naming this generation the Digital/Net/Google Generation because those terms don’t describe them, and have the potential of keeping this group of students from realizing personal growth by assuming that they’ve already grown in areas that they so clearly have not.”

The differences in how children and young adults play games and interact with technologies varies greatly, and originates from a myriad of different factors. It should be noted that this is not only a matter of proficiency, but also relates to frameworks of interpretation, and behavior during play in social settings. These differences have been attributed to socio-economic contexts, cultural backgrounds, gender, and many other factors. This is something I have researched a lot when exploring skills, literacy, and the effects on collaborative play. And, it has certainly also been explored by other researchers in countries that are often underrepresented

People, technologies, teachers, contexts



The many outlines of a DGBL ecosystem

in DGBL literature and game studies, and it is clear that these issues don't have any particular boundaries (cf. Pallitt, 2013).

The individuality of players is absolutely crucial for positive and meaningful uses of DGBL, regardless of the specific context and area of application. DGBL is, in many cases, focused on instrumentality – a focus on the things rather than humans in our research. The precise ways in which this can be addressed is unclear, but an important start is to initiate more critical discussions on the topic.

PRAXIS

Incompatible working models

Fundamentally speaking, the ways in which games are created, and how they generate revenue for the upkeep of games as well as the ability for studios to continue working on new titles, is not particularly suitable for DGBL development. The value chain that developers work under, and that ultimately brings their games out to consumers, is a complex relationship between publishers, distributors, retailers, and the game studios themselves (See Figure 2). But, how does this value chain work with DGBL development, where the “consumers” are not people playing for leisure, and where the market itself is still poorly defined?

The value chain for entertainment games presented in Figure 2 is, of course, a simplification. It is also a more traditional form, and the ubiquity of online distribution has made it possible for some studios to circumvent publishers. Instead, the presence of royalties taken by “middle-ware” (e.g., game engines) creators, might be taking their place. However, the fundamental fact still remains: developers get a significantly smaller profit from a sale than the consumer pays.

There are two crucial steps where DGBL development tends to fail: there are no established front-facing retailers reaching the type of people we would like to work with (e.g., teachers, nurses, museum guides, etc.), and the consumer market is incredibly fragmented. The former issue is fairly self-explanatory, but the second one deserves some extra attention. The issue is fairly banal, but severe. In regular game development, the consumers – regardless of country or specific living context – all play with the same purpose, and in a setting with no particular requirements. Everyone who owns the necessary playing device (e.g., a PlayStation, PC, or Smart device) is a potential source of revenue. A consumer in Switzerland is, fundamentally, the same as a consumer in, for example, South Korea. In DGBL, of course, the consumers work within very specific contexts, play with different purposes and working processes in mind, and have settings with very particular requirements and budgetary constraints that affect available hardware/technology. The pedagogical processes in Switzerland and South Korea will differ from one another, the players have different forms of literacy, teachers employ different pedagogical processes, and the educational system is structured in different ways.

All these factors result in DGBL developers either need to face a large but incredibly volatile and unpredictable market, or a very limited number of consumers that they court by specifically tailoring their games according to their specific needs. As most of you are familiar with – game development is an expensive practice. This severe market complexity means that DGBL development is risky, and developers often need to severely cut development costs to limit risks, and rapidly develop games in order to examine different market-type needs to hopefully find a niche that is profitable.

This causes a significant – almost insurmountable – problem for digital game-based learning development. The ability to reliably generate continuous revenue from consumers is what developers need to keep a game alive. Revenue is essential, since it can be re-invested into keeping the game updated, both in terms of technical upkeep and ensuring continued compatibility between the game and ever-changing hardware and software updates, as well as content updates to adapt the game to identified needs and preferences of the players. Without this generated revenue, a game will go obsolete, and will slowly become less reliable.

The reason why this is an issue for digital game-based learning, is that games – compared to “traditional” non-digital teaching methods – are reliant on continuous support. One component of digital game-based learning, that is rarely debated, is that it constitutes an entirely new form of teaching tool from a purely functional perspective: it is permanently “connected” to the outside world. If a teacher purchases a book for teaching purposes, it becomes his as soon as it arrives at his school. The printing press can explode, the publishing house can go bankrupt, and the author(s) can die, but the book will be completely unaffected. It can still be opened as, per usual, pages can be flipped through, and the words are still in the same order. Digital teaching tools do not work this way. They rely on an invisible string connecting the classroom to the developers as well as the owners of the platforms which the game relies upon to function (e.g., operating systems and hardware drivers). A teacher’s tools can be disabled remotely, without warning, and thus significantly impact his planned curricula.

A brief history of failures

To highlight this volatility, I’d like to point towards a series of fairly recent examples.

The lifespan and reliability of educational game titles has historically been remarkably poor. To name a few examples: “SimCityEdu”, a project by “GlassLab”, with “Electronics Arts” support, intended to remix SimCity to be more suitable for classroom use by making the Sim City: Pollution Challenge. The project (as many other DGBL projects) got plenty of attention when it was announced, but it has not had an update or online presence since 2013. In fact, there’s no real evidence that the game was ever actually used in an educational setting outside of “GlassLab” itself, and a disclaimer on the site “Common Sense Education” states: “this product is no longer available.” “CivilizationEdu” has a remarkably similar legacy: it was launched as a collaboration between “GlassLab” and “Take-Two interactive” to make “Civilization” (a series by “Firaxis”, 1991-2019) a better fit for classrooms. Similar to the “SimCity” project, this one also went from having significant news coverage in 2016 heralding its upcoming impact on history education, to then having no online presence at all. In 2018, “GlassLab” itself – which has been a staple in DGBL advocacy in North America – announced that they would cease all activity due to lack of funding. In an interview with “EdSurge” following the closure, the foundation’s CEO, Jessica Lindl, stated “GlassLab aimed to prove that educational games could be just as fun as their mainstream titles, and serve as reliable formative assessment tools. It also set out to find a profitable niche in the U.S. middle-school market.” A failure to achieve the latter part is cited as the reason for closing the institution. Lindl attributed the revenue issue to: “The U.S. middle school market [...] lacked ‘an appetite’ to sustain our work.”

It should, of course, be mentioned here that there exists one oft cited example of functioning game-based learning: Minecraft: Education Edition (MC:EE). However, we posit that the prominence of MC:EE in the discourse further solidifies the point rather than detracting from it. It takes the full backing of Microsoft, who own the platform on which the game is often played, in order to make game-based learning remotely workable and give it a longer life span, and it is also based work on a game title that is immensely popular. The game also generates massive income as an entertainment title independently of its uptake in education, generating resources that can be used to support its educational version. If MC:EE is to be used as an example of the DGBL potentials, it should also stand as an example of the efforts and resources required to make DGBL possible.

WHERE DO WE GO FROM HERE?

As mentioned in the introduction – this paper is not written in order to declare DGBL a doomed endeavor. It is more intended to be a call to action. As a community, we would do well to re-examine some of our fundamental ideas and assumptions regarding DGBL. In my view, we are currently stuck on a treadmill of adapting to technical innovations, highly beholden to game industry progress and new jargon, rather than a progressing path of new ideas and critical examinations anchored in a strong understanding of our community's history and disciplinary intersections. One clear incommensurability with DGBL and the reality of educational institutions, is the described issue regarding value chains. We are creating educational materials according to a process, and using the middle-ware, that is fundamentally not made for this type of "market." This, in and of itself, should be a basis of discussions when it comes to the practical process of developing and using DGBL solutions.

But we should, of course, not only emphasize the practical issues of development. Examining the DGBL values as learning and exploration environments is crucial. I have certainly had first-hand experiences with games providing meaningful value to educational situations, and public outreach contexts. From these experiences, I've frequently seen that meaningful play emerges once the barriers of the digital tools, and the complexities of the games, have been adapted to be inclusive and context-sensitive. When people are invited to participate without any pretenses of proficiency and game-knowledge, they are able to pursue self-actualization within virtual spaces, and form positive social contexts with one another. Exploring these particular benefits requires a lessened focus on the strictly concept-driven (or buzzword-driven), and instrumentalist, way of working.

As a regular participant in the GSGS community, I will also opine that this particular group of researchers and students work in fairly unique ways that put it in a good position to pursue these values. The amount of hybrid games presented, belief in non-digital solutions and board games, human-centering games (Ghofran, 2019), focus on self-actualization (Bernhard, 2017), and the interest in smaller "in-context-created" game solutions, presents a promising foundation for healthier work. It exemplifies how games that emerge from existing situations and are created by the people within that situation with an understanding of peoples' lived experiences (Chatelain & Descoeudres, 2019), and that are not made with any goal of mass-distribution, have immense potential. As opposed to working from the broader concept of game-based learning and a remotely identified application area, these approaches emphasize humanness of game-based learning that the thingness fascination that the community is often enamored by.

To conclude, there is no clear singular solution to provide. It is a complex, nested problem that is deeply entrenched in the DGBL community. But, continuing to promote the "smaller" types of games that emerge from their own contexts, and continuously emphasizing the importance of providing our students with ways to self-actualize, is an important step. Once that way of thinking has been embraced, it will become significantly easier to truly re-examine the DGBL foundations, which are made of more techno-centric and homogenizing ways of thinking about our students.

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SOCIETY, URBANISM & ECONOMY | ONSITE SESSION

FRIDAY 9 JULY

10:00–12:30



SOPHIE WALKER



JASMIN WIDMER



ELA PUSTULKA



CORENTIN BARMAN

19 | PROJEKT CH+ GAMES FOR DEMOCRACY: THIRD ITERATION PROJECT REPORT

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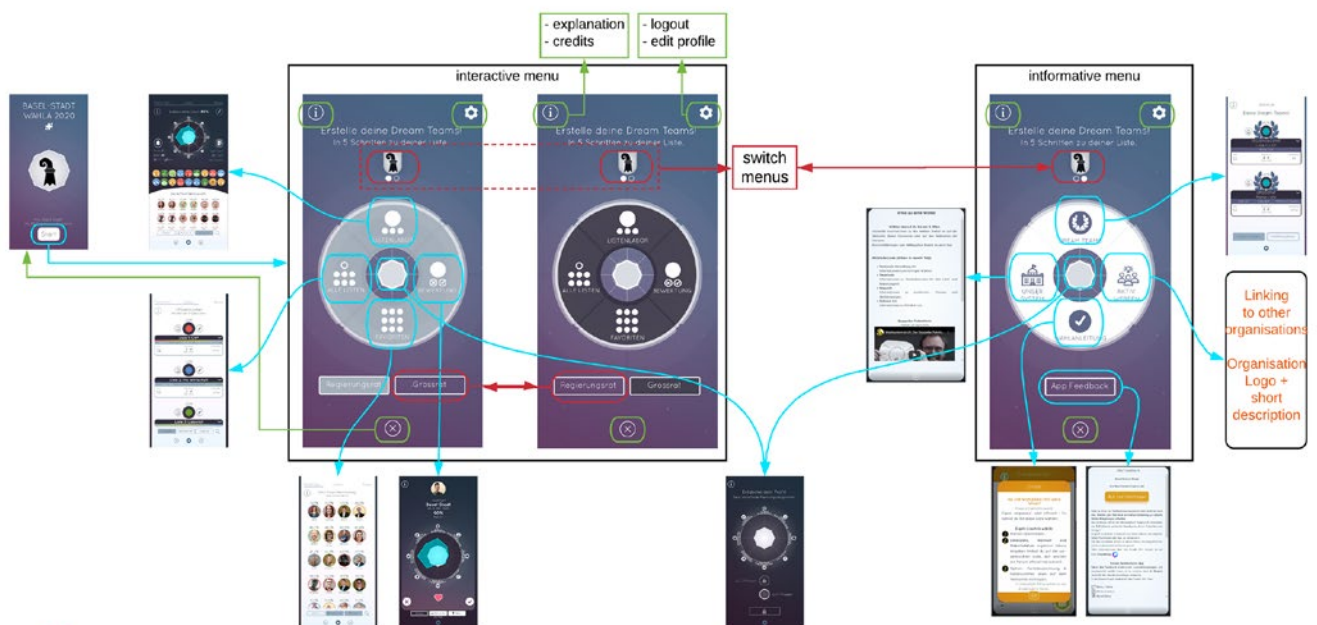
ABSTRACT

