Sustainable Entrepreneurship (SUSEN): A Game-Based Exploration for Secondary Schools

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Abstract

SUSEN's main goal is the development of a game-based learning tool to enhance Entrepreneurship Education as well as raise awareness for sustainability issues. An innovative student-centred classroom game for lower secondary schools combines typical features of strategic games, such as team-oriented problem-solving by facing uncertainties in a competitive environment, with elements of service learning. Service learning is a method of teaching that emphasizes critical thinking and personal reflection while encouraging a heightened sense of community, civic engagement and personal responsibility. Another learning goal is the acquisition of entrepreneurial skills. As a whole, the game "PowerPlayer" raises awareness for sustainability issues, both in a general sense and in connection with economic activities. Therefore, the learning tool combines aims of Entrepreneurship Education and Education for Sustainable Development with various other educational goals. Participating students will go outside, meet the needs of their community concerning energy, and explore strategies of regional energy providers. This strategy game challenges the students to adopt the roles of companies and make entrepreneurial decisions considering both economic issues and sustainability.

1. Introduction

In 2015 the authors and partners [1] from other European countries started to develop an educational game, in a project funded by the Erasmus plus program of the European Union. This game is designed to foster entrepreneurial attitudes and develop an awareness for the idea of sustainability. The game, PowerPlayer, will be described in the last section of this paper. First, we will discuss the goals of Entrepreneurship Education (EE) and Education for Sustainable Development (ESD). At first glance these goals seem vastly different, if not outright contradictory. Afterwards we will sketch the advantages of game-based learning, before finally presenting our strategic game that seeks to combine the divergent goals of EE and ESD.

2. ESD and EE: Compatibility or Exclusion?

"Education for sustainability seeks to enable students to understand the complex relationships between economic, environmental and social goals, to help them recognize the supposed need for change and develop a willingness to reflect on, and perhaps to change, their own behaviour [2]." ESD became a topic of pedagogy and didactics after the summit of Rio de Janeiro in 1992. This United Nations Conference on Environment and Development agreed upon the so-called Agenda 21. Article 36 emphasizes the outstanding role of education within a process that leads to sustainability [3].

Sustainability as a goal "wants to secure ecological, economic, and social livelihood [4]" of current and future generations. This means, at least implicitly, that empathy, social and ecological ethics, the willingness to draw personal consequences, e.g. in consumption behaviour, and other value-oriented topics are part of a pedagogical concept. For this reason, ESD aims not only at a cognitive understanding, but also, and with the same intensity, at attitudes.

EE, on the other hand, is a subtopic of economic education with its accentuation of rationality and legitimate self-interest. Focusing on entrepreneurial behaviour seems to reduce all thinking to cost-benefit-calculations and opportunity-seeking in competitive surroundings. However, as a subject of general education, EE fosters a multitude of key competences that are useful for lifelong learning processes. The overall goal is to develop students' capability to generate ideas and initiatives; to analyse and test possible solutions, and to evaluate their decisions. This is to be combined with an efficient use of resources to pursue their goals. The learning process is embedded in methodological arrangements that allow a simulation of entrepreneurial action.

EE is compatible with ESD because it refers to general education goals. Entrepreneurial thinking in school is not one-dimensional. It offers an opportunity to reveal the conflicts between a one-sided

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focus on profit seeking and cost minimization on the one hand, and ecological and social goals on the other. Highlighting these conflicts is one of the main objectives of our game.

3. The PowerPlayer game

3.1 Game-based learning

In EE, strategic games are an often used tool to simulate competitive markets. Most of the countless available games focus on competition in traditional economic sectors. The usual objective of the players is to make the highest profit in relation to the others. PowerPlayer instead focuses on energy consumption, and the winner is the one who best harmonizes the pillars of sustainability.
Classroom games offer several advantages in comparison to traditional school lessons. They allow students to perform complete actions as described above: from problem analysis to evaluation. The most often named advantage is the motivational effect of games. And indeed, empirical studies have found that gaming had positive effects on motivation and attitudinal valuing. In our context of conflicting values, another important benefit of classroom games is that they can "change learner's attitudes about the subject matter [5]."

