The use of role-play games in teaching: the International Climate Negotiation Game

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ABSTRACT

This paper presents a role-play game designed by the authors, which focuses on international climate negotiations. The game has been used at a university with students all drawn from the same course and at summer schools with students from different levels (undergraduate, master's and doctoral students and post-doctoral researchers) and different knowledge areas (economics, law, engineering, architecture, biology and others). We discuss how the game fits into the process of competence-based learning, and what benefits games, and role-play games in particular, have for teaching. In the game, students take on the role of representatives of national institutions and experience at first hand a detailed process of international negotiation concerned with climate change.

Key words: role-play games, game theory, climate change, international agreements.

Introduction

In nature it is through play that young animals learn the lessons that they need for their species to survive. Humans are no exception to this: from around 18 months old and throughout childhood, so-called "symbolic play" or "pretend play" has an essential role in the development of understanding, learning and trying out roles in society in a context in which children are not exposed to any dangers or risks, nor to any real consequences of their actions (Giménez-Dasi et al., 2008) Examples of such play include games of "mummies and daddies" and pretend jobs. Indeed, game-play has an important place in children's learning processes, and is frequently used by teachers to guide pupils as they discover the physical world and the society around them. However, when children move into primary education game-play becomes less prominent, and education takes place instead in a context of well-organised classrooms with rows of desks lined up facing a blackboard. Teachers and books become the main sources of learning, which thus loses its context, i.e. it becomes abstract and often unconnected with reality. This style of teaching is maintained in all subsequent levels of education, including universities. The consequences are many and varied: they range from a frequent lack of motivation among students, the worst result of which is a high dropout rate[1], to poor results in the PISA international surveys that measure learning by competences, i.e. the way in which students apply their knowledge to resolve tasks or practical problems that arise in real life (OECD, 2014).

Recent legislation on education in Spain (the LOE and LOMCE Acts) advocates a shift towards learning by competences, in which students take on a core, active role in the learning process. However, the fact is that there is a long way to go before these good intentions actually make themselves felt at schools and universities, in terms of preparing syllabuses and the classroom activities that are ultimately selected.

In this paper we discuss how play fits into the process of competence-based learning, and what benefits games, and role-play games in particular, have for teaching. Accordingly, we present a role-play game designed and used by the authors which focuses on international climate negotiations. This game enables students to experience at first hand the difficulties that arise in the process of reaching agreements at international summits dealing with climate change. It fosters the development of negotiating skills and provides students with a link to the practical implementation of various concepts of economics and an idea of the importance of climate change in the present and the future.

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[1]According to data from the Spanish Ministry of Education, Culture and Sport, the school dropout rate in 2013 was 23.6%, with 10.6% of students failing to graduate from secondary education.

Section One gives a brief explanation of how and why role-play games are used in teaching. Section Two outlines the goals, contents and basic rules of the International Climate Negotiation Game. Section Three looks at the basic premises of game theory that underlie this game. Section Four then discusses how the game is set up, lists the resources required to implement it and explains the role of the instructor during the game. Section Five discusses the experience obtained in the various forums where the game has been played, and outlines the steps that are being taken to improve its design and applicability. The paper ends with a summary of the conclusions that can be drawn.

1. The use of role-play games in teaching

Games can be used to achieve three goals: first, they place students at the heart of the learning process and enable them to experience at first hand the situations and lessons to be studied. They thus make a significant contribution to learning by making content easier to assimilate and fixing it in the mind for longer than information that is learned parrot fashion or taught out of context (Magee, 2006).

Secondly, games enable real-life situations to be recreated in a simplified, and above all risk-free, form. The absence of risk means that students can apply all kinds of strategies as they play, including some that they would never dare to apply in real life for fear of failure or losing. This means that they can also learn from their errors, develop greater initiative and creativity and tackle problems from different points of view.

Finally, the recreational setting implied by game-playing and the strong links with real life that this forges provide a further source of motivation for players. For all these reasons, games have great potential and it is desirable to maintain their use as tools in all stages of the learning process.

In the field of teaching, games are usually grouped under the headings of simulation and role-play (Andreu et al., 2005). If they are backed up by technology they may also be referred to as video games (Larsen et al., 2012). Real-life-based games used for learning are currently known collectively as "serious games" (Michael and Chen, 2005). They are used not only in teaching but also in areas such as business and personnel recruitment. The basic differences between simulation and role-play games are the following:

i) In simulation games each player plays him/herself, i.e. it is he/she who is seeking to solve a problem or tackle a real-life situation, whereas in role-play games players take on roles assigned to them, with characteristics and behaviour patterns of which they are informed.

ii) In simulation games there are no clear rules: players are set goals (e.g. to find a job) and decide on their own account what strategies to apply, what path to follow, etc. In role-play games there are clear working instructions and preset strategies that must be followed more or less closely (depending on each game), from which players must make choices.

iii) In simulation games the ending of the game is open and not pre-defined, so it may be different for each player, while in role-play games the ending is fully closed (there is a single, pre-set ending for each player) or at least partly closed (i.e. there are a number of possible preset endings depending on the decisions made during the game).

