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LETTER

A role-playing game to complement teaching activities in an ‘environmental impact assessment’ teaching course

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Abstract

Every project development that could possibly have negative environmental impacts must undergo a technical-administrative procedure called environmental impact assessment (EIA), which ensures that all environmental implications are properly considered before making a decision and that negative impacts are minimized. Therefore, in many universities, technology-oriented master’s degree programs include EIA teaching courses. At the University of Firenze (Italy), one such EIA course module was complemented by a role-playing game in which students acted as typical characters involved in a (simulated) public debate concerning the possible development of a geothermal plant in a rural environment. The roles were designed with competing objectives and contrasting codes of conduct; therefore, the evolution of the debate and the final outcome (acceptance/rejection of the project) were completely in the hands of the players. The game was played with different classes, and the experience was successful. The students reported that the following objectives were reached: (i) they had fun; (ii) they put into practice some theoretical concepts learned during the lessons; (iii) they understood that aspects other than technical ones can be involved in decision processes and dealing with them without proper preparation is very difficult. This last point was considered particularly important, and demonstrated that this role-playing game represented a valuable complement to the main teaching activities.

1. Introduction

Environmental assessment is a key step in the implementation of projects and public programmes for sustainable development. Two European Directives (2011/92/EU and 2001/42/EC) regulate the Strategic Environmental Assessment (SEA) procedure for public plans and programs (e.g. a regional energetic plan or a program of expansion of local infrastructures) and the ‘environmental impact assessment’ (EIA) procedure for individual projects (e.g. a power plant or a new motorway).

To prepare students to face these environmental procedures in their future professional career, the teaching course ‘Environmental Impact Assessment’ is included in the master’s degree (2nd cycle degree) programs of ‘Human and Natural sciences’ and ‘Geological sciences and technologies’ of the University of Firenze (Italy). The main topics of the course are the national and European regulation framework, the structure of the technical documents to be prepared for environmental assessment, the characterization of environmental components, the identification of the possible sources of interference from human activities and the resulting impacts, and the definition of possible measures of mitigation and compensation. This programme broadly covers the main technical and scientific issues of SEAs and EIAs.

However, according to the European directives, to pursue the interests of the local communities, every procedure of environmental assessment must undergo a stage of public debate in which the focus may shift from scientific issues towards particular interests or ideological points of view. It is quite frequent that EIA procedures become a sort of ‘battle field’ for two or more factions that, for many possible reasons (environmental, ideological, economic, social) strongly oppose or strongly support the project at hand: one of the most

straightforward exemplifications is the so called ‘NIMBY (not in my backyard) syndrome,’ which describes people generally favorable to a given typology of projects, provided they are not located near their dwellings (Brown and Glanz 2018, Boyle *et al* 2019, Uji *et al* 2021).

Although this is not the primary objective of the EIA course, which aims to form students in the technical environmental aspects of the matter, the last lesson was conceived to be a session of a role-playing game, to provide the students with a first-hand essay on how socially and politically complex an EIA procedure could be. Indeed, generally speaking, a scientifically sound project may not be enough if the perception of the project is negatively biased and communication issues are not properly addressed (Illingworth *et al* 2018).

Role-playing games (RPGs) are games in which individual players (‘gamers’ henceforth) assume and act out a different identity (‘character’ henceforth), speaking and acting as they think their characters would do in their best interest; gamers are responsible for deciding what those characters do over the course of the game (Cover 2014). A game master (GM) usually runs the game sessions, sets the background, and provides basic storytelling; however, almost all RPGs require the player to self-reflect on behalf of their character and continually assess how they would act, actively contributing to the development of the course of the events (Clarke *et al* 2018). RPGs are typically leisure activities, but serious RPGs also exist: they are simulations of real-world events designed to educate, inform, and train players to solve specific problems (Terti *et al* 2019). They have been used for education (Hoffman *et al* 1985), teaching specific subjects (Randi and Carvalho 2013, Chiu and Hsieh 2017); teaching multidisciplinary aspects (Bertoni 2019), therapy (Rossetet and Stauffer 2013, Kim *et al* 2018), resource management (Edwards *et al* 2019), decision-making and planning (Moreau *et al* 2019, Assefa *et al* 2021), and natural hazard management (Terti *et al* 2019).

An EIA procedure can be considered an ideal setting for RPGs, as different actors are usually involved, often opposing each other as participants in a game (Cheng *et al* 2007). Thus, in addition to the educational objective of putting into practice the theoretical notions learned, role-playing provides an opportunity for students to directly experience that factions and individuals usually have contrasting views on the impacts of a particular development (Crittenden and England 2005).

