Teaching Toolkit

HOW TO USE GAMIFICATION IN ENTREPRENEURSHIP EDUCATION

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Welcome to ISGEE!

Our mission

The ISGEE project is an Erasmus+ funded transnational project. The ISGEE partnership develops an **open access, modularly structured** serious e-game "**Entrepoly**" that is focused on entrepreneurial competence development among university students. The game is accompanied by a variety of useful resources – such as a comprehensive teaching toolkit – which facilitates educators to ignite entrepreneurial thinking and action during their lectures.

Aim of the project

The **aim** of the ISGEE project is to develop entrepreneurship and digital competences with a digital serious game, called Entrepoly (1), that arrives with a supporting adaptation handbook (2), a teaching toolkit (3) and also selected good practices for teaching (4).

This document

The current document is a **Teaching Toolkit** providing the necessary background and insight for professionals and interested parties into the topic of entrepreneurship education, gamification and gamification's usage in entrepreneurship education. This document entails the peculiarities of previously conducted gamification workshops under the framework of the ISGEE project, answering questions such as: What can a serious game be used for? What are the necessary requirements of a serious game? What should a newly developed serious game be like?

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Table of Contents

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1 Introduction of the project

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Rational behind the project

According to the European Commission, lifelong learning can be achieved by developing 8 key competences, out of which two is used for the current project:

- Digital competences – confident and critical use of ICT tools
- Entrepreneurial competences – Higher Education Institutions (HEIs) role too to develop these competences and promote entrepreneurship education (EE)

Aim of the project

The aim of the ISGEE project is to develop entrepreneurship and digital competences with a digital serious game, called Entrepoly, that is supplemented with a supporting adaptation handbook, a teaching toolkit and also a selection of good practices for teaching. The document you are reading right now is the teaching toolkit.

ISGEE fits DigiCompEdu's recommendation fostering the following activities:

- Creating or co-creating new digital educational resources: an open access innovative digital serious game (1)
- Organizing digital content and making it available to learners and educators: game adaptation handbook (2) and gamification teaching toolkit (3) for lecturers
- Identifying, assessing and selecting digital resources for teaching and learning: a good practice suite for educational implementations (4)

Target group of the project

The target group of the ISGEE project is diverse. It includes the following stakeholders:

Lectures - due to the increasing need to satisfy the needs of the new generation

Students - who are part of the new generations, especially generation Z; they use digital devices easily

Business Partners - who later employ the new generations

Methodology behind the game

Entrepoly's methodology relies on two frameworks determined by the European Union:

Entrecomp - The European Entrepreneurship Competence Framework

DigCompEdu - The European Digital Competence Framework

Project partners

ISGEE has a very diverse but united set of partners, who have been eagerly working together to reach the aims of the project. The partners include the University of Szeged (lead), West University of Timisoara, Technical University of Ostrava, STUCOM, Univations, Expertissa. The project also has associated partners including Nottingham Trent University and Mongolian University of Life Sciences.

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2 Gamification

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What is it and why are we using gamification?

Currently, teachers are facing **new challenges** and have to solve important issues related to the adaptation of the learning process towards students' needs, preferences and requirements. Teachers have to use different teaching methods and approaches that allow students to be active participants with strong **motivation** and **engagement** to their own learning.

One possible solution is to **reward the efforts** and achieved results by awards, which leads to increased motivation for participation and activity. That decision is based on the use of game elements in the learning process. Gamification in general could not only be applied in education. However, we currently focus on gamification in education, more specifically in higher education and entrepreneurship education.

Gamification has been at the center of research interest in the previous years, in connection to which several different definitions surfaced stating that gamification is

- "*taking game mechanics and applying them to other web properties to increase engagement*" (Trill 2019),
- "*the adoption of game technology and game design methods outside of the games industry*" (Helgason 2010),
- or it is "*the process of using game thinking and game mechanics to solve problems and engage users*" (Zichermann 2011);
- Gamification was later defined as "*a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation*" (Huotari et al. 2012).

However, the most used **definition of gamification** states that it is "*the use of game design elements and game mechanics in non-game contexts*" by Deterding, Sicart, Nacke O'Hara & Dixon (2011).

What are Serious Games?

Serious Games are considered to be the tools of gamification, as they are defined as "games (that) have been developed for the broader purposes of training and behavior change in business, industry, marketing, healthcare and government NGOs as well as in education" (Connolly et al., 2012). It should be noted that the concept of 'serious games' is often used interchangeably with 'game-based learning', the difference being that serious games are developed for specific learning outcomes (Connolly et al., 2012).

According to systematic reviews, most papers tend to find positive effects of gamification and serious games in education. Recently, there has been a great interest in using serious games in entrepreneurship classes (Fox et al., 2018); (Bellotti et al., 2014). Kriz & Auchter (2016) convincingly show that **entrepreneurial games have positive effects on participants**. Kasurinen and Knutas (2018) have investigated 1164 research papers on gamification and found that the most common types of

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research in gamification are development of proof-of-concept prototypes (computer science education, ecological lifestyles and sustainability and motivational tools); theoretical papers arguing the components or applicability; studies presenting the eLearning concepts such as massive open online courses.

Gamification in education

Gamification of educational process in universities has started mainly in the **21st century**. In 2011 there was a loud buzz about gamification -- the use of game elements such as point systems and graduated challenges for activities not usually considered games. Huang & Hew (2018) consider crucial aspects of five motivation theories to propose a goal-access-feedback-challenge-collaboration (GAFCC) gamification design model. They explore whether gamification can **encourage participation** in flipped activities in the higher education level and find that students in the GAFCC class completed significantly more pre- and post-class activities than the control class and produced higher quality work.