The type of game chosen depends on the goals pursued and the specific problems to be studied.

Finally, as well as simulation games and role-play games there is a group of techniques referred to as "gamification", which seek to incorporate elements and processes typical of gaming into non-recreational situations such as the drawing up of classifications, scoring, awards, medals, etc so as to encourage the type of motivation that arises in play without actually playing a game *per se* (Deterding et al., 2011).

2. The International Climate Negotiation Game

The International Climate Negotiation Game outlined below is a role-play game designed as a teaching tool. This game has been implemented successfully in various forums and courses since 2012. Other role-play games on the same topic can be found (Sterman et al., 2014), though with different set-ups. The role-play game that we have designed has a partly closed ending (i.e. there are several possible endings): players have a preset role (representing a specific country) and the setup of the game allows them some degree of freedom in their decisions.

2.1. Goals

The goals pursued in the International Climate Negotiation Game are the following:

1. Understanding the importance of climate change (CC) and its consequences.

2. Understanding the difficulties that arise in international negotiations on global public goods of an environmental nature.

3. Becoming familiar with certain micro-economic concepts concerned with public goods and with game theory.

4. Acquiring negotiation skills that can be applied to all areas of professional and personal life.

5. Fostering teamwork.

2.2. Content

The International Climate Negotiation Game enables a range of conceptual, procedural and attitude-related content to be covered.

Concepts	- Climate change. Causes and consequences.
	- International climate policies. Mitigation and adaptation.
	- Public goods. Pollution as a public good.
	- Game theory. Dominant strategies.
	- Negotiation strategies.
Procedures	- Active participation in an environmental negotiation process.
Attitudes	- Assessment of the importance of the consequences of CC for the planet.
	- Consideration of the difficulties of reaching an international agreement on the environment.
	- Acquisition of a range of negotiating skills applicable in real life.

2.3. Sequence of the game

The set-up of the game is simple, which means that it can be used as a way of motivating students in regard to the topics to be dealt with even before any explanation of theoretical content is given, or as a way of showing its practical usefulness and how it shows up in real life after explanations in formal lectures and other activities.

It is advisable to provide some prior explanations of the basic concepts of game theory (what is meant by a "strategy", the payment matrix, dominant strategies, etc). If this is not done these concepts will have to be explained together with the rules of the game for students not already familiar with them.

The game comprises two distinct rounds of negotiations, which can take place in a single session or in two different sessions. If the game is to be played in a single

session then at least two hours should be allowed, though the actual playing time will vary depending on the initial levels of knowledge of the players.

2.4. The basic rules of the game

This game is designed as a small-scale representation of the problems that arise during international negotiations on climate change, which are attended by representatives of different countries with their own, highly different situations and vested interests.

The imaginary world designed is simplified but nonetheless related to the real world. It is divided into 10 countries (or groups of countries) which, in turn, are divided into five groups:

- Developing countries: China, India and Brazil.

- Green-technology-intensive developed countries: The EU and Canada.

- Developed countries: The USA and Japan.

- Oil-producing countries Saudi Arabia.

- Developing countries highly affected by the consequences of climate change: Pacific Islands and African countries.

A flag (real or imaginary) is allocated to each country to make it easier to identify them with real situations.

Figure 1. Countries in the game
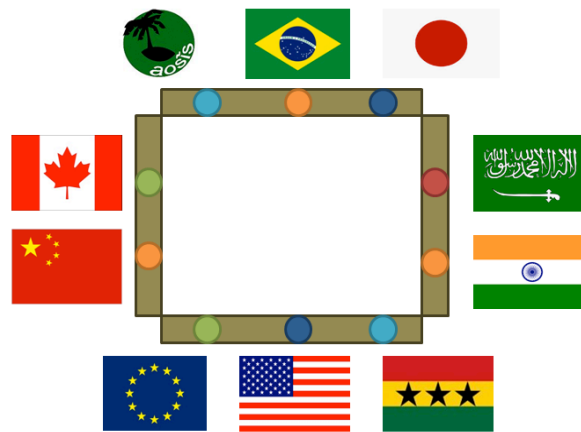
Source: Own work.

These countries must attend two climate change summits. The first takes place in the present (in the current year), and concerns negotiation on commitments that bind countries up to 2050. The second takes place in 2050 and covers commitments binding up to the year 2100. At each summit, the goal is to reach an international agreement to hold the global average temperature increase to 2°C by 2100 and forestall the harm that greater temperature increases could cause. To that end the countries must commit to reducing their CO_2 emissions.