Consequently, the idea of developing an RPG to be run during the last lesson of the EIA teaching course seemed supported by solid scientific and didactic bases. The game was developed with the following objectives.

- Applying the technical concepts learned during the class (identification of the main target environmental components, human interference, associated impacts, and possible mitigation measures) to a simulated case study;
- Providing students with a direct experience of the multifaceted perspectives involved in an EIA procedure and the social and political implications that were not considered during the lessons;
- having fun.

The remainder of this paper is organized as follows. In the Methodology section, the game design and mechanics are explained, highlighting the elements introduced to maximize the possibility of reaching the abovementioned objectives. Moreover, a description of how the game sessions were run is provided. Subsequently, the results are shown, discussing the elements of the game that were deemed more successful and the main didactical objectives reached. Finally, the main conclusions of this study are presented.

2. Method

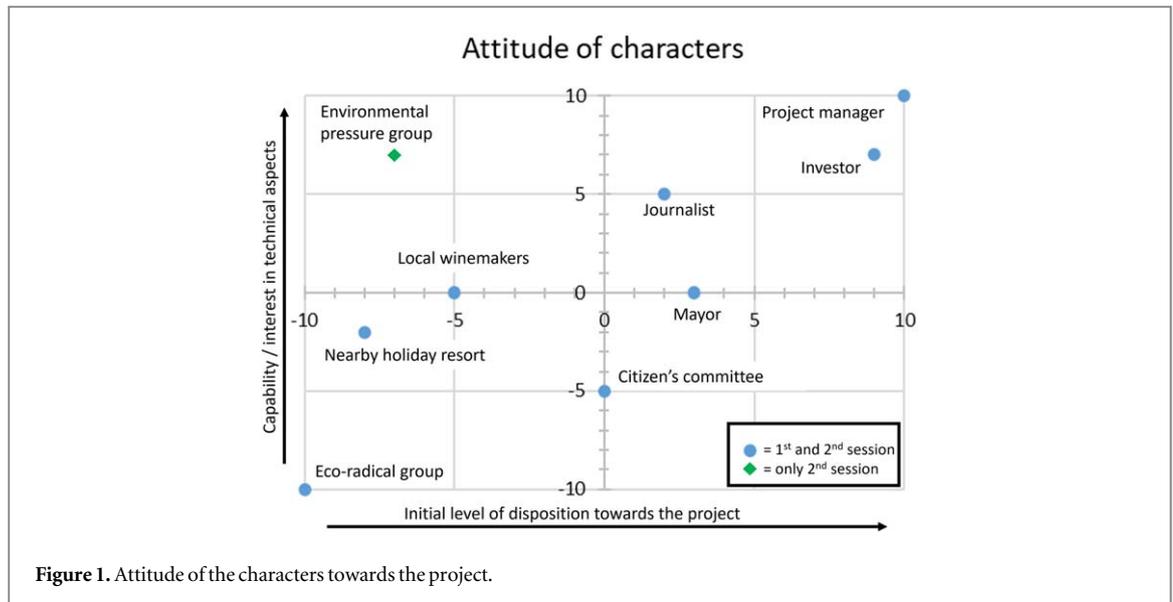
2.1. Game design

The RPG was about a public debate concerning the Environmental Impact Assessment (EIA) procedure for the development of a medium-enthalpy geothermal plant in Pincopallonia (roughly translated as ‘Averagetown’), an imaginary municipality located in Tuscany (Italy). The teacher was the game master (GM) and conducted the session as the moderator of the debate. Each student played the role of a character closely involved in (or impacted by) the project: the businessman investing in the project, the project manager (the engineer who designed the geothermal plant), the mayor, the representative of an eco-radical pressure group, the representative of an environmental association, a nobleman participating as the representative of the local winemakers (the main local economic activity), the representative of a local citizens’ committee, the owner of an important tourist facility located near the site of interest, and a journalist (table 1). A few days before the game session, each player received an email with the game rules, his role, and the description of the project and local territory. These descriptions were customized for each character to reflect the different degrees of knowledge that the character had of the situation (figure 1). The descriptions were funny (e.g., with absurd toponyms) to stress from the start that besides the didactical aspects, the imminent game session was also intended to have fun.

Table 1. List of the characters, their objectives, their codes of conduct, and the main customizations of the description received by the players.