Kusuma et al. (2018) survey some analysis of gamification models to increase motivation, achievement and engagement in learning activities, from 2009 to 2018 from 4 domain applications: generic, STEM, history, and language. The MDA framework performed by mentioned authors is a formal approach for analyzing game design by breaking them into three distinct components:

- **Mechanics:** player's progression, tasks, controls and features;
- **Dynamics:** rewards, role-playing, non-linear progression, real exploration, in-game exploration, puzzle solving, management –simulation, others;
- **Aesthetics:** sensation, challenge, fellowship, discovery, fantasy, narrative, expression, submission.

Reasons behind gamification

A large number of scientists review the **effectiveness of gamification** in education (Gray et al. 2015). Hamari et al. (2014) states that education and learning is the most studied context of gamification implementation (over almost half of the papers studied). One of the reasons why gamification is such a field of interest at the moment is because the needs of the new generation, in other words, the digital natives, challenge educators, as they demand new and innovative learning methods and pedagogical models. The traditional ways of teaching seem to be ineffective for the young students (Pappa – Pannese 2010).

Pappa and Pannese (2010) state that students nowadays are searching for **interactive, fast-paces, visually stimulating and engaging learning methods**. The key to understanding them and offering all these is to create serious games for them, which are such games in which education is the primary goal, rather than entertainment, and can facilitate learning from the experiences of others. In the context of education,

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"SGs have learning goals and structure, but in addition are adaptive and interactive and most importantly they provide enjoyment, pleasure, motivation, ego gratification (through competition and wining) and emotion, in order to achieve learner engagement and involvement" (Pappa – Pannese 2010).

At the same time, **teachers can monitor students' data** and track their progress (Kiryakova et al. 2014). In the educational context, gamification incorporates **game-centered thinking and game elements**. Therefore, gamification is usually applied in learning to **enhance learning outcomes and motivate students** (Kingsley – Grabner-Hagen 2015). Kingsley and Grabner-Hagen (2015) argue that gamification has a great potential to become an impressive force in education and can include the **development of skills** such as creativity, critical thinking, collaboration, and communication.

All in all, gamification can be used to:

- convey knowledge effectively, in an interactive, stimulating way
- engage students
- monitor students' progress
- enhance learning outcomes
- develop creativity, critical thinking, collaboration, and communication

Gamification principles

Gamification principles in education most usually include **elements of the game**, such as:

- visible user status (reputation and recognition, social engagement, freedom to fail (low risk submission)
- goals
- challenges
- quests
- immediate feedback.
- badges and points
- levels
- leaderboards

These gamification methods are most used in the subjects of computer science, information technology, programming, mathematics, science and engineering (Dicheva et al. 2015).

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Effects of gamification

The more and more widespread application of serious games and the continuously growing number of papers on the topic conclude that the **effects of these games seem to be positive**. The main benefits of gamification in education are called the 'four freedoms' including:

- the freedom to fail
- the freedom to experiment
- the freedom to assume different identities
- and the freedom to effort.

It would also allow **automated teaching** and **individualized learning**. Potential challenges of gamification include distracted attention of the learner, the social tension of being a newbie, and extrinsic rewards (short-term rewards or badges) (Oxford Analytica 2017). Additional barriers could be educational, technical and financial (Tsekleves et al. 2016).

Serious game learning outcomes

Serious games can have several **learning outcomes** and **affect the individual** in certain levels, such as:

- knowledge acquisition and understanding
- perceptual and cognitive skills
- motor skills
- behavior
- soft skills
- social skills
- affective and motivational outcomes and physiological outcomes can be affected (Connolly et al. 2012).

Due to the number of learning outcomes and individual influences gamification can have, gamification and serious games should be studied in the context of higher education as well.

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2.1 Gamification in Higher Education

There has been a keen interest in studying gamification in the higher educational context as well, as teachers are challenged by the **new generation** who have **different needs and preferences** in terms of education. Teachers have been using new and different teaching methods by adapting **game elements** in the learning process.

The higher education gamification process started in the **21st century**, when the usage of game-like elements (points, rewards, awards, etc.) began to take off, as classes with gamification elements had significantly better results and output higher quality work than those without (Huang – Hew 2018). Especially in an academic environment, gamification can be positively applied to an online context (Kuo – Chuang 2016).

Kusuma et al. (2018) states that a successful gamification model in higher education includes **three main aspects**. These elements are:

- mechanics (player's progress, tasks, controls and features),
- dynamics (rewards, tasks, controls, features),
- and aesthetics (sensation, challenge, discovery, narrative).

If a game is successful, it would have a positive effect on student performance and attitudes at a university level (Yildirim 2017) and both teachers and students can have an increasing motivation and fun while learning or teaching (Taspinar et al. 2016).

Gamification could successfully be applied in several study-fields, such as:

- business studies
- communication
- computing
- entrepreneurship
- languages
- engineering
- mechanical engineering
- nursing
- pedagogy
- psychology
- science (Subhash – Cudney 2018).

Applying gamification in HEIs resulted in better student academic achievement, engagement and attitude (Fisher et al. 2013; L. De-Marcos et al. 2014; Müller et al. 2015). Based on these results, it can be concluded that **entrepreneurship** is a field which is **suitable for the application of gamification and serious games.**

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3 Entrepreneurship education (the EntreComp framework)

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This chapter aims to **evaluate** the Entrepreneurship Competences Framework (EntreComp) from the serious games perspective to highlight the possible ways to interpret an EntreComp competence in a digital serious game. The aim of this is two-fold:

- to provide a general guidance for any serious-game approach in the field of entrepreneurship education.
- to provide specific guidance for forming Entrepoly game elements and modules where the EntreComp Framework competences can be used as targeted outcomes.

The idea was to create a shared understanding of the knowledge, skills and attitudes that make up what it means to be entrepreneurial – discovering and acting upon opportunities and ideas, and transforming them into social, cultural, or financial value or others -- and to translate this definition of entrepreneurship to specific aspect of the game design for Entrepoly.

The idea is not to create a clear pathway on how to take entrepreneurial competences directly from EntreComp and embed them into Entrepoly, but to list valuable adaptations relevant to the design of a serious game that can be applied in a broader sense. This will ensure that the flexibility of EntreComp is maintained, and that these adaptations can be applied to other serious games outside the scope of ISGEE.