Countries only have to decide whether to sign the agreement or not. However, the different characteristics of each country and their differing initial situations in demographic, socio-economic and environmental terms mean that there is a need for negotiation. Some countries may end up much worse off if there is no agreement (e.g. the African countries and the Pacific Islands), so they will try to negotiate so that an agreement is signed. Other countries may end up much worse off if there is an agreement (e.g. Saudi Arabia), so they will try to negotiate so that no agreement is signed. Finally, there are countries that must weigh up the opportunity costs of signing or not signing an agreement, and seek ways of obtaining rewards or compensation in each case.
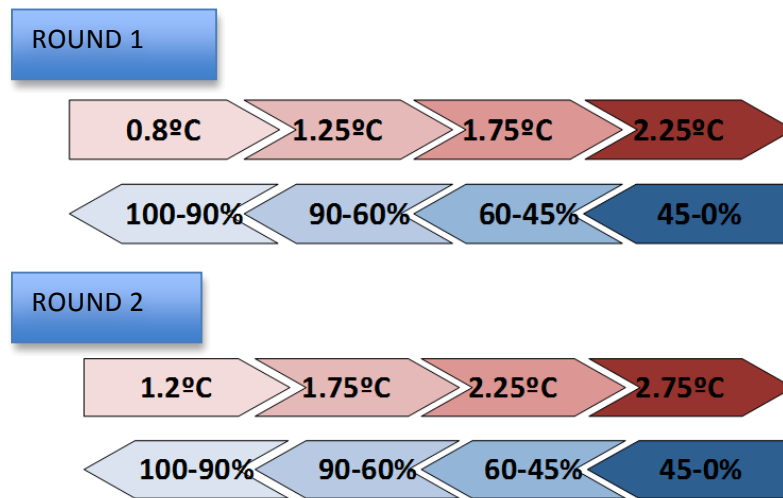
At the beginning of each round the players receive private information on the countries that they represent, indicating for instance whether they will be better off or worse off if an agreement is signed. Based on those data, the countries must decide their initial positions. However, the game allows money transfers between countries, so

countries that will be much better off if an agreement is signed (or not) may attempt to convince others to support their best strategies. Negotiation becomes highly important at this stage.

For an agreement to be carried into effect at least 7 out of the 10 countries must sign up to it. If fewer than 7 countries sing the agreement, the agreement is not valid, so no country reduces its CO_2 emissions. If the agreement is carried the signatories take the mitigation actions to which they have committed and incur the relevant mitigation costs, while the non-signatories do not implement any CO_2 emission reduction policy but can still benefit from the actions taken by those which do. The struggle to combat climate change can be seen as a public good, so non-signatories can act as free riders, i.e. can benefit from actions taken by other countries to reduce their CO_2 emissions, thus obtaining a more favourable future climate scenario without incurring the costs entailed by actually implementing relevant measures of their own.

As mentioned, the game comprises two rounds. The results of round one condition the initial situations of the countries in round two, their costs and their benefits. Given that each country accounts for a different proportion of total global CO_2 emissions, what matters is not just that 7 countries should sign the agreement but also which 7 they are. The consequences in terms of climate change are very different if the signatories represent 50% of total global emissions than if they represent 80%. To reflect this, the game is designed with four different scenarios for round two, based on four different levels of temperature increase (0.8°C, 1.2 5°C, 1.7 5°C and 2.2 5°C). Thus, the average global temperature increase up to round two depends not just on whether or not an agreement is reached in round one but also on the volume of global emissions accounted for by the signatories to the agreement, as shown in Figure 2. The bigger the temperature increase, the higher the environmental costs that countries must bear in round two will be.

Figure 2. Temperature increase depending on the proportion of total emissions accounted for by signatories in both rounds

ROUND 1

| 0.8ºC | 1.25ºC | 1.75ºC | 2.25ºC |

| 100-90% | 90-60% | 60-45% | 45-0% |

ROUND 2

| 1.2ºC | 1.75ºC | 2.25ºC | 2.75ºC |

| 100-90% | 90-60% | 60-45% | 45-0% |

Source: Own work.

As can be seen, the results in round two are also linked to a temperature increase in that round. To calculate the total average global temperature increase by the year 2100 the increases resulting in round one and round two must be added together. Thus, if all or most countries sign the agreement in both rounds the average global temperature increase by 2100 will be 2°C (the minimum possible in the game) but if there is no agreement in either round the increase will be 5°C (the maximum considered in the game). In all other possible combinations of agreement/no agreement in each round the total temperature increase is between 2°C and 5°C. The players are not aware of this information. They know that their actions have an effect on temperature increase, but they do not know exactly how great that effect is.

Moreover, if a country decides to sign the agreement in round one and the agreement is carried through then that country makes a number of environmental investments to reduce its CO_2 emissions and thus incurs costs in that round. However, these investments are maintained in round two so the environmental costs incurred by that country must necessarily be lower in the second round. This is also taken into consideration in the game, so if an agreement is reached many of the signatories in round one face lower costs in round two.

3. Basic concepts of game theory: strategy and payment matrix

The private information that players receive concerning their countries includes payment matrices, which have a decisive role in the working of the game (see Table 1). These matrices provide information on the profit and loss entailed for each country by signing or not signing the agreement, conditional on the strategies chosen by the other countries and, therefore, on whether the agreement is carried through. Thus, the game theory concepts of strategies, payments, dominant strategies, dominated strategies, etc are of great importance in the way the game is played[2].