Character	Customization of description	Objectives	Code of conduct
Investor	Full economic and good technical details of the plant, poor knowledge of local society and territory	Make money. Convince the audience to accept the project, but contain the costs.	You think that everything has a price: use compensation measures to 'buy' consensus, but keep the costs down!
Project manager (and plant designer)	Full technical and good economic details of the plant, poor knowledge of local society	Convince the audience to do the development, at any cost.	Appear serious, reliable, and professional. Cite numbers and statistics whenever possible. Don't contradict the investor.
Mayor	Good knowledge of local society and territory, fair of economic details	Gaining consensus among the citizens for being elected again.	You don't care about environment or geothermal plants. Ask yourself: which is the decision that increases my votes?
Eco-radical	None (the basic description was provided).	Block the development, at any cost.	Spread hoaxes and fake news, generate fear (e.g.: the geothermal plant will trigger earthquakes!). Be verbally aggressive. Never surrender: if needed, deny everything, even evidence.
Environmental association	Good knowledge of the territory	Zero impacts on flora, fauna, and ecosystems which are already very fragmented because of vineyards and roads.	You give voice to those that do not have a voice (vegetation, animals): cry out loud!
President of the Citizen's committee representing a nearby village	Full description of the society (including citizen's most urgent needs and problems)	The committee was born to improve the situation concerning inadequate services (unmaintained road network, poor internet connection, insufficient streetlight and so on).	The mayor is your 'opponent': during the election campaign he did many promises, but the village situation has not improved. The village first! You support the project if it directly ameliorates the situation of the village, otherwise it's just another trouble to avoid.
The Count, representative of local winemakers	Good knowledge of society, territory, local economy. Fair knowledge of the plant.	Keep your prominent social and economic position (either keeping the status-quo or, in case the plant is developed, maximizing the positive impacts for yourself or the category you represent).	You are a noble: act as such, demand respect and deference. Be polite but resolute. Think 'there is no way somebody can do something in my territory against my interests'.
Owner of the nearby tourist resort	None (the basic description was provided).	Save your resort (hard times for business and the construction of a nearby plant may be a huge setback)	You hate the Count because you know he thinks only in his own interests. Fight hard and loud for your resort. Don't trust technical explanations.
Journalist	Good knowledge of society.	Having a 'hot' title for tomorrow's edition of the journal	Put in trouble public figures like the Mayor and the Count. Be aggressive.
Moderator (Game Master)	(Not applicable)	Moderating the debate and running the game	Impartial referee and facilitator

Moreover, each character had a specific objective to pursue during the debate. As instance, the investor, as a cynic businessman, had the aim to convince the public of the feasibility of the project while minimizing the costs of environmental mitigation measures (to maximize his earnings); the eco-radical would oppose the project anyway; the mayor would be more interested in gathering consensus and votes rather than in the project 'per-se,' and so on (table 1). This part of the game was the most delicate to design, as the characters and their objectives were conceived to be connected or separated by a complex network of personal interests (or ideological positions) that would oppose each player to some of the others while providing the basis for potential alliances with others. At the beginning of the debate, the situation was designed to be in equilibrium between those



opposing the project and those favorable: the gamers' ability during the debate would be crucial to move the balance and to determine whether the project will be accepted (figure 1).

To make the game session funnier and to let the opposing viewpoints stand out, the roles and objectives were designed in a satirical way, exaggerating the typical traits of each role and fostering the possibility of conflicts originating from competing demands and objectives. This was further amplified by assigning a 'code of conduct' to follow (table 1): the code of conduct refines the character by describing his nature, morale and behavior, and stating 'how' he will try to reach his objectives.

During the debate, the gamers took turns talking, and the GM evaluated their effectiveness according to the objectives and code of conduct. Bonus points were assigned when clever or effective actions were taken. Conversely, malus points were assigned whenever critical failures occurred or for metagaming (an annoying circumstance in RPGs, consisting of players who use their own knowledge or skills instead of those of their characters).

As a last remark about the game design, it should be stressed that some RPG (and many educational RPG in particular) are based on a predefined storyline and the characters can act within the limits of that (Terti *et al* 2019). Conversely, this game was designed without a storyline: there was a precise and thorough description of the initial background, the GM set the stage, and everything was in the hands of the players. The disadvantage of this approach is that the GM has to face a chaotic and unpredictable development of events, but this is compensated by relevant advantages. First, it is reflective of reality. Second, gamers should have a better game experience because the outcome of the debate is directly and exclusively influenced by their decisions and actions.

The GM was the teacher, acting as the moderator of the debate (thus, managing the debate and fostering the participation of everyone) while running the game (evaluating the players and assigning points).

2.2. Game session

The game session was not formally part of the teaching activities, and it was conceived as an experimental and complementary side activity of the teaching course. Thus, students participation was voluntary and took place after their informed consent was gained. Since no ethical issues were involved in the study, a formal approval from the ethics committee was not required. To date, the game has been played during the 2020–2021 and 2021–2022 academic years.