Projekt CH+ uses game mechanics to make political self-education more inviting for young voters. On the basis of co-design, a playful voting aid was developed. The goal is to playfully support voters in finding out which political candidates they match best. The CH+ Voting Aid was first tested in the canton Uri and got a feature update for elections in Basel-Stadt. For the first time, the app was tested in a canton with a large number of candidates. While the user flow though the app has to be improved, the application playfulness was well received.

KEYWORDS

Democrac; CO-Design; Gamification; Report.

CH+ Voting Aid v.3 Basel-Stadt 2020 | App Flow Main Menu





CONTEXT

After an initial test of the playful voting aid in Uri (Walker, 2020), new features were designed to improve both the play factor and usefulness of the voting aid.

The voting aid unlocks one functionality at a time. In its core, the application requires users to create their own political profile by answering a political questionnaire provided by smartvote. Smartvote creates political questionnaires answered by politicians and voters; voters, get then to see how they match with specific politicians. The CH+ Voting Aid asks users to swipe through candidates in a Tinder-like evaluation round. Accepted candidates get saved to a personal collection, while disliked candidates remain in the “card deck”. Accepted candidates can be reordered via drag and drop, marked with hearts or discarded. Once users have created a personal ranking, they can view the official political candidate lists, where their favorite politicians are marked. And they can dynamically try out different lists by dragging and dropping candidates onto empty seats and viewing how the average stats of their list (e.g. average age, gender distribution and top 3 parties on the list) change, which supports them in their list creation. In Basel-Stadt, there were a lot more candidates compared to the elections in Uri. Depending on their voting district, voters had to go through hundreds of candidates to fill up their personal voting list with up to 34 candidates (Kanton Basel-Stadt, 2020).

TARGETED ISSUES

Especially for young or inexperienced voters, filling out a large voting list with candidates can be a real challenge. Many people decide to vote for party lists instead of voting for individual

people. Meanwhile, research shows that people between 15-25, especially, often do not feel represented by specific parties (Jans, Golder, Wattenhofer, Salathe, & Bohn, 2020). From their perspective, the option of voting for a lot of unknown people or for a party list that they don't really believe in is not very appealing. For this reason, supporting voters in getting to know individual candidates is desirable. Whether users simply familiarize themselves with the candidates or they start comparing the candidate profiles from different parties, they learn about their voting options.

The goal is to playfully support voters in finding out which political candidates they match best



PROPOSED SOLUTION

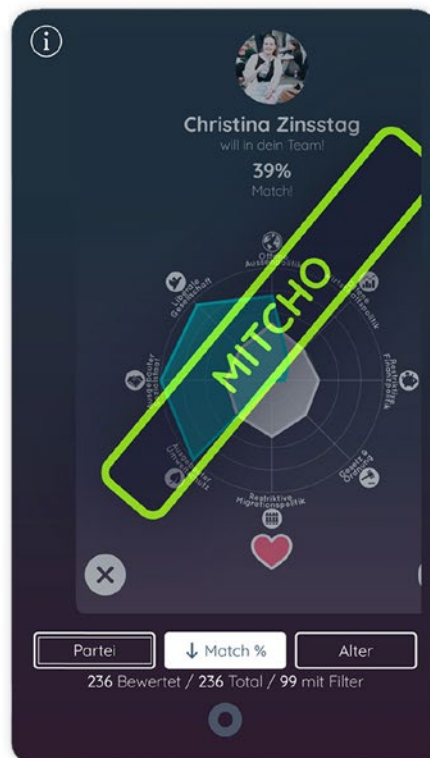
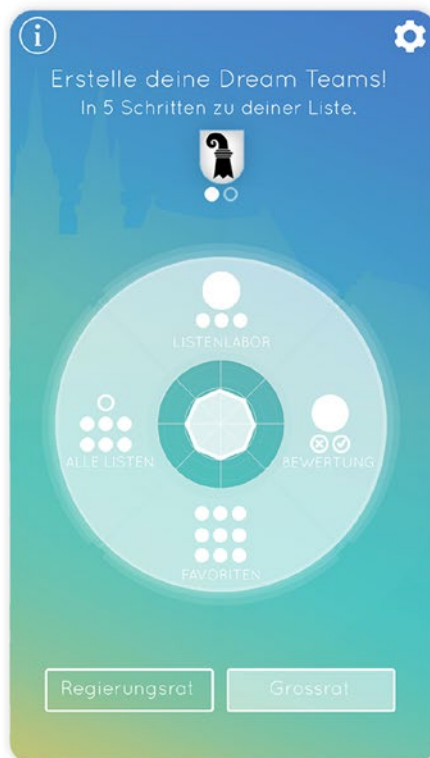
In order to transform into the “Basler Wahl-App”, the “Ürner Wahl-Äpp” needed to be expanded. Learnings from the research on the “Ürner Wahl-Äpp” were implemented into the redesign, and new features were added to help users find their way through a large number of political candidates. Also, users were able to view candidates for the cantonal legislative as well as the executive council. For the first time, users also had a say in the application visuals.

To support voters in large cantons and to improve the current concept, we had four major goals:

- › Customizing the app content for Basel-Stadt
- › Adding the possibility to choose candidates for the cantonal executive council
- › Improving feedback inside the application
- › Designing a usability strategy for large lists

To reach these goals, four completely new features were introduced:

- › “Dream Teams” – Users can mark one list as a Dream Team and see who got elected in the end.
- › “Unser System” – An explanation of the Swiss system and the cantonal government.
- › “Wahlanleitung” – An explanation on how to vote in Basel-Stadt.
- › “Aktiv Werden” – An overview of political or charitable associations.



RELEVANT INNOVATION

Next to the new features, the Basler Wahl-App also addressed shortcomings of the Ürner Wahl-Äpp. The following improvements were realized:

(needed improvements: left column; realized improvements: right column)

Main Points

- › Offer the application functionalities for the cantonal legislative
- › Improve unlocking experience/ change overarching macro mechanic
 - » Add final feedback once list is complete (according to the user)
 - » Make progression more rewarding
- › Improve candidate descriptive texts to be more positive towards candidates

Specific Functionalities

- › Improve usability of "Alli Liischtä"
- › Inform users who made it into the parliament

Fluff

- › More animations
- › More videos

- › Added cantonal legislative candidates, councils swappable in the main menu
- › The cantonal executive is used as an example to explain all functionalities of the application.
 - » Once the list is complete, users can follow lists to follow who got elected
 - » Progression statements are animated and more frequent, since the council is since the legislative council is smaller and does not take that long to swipe through.
- › Descriptive texts for missing candidate profiles were altered to be less cheeky.

- › "Alle Listen" is divided into "official", "edited" and "custom" lists
- › The "Dream Team" functionality shows users who got elected to parliament.
- › More animations in unlock statements
- › Video explanations on how to vote and on the Swiss System.



PROJECT OUTCOMES & RESULTS

The Basler Wahl-App went online and was publicly accessible in September 2020, one month before the cantonal elections. After the elections, users were invited to participate in a final evaluation. During the elections, 566 users signed up for the application and 55 users participated in the optional evaluation after the elections.

While most users had difficulties comprehending the tutorial and struggled with finding their way through the application, users who managed to unlock all functionalities were largely content with the offered functionalities. The respondents rated the application with a 3.7/5, the visuals with a 4.2/5 and the usability a 3.4/5. The largest usability flaw turned out to be the new unlocking and progression system of the application, which confused many respondents. An additional issue was that too many candidates did not have a Smartvote profile, which meant that there was not much information about them in the CH+ application. Overall, the individual functionalities were well received but needed more polish in their usability. With regard to the new challenge of having a lot of candidates and large lists, the dynamic list creation, which was the most popular feature in the “Ürner Wahl-App”, was less popular in Basel-Stadt. The application playfulness was well rated, some people thought it could be even more playful. The main critiques were connected to the usability of the application.

CONCLUSION

Our project round shows that there is a lot of work to do in terms of explaining the application and improving the user journey. However, the CH+ concept is on the way to be user friendly in large and small cantons alike. In order to achieve our usability goal, the most important improvements for the next prototype iteration were determined. The changes include improving:

- › tutorial experience and explanations
- › usability of “Listenlabor” for large lists
- › explanation of “Dream Teams”

PERSPECTIVES & NEEDS

Main Points for Improvement

- › Improve tutorial experience and explanations,
- › Clearly communicate end goal,
- › Clearly communicate process of advancing/ the different functionalities.

Specific Functionalities

- › Improve usability of “Listenlabor” for large lists,
- › Improve overview of candidates,
- › Improve the communication and explanation of “Dream Teams”.

Fluff

- › More animations & playfulness.