3.1 About the EntreComp framework

It is not trivial to clearly delimit entrepreneurial competences that concern entrepreneurial thinking and acting, as there is **no generally accepted conceptual understanding** (neither in the narrow nor in the wider sense) of what entrepreneurship education means and includes. To address this issue, the Joint Research Centre of the European Commission (JRC) has been motivated to clarify the foundational understanding of EE and to bring all concerning ideas to the table. These efforts bloomed into the publication of the **Entrepreneurship Competence Framework** (EntreComp) in 2016. Within the framework of EntreComp, entrepreneurship is defined as a transversal core competence and as "the capacity to act upon opportunities and ideas, and transform them into financial, cultural or social values for others". Building upon this definitional basis, EntreComp proposes the delimitation of three closely related **competence areas**:

- Into action
- Resources
- Ideas & Opportunities

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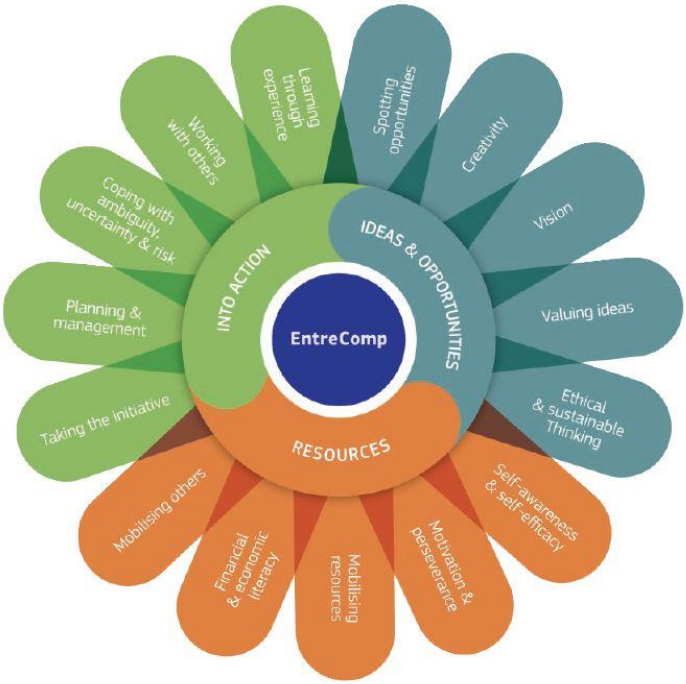
Each competence area is in turn based on five competences, which form the foundation of the methodological framework designated as "EntreComp Conceptual Model". The following diagram outlines the basic idea of this approach ("The EntreComp Wheel"):

Fig.1 The EntreComp Wheel.



According to Figure 1, the competence delimitation takes place at an **abstract level**. In order to be able to finely distinguish between the individual competences, EntreComp contains brief descriptions (called "hints") that clarify how the competences are to be understood and practically applied. For example, the competence "creativity" inside the competence area "Ideas & Opportunities" refers to the ability of developing creative and purposeful ideas. This explanation of a competence is then supplemented with further details (called "Descriptor"), which altogether provides a comprehensive understanding of entrepreneurial competences that can be imparted with the help of Entrepreneurship Education activities.

After EntreComp introduces the fundamental entrepreneurial competences, it supplements the conceptual model with a competence progression model. Here, a total of **four competence levels** build on one another and are distinguished as:

- Basic competence level - "Foundation"
- Intermediate competence level - "Intermediate"
- Advanced competence level - "Advanced"
- Expert competence level - "Expert"

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Based on the competence progression model, the respective manifestations of existing entrepreneurial competences (individual or collective) can be qualitatively assessed. In analogy to the detailing of the conceptual part, the EntreComp "competence progression model" is also thoroughly explained and characterized. On one side, **the individual competence levels** are distinguished by the extent to which the application of the respective competence is carried out with support or independently. In addition, a **distinction is made** between two consecutive stages for each competence level. The characterization of the respective competence and/or the skills necessary for competence enhancement are based on this distinction. For example, in the competence field of "resources" (see figure 3), it makes a difference whether you are merely able to roughly estimate the necessary financial resources for the implementation of a project or whether you describe financial necessities with a professional, multi-year finance plan for various scenarios, both in tabular form and argumentatively. In total, a distinction is made between eight different qualification levels.

The fundamental question now is: **How are the conceptual and the competence progression models "connected" to serious-game techniques within the scope of the EntreComp framework?**

3.2 EntreComp competences and their adaptation to serious games

In its blueprint, EntreComp is designed to be broad enough to be **applicable** to most educational and non-educational learning environments. This creates a wide understanding of the entrepreneurial competences outlined in EntreComp and provides a basis for a diverse range of applications. In serious games, many of the entrepreneurial competences outlined in EntreComp become relevant as the outcomes of user-interactions are planned during the game-design phase.

User experience

User-interactions are also commonly referred to as user experience. User experience is generally a **personal experience** where a user's contact with certain digital elements produces some type of an emotional/physical reaction. These reactions can be guided in a manner as to establish learning mechanisms that would allow serious game developers to indirectly integrate entrepreneurial competences outlined in EntreComp.

EntreComp competences and examples of their adaptation in Serious Games

Table 1 (below) shows the competence area, competences, and the examples of gamified adaptation/translation of each competence from EntreComp. The **suggested adaptations/translations** are to serve as a basepoint for a discussion in regard to how aspects of

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EntreComp can be "gamified" and to provide a general sense of direction in regard to how this target can be achieved. The exact adaptation/translation to game element/scenario/'house' will always depend on the perception and knowledge of the game developer; *however, these adaptations/translations are encouraged to be documented*. A further example of this will be provided later in this document.

Table 1. EntreComp competences and examples of their adaptation/translation in Serious Games.