Because of Covid-related restrictions, the game sessions were organized as virtual teleconferences on the platform used by the university to provide online lessons. This allowed the widest possible participation of the students and encouraged their interpretation of their roles. As the students connected, they found themselves already in-game, as the GM greeted, and introduced them as their character ('Good morning His Majesty the Count, thank you for sharing your noble time with such commoners like us' instead of 'Good morning Mr [name of the student]'). This set up was very functional, as from the very first moments the GM mixed the serious interpretation (all the sessions proceeded strictly in-game and nobody ever broke his character) with funny elements (as the GM was the first to make puns and laugh, all the gamers implicitly understood that laughing and making jokes was allowed and followed along, while pursuing the serious objectives of the game).

The game continued with an online discussion. In turn, each character was allowed to express his/her arguments for approximately 3 min. Two rounds were performed, and approximately 30 min were left for shorter interventions. During this last phase, the GM also acted as a facilitator, keeping the debate alive and fostering everybody's participation.

During the game, GM wrote down positive/negative remarks about how each gamer was playing. This involved evaluating, for each player, (i) the primary and secondary objectives reached; (ii) how appropriately they used the notions learned during the lessons; and (iii) interpretation of the character.

The GM declared the game session concluded after 1.5 h and immediately started an off-game session (about 30 min) in which all participants 'broke characters' and shared their thoughts on the experience. The gamers were invited to openly explain why they acted as they did; this process usually included unveiling their goals and commenting on how easy/difficult it was to use the notions learned during the lessons. Afterwards, they were invited to comment on the game, on connections with the topics learned during the lessons, and if they encountered issues that were not explained during the teaching course.

At the end of the session, the GM took a few minutes to recap what happened, highlighting the educational aspects and how the debate influenced public opinion about the feasibility of the project. Finally, he declared losers and winners.

To get a more robust and objective dataset to understand and discuss the engagement and perception of the participants, an anonymous online questionnaire was administered to the gamers. The questionnaire assumed the assignment of scores from 0 to 5 (very negative, negative, neutral, positive, very positive) to evaluate different aspects of the game concerning amusement and didactical effectiveness. Moreover, some questions allowed open answers to provide suggestions or to share additional comments.

3. Results and discussions

The game session was played twice, with 2020–21 and 2021–22 classes. After two years, some partial outcomes can be drawn and shared with the community involved in EIA.

The game design proved to be robust: the fact that the game outcome was completely in the hands of the players' cleverness is confirmed by the opposite outcomes of the sessions played so far.

During the first session, two ideologically opposed blocks clashed and quarreled the entire time, no consensus was reached, and the destiny of the project was still uncertain at the end of the debate. This outcome can be summarized as a 'draw'. The journalist was the winner, as he gathered plenty of material for a 'hot' article in the next edition of the local newspaper, which was largely his merit: he was able to turn the factions against each other and make things difficult for public personalities (the mayor and the Count). The eco-radical deserved a mention of honor, as he was able to throw in the debate hoaxes and fake news that were later used by the committees to oppose the project. The manager and the technician did a good job in defending the project and they were almost prevailing until the end of the debate, when they unexpectedly lost the empathy of many of the inhabitants because of critical errors in the communication of technical arguments. Given the uncertain outcome of the debate, the mayor chose a prudent political position and did not openly express himself against or in favor of the project.

Conversely, during the second session, the faction favorable to the project was very effective in explaining their arguments and managed to move some other characters (initially neutral or even moderately negative on the project) towards a moderate level of acceptance. The method they used was to promise all possible mitigation measures to reduce environmental impacts, and they were also very clever to promise additional compensation measures that could fix some of the problems existing in the area. Among the promised measures:

- Implantation of vegetation to mitigate visual impacts and restore the ecological networks in the area (this was an objective of the ecological association, who gained a point because of this; however, the restored network would attract more ungulates towards the vineyards, so this point was a downside for the winemakers);
- Minimization of visual impacts and transfer of the heat generated by the plant to the nearby resort (a good point also for the resort owner, as she argued that the panoramic outdoor swimming pool (not facing the site of the plant), if heated, could extend the tourist season in the coolest months of the year, increasing her earnings).
- Transfer of the heating to the nearby sports facility (the possibility of hot showers for the local football teams attracted the sympathy of the local citizens' committee);
- Restoration of the local road network after the construction phase, with the mayor playing along and declaring to invest part of the public budget to improve the network further (thus representing a victory also for the local citizen's committee and the mayor).