ACKNOWLEDGEMENTS

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20 | MURGAME - A PLAYFUL DEBRIS FLOW SIMULATION

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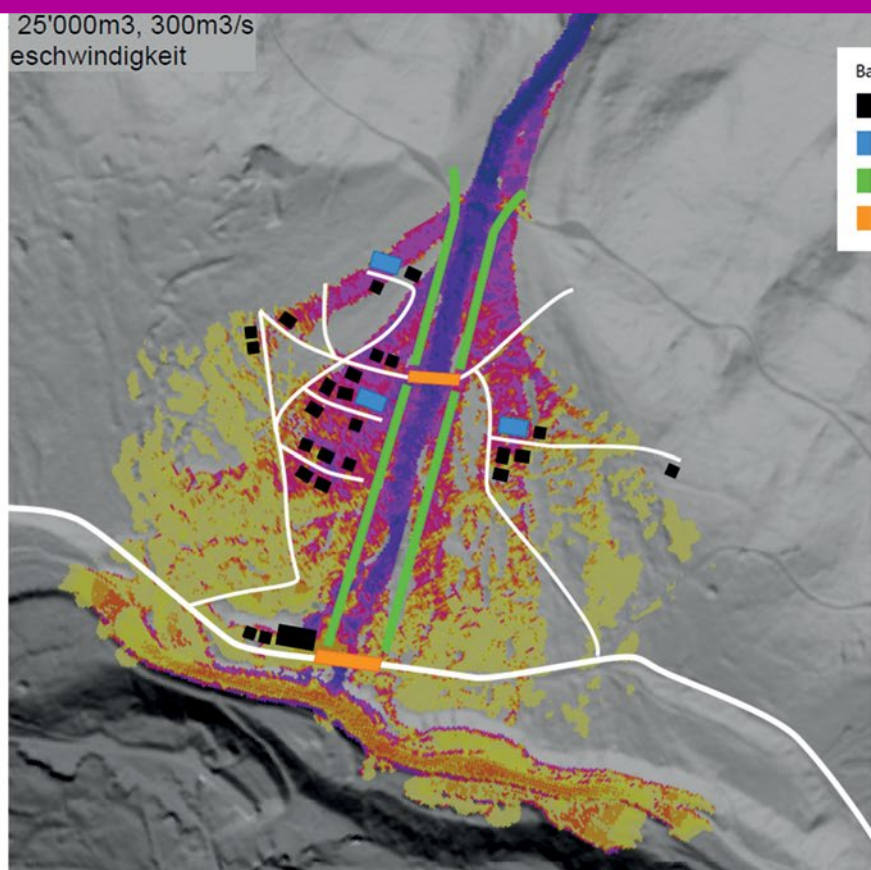
ABSTRACT

MurGame is a playful debris flow simulation, where players defend a quaint alpine village from giant mudslides. The game provides a sandbox based on real-life topology and debris flow data, in which players can experiment with different buildings and countermeasures.

MurGame is used for educational and promotional purposes, to raise awareness of the costs and dangers of giant mudslides in Switzerland and what kind of countermeasures can be taken in high-risk locations.

KEYWORDS

Debris flow; city building; natural disaster; geodata; Switzerland.





CONTEXT

Damage caused by debris flow is quite costly, though with some small upgrades to housing, it could drastically be reduced.

This game raises awareness of the destruction amount giant mudslides can cause. Players build their own town and can experiment which constructions are helpful.

MurGame was made for an exhibition at the Swissbau convention in Basel in January 2020, was then released online on April 28 2020, and is in further development for educational purposes.

It was co-developed with Geo7 and the Swiss Institute for Snow and Avalanche Research, SLF. MurGame uses realistic data provided by the SLF, implementing RAMMS (Rapid Mass Movement Simulation) to calculate a realistic debris flow depending on what the players build in their town. The development was funded by "Präventionsstiftung der Kantonalen Gebäudeversicherungen", "Die Mobiliar" and the "Federal Office for Environment" (BAFU).

TARGETED ISSUES

It is not always obvious what countermeasures can be taken. Depending on the situation, some measures are more suitable than others. It may also not be clear that urgent measures need to be taken at all.

In order to draw attention to this problem, the complexity of a murgang must first be broken down. The probability of a debris flow, the nature of the affected site as well as the costs and effectiveness of different countermeasures must be mapped in an understandable way, while still being realistic enough to learn the real-life application.

Because of the interplay of complex systems, it made sense to create a simulation game.

As we were planning to exhibit the game at the "Swissbau" in Basel, another problem arose. The game had to be understandable and easily accessible for the event visitors, among whom are mainly architects, builders and laymen. At the same time, it had to be designed for being a standalone online learning tool as well.

PROPOSED SOLUTION

To make the information more accessible, we wanted players to be free to experiment and experience different outcomes themselves. A balance between freedom of experimenting and the technical limitations was necessary. How much diversity in gameplay would be enough to get a feeling of a sandbox type game?

We started with a lot of real-life data and had to cut it down because of limitations for an online playable game.

The relocation of villages is a costly option in real life, so to make sure players had to deal with this problem, we decided against a free building mechanic. This fits well together with the reduction of data. We decided on fixed spots, on which a specified selection of buildings can be chosen from. There are spots for countermeasures, smaller or bigger buildings as well as some extra objects like the sirens. These spots were deliberately chosen based on the debris flow location, as seen in [abb1].

Finances, protection and damage numbers were derived from real-life data and had to be balanced. The calculations were made by the data experts at Geo7.

MurGame is used for educational and promotional purposes, to raise awareness of the costs and dangers of giant mudslides in Switzerland...





The topology data come from an unfamiliar location in rural Switzerland. The fluid calculations are based on data of the Swiss Federal Institute for Snow and Avalanche Research (SLF). We also used the RAMMS software they had developed.

RELEVANT INNOVATION

We had to decide on a finite number of buildings that influence the debris flow, which included the countermeasures as well as the big building. Small buildings do not influence the damage reduction (debris flow shadow), but are for gameplay variance. With 8 relevant buildings, the number of different calculations went from an infinite number to the manageable amount of 1024.

After this, we still could not calculate the debris flow in real time. The game would just crash because a normal computer can't handle these numbers. It was decided to pre-calculate the simulations on the SLF computers. That also meant we would not offer more differently sized mudslides and kept to the two we already had.

More in-depth information on these reducing measures in Unity3D can be found in our blogpost “Wie Murgänge gemacht werden” [\[3\]](#) from February last year.

With the simplified damage values (Damage) as well as the simplified finances (Protection Costs) we had two values to weigh against each other. To make it more interesting gameplaywise, we turned to the triangle balancing, to prevent one clear dominant strategy. As a third value, Population Satisfaction was chosen to factor in human preferences. It made sense, because some people are unhappy with the look of some countermeasures, which factors in a lot in decisions. The values are not derived from specific real-life data. We prioritized game design decisions, to balance out the finances and protection values as well as player feedback.



PROJECT OUTCOMES & RESULTS

The performance of the online game with WebGL is smooth. There is some loading time after the players clicked the button to get one of the two debris flows. Depending on the internet connection, this may be a bit slow. Each of these 1024 debris flows is around 2-3 MB. In WebGL, you only need to load them, while the download of the standalone game is 3GB in size.

We had overwhelmingly positive feedback at the “Swissbau” convention as well as online. Even architectural experts thought it is a good simulation for laymen to get a good picture of the countermeasures, costs and dangers.

CONCLUSION

Based on the visitors and feedback we got at “Swissbau”, our game was a full success as an exhibition game. There was a lot of lively playing, discussing, puzzling and laughing together.

For the game to be useful for educational purposes, it needs more context and help. We are already working on a new update together with Geo7. We are open for more collaborations beyond that.

PERSPECTIVES AND NEEDS

Next steps are taken to improve the “serious” aspect of the game. We want to improve “MurGame” as a learning tool. It’s possible to create downloadable worksheets for schools, but we would like to add as many updates as possible within the game itself.

There will also be new countermeasures and improvements of the visual communication, like shrinking the small mudslide, to make the difference clear.

ACKNOWLEDGEMENT

Developed by Koboldgames GmbH, Geo7, SLF.

Geo data provided by the Swiss Institute for Snow and Avalanche Research (SLF).

Funded by “Präventionsstiftung der Kantonalen Gebäudeversicherungen”, “Die Mobiliar” and the Federal Office for Environment (BAFU)

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21 | A LOGISTICS SERIOUS GAME

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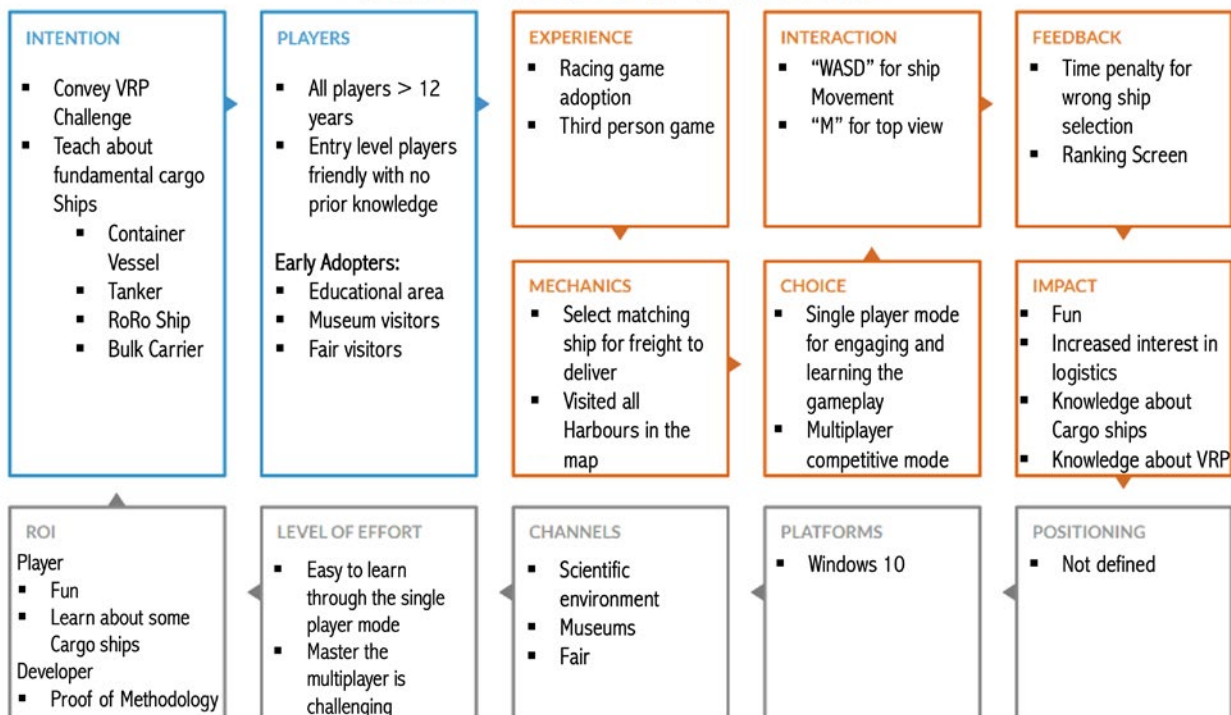
ABSTRACT

Switzerland is a logistics hub which needs many trained professionals. As logistics does not have a strong public image, the profession does not attract enough young people. A logistics game could help recruit more candidates at the apprenticeship and university level and help in teaching. We have prototyped a logistics game and found out that it raises interest in logistics and successfully teaches about cargo ships. The game test showed that the game is visually appealing but the competitive aspect may interfere with learning.

KEYWORDS

Logistics; game; ship; game design; gameplay.