Area	EntreComp competence	Description of the Competence from EntreComp	Exemplified Adaptation/Translation to Serious Games
Ideas & Opportunities	1.1 Spotting Opportunities	• Identify and seize opportunities to create value by exploring the social, cultural, and economic landscape. • Identify needs and challenges that need to be met. • Establish new connections and bring together scattered elements of the landscape to create opportunities to create value.	• Collaborative aspects • Opportunity management techniques • Pre-game goal identification for users • Open-world setting • Room for exploring the game map
	1.2 Creativity	• Develop several ideas and opportunities to create value, including better solutions to existing and new challenges. • Explore and experiment with innovative approaches. • Combine knowledge and resources to achieve valuable effects.	• Able to implement own ideas instead of following strict game code. • Flexibility with decision-making • Reward system for implementing own ideas • Relevant to in-class entrepreneurial pedagogy • Reward system for creative ideas • Allow room for different strategies to achieve goals/targets, instead of "one-way-to-win" approach. • Allow users to control the virtual reality they will be in (e.g. colors, objects, map elements)
	1.3 Vision	• Imagine the future. Develop a vision to turn ideas into action. • Visualize future scenarios to help guide effort and action.	• Pre-game goal identification and post-game self-evaluation of how much of their own ideas developed within the game. • To create a strategy for each game task. • Create clear path for tasks, and how the game ends.
	1.4. Valuing ideas	• Judge what value is in social, cultural and economic terms • Recognize the potential an idea has for creating value and identify suitable ways of making the most out of it	• Have the ability to choose from different ideas in the game. • Being able to value ideas of others in decision-making du

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	1.5 Ethical and Sustainable Thinking	• Assess the consequences of ideas that bring value and the effect of entrepreneurial action on the target community, the market, society and the environment. • Reflect on how sustainable long-term social, cultural and economic goals are, and the course of action chosen. • Act responsibly.	• Reward system for active and responsible participation. • If game is graded, introduce points for fair play • Promote fair play at each step of the game • Introduce characters/elements that challenge the users to think forward. • Require "planning docs" at the beginning of the game/at the end if post-game results are available
Resources	2.1 Self-awareness and self-efficacy	• Reflect on your needs, aspirations and wants in the short, medium and long term Identify and assess your individual and group strengths and weaknesses. • Believe in your ability to influence the course of events, despite uncertainty, setbacks and temporary failures.	• Users are made to question their decisions/actions • Introduce elements of decision making that effect game outcome • Allow interaction between different users within the game • Allow co-facilitation of knowledge between users
	2.2 Motivation and perseverance	• Be determined to turn ideas into action and satisfy your need to achieve. • Be prepared to be patient and keep trying to achieve your long-term individual or group aims. Be resilient under pressure, adversity, and temporary failure.	• Present a performance-based reward system • Introduce a time-management dimension (e.g. deadlines) • Allow players to create individualized strategy instead of taking fixed path • Introduce a level system for user progression
	2.3 Mobilizing resources	• Get and manage the material, non-material and digital resources needed to turn ideas into action. • Make the most of limited resources. • Get and manage the competences needed at any stage, including technical, legal, tax and digital competences (for example through suitable partnerships, networking, outsourcing and crowd-sourcing).	• Introduce a common "game" currency • Allow "item" trading between users • Allow users to collect resources needed for game progression • Allow users to choose the quality of submissions per task • Create side tasks for added value to separate advanced users from average users • Allow users to bring resources from non-game sources (e.g. information search, in class material etc.)
	2.4. Financial & economic literacy	• Estimate the cost of turning an idea into a value-creating activity • Plan, put in place and evaluate financial decisions every time • Manage financing to make sure your value-creating activity can last over the long term	• Present a game currency • Allow risking game currency • Allow game currency trade and currency spending mechanism • Introduce a currency management system to allow users to keep track of their resources

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			• Introduce game elements that will multiply user currency for certain tasks/actions • Introduce profit/loss system
	2.5 Mobilizing others	• *Inspire and enthuse relevant stakeholders.* • *Get the support needed to achieve valuable outcomes.* • *Demonstrate effective communication, persuasion, negotiation and leadership.*	• *Create collaborative tasks, where co-dependency is key to solving those tasks* • *Introduce certain tasks that require creating a team, and finding the right users to work with* • *Create/embed a user communication system*
Into Action	*3.1 Taking the initiative*	• *Initiate processes that create value.* • *Take up challenges.* • *Act and work independently to achieve goals, stick to intentions and carry out planned tasks.*	• *Add additional challenges/tasks than the mainstream ones to allow motivated users to show interest* • *Introduce points to separate easier tasks from more difficult ones* • *Add task-lists for users to keep track of their game progress*
	3.2 Planning & management	• *Set long-, medium- and short-term goals.* • *Define priorities and action plans. Adapt to unforeseen changes.*	• *Add task-lists for users to keep track of their game progress* • *Allow inter-group discussion outside the game to allow users to align their goals with their peers* • *Keep elements of uncertainty in the game to allow users to think about different outcomes of challenges*
	3.3 Coping with uncertainty, ambiguity and risk.	• *Make decisions when the result of that decision is uncertain, when the information available is partial or ambiguous, or when there is a risk of unintended outcomes.* • *Within the value-creating process, include structured ways of testing ideas and proto- types from the early stages, to reduce risks of failing. Handle fast-moving situations promptly and flexible*	• *Keep elements of uncertainty in the game to allow users to think about different outcomes of challenges* • *Build upon different tasks within the game* • *Allow room for failure* • *Introduce elements that would require risk-taking* • *Introduce time-limits and deadlines*
	3.4 Working with others	• *Work together and co-operate with others to develop ideas and turn them into action* • *Network* • *Solve conflicts and face up to competition positively when necessary*	• *Create elements that require cooperation.* • *Create a "common-area" for networking* • *Introduce conflict between different users & game*
	3.5 Learning through experience	• *Use any initiative for value creation as a learning opportunity* • *Learn with others, including peers and mentors*	• *Embed experiential learning in the game* • *Put emphasis on self-learning for users* • *Teacher to only play role of a facilitator*

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		• *Reflect and learn from both success and failure (your own and other people's)*	

Source: Own ISGEE construct

3.3 Case Study: Entrepoly "Entrepreneurship" House

The entrepreneurship house in Entrepoly focuses on the broader definition of entrepreneurship and tries to **link all entrepreneurial competences from EntreComp into a single house** that enables the user to gain an insight into this broader definition. In doing so, this house focuses on "creating value", which is the core message of EntreComp, and all map elements plus user tasks are embedded with this message.

