Pollutions Solutions – a serious game for education to social dilemma facing common good

Information can be found at: https://www.economie.gouv.fr/igpde-editions-publications/larticle_n2

Why construct this game

The concept of *common good* has been redefined and extensively studied by Elinor Ostrom, and was thus popularized following her Nobel Prize in 2009. In particular, she was distinguished for the very high relevance of her work to increase the sustainability of our living environments – be them natural, man-made infrastructures, or mixed – and as such, the knowledge she has produced is recognized as highly relevant for the near future of our societies.

However, common goods and the social tensions they imply are not yet taught in France before Master level, and in particular, the ways to go beyond the cognitive stress generated by uncertain collective action are not approached. This is why we developed the game Pollution Solution, based on a classical model in behavioral economics called "common-good provision game", which we transformed so that it could be played on a paper board, and calibrated so that to induce an important stress for the group of players, to be solved collectively.
Serious game can be seen as an educational device for discovering social science concepts and has been increasingly used in the last decades. This type of games includes in particular *role-playing games* which allow to simulate a social setting, and produce an experience for the player which can be collectively discussed and analyzed at the end of the game, in a debrief session. The ComMod collective (www.commod.org) has been applying the use of these games to participatory research, to enable discussions around formal complex settings, be them Agent-Based Models, or complex Role-Playing Games.

Our game, Pollutions Solutions was created initially for a *participatory research project*, on the basis of a real-world case which was the so-called "Boues Rouges" pollution in the south of France, that created a long lasting conflict. After creating the game, we readapted it for diffusion in for middle school level (from 11 year old) and tested it several times in association with the Aix-Marseille Rectorat. We varied the public, as it was tested in the cities that are concerned by the inspiring pollution, but also with first year environmental economic student in several universities in Brittany, or in Germany.

At this stage, it reveals itself a good start for discussions, argumentations and discovery of important notions, that helps founding following courses or discussions, by referring to some structural elements of the game (the role of taxes, subventions), the emotions that are generated by the game (because it can lead to unfair situation or the confrontation to liars), but also the diverse innovations that the players can invent while playing (exchange of resources through a market, changing the rule of anonymity,…).

A few ideas within the game

The game is an interpretation of the "common-good provision game" in experimental economics, which constructs a situation where individuals can experience a *social dilemma.* In the game there are 4 types of players (farmer, citizen, elected people, industrial boss), each receiving two types of resources for leading some projects : time or money. There exist individual projects (three for each player, to be chosen anytime) or collective projects. Individual projects are good for the individual but one of them is harmful for all,l because of the generated pollution; they have to be financed in time and money by each player for its own interest. Collective projects are proposed at each step (9 steps are played) and are financed by the whole group: they usually solve pollution problems. Pollution is a problem for all, because after a certain level, it impacts everyone at each step, where everyone loses happiness and either health or reputation.
An interesting point is that the notion of resource is diverse (time and money), as well as the notion of gain (health, well-being, reputation) and can launch discussions on the importance of non-monetary activities or utilities.

Another interesting point was a real innovation: to translate the protocol from experimental economics where the contributions to project are *hidden* because participants cannot see each other actions. The center of the social dilemma in that contributing to common-good is not easy as there is a risk of being a "sucker" (the only

one to contribute while others carry their own projects): no one knows who is participating and who is keeping its resources to him or herself. We proposed a card system where valid resources (time and money) are distributed according to the precise rule at each step, whereas “cheating” resource is freely accessible to all players, and when participating, the type of resource Is unknown (Figure 1).

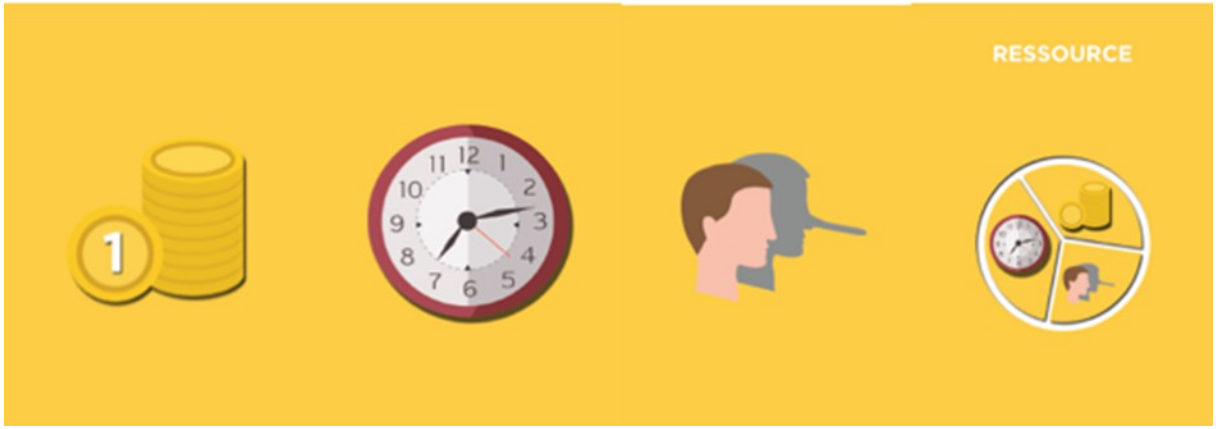

Figure 1: A resource card is composed of a recto with either money, time or cheating ability and a unique verso.

Using the game in diverse contexts

Although the game was designed for teaching purposes, it has now had a much larger life and got independent of his creators (co-creator being a game company called PlayTime). It has been used in several classes, in France in sixième and cinquième, but also at University to present the idea of common-good contribution (Brest, Rennes, and in Germany). It was also used three times in science festivals (Figure 2 – no pictures from children have been taken in the different classes) centered around sustainability issues. Its next apparition will be in Geneva for a series of conferences and round tables on the limits of the planet, where the members of an NGO will be formed to use it in the future.

Figure 2: left: image of a game led among researchers; right: session for general public at an “sustainability fest”.

A notable element is the high difficulty for researchers to get into the logic of the model and abandon themselves to play (in three cases out of four researchers destroyed the environment and themselves, being unable to cooperate) – which could explain some difficulties to create real interdisciplinarity in our academic world ; a problem that children have much less, as they accept the game as it is and find their way in the logic of the model. As said before, several institutions have emerged: discussions are organized to establish the best collective choice, a market to exchange time and money, a suppression of anonymity in contributions, gift giving by the group (at the end) to those who have shown more solidarity and made the group win.

When the game “works” (100% of the case with public and children), it can be noticed that the wording of players changes: if “I choose this project” is a common expression at the first step, “what do we do?” is a usual

attitude after 5 steps. In the same way, if players are interested first in their own gains, after a few step where pollution is damaging everyone, its disappearance is the occasion for shouts of joy and congratulations. We interpret it as a signal that the game induces in players the experience that collective problems have to be solved collectively, and that communication is essential, one of the main direct results of Ostrom's work over years.

Integration in the Pole 1 dynamics

This work is at the interface of formal representations (a model from economic theory transformed as a model-game) and their use for having groups of individuals participate. It integrates in the idea of diffusing knowledge, but also create spaces for free argumentation around a problematic situation. The advantage of the game compared to many different types of complex representations is the playfulness, which pushes players out of their routine, forces them to get into a new logic as they have to perform a role.