GAME DESIGN CANVAS





CONTEXT

We aim to get a teenager or young adult interested in logistics via play and teach them some facts. A game could be staged in a museum or a school foyer and attract people to play by showing beautiful landscapes and inviting them to explore. None of the games we know corresponds to our setting which is about raising public interest via a short game. “Train Fever” and “Transport Fever” from Urban Games focus on driving fun and Dreipol’s “EcoDriver” teaches how to drive ecologically. Related games include “Ports of Call”, “OpenTTD”, “Truck Driver”, “Spintires”, “MudRunner” and the classic “MS Flight Simulator”. The games we reviewed require a lot of time to play as they were designed as entertainment and not primarily to be an appetiser which transmits some knowledge and raises interest in logistics. Teaching games have to start with the teaching in mind and focus on the teaching objectives. They belong to the serious games genre and there is still too little knowledge on how to design serious games that are pleasing, entertaining and teaching effective. Our previous exploration into serious games produced a Teaching Learning Based Optimisation (TLBO) game (Pustulka et al. 2019) which showed that a game can teach some algorithmic concepts and support collaborative learning. Here, we focus on making the learning objectives explicit and investigating how they influence the game design. We conduct an evaluation experiment which allows us to test the learning outcome.

TARGETED ISSUE

We focus on educational goals, design, and game outcomes. To identify the goals, we interviewed a logistics teacher which led to the identification of the vehicle routing problem (VRP), see Hanne and Dornberger (2017), with possible extensions. As the complexity of such a game was too high for a first prototype, a subproblem was identified: teaching about cargo ship types set in VRP context.

The design is based on Aleven et al. (2010), and considers the learning goals, MDA (mechanics, dynamics, and aesthetics) and instructional design. As learning objectives, we first considered the skills needed to start playing, second, define the skills to be learned, and third, decide what skills might be learned that go further than the skills actually encountered in the game. Following this, we teach the skills needed to play (game mechanics and ship types) in the solo game, and in the competitive game the player applies the skills. As skills that go beyond, we see the players realising that VRP is a difficult problem and there is only one winner. The MDA aims not to interfere with learning and convey the routing challenge. The instructional design comes into play in the matching of ships to cargo and in the two game phases, where the solo game teaches, and the competitive game offers practice. We used the design canvas (Carey n.d.) which identifies the core design parts: setup, design and consideration, see Figure 1.

PROPOSED SOLUTION

The player learns to match the ship to cargo and experiences the VRP. Four ship types and four difficulty levels are offered. The player selects the ship to fit the cargo. After matching the ship to cargo, with a time penalty for the wrong choice, the player plays a solo ship steering game.

A camera positioned above the ship shows the ship and the seascape, with the islands and ports with cranes, see Figure 2. On approaching an island, the port is marked in red and on reaching the port the area turns green. The ship is manipulated using AWSO keys. A top view showing a map is activated by the M key. The second game part is competitive. The player who starts the game invites others. The motivation is to be the fastest to deliver to all harbours. Each player selects the route and controls the speed. A sea landscape and some background music imitating the waves and the engine sound are present.

...we teach the skills needed to play (game mechanics and ship types) in the solo game, and in the competitive game the player applies the skills





RELEVANT INNOVATION

We designed a game which is new in several respects: focus on teaching logistics, design based on theory, and an evaluation using a pre- and post-test. We tested knowledge about ships and we also asked the following questions: Were the players motivated after the solo part? Did their interest in logistics increase? Did they have fun? How do they rate the graphics and the user interface? And did they experience any frustrating moments?

A pre-test, gameplay with two groups of two players and a post-test helped us to answer these questions, with answers being on a scale from 1 (lowest) to 5 (highest). All players said that after playing solo they were motivated to play the second part and that the game had increased their interest in logistics. Overall, the players improved their knowledge about cargo ship types. However, beside an overall knowledge gain there was also a small knowledge loss (or a mix up). The enjoyment rated 5 to 4 and so did the user interface and the graphics. Three players experienced frustration, and two commented that they experienced it in the multiplayer competition, as they lost. This remark and mix up in knowledge acquisition leads to the conclusion that competing may stand in the way of learning, see also DiMenichi and Tricomi (2015) who advocate competition in physical tasks but not in memory tasks.

PROJECT OUTCOMES & RESULTS

This is the first game we are aware of which teaches about cargo ships and introduces the VRP in a natural peaceful setting. The solo part allows the player to get confidence in selecting the right ship and directing it towards the harbours it should reach. All players felt a rise in interest after this part of the game. We showed that the game stimulates interest in logistics and teaches about ships. The players found the game attractive and usable.

The game was developed iteratively via playtesting. This helped us develop a game that was pleasant and natural to play and avoided seasickness which was observed in testing the first prototype.

The experimental setup allowed us to confirm that the players get motivated and learn and told us that the competitive aspect needs to be paid attention to as it possibly interferes with learning. One improvement to the experiment would have been to discuss the understanding of the VRP that the players developed. We will add this aspect to the follow-up on work.



The game has the potential to be used in a museum of foyer setting, as the game is short and its length could be adjusted by changing the marine landscape to one with fewer islands and ports.

CONCLUSION

We produced an educational game for logistics with modest goals: getting the players interested in logistics, teaching about cargo ships, and introducing a logistics routing challenge. We have achieved our goals and developed a prototype which can be extended with more ship types, and an interface to routing algorithms. Further design work will reduce the competitive aspects of game playing which may have interfered with learning.

PERSPECTIVES & NEEDS

The game can be refined to be used in a museum or school foyer, to attract a young audience towards the topic. Further game development will include an interface to a number of routing algorithms and expose the visual programming interface available in the game platform, Unreal Engine.

ACKNOWLEDGMENTS

The game was designed and produced by Attila Güler as a thesis leading to an MSc in Business Information Technology at the FHNW.

[Video](#)

Research leading towards the game project was supported by the FHNW.

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22 | THE SPARK-IT PROJECT: HOW TO IMPLEMENT BRAINSTORMING WITH GAMIFICATION?

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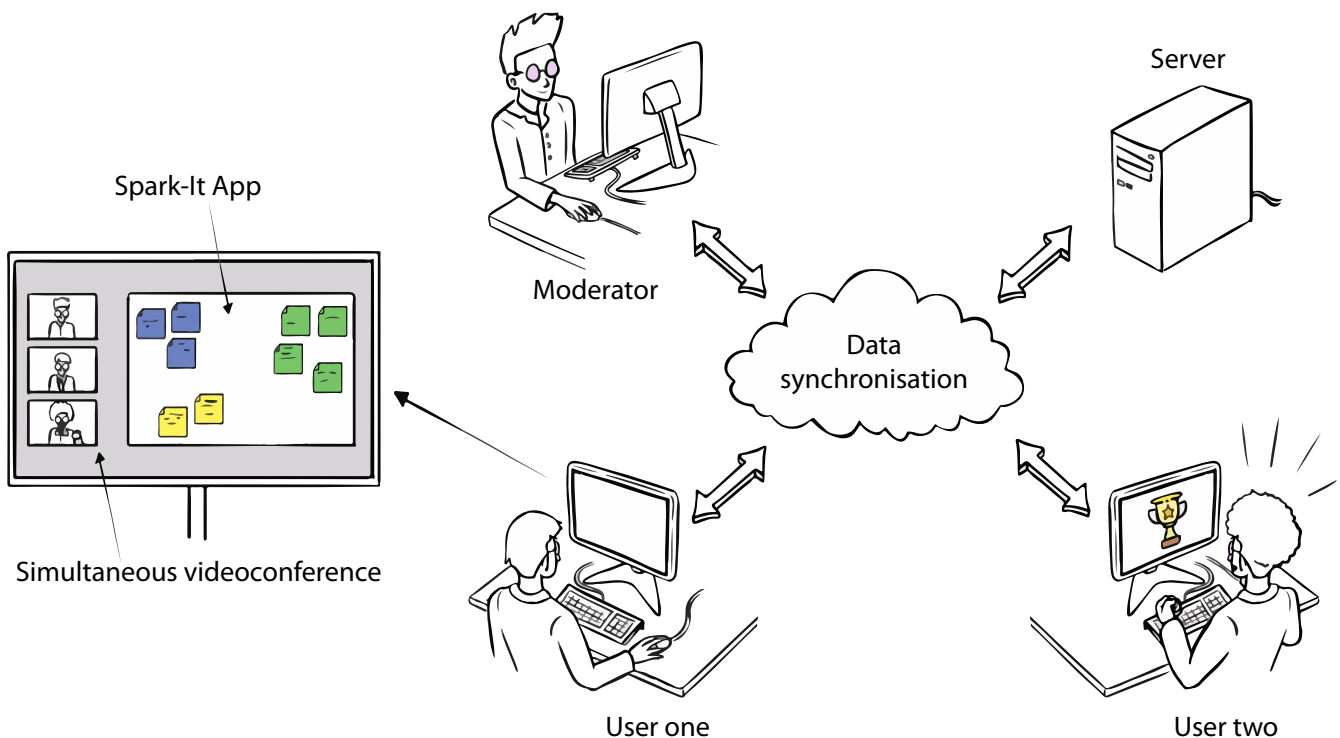
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ABSTRACT

Brainstorming is a creative tool by which a group of people gather ideas on a specific problem. Digitizing such a technique becomes more and more popular, unfortunately skipping the social and fun aspect of it. The Spark-It project gives an answer by studying the effect of gamification. This proposal focuses on implementing and deploying ludification - e.g. race, trophies, scoring. A twin paper describes the impact of gamification on creativity during a brainstorming session [6].

KEY WORDS

Brainstorming; e-Sharing; Gamification; Networking; Interpersonal communication; Effective communication; Trophies; Emotion analysis.





CONTEXT

Effective communication has become one of the most important soft skills implying a strong increase of talented communicators on the working market [1]. The communication process refers to the sharing of information, ideas or feelings from one place, person or group to another one. In such a context, brainstorming is a group effort to find solutions to a specific problem by gathering ideas from the participants. This medium is well known to (1) convey information or ideas effectively and (2) implicitly train participants in communication skills such as creativity, group working, or sharing opinion. Furthermore, it has been shown that this type of tool can be enhanced by gamification [2]. While this document details the implementation of the project, the impact on creativity is described in a twin paper, which also talks about the possible implications in education from a research perspective.

Spurred by the 2020 pandemic events, an increasing number of students and employees are working from home; which is why we believe that there is an urgent need to invest in the brainstorming digitization with the use of gamification and networking.

TARGETED ISSUE

The main objectives of the Spark-It project were to (1) set up a networked digital brainstorming application by using a videoconference app for vocal communication between partners, and (2) explore a gamified solution to increase participants' motivation and see its impact on idea generation. A successful brainstorming session requires creative and motivated participants. Some factors blocking idea generation have been identified [3] such as social inhibition, distractions and "production blockage", when one participant has to wait until another has finished speaking before giving his or her ideas. Social factors have been shown to be resolved anonymously. Production blockage does not exist in note-based brainstorming sessions, as everyone can write down ideas at the same time. The online brainstorming tools we have researched are rich in functionality and allow total freedom of use. However, it has been demonstrated that the interface complexity goes against good practice in the UX field [4]. Such an approach can be a major issue for new users since looking at all the available tools can be overwhelming and distracting for them. Another concern is the potential gamification impact during a brainstorming session: as generating ideas is the first step in the process, gamified elements added to the next steps will not have any impact for new users.