3.2 Game idea and teaching tools

The idea for the game arose in considering one of the great social challenges, the implementation of sustainable development. ESD is one major strategy for realizing this goal. The learning arrangement that has been developed in this project focuses on energy consumption, which plays a major role in dealing with climate change. In the PowerPlayer game students take on the roles of stakeholders in energy production. In this way students are confronted with different aspects of the conflicts between economic, social, and ecological goals. These multiple perspectives reflect the complexity of real problems.
The game-based approach was chosen because of the various advantages mentioned before: The students acquire subject-related knowledge and understanding, while the game-based approach fosters their social competences and supports motivation and volition. Therefore, PowerPlayer is innovative in multiple ways, as it unites EE with ESD. Besides quantitative results, the students' game success is also assessed by indicators of sustainability, e.g. decisions on energy reduction, energy mix, needs of consumers and citizens.
Due to its conception, the game is applicable to different curricular settings, and also addresses younger students more than typical simulation games do. Furthermore, PowerPlayer combines school lessons with active learning in the community, and it strengthens school collaboration with regional stakeholders.
To secure these aims, suitable gaming material was developed, complemented by suggestions on how to integrate it in the curriculum. Due to the cross-disciplinary nature of the game, PowerPlayer can be adapted to different curricular settings and subjects, and is thus applicable in all European countries. Sustainability is not looked at from a natural sciences perspective, so that PowerPlayer fits well in the social sciences school subjects such as social science, citizenship education, and economics, as well as business and employment studies. The game's focus on different types of energy sources would also make it suitable for geography or technical subjects.
The game itself, a strategic classroom game for lower secondary schools, is set in the fictional region of Wattland where five new clothing production companies have established themselves. The class is divided into groups and each group takes on the role of one of the companies.
Wattland offers many different types of energy production, both non-renewables and renewables. So students have to choose which energy supply they want to use (nuclear energy, biomass, gas, coal, crude oil, solar energy, hydroelectric energy, wind energy, or a combination of them).
In order to build a successful business, each group has to reach a certain energy target within the limits of their set budget. As the rounds progress, the students have to consider additional aspects, such as the environmental impact of the energy sources they use. The overall goal is to maintain a reasonable balance between economic considerations and issues of sustainability.
As mentioned above, an extensive package of gaming materials has been developed to accompany the learning process. The Teacher Support Pack contains in-depth information, including background information on learning goals and the practicalities of implementing the game as well as an introductory presentation to introduce the context of the game and its rules.
First, each group of students receives a company profile sheet. This description features their core business, guiding values, legal form and key stakeholders. The profile also indicates how the various parameters of the game will contribute to generate the team's score in each round.

PowerPlayer consists of four rounds. In each round, each team has to tackle a special task about sustainability and energy provision. Round sheets introduce the key elements of the several rounds to each team, indicating their budget, their energy need, and special objectives.
The game board provides an overview of all available energy types, the resources that players should use to achieve their objectives. For each quantity of energy type, the board indicates the cost and the impact on environment, reputation, and satisfaction.
During the game teams can use action cards, which describe actions that companies can take to invest their money in order to increase satisfaction and/or reputation, or to reduce environmental impact and consequently increase their score. Furthermore students can use score sheets to test hypotheses in order to find a solution during the game. While playing, students will need small placeholders like coins, beans or buttons to mark the solution on their game board.
The scoring part of the game uses a simple mathematical model. In order to simplify the scoring phase, a useful online companion can be used. If a mobile device or a computer is available, the online companion can be accessed from the SUSEN website [6], where the data for each team has to be inserted after each round. The online companion will do all the maths and provide the final round score for each team. The given results of the online companion will not be saved, instead the round scores must be entered in a Summary Sheet Excel file, downloadable as part of the game materials. With the help of this file the round winners are determined and the game results can be displayed in a diagram format.
In addition to the classroom game, a teacher training workshop is planned that will enable teachers to use the game effectively in class. Furthermore, the project team provides additional teaching materials that can be used to prepare the relevant topics, available on the project website [7].

3.2 Classroom implementation

To implement the game in school a total of eight school periods of 45 minutes each is suggested. At least six of these periods should be planned as double periods. So it is possible to integrate PowerPlayer into the timetable of normal classroom teaching as well as to play it during one or two project days. The advantage of playing the whole game in one day is that the students' motivation remains intact throughout. Once the students have fully grasped the game, the last two rounds might take less time, even though the tasks for the teams are more challenging than in the beginning. As the teacher knows his or her students best it is up to them to decide whether to give an introduction about the topics of sustainability and different energy sources before the start of the game. This may also depend on the learning goals.
If the game is integrated into normal classroom teaching, it is advisable to give research tasks relating to these topics as homework between the rounds. Thus, students acquire the knowledge on their own by collecting data and presenting their results to their classmates.
Depending on the time frame and learning goals it is possible to make use of the case studies and ideas for service learning provided on the website. The case studies deal with actual (school) companies and provide insights into the conflict between sustainability goals and economic considerations. Service learning ideas offer the opportunity to develop concepts in class, enabling the students to use what they have learned for the benefit of the community.
To ensure the quality of the game and supporting materials, and to find out where improvements are necessary, the game was piloted in at least 12 classes in Germany, Belgium, the UK, and Poland with a total of about 280 students.
The broad agreement of all the teachers who conducted the game during the pilot can be summarized as follows: Teachers see the importance of changing attitudes in the field of sustainable development and agree that the game adequately models decision structures and complex real life problems. So the methodological effectivity of the game is secured, and furthermore both cognitive and affective learning goals can be achieved.

References

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