Table 1. Example of a payment matrix for a country (Z)

Number of signatories

		< 6	= 6	> 6
Country Z	**Sign**	100	50+F	-50+F
	Do not sign	100	100	-50+F

Source: Own work.

Country Z must choose between two strategies – "Sign" and "Do Not Sign" – and the payments that it obtains depend on the strategies implemented by the other countries and on how many countries decide to sign. Each country chooses the strategy that provides it with most payments, and the game is designed so that if there is no negotiation there will be no agreement, since at least seven countries must be prepared to sign up.

However, the existence of negotiation and the possibility of money transfers between countries mean that there are countries that benefit from signing the agreement which are willing to provide non-signatories with monetary rewards to persuade them to change their votes. There are also countries that benefit more if there is no agreement and are willing to reward others for not signing. The minimum and maximum amounts that each country is willing to receive or give depend on their payment matrices and on the differences in absolute values between their best and worst results.

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[2] The basic concepts of game theory are studied in the subject of Microeconomics on degrees such as Economics and Business Studies. The game covers only the simplest concepts of game theory, so the initial presentation should suffice to provide students from other backgrounds with enough of an intuitive explanation of these concepts for them to understand and be able to work with the game, without going into too many technicalities and formalities.

Table 2 shows an example with two countries. In the absence of negotiation country A obtains more benefits if the agreement is not signed than if it is, regardless of what B does. It therefore chooses the "Do Not Sign" strategy. In game theory terms, the "Do Not Sign" strategy weakly dominates the "Sign" strategy[3]. Country B obtains more benefits if it signs the agreement (once again, there is weak domination), so it chooses "Sign" regardless of what A decides. In this situation no agreement is possible, because both countries must sign for the agreement to be carried through.

Table 2. Example of the game with two countries (A & B)

		Country B	
		Sign	Do not sign
Country A	**Sign**	-50, 100	50, -75
	Do not sign	**50, -75**	50, -75

Source: Own work.

However, if negotiation is permitted and the countries can transfer money from one to the other then country A might change its vote if it is rewarded for doing so by country B. Specifically, country A would be willing to change its strategy and sign the agreement if it receives at least 100 monetary units (mu). This amount is the sum in absolute terms of its best result (50 mu if there is no agreement) and its worst result (-50 mu if the agreement is signed). As can be seen in Table 3, if it receives at least 100 mu then country A is indifferent between signing and not signing, as it is equally well off in both cases.

Table 3. Example of the game with two countries and a transfer received by A

		Country B	
		Sign	Do not sign
Country A	**Sign**	-50+**100**=50, 100	50+**100**=150, -75
	Do not sign	50, -75	50, -75

Source: Own work.

[3]In game theory there are two types of domination: strong and weak.
One strategy "strongly dominates" another when the payments obtained by the dominant strategy are greater than those obtained by the dominated strategy for all possible strategies implemented by the other player.
One strategy "weakly dominates" another when the payments obtained by the dominant strategy are greater than or equal to those obtained by the dominated strategy for at least one case.

For its part, country B is willing to transfer money to country A to persuade it to change its vote and sign up to the agreement. As can be seen in Table 4, the most that country B is willing to transfer is 175 mu, which is the sum total in absolute value of its best result (100 mu if there is an agreement) and its worst result (-75 mu if there is no agreement). With a transfer of 175 mu from country B to country A, country B is indifferent as to whether there is an agreement or not, as it is equally badly off in both cases.

Table 4. Example of the game with two countries and a transfer made by B

		Country B	
		Sign	**Do not sign**
Country A	**Sign**	-50, 100-**175**=-75	50, -75
	Do not sign	50, -75	50, -75

Source: Own work.

There is therefore a margin between the minimum required by one country to change its vote and the maximum that the other is willing to offer. Negotiation is therefore not only possible but desirable. The exact sum of the transfer depends on the negotiating skills of the two countries and on the ability of each to use its private information, which is unknown to the other. It is important to bear in mind that if negotiation leads to both countries signing an agreement there will be overall benefits (-50+100=50 mu), which could actually be distributed according to various criteria of fairness, while if there is no agreement there will be an overall loss (50-75=-25 mu).

The game works in the same way when it is played with 10 countries. Thus, the dominant strategy of country Z in the initial example (Table 2) is not to sign. Its payments depend on three different situations: whether the number of countries willing to sign is below 6, exactly 6 or more than 6. If fewer than 6 countries sign up then there will be no agreement whatever Z decides because a quorum of 7 countries is required. If exactly 6 sign up then whether an agreement is reached or not hinges on the strategy adopted by country Z: if it signs then the minimum of 7 countries is reached and if it does not then the minimum is not reached. If more than 6 countries sign up then there will be an agreement regardless of what country Z decides.

Although country Z's initial weakly-dominant strategy is not to sign, it is prepared to change its vote if it is rewarded with a transfer of a least 150 mu. Maximising its gains will depend on its negotiating skill and ability in using its private information (which is unknown to the other players), as it may obtain transfers in excess of 150 mu from other countries.