Our project, strongly connected with the fields of digital education and creativity, focuses on online brainstorming sessions to generate ideas

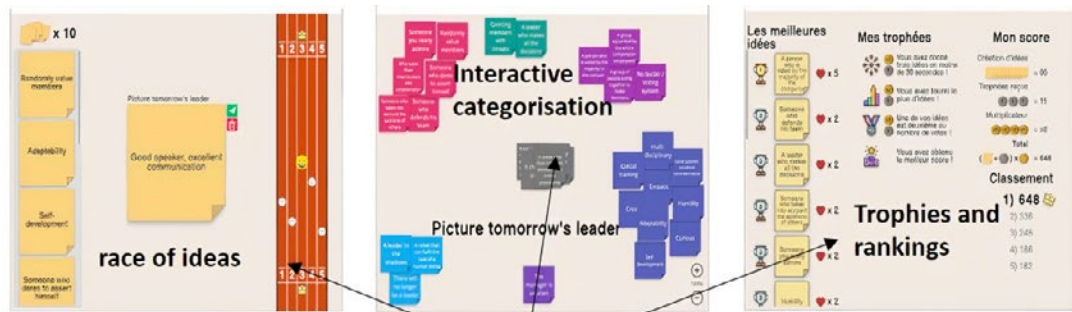


PROPOSED SOLUTION

The Spark-It project is a Web-based app (figure 2), developed by Unity, that mimics classic note-based brainstorming sessions. It allows a moderator and up to eight participants to join a session using a keycode on a Web browser, phase 1. The process of the app is linear, following the steps of an analogue brainstorming meeting. The moderator has full control over the program status, chooses the interface seen by the users and informs them about the session progress. The main interaction the participants have is writing their ideas during phase 2, sharing opinions with categorisation (phases 3 and 4) and voting for their favourite ideas in phase 5. This methodology allows rapid integration of new participants, resulting in shorter sessions. Concerning gamification elements:

1. For each written idea, a participant's avatar progresses on a race track based on the number of ideas – phase 2
2. After each stage, networking clients synchronise their data with one another
3. Analysed data then allow trophies such as higher vote on an idea, the biggest number of ideas, being altruistic during the voting phase, etc

Spark-it With gamification



Gamification

Software X Without gamification



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Our goal being to distribute as many rewards as possible and make the final score highlighting the quality of ideas – phase 6. To do so, the trophies are parameterised with a flat bonus and a score multiplier, e.g. the “three idea streak” would only award a flat bonus and the “best idea” would receive a flat bonus and the maximum multiplier.

RELEVANT INNOVATION

The Spark-It project is the result of collaboration between education and engineering experts. It provides a robust and easy-to-use tool to export and further analyse the generated session data. The result is a fun and innovative brainstorming tool, validated by user tests. This playful racing competition with other participants has shown a substantial increase of the number of ideas; we are currently studying its effect in more details, by answering questions such as: does the stress involved change the quality? In addition, a simple emotion analysis tool has been integrated to the awards - low scoring impact trophies - according to the positive or energetic (i.e. valence and arousal [5]) vocabulary of the users. This subject is also part of further investigations in a bigger project where a significant amount of collected data can validate relevant results.

PROJECT OUTCOMES & RESULTS

We conducted a blind experiment with business school students (N=32) who are familiar with brainstorming methodologies. We compared Spark-It with probably the most famous existing online brainstorming application: a very similar solution in terms of process and functionalities but that does not include any gamification. First results have shown that a positive opinion emerged from the users, with two thirds stating they preferred the gamified application. The main complaints are due to some technical problems on older laptops where Unity couldn't work properly. Otherwise, end-users found the interface easy to understand enabling them to focus directly on the brainstorming. A deeper analysis involving statistical relevance on every comparison aspect comparison is currently conducted.

CONCLUSION

In a context where soft skills are being put forward and the study of distance work is becoming a priority, we have developed a gamified digital brainstorming tool involving educational and engineering experts. Studies and results have demonstrated that gamification brings an improvement in terms of UX as well as productivity.



PERSPECTIVES & NEEDS

First, new experiments are currently in progress to better understand the impact of the parameterisation for each gamified aspect. Second, we plan to adapt the solution for an in-person usage where (1) each participant has a tablet to write and share ideas and (2) the moderator interacts with a large touchtable to categorise ideas. Last, as a long-term project, we also would like to provide innovative educational methods by improving communication through similar means.

ACKNOWLEDGEMENT

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LEARNING THROUGH PLAY. MYTH OR REALITY?

Eric Sanchez

University of Geneva

ABSTRACT

Game-based learning is becoming increasingly popular with teachers and trainers, whether as a means of designing learning situations that motivate and engage students or as a means of assessment that attests to the acquisition of authentic skills. However, this interest goes hand in hand with a certain number of myths that need to be deconstructed by taking into account the research conducted in the field. My talk attempts to deconstruct these myths and identify the elements that need to be considered in order to introduce a pedagogical approach that integrates play.

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SHORT BIO

Eric Sanchez is Professor in educational sciences at the University of Geneva, He holds a PhD and the French habilitation qualifying to supervise research. He specializes in technology enhanced learning and He has done research in the use of game-based learning for formal (school and university) and informal (museum) learning. He has a sound experience in design-based research and learning analytics.

He heads a Master degree program and he teaches technology enhanced learning and game-based learning.



EDUCATION & TRAINING | ONSITE SESSION

THURSDAY 9 JULY

14:00-18:00



CRAIG DOCHERTY



XAVIER LINCE



MELA KOCHER



VIPIN VERMA

23 | COMPARING A GAME V. NON-GAME APPROACH FOR PLANT PROVENANCE PUBLIC EDUCATION

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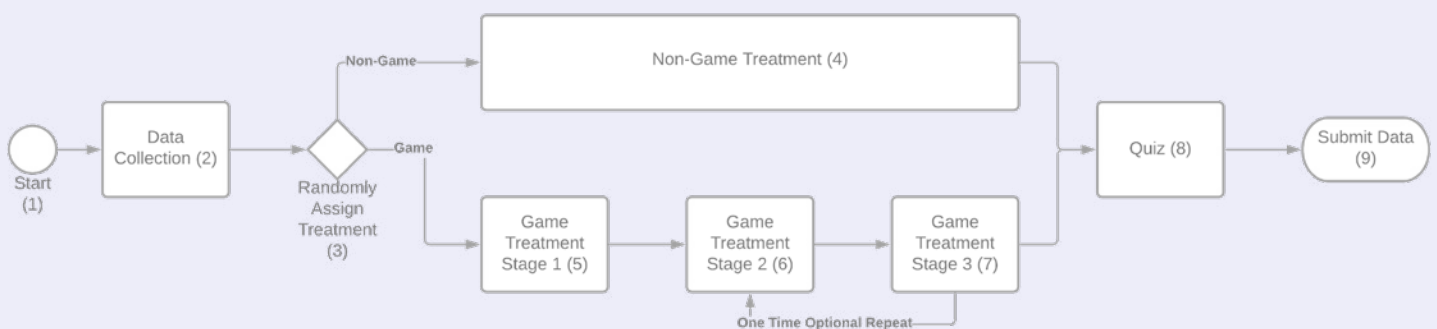
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ABSTRACT

Imported plants risk to bring non-native threats that can cause environmental and economic harm. Introducing serious games is a novel approach to teach the public about the importance of plant provenance. Our study compares information presentation via a game and a non-game approach: we assessed learning via a quiz completed immediately after the experience and again three weeks later. We found that enjoyment in Phase 1 is an indicator of better performance in Phase 2.

KEYWORDS

Serious Games; Tree and Plant Health; Plant Provenance.





CONTEXT

The introduction of ash dieback in the United Kingdom in 2011 led to a joint agreement between England, Scotland, and Wales that more needed to be done to engage the public to help protect trees and plants [1]. While games have been used to varying degrees in public plant health communication, no published studies of the use of serious games in this domain exist.

Plant provenance is an important issue as imported trees and plants may introduce invasive pests and/or pathogens that native species have no natural defence against. These threats can cause environmental, ecological, or economic damage: the introduction of Oak Processionary Moth in 2005 [2] is an example.

While we studied the use of serious games in the tree and plant health sector, e.g. Caledon [3], we have yet to see this combination explored in academic study. Therefore, we approach this from a perspective of: does the use of a serious game to present information influence the ability of the participant to learn information when compared to the same information in a non-game context?

The structure of the experiment is outlined in Figure 1.

TARGETED ISSUES

Traditional methods of public engagement include posters, displays, and talks, but we are interested in comparing the game v. non-game contexts to begin examining whether the introduction of a serious game where one currently does not exist has any benefit compared to the information on its own.

Our interest goes from short-term to long-term retention of information given to the public. Given that the government strategy outlines more engagement with the general public, e.g. botanic gardens [1], there may be some time between information being learned and being required in practice.

Previous, unpublished work indicates that the enjoyment a participant feels during his experience – regardless of whether he is playing the game or not – has a positive impact on his ability to learn information.

The innovation here is the introduction of a serious game to the tree and plant health public engagement context with a focus on plant provenance



PROPOSED SOLUTION

In the study we randomly assigned the participants two one of both groups 1) Non-Game and 2) Game. These groups are kept consistent between the two phases of the study, with participants unable to move between them.

To ensure parity of information between participants, every single participant was presented with the same information to learn. This information was presented on screens that looked exactly the same. These information sets cover Plant Provenance, Emerald Ash Borer, Oak Processionary Moth, and Xylella Fastidiosa.

All participants had to read each of the four information sets at least once before completing the experience. Non-Game participants could view the information sets in any order they wished, e.g. 2 – 3 – 1 – 4 whereas, the Game participants viewed the information set on Plant Provenance first.

In the Game, the players represent someone responsible for completing the landscaping of a local park. They must make a selection of plant products, their country of origin, where to plant them. The choices made here will give a score, with lower levels if threats leading to a higher score have been introduced (Figure 2).

We gave all participants the same end of experience quiz, consisting of 16 knowledge questions and associated demographic and enjoyment questions. Phase 2, conducted 3 weeks after participation in Phase 1, re-used the same 16 questions and introduced 6 new ones, drawn from the same data sets used in Phase 1.



RELEVANT INNOVATION

The innovation here is the introduction of a serious game to the tree and plant health public engagement context with a focus on plant provenance. Plant provenance is an issue that the Department for Environment, Food, and Rural Affairs, FERA Ltd., and others have spoken about at events like the Chelsea Flower Show [4].

Typical engagements at gardening shows, and botanic gardens, only captivate members of the public for a short time. Furthermore, soliciting their details for follow up engagements can be difficult. The online nature of this game, played from the comfort of their own home, allows capturing time and details that otherwise would be missing in this space.