Game blocks and sub-blocks

As a house, the entrepreneurship house is designed in **three main-blocks** and six sub-blocks, namely:

1. Abstraction
    a. Ideation
    b. Concepting
2. Organization
    a. Committing
    b. Validating
3. Growth
    a. Establishing
    b. Scaling

Each **sub-block** then carries a user-task that the users of the house will participate in and add to their experience of Entrepoly. Some example tasks for each-sub-block include:

1. Ideation
    a. Idea paper
    b. Value proposition
2. Concepting
    a. Modelling
    b. Strategy & Milestones
3. Committing
    a. Prototyping
    b. Gaining visibility
    c. Team building

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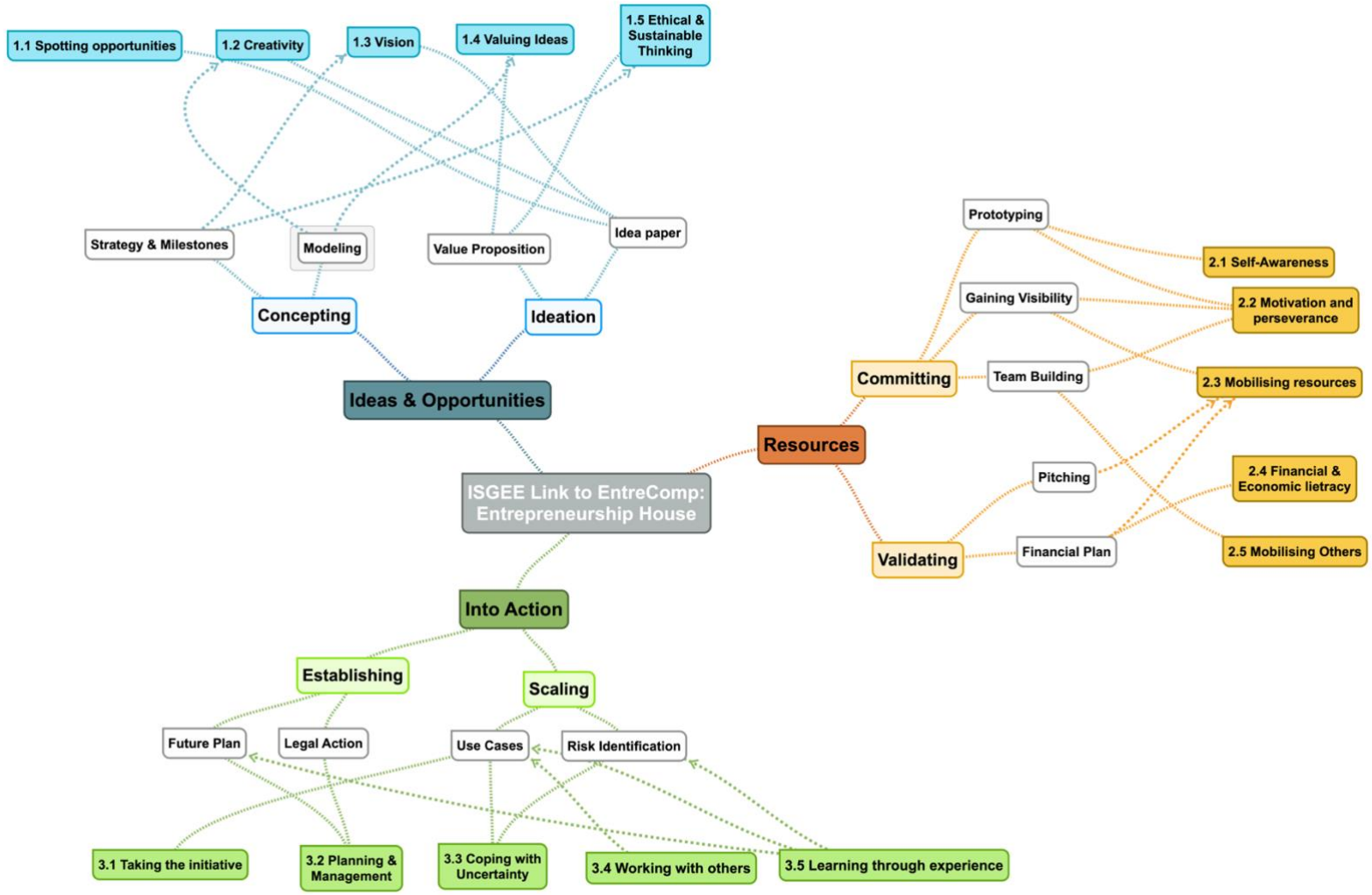
4. Validating
    a. Pitching
    b. Financial Plan
5. Establishing
    a. Future plan
    b. Legal action (if applicable)
6. Scaling
    a. Use cases
    b. Risk identification

During the **design phase**, the Entrepreneurship house within Entrepoly considered different competences and their connection to the abovementioned sub-blocks and their associated tasks. This process, and the links created between tasks and competences, is visualized in the EntreComp-Entrepoly Mind-Map in Figure 2. The links created here are elaborated through the "Exemplified Adaptation/Translation to Serious Games" given in Table 1.

Such structure can prove to be useful in de**veloping and assembling links between EntreComp and serious game elements** related to entrepreneurship education.