The players are provided with transfer cheques that they must sign to formalise these transfers in the course of their negotiations. These checks must show the names of the issuing country and the recipient country, the amount of the transfer and the way in which the recipient country undertakes to vote. In other words, once a transfer is signed the recipient country is obliged to adopt the strategy agreed and cannot deceive the issuer or sign cheques with other countries that entail opposing strategies. The instructor who directs the game plays the part of an international body in charge of seeing that this condition is met.

Finally, as can be seen, if an agreement is carried into effect (i.e. if 7 or more countries sign) a term "F" appears in the payment matrix, of which the players are unaware. The function determined by F is not shown, but the players are shown information on its maximum and minimum possible values, which depend on the number of countries that sign up to the agreement and the proportion of total emissions for which they account. This function is intended to factor some degree of variability into the payments in the game and thus make them more realistic. The situation is not the same (and nor are the environmental benefits) if the agreement is signed by 7 countries, that account between them for 50% of global emissions, as if it is signed by 9 countries that account for 90%. Moreover, this uncertainty function introduces the possibility of free riding into the game, as it shows the benefit that countries can obtain if others sign up to the agreement that they themselves do not.

4. The workings of the game

The game takes place in a number of stages,

i. Initial presentation

The first essential step is for the instructor to present and explain the game, its basic rules, its key concepts and how it is played.

Round One

ii. Handover and reading of information

First all players are given the general instructions for the game to read, then each player is allocated a country and provided with the information on that country for this round. For large groups of players 10 groups of two or three players each (more than four is not advisable) can be organised, who must make decisions unanimously with one member of each group being appointed as its representative.

Once they have read the information, players are given a few moments to consider and decide on what strategies are most advisable for them: they may decide to be truthful about their intention to vote for or against an agreement, to be ambiguous with a view to attracting transfers from other countries or indeed to be deliberately misleading.

iii. Round table

Once the players have read the information and decided on their positions a round table is held at which the representatives of each country give brief (one or two minute) presentations of themselves, their countries, their situation and the strategies that they have chosen. Ideally, a suitable setting should be created for this stage by setting up desks and chairs in a round-table format so that all representatives can see and identify one another.

iv. Negotiation

After the round table the players can move freely around the room, holding discussions and negotiations with others concerning the strategies to be followed. This stage should last about 20 minutes. To avoid problems and confusion it is advisable for all members of the same group to move around together rather than separately, or for the representatives of each country to be the only ones authorised to sign transfer cheques. It is important to alert players regularly to how much time is left, and to remind them that they must submit their transfer cheques before time is up if they wish to reach any bilateral agreements.

v. Voting

Once the transfer cheques signed after negotiations have been collected, voting can take place. Players write on a piece of paper whether their country intends to sign the agreement or not and then they all read out their decisions.

vi. Presentation of results

Once the voting and transfer data have been entered on the Excel spreadsheets for the game the results for round one are shown to the players. It is important to indicate the average global temperature increase that results from this round, as this marks the initial scenario for the following round. The graphs representing the transfers made and the final benefits/losses obtained by each country can also be shown.

Round two

vii. Handover and reading of information

Each country is provided with the information for the scenario that results at the beginning of round two. That information depends on whether or not an agreement was carried into effect in round one, and if so on whether each country signed up to it. Once again, the members of each group read the information and then decide what strategies to follow.

viii. Round table

Another round table is held at which the representatives of each country set out their new positions and strategies for the new negotiation process.

ix. Negotiation

Once again, players are allowed to move freely around the room and negotiate however they see fit, under the same rules as in round one. Transfer cheques must be collected before the time allowed is up.

x. Voting

As in round one, the players write their votes on a piece of paper and then read them aloud.

xi. Presentation of results

Once all the data on votes and transfers have been entered on the Excel spreadsheet the results for round two are presented, showing the average global temperature increase in this round (which must be added to the increase in round one to obtain the total increase by 2100), the volume of transfers made and the benefits/losses of each country in this round.

xii. Discussion

This is an important stage of the game, because without it none of what has gone before has any point. In this stage discussions are held between players concerning their experience with the game, the difficulties that they have encountered in the negotiations, the lessons that they have learned and extent to which the game is similar to and different from a real-life international climate negotiation process. The instructor acts as a moderator, and at this point can also explain and highlight interesting points from the game, such as the overall benefits that would have been obtained and distributed if all countries had decided to sign the agreement and the lack of international organisations in real life (unlike the game) with the power to monitor and enforce compliance with agreements, which makes it difficult to attain international (or global) agreements in the real world.

Table 5. The workings of the game, with the recommended time spans

ROUND	STAGE	RECOMMENDED TIME
	i. Presentation	15-20 min.
ROUND 1	ii. Handover and reading of information	10 min.
	iii. Roundtable	10-15 min.
	iv. Negotiation	20 min.
	v. Voting	5-10 min.
	vi. Presentation of results	5 min.
ROUND 2	vii. Handover and reading of information	5 min.

	viii. Roundtable	10 min.
	ix. Negotiation	15-20 min.
	x. Voting	5 min.
	xi. Presentation of results	5 min.
	xii. Discussion	No set time
Estimated total time		1 h 45 min – 2 h 5 min + Discussion time

4.1 Material required for the game

The following materials are required to play the game[4]: the instructions to be distributed to all players, the information for each country in each round, the transfer cheques and the Excel spreadsheets set up to calculate the outcomes of the game. Countries should vote simultaneously to prevent any of them from changing their votes after learning how others have voted. To that end, slips of paper can be used on which each representative writes whether his/her country has decided to sign the agreement or not before reading out the decision to the rest.