We also present an opportunity to compare the traditional text presentation to that bolstered by gameplay, which is not a usual offering in these settings.

PROJECT OUTCOMES & RESULTS

In Phase 1 we had a total of 42 participants, split into Game (24) & Non-Game (18) categories. 23 participants returned to Phase 2, Game (12), Non-Game (11).

In Phase 1, when we compare the likelihood of the game having an impact on the ability of a participant to answer questions correctly, we find some weak evidence ($p < 0.05$) that the game is more likely to lead to a lower score.

When we look at “enjoyment” as an outcome, we again see some weak evidence ($p < 0.05$) that the game treatment is more likely to lead to lower enjoyment, as is being in the 28 to 27 age group, when compared to 18 to 27s. However, we also see that self-reporting a gain in knowledge of “a lot” compared to “none” is more likely to enjoy the experience more, as does winning in Phase 1 ($p < 0.05$ for both).

Interestingly, we define winning internally as getting more questions correct than incorrect. To preserve the integrity of Phase 2, participants were specifically not told of their performance in Phase 1.

In Phase 2 we had some evidence ($p < 0.05$) that participants who had levels of enjoyment in Phase 1 corresponding to “Enjoyed” or “Very Enjoyable”, when compared to “Disliked”, were more likely to score better in the repeated questions from Phase 1. We also see the same effect for all questions in Phase 2 for an enjoyment value of “Enjoyed”.

We do not see any significant evidence that the game treatment is any better or worse than the non-game treatment for long term retention.



CONCLUSION

From the results, we can conclude that the game approach influenced slightly more than the non-game one in Phase 1 in terms of both participant enjoyment and the ability to recall information.

It appears that participant enjoyment is a stronger indicator of long-term retention than the treatment they were exposed to initially. This raises questions around enjoyment, specifically how an enjoyable experience can be built for a wide section of the public.

PERSPECTIVES & NEEDS

The introduction of research in this field will hopefully start a dialogue between researchers and tree & plant health professionals.

Future iterations of this experiment will focus on understanding how to create an enjoyable experience. We also suffered some technical issues that prevented users accessing the experiment from mobile devices – these issues should be resolved for future iterations.

ACKNOWLEDGEMENT

The authors would like to thank staff at FERA Ltd., and the Animal and Plant Health Agency for their time and expertise on the tree and plant health threats. With particular thanks to Professor Nicola Spence for her guidance on plant provenance.

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24 | SPARK-IT PROJECT: USING GAMIFICATION IN THE CREATIVE PROCESS

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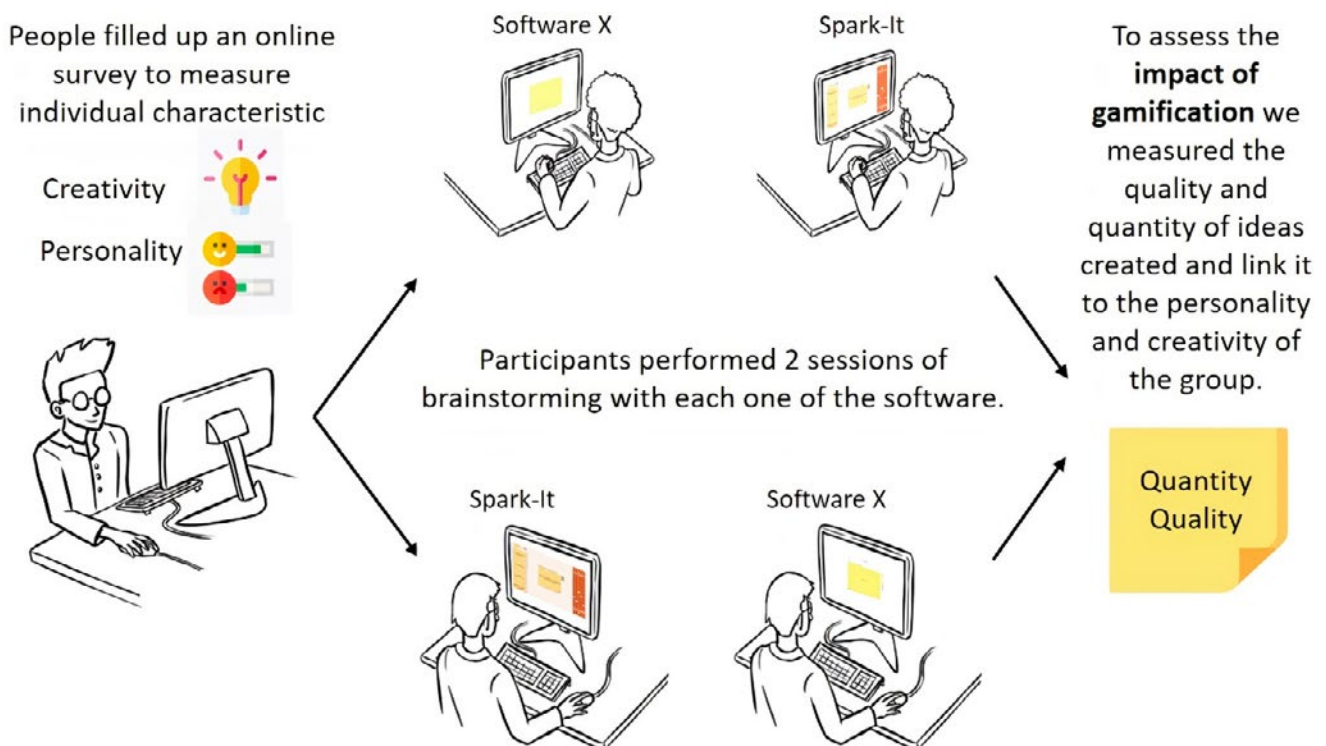
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ABSTRACT

Creativity, defined as the capacity to generate ideas, is present in every field and is the engine of innovation and creative task effectiveness. Brainstorming is a technique to enhance creativity as it allows idea generation, helps to think differently and find innovative solutions to a problem. In this project, we have developed an online gamified brainstorming software, in accordance with the latest research on brainstorming and creativity. The aim is to track the idea generation process and assess the impact of gamification on the creation process. This article is linked to a twin paper that focuses on the technical and development gamification parts.

KEYWORDS

Digital process; brainstorming; post-it; gamification; creative process; educative innovation.





CONTEXT

Our project, strongly connected with the fields of digital education and creativity, focuses on online brainstorming sessions to generate ideas (Craft, 2011; Zobrist & Brandes, 2017). These sessions use a traditional design-thinking environment which includes the following steps:

- › Generate ideas individually – usually on digital post-its;
- › Share group's ideas – on a board;
- › Sort ideas into categories – predefined or emerging;
- › Vote with likes – ranking from one to five – on digital post-its;
- › Identify an action strategy that prioritizes the most selected ideas.

During these sessions, students are constantly led to the emergence of creative micro-processes such as divergent and convergent thinking, analogical combinatorial or comparative thinking, serendipity, or flexibility (Lubart, 2015; Beckman, 2007).

TARGETED ISSUES

In the context of authentic research, the first aim is (1) to follow the creative process efficiently, (2) analyse it with a non-invasive method and (3) link it to psychometric tasks that measure the determinant variables in a productive idea generation. The second aim is to assess gamification impact on idea generation and enhance it. In fact, in the traditional brainstorming process, gamification is only present at the end with the process of liking the idea generated. The problem is that the initial idea generation phase is crucial to determine the outcome of a successful brainstorming session; gamification should be included at every step of the process to enhance the creative process of participants. Moreover, in traditional brainstorming, it is not possible either to have a complete view of each participant's actions during the session. The project Spark-it supports the research by creating an export file in CSV of the complete actions of participants, helps to complexify the system of creation and adds gamification to the creative brainstorming process.

PROPOSED SOLUTION

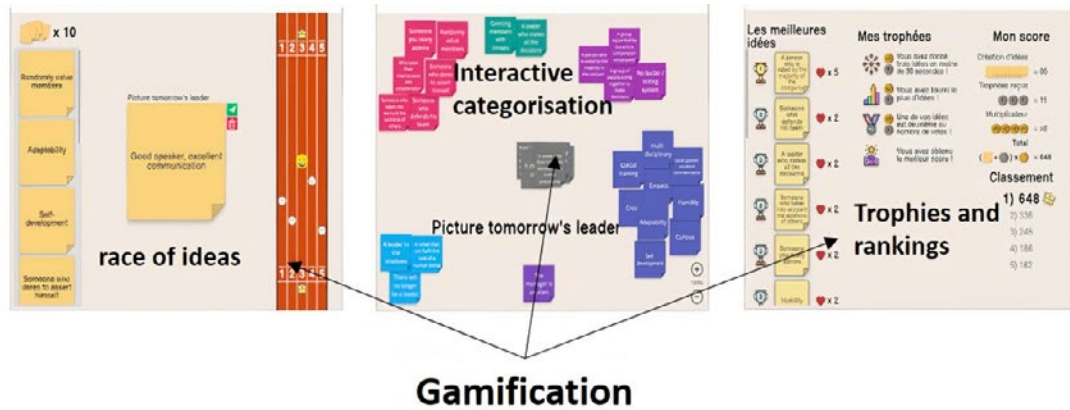
Different from a traditional brainstorming session, the spark-it project includes gamification at every stage of the session, from idea generation to final scoring through idea assessment. We aim at analysing the effect gamification has on the creative process in regard to individual differences such as personality. We designed our gamification as a competition, as such, the participants receive in the end of the session several trophies for the number of ideas generated and the number of likes these ideas received. All the actions of the participants are registered to track the ideas individually and profile their integration into the global pool of solutions generated. Furthermore, the application promotes, by its methodology and coding, the export of ideas in a file format, making it possible to trace a follow-up of participants and profile the evolution of their ideas over successive brainstorming sessions. Moreover, it also leads to a more global coding of micro-processes of creativity allowing to compare the ideas of different groups in terms of recurrences and differences.

RELEVANT INNOVATION

The implementation of the application opens new exploratory research on the creative process axes, gamification, and its limits. Indeed, gamification in a brainstorming session could lead to better creative process, leading to more productive ideas that would transpose into smarter innovation (Amabile, 2004). It could be interesting to see how different the outcome of a session is with respect to quantity and quality of ideas. To this end, an analysis of the following is currently carried out:

- › The outcome of the session in regard to the software used – Spark-it and similar software;
- › The impact of gamification on idea generation depending on the quantity and quality of the ideas;
- › The impact of the individual factors such as creativity or personality on the outcome of a brainstorming session.

Spark-it With gamification



Software X Without gamification



PROJECT OUTCOMES & RESULTS

The first, expected result at the end of this project will be to produce a viable online artifact that enables gamified group brainstorming and complete data export for research analysis. The second one is an analysis of the developed application with 32 participants who realized a brainstorming session with our application and with a control software for the scientific report. Beyond the project, we aim at the submission of a second project with a broader target audience (i.e., companies, schools) as part of a European Horizon 2020 project or an Innosuisse project.