Fig 2. EntreComp-Entrepoly Mind-Map



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3.4 Conclusions

Although the **Entrepreneurship Competence Framework** is established to be a broad brush, the pictures it paints can be narrowed down to different use-cases. In the use case of ISGEE, and more specifically Entrepoly, **entrepreneurial competencies** from EntreComp **can be linked to individual game elements** in the form of learning outcomes.

Examples of such learning outcomes have been compiled in Table 1, showing how game elements can be developed to represent all 15 entrepreneurial competences from EntreComp. Moreover, a use case has been presented for the "Entrepreneurship" house of Entrepoly, where the links between EntreComp and game elements have been detailed and visualized in the EntreComp-Entrepoly Mind-Map (Fig.2). This **mind map** can be followed to create a **groundwork** for adapting EntreComp to any serious game elements.

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4 Gamification in entrepreneurship education

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The literature seemed to lack an extensive study of serious games in entrepreneurship education even though entrepreneurship and its education is one of the key issues today. However, there is a renewed interest in entrepreneurship education and relevant research started to appear. Subhash and Cudney (2018) recognized that gamified learning is being increasingly studied and applied in business and science studies.

Entrepreneurial learning and related serious games initially have been studied (Low et al. 1994; Hindle 2002) and games' main characteristics include:

- fun
- play
- rules
- goals
- interactivity
- outcomes or feedback
- conflict
- problem solving (Prensky 2001).

Serious Games' effect in entrepreneurship education

The essence of gamification in entrepreneurship education is that the games are not directly associated with knowledge and skills, because the games affect:

- student behavior
- commitment
- motivation.

These can later have an effect on knowledge and skills (Huang – Soman 2013). Moreover, most serious games help developing the entrepreneurial mindset, motivation, skills, innovation and ability of finding new solutions and understanding others' needs, while fostering lifelong learning. If the curriculum is difficult to be explained in words or in the traditional educational system, serious games can help (Klopfer et al. 2009).

Developing games specifically for this education is thought to be challenging. However, there are certain benefits once it is successfully implemented, such as studying with modern technology, modularity and flexibility of the game, inclusion of both national and international students, using university alliances and contacts to develop the game, and learning outcome analysis (Poonnawat – Lehmann 2015).

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Learning from the gamified environment

Fox et al. (2018) is of the most recent studies and claims that different types of learning can be relevant in gamified environments, such as:

- active learning (learning by doing),
- entrepreneurial preparedness (game adds to the learner's experience),
- reflective learning (reflection encouraged),
- situated learning (game places learners into a situational context),
- vicarious learning (level of involvement of peers, mentors or instructors),
- affective learning (emotional engagement).

Furthermore, a more exact definition of serious games within the entrepreneurship education has been determined.

"*Serious games can be defined as computer- based learning simulations that engage players in realistic activities designed to increase knowledge, improve skills, and enable positive learning outcomes. While such simulations are not always "games" per se, the main focus is the use of a digital game-based learning environment to support "serious" outcomes. Despite having an entertainment component, these simulations are designed to promote learning, primarily by leveraging a narrative or story centered in an entrepreneurial setting. Serious games also differ from entertainment games as they focus on problem-solving tasks and incorporate the imperfect nature of interactions with the real world.*" (Fox et al. 2018).

Serious Games' effect in entrepreneurship education

The effects of serious games have also been studied in entrepreneurship education and it was found that

- perceived competence of students is higher after playing the game,
- students' business-related knowledge is higher,
- according to the longitudinal results, game satisfaction of students is high,
- the motivation of students to start an own business is occasionally lower (Kriz – Auchter 2016).

Based on the current review, we can conclude that serious games have been studied and used in entrepreneurship education; therefore, there is a solid ground and need for these games in HEIs. Even though these serious games' usage is not widespread currently, their application has great potential for the future generations.

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4.1 HEI teachers' previous experience with gamification

Due to the changing needs of the new generation of students, there has been a rising interest to look at **what needs HEI teachers have** in terms of gamification, as they are the target group (primary target group in the ISGEE project) that can take the serious games into their classrooms.

The current chapter aims to introduce the results of the need analysis among higher education teachers through **two workshops** held at the:

1. University of Szeged, 05 December 2018;
2. Technical University of Ostrava, 11 January 2019.

Altogether, **25 teachers** participated in the workshop, all of them teaching in economics. Results of the workshops are introduced according to three main categories: General views and experience with gamification, role of gamification in education, and the advantages of serious games in the classroom. At the end, general implications and suggestions are summarized.

General views on gamification

Both gamification and serious games were terms that some of the participants have already heard. Teachers associate gamification with:

- "learning through playing"
- "implementation of the learning material into games"
- "the use of games in teaching".

There is a bit of confusion about the term itself, because some teachers regard simple games, such as self-developed board games gamification.

Previous experience with gamification

Regarding previous experience and usage of serious games, only the **minority** of participants **have** actual **experience** with applying digital gamification in education. Those colleagues who have experience, mainly used simpler (text) platforms or games, but could enlist many applications that can be used in education and that they regularly use in education.

They mentioned **five different games**, one of which is the banking game, where students take part in the management of a bank. The second game they mentioned was team cooperation game, which lets students get a delegated role within the company. The third game was an HR management game, which included finding the appropriate skills of potential candidates in the recruitment process. Another game was a software development game that allows students to be involved in the software development process, while the last game mentioned was an investment

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game. Only one participant could name concrete games, which were Marketplace, JaTitan, Markethero.

As a conclusion, the majority of teachers know about the term gamification, but the exact meaning behind it is not always clear. They can name many software and applications they use to make learning more joyful for students, but serious games are rarely used and less known.