As indicated in Annex II, the Excel spreadsheets are set up so that only the way in which each country votes and the transfers made need to be entered by hand: the rest of the information needed to produce the results of the game is filled in automatically.

The room where the game is played should be large, with enough space between desks to enable players to move around freely during the negotiation stage. It is also advisable to set up desks in a round-table format somewhere in the room, to provide the right setting for the exposition stage and enable all players to see one another and thus identify each country, its representatives and their initial strategies. To create the right ambience, the flags of each country or signs with their names can be set up on each

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[4]Part of this documentation is available at: https://sites.google.com/site/cumbreinternacionalcces/
To access the supplementary material on the game, please contact the authors by e-mail.

desk, and the information for each country could be provided in a file decorated with its flag[5].

We are currently looking at the possibility of playing the game online. To that end, we have set up a preliminary website (see Annex I) to centralise all the information needed by players and the materials needed by the instructor in charge of the game.

4.2 The role of the instructor during the game

It is the students who actually play the roles of the representatives of each country who take centre stage in the game and decide how it develops and what the outcome will be, but the supporting role of the instructor as a guide and observer is also crucial.

The first task of the instructor is to present and explain the game before play begins. At this point it is essential to explain the basic premises of game theory used in the game and to solve any doubts that may arise concerning its workings and stages. This does not mean telling players what choices to make or what strategies are most favourable but rather helping them to make these decisions for themselves. In round one there may seem to be some confusion, but the experience generally serves for students to learn the process by round two. The information on their performance provided via the results of round one tends to help them obtain a better understanding of the game.

At the round-table stage the instructor acts as a moderator, in the guise of a supra-national authority, ensuring that the players do not take too long in their expositions.

Once the negotiation stage begins, players must be able to move around the room so as to strike up negotiations however and with whomsoever they wish. At this stage the instructor is a mere observer of their movements, and should intervene only if doubts arise. If the players seem not to be active enough the instructor may provide encouragement to foster negotiation. At this stage it is advisable to remind students regularly of how long they have left to complete their negotiations. They should also be

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[5]Annex III contains photos of the different stages of the game, taken during one of the summer courses organised by BC3 and the University of the Basque Country.

reminded that they must sign the cheques for transfers between countries and hand them in before their time is up.

Once the transfer cheques have been collected and the vote has taken place the instructor must enter the relevant data on the Excel spreadsheets (see Annex on materials). The essential results must then be shown to students, i.e. the graphs for transfers and benefits/losses, whether the agreement has been carried through or not and what the temperature increase is for the next round.

The same sequence of stages is used in round two. The instructor must take particular care when distributing information in round two, taking into account the specific scenario applicable, whether or not an agreement was reached in round one and if so what countries signed up to it, as the information to be provided differs in line with these factors.

Lastly, at the final discussion stage the instructor must encourage players to reflect on what lessons they have learned and whether they can be extrapolated to real life, and on what difficulties they have encountered in negotiating the climate change agreement.

5. Actual implementation and future development

The International Climate Negotiation Game was played by undergraduates (as part of the Environmental Economics subject on the Economics and Business Studies Degree) at the Faculty of Economics and Business Studies at the University of the Basque Country (UPV/EHU) in academic year 2011-2012, and on summer courses on climate change organised each year via the UPV/EHU and the Basque Centre for Climate Change (BC3). Participants therefore included undergraduate and postgraduate university students from various backgrounds (economists, engineers, environmental scientists, physicists, biologists, etc). We believe that the game is simple enough to be used also with upper secondary school and vocational training students. The game was also presented at the sixth Seminar on the Teaching of Economics (Escapa et al., 2014) held in Bilbao in 2014.

No objective statistics are available to show how participants rated the game, but we can confirm that it was well-received. Informal opinions conveyed by participants revealed that they enjoyed the game and learned from it. From observing their attitudes and opinions during the game and in the debriefing that followed it, we can state that most participants were able to grasp its essence and draw lessons from it that can be extrapolated to real life.

The game has a number of possible closed endings, given that the final outcome depends on the decisions and positions of players throughout the two rounds. Indeed, it turned out differently each time it was played, and on each occasion different important points arose. For instance, on some occasions players were seen to begin forming coalitions from the outset, aligning themselves with other countries favourable to their positions so as to set up distinct groups, i.e. countries in favour of an agreement and countries against it. On others, however, players acted much more individually. In both cases important lessons were learned which are applicable to international climate negotiations in real life.