CONCLUSION

The innovative project changes brainstorming radically in the context of education. Spark it: (1) opens the way of the gamification of the brainstorming in education, (2) offers the possibility to analyze the creative process from a research perspective and (3), adds more research-supported gamification opportunities.

PERSPECTIVES & NEEDS

We have developed a gamified web application (or product) and, if our paper is accepted, it will be possible to present the project as well as the results of the experiment.

ACKNOWLEDGEMENTS

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25 | PHEW! OR HOW TO DEVELOP AN EVERYDAY SUPERPOWER FOR EDUCATION

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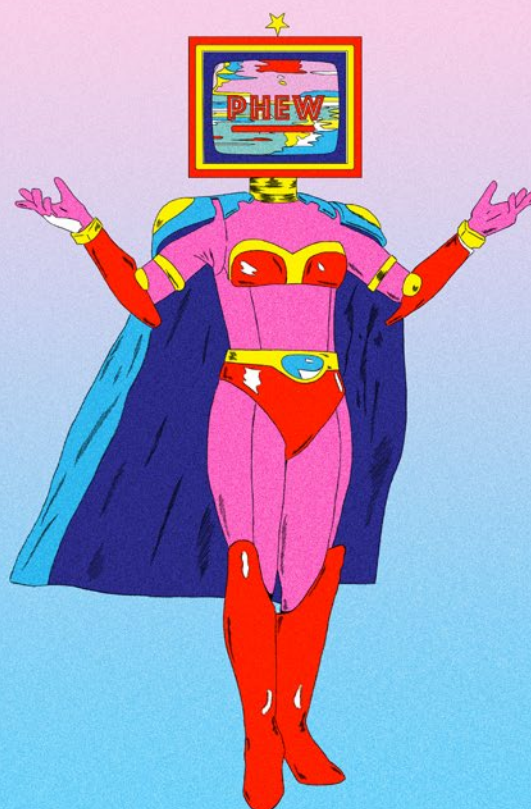
Contact: mela.kocher@zhdk.ch

ABSTRACT

«It is not about the mastery of tools, but rather the creation of engaging learning environments» – this is our understanding of the mission that e-learning is facing today. The vibrant environment of the ZHdK, with its many different creative and hands-on practices, now calls for digital or hybrid solutions due to the Covid-19 pandemic. To face this challenge, we have developed a fresh approach to e-learning: The «PHEW» model containing «play», «hybrid», «easy» and «walk» as distinct features.

KEYWORDS

Education; e-learning; gamification; game-based learning; digital learning; hybrid learning; future skills; didactics; online courses; creativity; motivation; activation; digital culture; digital didactics.





CONTEXT

Our playground is the Zurich University of the Arts (ZHdK) and we develop digital learning and teaching environments [1]. The ZHdK E-Learning development sector exists since 2017 and has been constantly growing. The actual Covid-19 situation has proved to be a unique accelerator – not only resource-wise but even more in knowledge building. Continuously, we experiment with new and old ideas in digital and hybrid environments. At the ZHdK, we have a large user group which is grateful to try out our ideas and in turn inspires us. We create new «counter- and design worlds» [2] with playful techniques which are inspired (influenced) by gamification methods.

The e-learning team launches formats like «digital teaching style», «exchanged», «LeLa» or «digital teaching in practice», where we reflect methods and techniques and build a «community of practice» [3] to exchange and discuss knowledge. We believe this digital culture brings about a new mindset which is an innovation engine for the teaching approach. Our idea behind the “E” of E-Learning is not “electronics”; it stands rather for “extending” the act of learning and teaching. With this mindset we bring a bouquet of playful and interactive moments into the classroom and, when used well, these methods put the human being in the center – and not the techniques (see illustration 1).

Therefore, we should “(...) emancipate ourselves from the Moodles, Microsofts or Zooms and learn to use them creatively instead.” [4].

TARGETED ISSUES

Consequently, this article will specifically cover the methods we have developed to create and teach learning environments that facilitate a motivated and friendly learning atmosphere. We will discuss our «superpower model» which encompasses insights from our long-term engagement with game studies, gamification and serious games. By jointly thinking gamification and education, e-learning is promising to be a vessel that unleashes creativity as well as new ways of learning – therefore strongly giving us ideas, where the future of learning can lead to.

PROPOSED SOLUTION

To explore the gamification methods possibilities in the education sector we have summarized our best practices and categorized them in four perspectives. «PHEW» stands for play, hybrid, easy and walk. This model has a superpower, which can activate a participant, create informal spaces and foster creativity:

- › “Play” is a bit crazy and releases the unknown, shedding unexpected perspectives,
- › “Hybrid” is a mixed-reality and shows us how to be – in a constructivist reality,
- › “Easy” shows the “in-between” – the informal – the randomness,
- › “Walk” gives the gift to take a moment to pause, to reflect together and alone.

Just as the theoretical model of the French sociologist Roger Caillois [5] proposes (highlighting the game categories Agon, Alea, Ilinx and Mimicry), our 4 perspectives of PHEW are both features and categories. According to that, they are methods that are successfully mixed together in many of our projects, but at the same time they stand for single categories which our practices can be investigated upon.

To make it more comprehensible, in this paper we will explain our model considering one of our best practices, “Creative Encounter”.

*It is not about the mastery
of tools, but rather the
creation of engaging
learning environments» –
this is our understanding
of the mission that
e-learning is facing today*





RELEVANT INNOVATION

“Creative Encounter. 10 days, 10 tasks & 1 box” is an online course that the ZHdK launched in 2020 [6], and will be repeated at least twice in 2021. The course addresses anyone who is curious to awaken or deepen his/her creative skills.

In October 2020, before the course start, each of the 30 participants received a box per postal mail, containing certain objects – a sponge, a straw, a colored foil and more. They also got a login for the online platform PAUL, our customized ZHdK moodle. For the duration of the course, every weekday morning, a new video popped up on the platform where an expert from one of the different ZHdK design and art disciplines explained his or her field, and proposed creativity methods, along with a specific task for the day. In their own time and pace, the participants pursued the activity, shared results and processes on the PAUL forum, and reviewed the others’ projects.

The 10 tasks ranged from singing in the forest, building a fortune wheel (as decision machine), creating light installations in their own living-room, or kneading everyday objects’ affordance with Play-Doh. A kick-off meeting on Zoom, where everyone had to bring a physical object explaining his/her idea of creativity, and a closing Zoom meeting, where we included challenges such as «get a fancy drink and change into a party outfit in 3 minutes», added up to a synchronous community atmosphere.

PROJECT OUTCOMES & RESULTS

How does this project represent our superpower PHEW model? In many ways, «Creative Encounter» was interfused with playful elements. For one thing, the community and the activities, that centered around the closed Moodle platform, formed a “magic circle” according to Huizinga [7] – a safe place, where new experiences could be made without fearing failure. Not knowing what to expect on the next day evoked feelings of curiosity and excitement – in a way, the yet closed tabs for the next days on the Moodle platform had a strong functional resemblance to an advent calendar. We emphasized on a hybrid world: large parts of the course instructional content being digitally provided, but the tasks themselves encompassed both digital and analogue settings. We also aimed at combining synchronous and asynchronous elements to offer a variety of learning fields. We kept an eye on the tasks and the course moderation was given in an easy, informal and inviting way. Even though some of the activities were quite pervasive and challenging, it was possible to experiment also alone without sharing every content. Lastly, being sent out to explore the world every day



in a walk-about style was an eye-opener and discovery for many. Who would have guessed before that you could use moss for paint or invent stories by extending the pavement stains with chalk?

CONCLUSION

The powerful combination of a playful attitude and gamification methods for education purposes has been getting a lot of attention at our university. After the first «Corona wave» the e-learning team perceived a huge need for basic instructions, e.g. how to use video conferencing software to teach. Now, half a year later, the demand has shifted: Not the tool mastery, but didactically-inspired learning scenarios stand in the focus of most people involved in teaching.

PERSPECTIVES & NEEDS

In this paper, we have elaborated on the importance of creating motivational learning environments. We believe that the employment of PHEW – playful scenarios in hybrid environments, that are conducted in an easy, accessible way, encompassing moments to reflect, such as walks – is a promising way for the further development, experiments and research. With our upcoming research project «CUTE» we shall investigate it on a broader level [4].

ACKNOWLEDGMENTS

Picture Credits:

Human-centered PHEW model by Marie Mohanna | Creative Encounter Experiment by Marc Stocker.

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26 | CONTENT AGNOSTIC GAME BASED STEALTH ASSESSMENT

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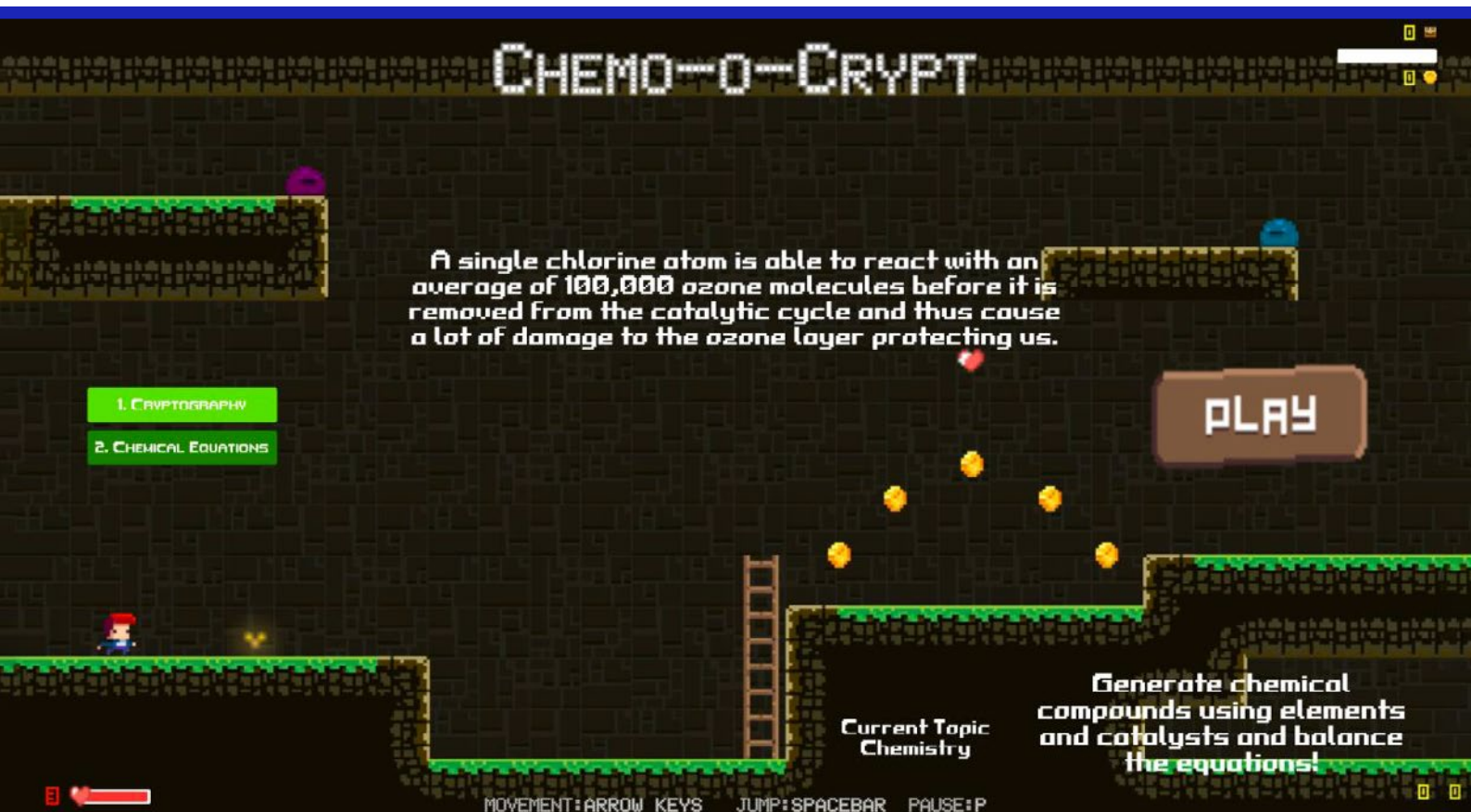
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ABSTRACT