4.2 The role of gamification in education – risks and opportunities

Participants were mainly **open and positive** towards the concept of gamification and serious games. They found many positive effects of gamification:

- "The game is able to develop application skills, ability to teamwork and promotes competition"
- "The game allows a natural division of roles"
- "The game will help reveal the characteristics and abilities of students"
- "The game can convince students that theory and practice goes hand in hand"
- "Games provide a great background for the research. We can observe the behavior of students, which can be an inspiration to upgrade games".

On the other hand, several **concerns** have been noted, such as:

- if the game provides students with a PDF file, then students would just ignore the game and go for the book instead. Therefore, it is questionable whether a serious game can transfer hard skills to students.
- Some participants were concerned about the role of the teachers. Once the game is brought into class, they did not know what happens to the teacher, while students are playing.
- A real-life risk cannot be simulated in a game, which is a barrier when developing a game aiming at developing soft skills. They stated that "the main downside is that students may over time find out the principles of the game and start to make decisions mechanically. They cease to think" and "Competition during the playing of the game can lead to fights in the group".

Participants were asked what **ideas** they have for the development for serious games. They identified that activities have to be subject-related, so students have to know the notions and the basic theoretical background in order to be able to play. Adding a spying element could raise excitement, if you have to ask for some information from others or from the game. A special 'user guide' for each player could be useful and would introduce avatars of players.

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4.3 What a digital game is good for

When teachers were asked about what a digital serious game is good for, they enlisted certain potential characteristics of a good serious game:

- it should provide practice
- develop students' soft skills
- can substitute tests or exams
- students should be able to check their knowledge with the help of the game
- the game should be applied and be useful for courses with a high number of students, where individual contact is not feasible
- if students play throughout the semester, their progress or lack of progress should be monitored
- Moreover, certain game theory examples should be illustrated (prisoner's dilemma or tragedy of the public) with the game. – These can be linked to more than one course.

Serious games do not seem to strengthen the student-teacher relationship, but it could potentially build stronger student-student relationships. Therefore, there should be a common platform, where students can see their own progress and shows all their subjects in which they can play serious games. Table 2 shows the purposes serious games can be used for.

TABLE 2
SERIOUS GAMES' MAIN PURPOSES

Target group	Purpose
Students	practice
Students	self-check
Students	personal bonds between students
Teachers	testing students
Teachers	monitoring students
Teachers	illustrating theory with practical examples

Source: Need analysis of the ISGEE project

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4.4 A Serious Game to be brought to classes

As one of the primary target group of the 'Entrepoly' is teachers, they were also asked what kind of serious game they would like to bring to their classrooms. Their answers can be grouped into three big categories. These are suggestions about the introduction of the game, game characteristics and game content.

Introduction of Serious Games to classes

According to the results of the need analysis, the introduction of Serious Games into a classroom should have certain elements, such as:

- introduction
- users' guide
- customizable game content (for teachers to change)

These would enable the potential users to understand the logic of the game easily. The reason for this is that social media sites such as YouTube made it natural for them that they take tutorials for granted. If there is a users' manual for teachers, they would also be more likely to accept the game and take it to class. If teachers had the opportunity to customize the game themselves, they would also be more likely to accept it and take time to learn it.

Game characteristics

In terms of the *game characteristics*, teachers suggested that **competition** is a factor that has to be present among students or groups of students. Additionally, the competition can even last a whole semester. There should also be a **link between the students**, which could be a chatroom, a direct messaging contact or a common platform, which can link courses too. The **characters** should be **customizable** in the game, so that students would feel personally connected to their character. They should also be able to **collect** certain **items**, such as badges, money and different achievements. The story of the game should be a real-life scenario. *"It is appropriate that there should be a story. The game should represent a real case".* Additionally, the game should have a limited time for certain tasks that would put a pressure on the students but encourage having the task done in a timely manner. Having a **modularly structured game** could also enhance the player experience as it would allow students to play a shorter game or a game extended throughout the whole semester.

"It *depends on the type of module and type of game. For some modules it may be appropriate to only play one exercise, in other module game can be played full semester*."

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Game content

Teachers' ideas about the *game content* were also of broad scale. They suggested that for developing negotiation skills, the game can include a scenario where the student meets two different people. The first one is hard to come to terms with one, while the other one accepts every solution. At an international trade class, the game could be used in intercultural situations, in which the first person is a Chinese partner, the second is a Polish, and the third is American. In HR classes, the script could be that an employee is undermotivated and has to be motivated. Table 3 summarizes the findings of the required features of a serious game in a classroom.

TABLE 3

HOW TO APPLY SERIOUS GAMES IN A CLASSROOM

Category	Idea
introduction	users' guide for teachers
introduction	users' guide for students
game characteristics	customizable avatar
game characteristics	collectibles (badges, money)
game characteristics	competition
game characteristics	connected students
game characteristics	real-life situation
game characteristics	time limit for decision making
game characteristics	modular structure
game content	negotiations skills, HR, international trade
applicable	classes

Source: Need analysis of the ISGEE project.

All in all, we can conclude that serious games provide value in education, as students can engage in activities that can make learning fun, while they are learning by doing (Low et al. 1994). Serious games allow student to use an interactive learning environment and develop their entrepreneurial skills relatively risk-free (Fox et al. 2018).

The aim of the current chapter was to uncover the real needs of higher education teachers of a serious game they think is necessary in today's education system. The importance of these findings is not questionable, even though further steps are taken to conduct the need analysis of students and business stakeholders.

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4.5 What should a new game be like?

The need analysis of teachers provided valuable feedback for the development of the serious game at hand. In this chapter the results are analyzed, and an ideal customizable serious game concept is introduced.