Sometimes countries managed to carry the agreement into effect in both rounds and sometimes in neither, though on most occasions they failed to reach an agreement in round one but did reach one in round two. Regardless of whether the outcome is positive (i.e. an agreement is reached and the temperature increase is held to 2°C) or negative (i.e. no agreement is reached and the temperature increases by more than 4°C, causing one player -- the Pacific Islands -- to disappear) there are still important lessons to be learned concerning what needs to be done and why agreements are not reached in real life. Students are able to obtain first-hand experience, albeit on a small scale, in the course of the game.

The payment matrices clearly define the financial benefits and losses for each country depending on strategies followed, but given that the game also involves issues of ethics and fairness interesting strategies and attitudes can be observed on the part of players over and above those evidenced by monetary payments: it can be seen how far they empathise with the country that they represent and with other countries. All these points deserve to be taken into consideration in the discussion stage.

As can be seen, the game has great potential and enables a wide range of important current issues to be tackled through the experience gained by the players.

With a view to the future it is intended to work on the design of the game so that it can be played online. To that end, a website is being developed to centralise information and facilitate the playing of the game for students and for the instructors responsible. This may lead to significant advances such as the ability to play remotely outside the classroom, and in different sessions, thus minimising the need to print out information.

6. Conclusions

Games in general and role-play games in particular are a powerful tool in learning processes. The intrinsic characteristics of games make them an aid to motivation: first-hand experience and the absence of risks enables players to engage in unlimited experimentation in situations that, although they are simplifications of real life, encourage significant learning, with outcomes that are retained and fixed in the mind for longer.

This paper presents an example of a role-play game suitable for use with students from different backgrounds including economics, the environment, international relations and ecology. Players take the roles of institutional representatives of different countries and experience at first hand a detailed process of international negotiation. The fact that the game is partly closed means that there may be various endings, enabling different results and strategies to be observed. This means that each game is a unique experience with its own important lessons, explaining many of the situations that arise in real-life negotiations of this type.

Our experience as the designers of the game after having played it on several occasions (on which it was well-received by participants) enables us to conclude that role-play games can play an important role in teaching, as a different, highly motivational tool for both students and teaching staff. They can also facilitate the development of competences to help students connect abstract concepts with real-life applications.

Acknowledgements

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Annex I

We have developed a website on which part of the information on the game is available. The game is available in Spanish at

https://sites.google.com/site/cumbreinternacionalcces/

And in English at

https://sites.google.com/site/cumbreinternacionalcc/

For more information about the International Climate Negotiation Game, or if you wish to use it as a teaching tool, please contact:

<div align="center">

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</div>

ANNEX II

The pictures below show the Excel spreadsheets used to compute the results of the game. There are five different spreadsheets, one for round one and one each for the four potential scenarios in round two, which depend on what happens in round one (+0.8ºC, +1.25ºC, +1.75ºC y +2.25ºC). The spreadsheets are set up in such a way that only the way in which each country votes and the transfers of money between countries need to be entered manually: the rest of the information is filled in automatically to show the results of the game. Each Excel sheet is divided into various pages: page 1 covers voting, and it is here that the votes of each country must be entered along with the information as to whether an agreement has been reached or not, the total proportion of CO_2 emissions accounted for by the signatories if there is an agreement and the temperature increase. Then there is a page for each country, where its specific results in each round entered, along with any transfers made. There are also pages for the overall results of the game, along with various illustrations showing results in graphic form.

