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Dissemination Level		
PU	Public	×
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	



Introduction

In 1986 in the department of psychology of the Moscow University, a graduate student was trying to teach about the construct of time to a psychology class for students of high school. The name of the student was Dmitry Davidoff and to make his teaching more accessible, meaningful and not boring for the high-schoolers, he invented a game that he named “Mafia”. In the context of the game, the majority of the students took the role of villagers, while a small number of them took the role of Mafiosi. The purpose of the game was for the villagers to find out who their evil co-citizens were, without first being killed. The game required no special equipment, it had only a handful of rules and it allowed for the introduction of variations.

The game spread like fire in the dormitories of the Moscow University. Soon enough, the game left the borders of the (then) Soviet Union and became a worldwide sensation, favored as one of the best party games and became the basis for a number of variations (the most famous of which is the Werewolf game¹). The game demonstrated in the most emphatic way that teaching difficult subjects can be associated with fun and at the same time produce something that has repeatability in a non-classroom context. Simultaneously, the game itself drives scientific research across a variety of areas such as mathematics [1], artificial intelligence [2], psychology and communication [3], social dynamics [4] and more.

The game of Mafia was not the only one that used this alternative approach to teaching. Examples include Darfur is Dying (<http://www.darfurisdying.com>), Microsoft Flight Simulator (https://en.wikipedia.org/wiki/Microsoft_Flight_Simulator) to name just a couple of the more successful.

These games demonstrated that education could become a learning process and escape from the traditional, analytic way of teaching (Dieleman & Huisingsh, 2006), be transformed into a more experiential and student-centred way of learning, help students to develop the ability of constantly assessing the environment, operating and adapting to it through continuous and iterative individual and personal process of revision from their frames of reference (Fabricatore & Lopez, 2012), provide the appropriate materials to comprehend complexity and equally import to be fun.

This experiential learning form has been increasing in importance with education on all levels (Hauge, et al., 2014) and in particular with game-based learning that has become an important issue for economy, society and research (Wang & Tseng, 2014). Such games that combine entertainment with an educational dimension are called Serious Games (SGs) (Michael & Chen, 2005); (Laamarti, Eid, & Saddik, 2014).

¹<https://www.playwerewolf.co/>



The potential of SGs to provide educational enhancement (Bellotti, Berta, & DeGloria, 2010) is already acknowledged in the research community along with the ability to:

- Allow learners to experience situations that are impossible in the real world for reasons of safety, cost, time etc. (Squire, 2002)
- Engage the user in a pedagogical journey and have a positive impact in the development of a number of skills (Mitchell & Savill-Smith, 2004)
- Enable improved self-monitoring, problem recognition and solving, decision making etc. (Katsaliaki & Mustafee, 2012)
- Create a context of communication, collaboration and sense of belonging (Klopfer, Osterweil, & Salen, 2009)

Sustainable development

Sustainable development is among the grand challenges of the next decades. To come close to achieving that state, the European Union is committed to mainstream the Sustainable Development Goals (SDGs) in the European policy framework and current Commission priorities. Moreover, special attention is paid to means for the achievement of the SDGs, their universal application to all countries and the simultaneous address of the economic, environmental, and societal dimensions of sustainability. Thus, there is the need of not only raising awareness on the issue of sustainability, but acquiring a **sustainability literacy**, in the sense of a **functional education that will provide the necessary skill and motives to cope with the challenges of and contribute to sustainable development**.

As a result, it is essential to provide an innovative pedagogy to students of higher education that will be the policy makers of tomorrow. Serious Games are a serious candidate to take that role and teach the complexity of sustainable development.

The objective of the SUSTAIN project is to commence and promote sustainable literacy among students of higher education (and young people in general) through an innovative and student-centered education. To achieve this objective, we will design, develop and implement a course to be taught in students of higher education; a course hybrid in nature, as it will combine game-based learning with an analytical style of education. In detail:

- 1) The course will deal with transportation sustainability, societal metabolism and decision making under those contexts. The purpose will be to teach students the definitions of those notions, how they are translated in everyday life, and formalize the mathematics necessary to make robust decisions.
- 2) The project team will develop small, illustrative simulation models that will make the definitions more concrete and allow students to experiment in a consequence-free



environment. The simulation models can be used to identify scenario exemplars on how we can achieve sustainable urban transportation and a balanced societal metabolism, while taking into account formal decision making process. Thus, greater insights will be provided to the policy makers of the future regarding the complexities of decisions in uncertain issues where many stakeholders are involved.