Given this outcome, the technician was declared the winner (followed by the resort's owner and citizen's committee). The funder obtained a positive evaluation of the project, but the large amount of promised mitigation/compensation measures cut his earnings too much and could not be considered the winner. The worst performances were made by the Count (he did not save his prominent social and economic position, and he could not exploit the willingness of the funders to grant mitigation/compensation measures to gain advantages for himself or for the category he was representing) and the ecological associations (besides the restoration of the ecological networks, the impacts on the biosphere were almost absent from the debate, which revolved around elements pertaining to the anthroposphere, such as tourism, job availability, and infrastructure).

The game mode, as a virtual conference platform, was positively evaluated. The feature of private chats was used by the gamers to communicate with the GM to ask for clarifications without breaking characters in the game (for example, 'What's this thing she just mentioned? Does my character know something about it?'). In addition, the GM could use this feature to provide inputs to some players privately, without others noticing and keeping the debate always in-game (e.g., 'your character knows that this is not true' or 'the measure you have just promised is very expansive, you cannot afford many other relevant mitigation measures'). In addition, it was effectively used to foster inclusion and participation (e.g., 'you have received a subtle attack by the committee... are you sure you want to remain silent?').

In both sessions, nobody got penalties for metagaming. This outcome demonstrated that the game session was immersive and that the game explanations and characters' descriptions provided in advance were clear and detailed (as reported by many gamers during the final discussion). Moreover, the technique of 'hiding' the GM under the role of the debate moderator helped the gamers to never break the characters.

Based on the 16 answers received from the online anonymous questionnaire, the students' feedback was very positive concerning both the amusement and didactical aspects. The students declared that they had enjoyed the game (3 answers out of 16) or enjoyed it very much (13 answers) and found it useful (3 answers) or very useful (13 answers) from a didactical point of view. In particular, they declared that the game was useful in two ways. First, to put in practice theoretical notions learnt about environmental components, impacts and mitigation/compensation measures (yes very much: 11 answers; yes: 3 answers; average: 2 answers; no: 0 answers; not at all: 0 answers). Second, to experience how aspects other than technical ones are involved in decision processes and how difficult it is for a scientist to deal with social and political aspects without a specific preparation (yes very much: 12 answers; yes: 3 answers; average: 1 answer; no: 0 answers; not at all: 0 answers). All students recommended repeating the RPG again in the next years. Volunteer participation from the first to the second year increased significantly, from five to nine students, while the total number of students regularly attending the lessons (either in presence or virtually online) was almost identical (about 15 students). The first session was played by eight gamers, but three of them were ex-students or research fellows who helped fill some of the vacant spots.

For gamers playing technical roles, one of the most recurring comments concerned the difficulty in effectively communicating scientific knowledge. Initially, they thought to have a tactical advantage with respect to non-technical roles, but soon they discovered how hard it was to fight back fake news and to let the audience focus on scientific aspects rather than on economic interests, specific needs, unrealistic fears, or ideological positions. Similarly, all students could experience how the same subject of discussion may face very different perspectives, and that opinions tend to be polarized. All these features clearly stood out from both sessions; consequently, the game was deemed very educative, as these are typical situations that technicians/scientists involved in EIA may face during their career, and the students of these master's degree programs are not trained for that.

The final recap of the teacher was useful to let the students focus on some aspects explained by the teacher during the previous lessons, which were put into practice during the game. The mitigation and compensation measures were already mentioned above, and the importance of the correct identification of interferences (and related impacts on the environment) was clearly highlighted and recognized by the students.

The game design described in this paper was conceived for a relatively small group of players recruited from the students of EIA teaching courses included in university master's degree programs. However, small adjustments could allow adaptation of the game to other audiences, for example, it could be used with people actually involved in the implementation of a project. The game could also be improved to involve a larger group of players, introducing a wider list of characters (e.g., the following characters have already been prepared in case of further expansions: two more environmental groups, a journalist writing for an editor strongly interested in supporting the proposed development, and a member of the political opposition).

4. Conclusion

A role-playing game was developed as a side activity for an environmental impact assessment teaching course included in two master's degree programs (focused on geological sciences and natural sciences) at the University of Firenze (Italy).

The experiment was considered to be successful. The feedback from the students was very positive, and their volunteer participation from the first to the second year increased significantly (from 5 to 9). During the open discussion after the in-game sessions, both classes unanimously agreed on the following points: (i) they enjoyed the game and recommended repeating it again for the next classes; (ii) the game helped put into practice some concepts learned during the theoretical lessons; and (iii) the game helped understand how aspects other than technical ones are involved in decision processes and how difficult it is for a scientist/technician to deal with social and political aspects without a specific preparation. This last point is particularly important, as it demonstrates that this game represents a valuable complement to the main teaching activities.

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

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