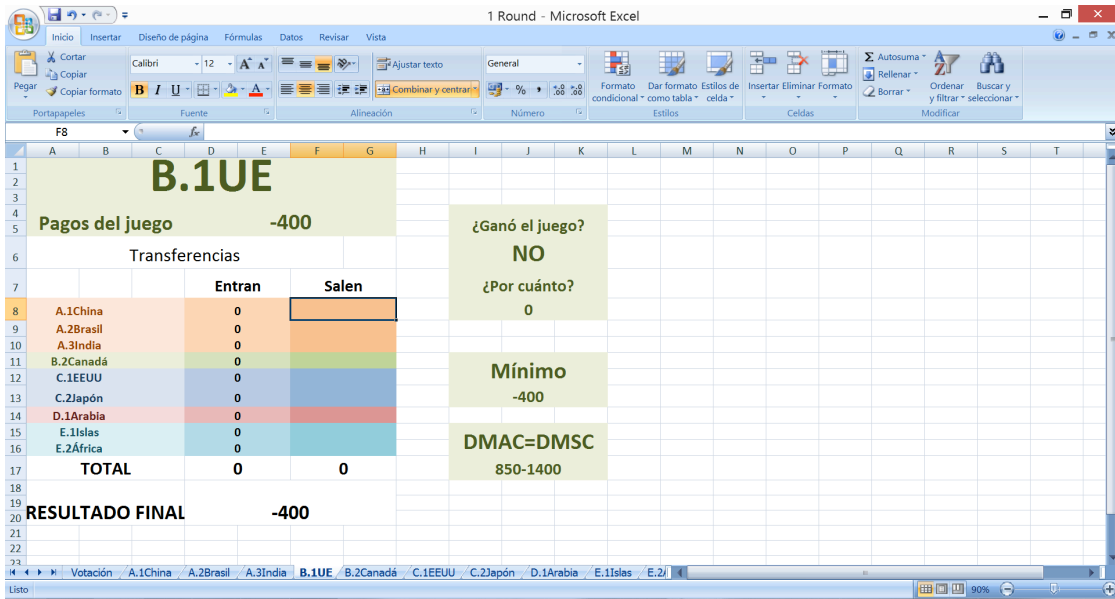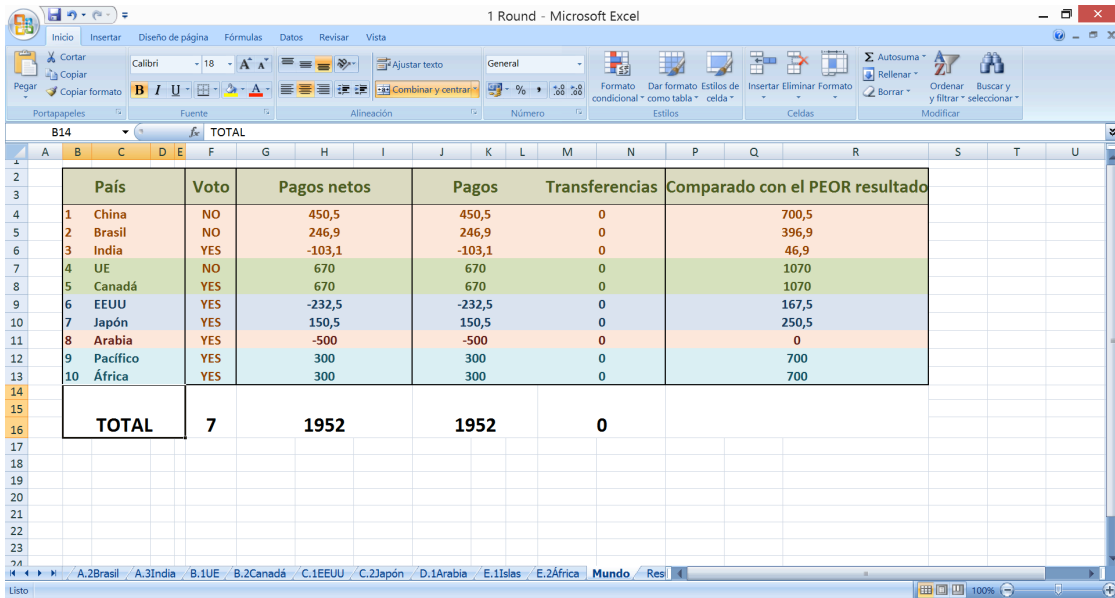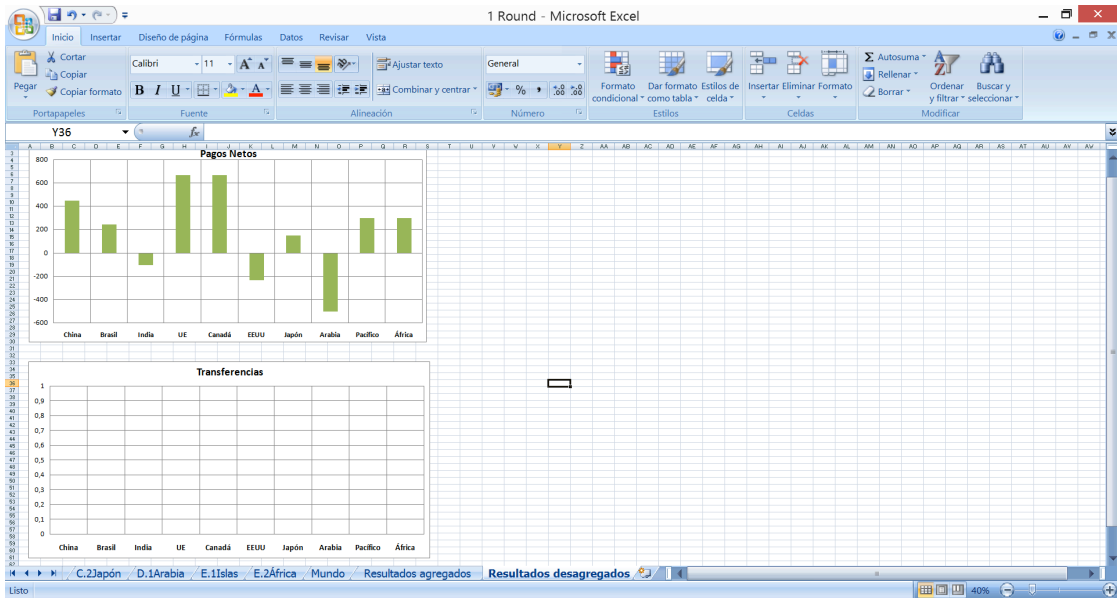Figure AII-1. Excel voting page

Figure AII-2. Page for one country.

Figure AII-3. Overall results page.

Figure AII-4. Graph page.

Pagos Netos

Transferencias

ANNEX III