3) The approach of the SUSTAIN project is hybrid and as such the material developed so far, will be translated, in elements and mechanics of a Serious Game. The purpose is to create a board game that will allow students to learn about transportation sustainability and societal metabolism through playing. One important aspect of the design of the game it will be that it will avoid being just an informational/fact-delivering game; the core design principle will combine delivery of facts with experiential elements that will allow students to explore their own sustainability goals and the means to achieve them.

The project team envisages that the impact of the project will be in three areas:

- At the European (and EU) level, the project will provided added value in the efforts of the EU to disseminate the principles of sustainability, while at the same time educate the future generation of policy makers to be better equipped to promote and achieve the SDGs. Furthermore, the project will continue the effort for an enhanced education that will utilize and incorporate the principles of game-based learning and IC Technologies.

- For the partners of the project, the impact will take the form of a strengthened cooperation and networking of different organizations among different European countries and with different scopes and experiences. At the same time, it will strengthen the role of the participating partners in their respective areas, as the project will bring cutting-edge research closer to students and citizens.

- Finally, for the students that will participate in the project, the new course will provide a more student-centered education that will inform them on important EU and global issues, and at the same time help teach them develop the key competences to deal with complex situations that they will have to face. The project will bring them in touch with the work performed by the partners and connect them with other facets of the European culture.

Project Consortium

To achieve such a task, each partner of the consortium brings its own experience and expertise on the issue.

University of Macedonia consists of experts in decision making and programming and will help students with the formalized mathematics of the decision making process in the context of sustainability.



SYDIC members are representing knowledge and competences from Management & Social Sciences to Engineering and Natural Sciences. SYDIC is currently deeply involved in disseminating and promoting the uptake of Systems Thinking & System Dynamics at various levels, from the Primary and Secondary education, to the development of such competences in youngsters and adults in managing positions. Furthermore, SYDIC strives to stimulate the interchange of learning and research in related areas and to promote and develop educational programs related to the System Dynamics methodology. To achieve the goal the Society employs the experience and expertise of people in Modeling and Simulation with a particular focus on Education and Training.

H.I.T. is a highly recognized research body in the field of Transport. Since its establishment in 2000 it has been a leading research institution in Greece offering specialized research and technical services in all fields of transport. H.I.T. has been recognized as a center of excellence in several fields and is a well recognized source of innovation and entrepreneurship in the field of transport in Europe. Although transport in general is 'covered' by the HIT's activity, the last years special interested is given to sustainable urban mobility, and H.I.T. has taken part in many EU and national projects that aim to support sustainable urban transportation - an experience and expertise we wish to transfer to the students.

Centre for Systems Solutions (CRS) is combining research with applications in the field of strategy development, decision making, implementing solutions and education. The people of CRS are experts in creating educational process to increase participation and they are increasingly using serious games as a tool to promote systems thinking and sustainable development. To this end, they have designed, developed and applied a number of serious games.

SRC was established with the aim to raise awareness and educate the non-technical public about matters related to environmental protection, protection of public health, sound environmental and economic practices, alternative economic models, community development, active citizenship on matters related to environment, health and self-sufficiency, sustainable consumption in an environmentally responsible and socially equitable manner having in mind the long-term impacts on the environment and society of various consumption practices. A secondary set of activities is related to research and facilitating the understanding of wider public regarding current environmental and social challenges. In this regard, they contribute to translating scientific information into more accessible language included in non-technical publications targeted at non-professional public. The organization is further exploring ways to outreach to wider public, particularly the young one, and educate them through user-friendly, attractive and effective online and offline tools.



Ergo Ludo Editions is an individual enterprise that deals with the worldwide creation, development and printing of the board and card games. The aim is to spread the knowledge of the games that help the socializing. Although it is the only organization that has not participated in a European project, its added value to the partnership is apparent as they are people who specialize in the development of board games and will bring the market experience in the project and will help to develop a product that is not only educational but can be compared with commercial products.

Communication

Website: <http://www.sustainerasmus.eu/>

Facebook: [fb.me/SUSTAINproject](https://www.facebook.com/SUSTAINproject)

Twitter: https://twitter.com/SUSTAIN_erasmus

Linkedin: <https://www.linkedin.com/in/sustain-project-erasmus/>

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