Serious games usually have game mechanics, game content, and content assessment all tied together to make a specialized game intended to impart learning of the associated content to its players. While this approach is good for developing games that teach highly specific topics, it consumes a lot of time and money. The Content Agnostic Game Engineering (CAGE) Architecture mitigates the problem by disengaging the content from game mechanics. Integrating stealth assessment into the framework in a content-agnostic way will increase its usability and a further decrease of game and assessment development time and cost.

KEYWORDS

Content-agnostic; stealth assessment; affective computing; boredom; frustration; flow; Bayesian network; student model; Knowledge Tracing.





CONTEXT

The video game industry has expanded a lot during the pandemic as more people have played games during the coronavirus-imposed lockdown and is expected to surpass both film and sports combined. Dominating the other entertainment industries, it generated about \$180 billion in revenue, of which \$2.6 billion was the revenue generated by serious games alone. Revenue yielded by serious games is expected to increase to 8.1 billion by 2022, with the highest revenue obtained by China, followed by the US, and India, indicating the extent to which serious games are being used across various countries in the world. One of the key factors promoting the serious games sales growth is the increasing demand for early childhood learning games, followed by the serious game resistance decrease. In old days, parents used to stop their children from playing games, but in the present era, 70% of the parents feel that video games have a positive influence on their children and about 67% of them play with their kids at least once a week. With the availability of fast network connectivity, serious games can use location-based services, virtual reality, augmented reality, and have low latency rates, enabling online multiplayer games with ease. Thus, there are many factors which are operating simultaneously to boost the serious games sector.

TARGETED ISSUES

Development of an educational game and assessment takes plenty of time, and once the development is complete, the developers may well have to start over to create another game. Baron (2017) designed a content-agnostic architecture called Content Agnostic Game Engineering (CAGE) to create multiple educational games that rely on the same game mechanics, leading to lower time and cost requirement to build several games at once. However, the architecture did not implement a content-agnostic student assessment model built into it and the study employed survey questionnaires to evaluate the engagement which Baron (2017) noted are interruptive in nature and leads to a reduction in motivation level of players.

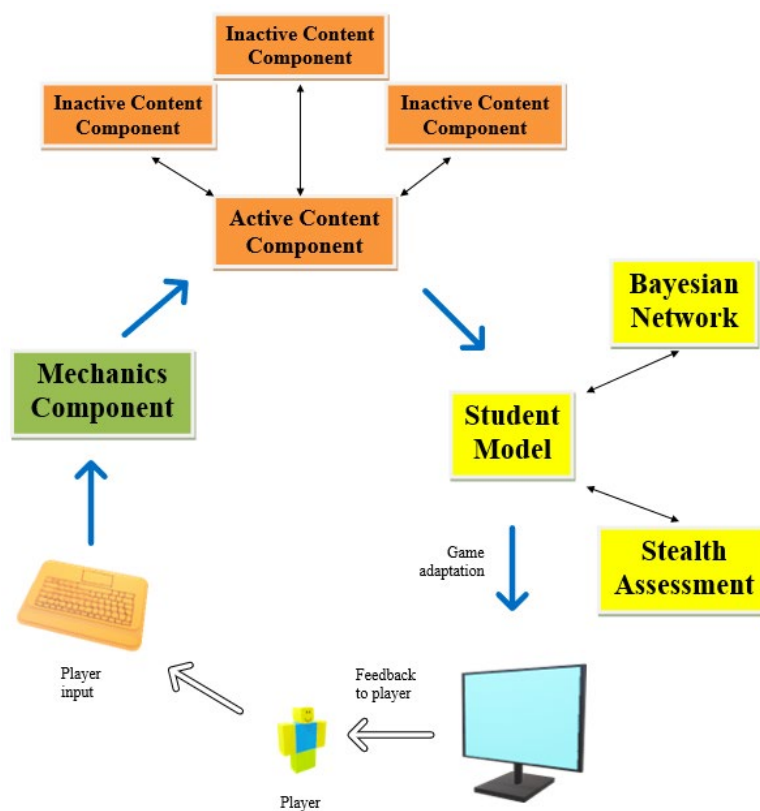
Previous research has used commercially available games for educational purpose (van Eck, 2006), and has tried to integrate stealth assessment in an existing game (Shute & Wang, 2015). Further, Baron (2017) has provided an architecture that helps develop multiple educational games at once. But no research has been done regarding the use of stealth assessment in a content-agnostic way. To address this problem, stealth assessment will be built into the CAGE framework as it helps in sustaining the students' motivation level.

This research proposes to build on an existing software architecture called CAGE, which will allow game and assessment developers to develop a game-based learning assessment that can be used across several content domains



PROPOSED SOLUTION

This research proposes to build on an existing software architecture called CAGE (Baron, 2017), which will allow game and assessment developers to develop a game-based learning assessment that can be used across several content domains. The CAGE architecture incorporates the design of game mechanics in a content-agnostic way, but it doesn't include a method to create content-agnostic stealth assessment into the framework. Without the content-agnostic assessment, every new project would need to create a valid assessment for the different contents from scratch. This research aims to introduce the content-agnostic assessment into the framework in such a way as to improve the development cycle of a learning assessment while creating an educational video game. This will help reduce the development time and cost of educational games (Baron, 2017). Such a model will be beneficial for both large and small video game studios as well as academicians who research in educational video games. The research will also include a dynamic student model of assessment built into the game using



a Bayesian network, which will help adjust the game difficulty in real time while providing feedback to the player and augmenting their game-play experience and learning.

RELEVANT INNOVATION

Currently, there is no research which provides a content-agnostic way to incorporate student model and assessment into an educational video game for the quantification of learning, which results in more time and cost required to build assessment into any game. The proposed research ameliorates this by allowing multiple games for assessment to be developed in the time and cost which would otherwise be used for creating just one game. It will help in developing games and assessment in a content-agnostic way so that in future projects the same set of mechanics and assessment can be used to teach and evaluate other contents. This is not only helpful for businesses in this domain but also better for academicians and students as such. The research also evaluates the use of game adaptability using methods such as stealth assessment, emotion assessment, and Bayesian networks to better engage students to the game and improve the learning outcomes in a content-agnostic game. Student affect is predicted using the equations derived from their facial expressions obtained through facial emotion tracking (Verma et al., 2020). Student model is built using Dynamic Bayesian Network integrated into the Unity game using the [Bayes Server software](#) and will constantly update itself as new evidence of student knowledge is made available through the game.

PROJECT OUTCOMES & RESULTS

The CAGE framework can be used to speed up the research and development as well as to create serious games for commercial purposes. The affect modeling that is incorporated in the CAGE game, can be applied to any other game or even online tutoring systems and websites. It can be used to detect if the user is getting bored or frustrated with their product or service, and thus provide intervention which could be used to pull them into positive affective states such as engagement. The Bayesian student modeling that it contains can also be applied to any other content or scenarios where additional evidence is available in real time and can be used to infer a target skill.



CONCLUSION

Personalizing educational content in games or online learning systems can be achieved by assessing the learner cognitive-affective states in real time and adapting the system to the learners. In return, the personalized systems may be able to adapt better, be inclusive, and tailor learning to students from all skill levels. Using the current findings, educational games and online learning systems can provide personalized learning environments that support student skill acquisition.

PERSPECTIVES & NEEDS

Research and development regarding serious games and adaptation is increasing. Educational data mining, affective computing, mouse-tracking, and many other ways of stealth assessment could be used to adapt the game to the level of an individual learner. However, it will take some time before all these practices leave the research environment and are implemented into an actual physical classroom.

ACKNOWLEDGEMENTS

I am grateful for Tyler Baron who developed the CAGE architecture and shared it with me so that I can expand the framework.

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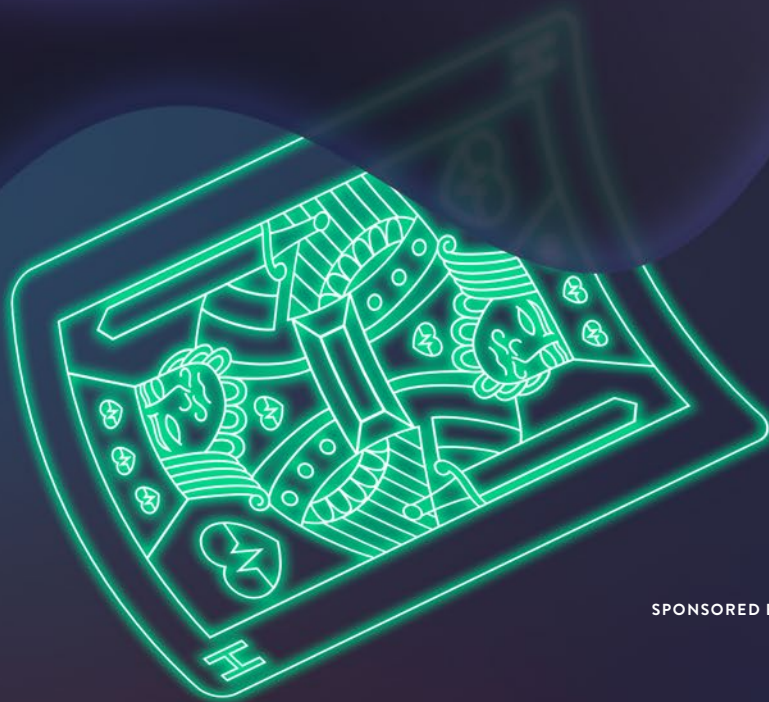
Play as a way to (re)create memories of a successful and gratifying moment. Playfulness can help human memory nowadays give back the feeling or sensation that one has lived before.

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