- The game might be **suitable** for developing entrepreneurship competences, but much more for introducing entrepreneurial competences and self-check. It should also contain a handbook with a clear description of the game and its mechanics.
- The game could be made **attractive** for teachers if it is able to connect students and classes with a high number of students, and can get to those students, who do not attend regular classes. It is also able to strengthen student-student or student-teacher relationships. The interface can become familiar to students after playing at one class. For the second time, they will already know the mechanics. Moreover, the game can link many different topics in a scenario.
- A good serious game is **able** to develop soft skills rather than hard skills and is good for students' own self-check. It can also link not only study materials of one course, but several courses too. It should also be able to expose users to failure scenarios.
- Moreover, a good game is **fun** to play. Collecting badges, ribbons, money, or certain items can bring fun to the learning experience together with an attractive design. Once a game scenario is played, students should be able to replay it, but with various other questions or scenarios. This way, they will not get bored and can play many different times if they want to spend their time on one specific competence.

Table 4 shows the features of a good serious game, collected by the teachers participating in the need analysis.

TABLE 4

FEATURES OF A GOOD SERIOUS GAME

According to teachers, a good serious game
is attractive for both teachers and students
attracts students who do not attend regular classes
is easy to understand based on its handbook
strengthens the relationship between students and teachers
links different topics at a course
develops soft skills
is good for self-check
is able to link courses
is able to produce failure situations
is consistent regarding the interface
including collectibles (badges, money)
repayable with different scenarios

Source: Need analysis of the ISGEE project

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The **risks** and **potential problems** of developing a serious game also have to be taken into account. Not surprisingly, there have been fewer risks and obstacles were found than advantages. First of all, it consumes a lot of time to prepare and to keep a serious game up to date. Setting the rules and scenarios of the game is thought to be extremely challenging, similarly to evaluating the results and getting a standardized game. Table 5 shows the potential challenges of developing a serious game, collected during the need analysis.

TABLE 5

POTENTIAL CHALLENGES OF DEVELOPING A SERIOUS GAME

According to teachers, developing a serious game is challenging, because of
time-consuming preparation and maintenance
complicated rule development
problematic evaluation of results
problematic standardization

Source: Need analysis of the ISGEE project

All in all, participants of the need analysis have had a general idea what a newly developed serious game should be like. Project ISGEE has been doing its best to create a serious game that fits teachers' and educators' ideas, as they are one of the stakeholders of the project. Moreover, they will be the ones to use gamification tools (e.g.: Entrepoly) in their classes; therefore, their ideas and willingness to apply these tools is crucial.

Based on the results presented here, a new customizable serious game was developed, which is introduced in more details in the next chapter.

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5 Entrepoly, a new and customizable serious game

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What is Entrepoly?

A free online game fostering the entrepreneurial mindset.

Who is Entrepoly for?

Entrepoly is dedicated to university students and teachers.

Entrepoly's features

Based on the previously detailed need analysis, the ISGEE project has been finalizing the newly developed serious game, Entrepoly. Entrepoly has the following features:

- an open access, modularly structured role-playing digital serious game
- with dynamically adjustable content (scenarios) to match the specific educational requirements
- it is available on multiple platforms
- it has a modular structure
- different modules are dedicated to different entrepreneurial competences (based on the EntreComp Framework)
- is suitable both for general (non-discipline dependent e.g.: creativity, vision, etc.) and business type modules (planning & management; financial and economic literacy)

Entrepoly's target audience

Teachers:

- they have access to a teaching platform to try and modify the games
- they can modify Entrepoly's content according to own needs
- they can limit the number of houses used by their students inside the game

Students, who can

- create their own profiles
- customize their avatars
- collect points, badges, accomplishments
- play on basic vs. hard levels

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The game

The game includes an online platform, where the intended house(s) is available for students to play. Currently, Entrepoly has 4 houses:

- Creativity house
- Casino house
- Break-even point house
- Entrepreneurship house

The houses are designed for a specific topic; however, the content can be changed any time by the teachers. Now, a basic game content is uploaded in order for teachers and students to be able to test the game.

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House 1: Creativity

This house (module) fosters creative thinking with simple tasks that require smart solutions.

House 2: Casino

This house (module) gives insight into consumer behavior and fosters risk taking.

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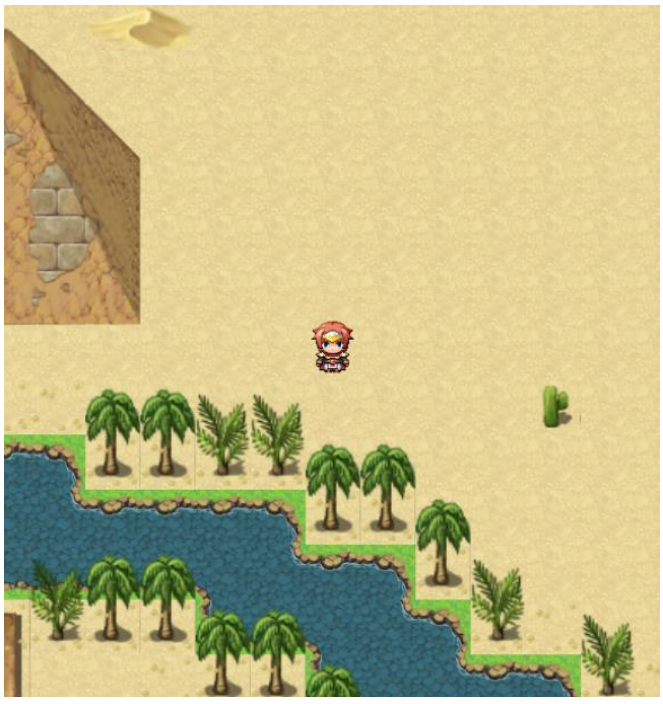
House 3: Break-even point

This house (module) requires business thinking and fosters complex problem solving.

House 4: Entrepreneurship

This house (module) provides opportunity for students to introduce their own start-up idea.



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Interested finding out more about Entrepoly?

If you are interested in trying any of Entrepoly's houses, or you are up to customizing your own, do not hesitate to visit our webpage, where you have got the possibility to do so:

Find Entrepoly testing site at https://www.games.isgee.eu

ISGEE project website: https://isgee.eu

Further details of Entrepoly can be found in project ISGEE Intellectual Output number 2 (**Adaptation Handbook**).

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