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Climate Change Games as an Effective Tool for ESD Practices

Abstract. Climate change is one of the most acute problems humanity is facing nowadays. At the same time, the school curriculum in Ukraine in most cases does not include up-to-date, practically oriented knowledge about climate change threats. For this reason this study describes examples of well-known climate change games, translated and adapted for use in Ukrainian schools and aims to analyze role playing games about climate change as a tool that can be used in Education for Sustainable Development (ESD). The article describes 12 games selected from 5 open-access sources (like WWF, Red Cross Climate Centre), which were used in pilot studies conducted in 5 Ukrainian schools in order to estimate their applicability in the school educational program for biological disciplines. The results indicate a significant effect of raising the level of understanding of climate change threats and solutions; the proposed games can efficiently cover the educational gap in this field.

Keywords: climate change education, ecological games, ESD, role playing games

1. Introduction

Evidentially, climate is changing nowadays. Weather observations both in Ukraine and abroad demonstrate the tendency to a warmer Earth: significant temperature increase and reduced precipitation in summer months are expected in the upcoming century, which will lead to more frequent hot and dry patterns [Jylha et al. 2008: 441-462; Shevchenko et al. 2014: 5-7; Gorny et al. 2016: 176-191]. The National Aeronautics and Space Agency (NASA) has reported that the

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six-month period from January to June 2016 was the planet's warmest half-year on record, with an average temperature 1.3° C warmer than the late XIX century.¹

Among the instruments of adaptation and mitigation the climate change consequences, education for sustainable development (ESD) plays an essential role. The United National Framework Convention on Climate Change (UNFCCC) has "a sharp and sustained focus on education, training, and public awareness" according to its Article 6. Under the UNESCO Climate Change Initiative, which was launched at the 15th Conference of the Parties to the UNFCCC (COP15) in 2009, the Climate Change Education for Sustainable Development Programme has been formed. The Programme foresees making climate change education a more central and visible part of the international response to climate change by helping young people to understand the impact of global warming today and increase their "climate literacy." Among others, it emphasizes the necessity of encouraging innovative teaching approaches to integrate climate change education in schools and raising awareness about climate issues within non-formal education programs [UNESCO Climate Change Initiative 2010: 3-5]. The critical role of education in climate change was emphasized at the two last COP events: the Paris Climate Conference (COP21) in December 2015 and COP22 in Marrakech, 2016 [UNESCO Climate Change Education 2016: 1-4].

Despite the more visible presence of ESD concept the in Ukrainian education nowadays, the school education programs here mostly do not provide any up-to-date, practically oriented knowledge about the climate change threats in a system manner. The ESD methodology together with some aspects of climate change education is being implemented in particular study courses in universities, like "Climate Change and ESD for Engineers" [Soloshych & Pidlisnyuk 2009: 229-232] or "Energy Efficiency in ESD" [Zahvoyska 2011: 295-303]. EDS methodology has been adopted for school education also [Pometun 2015: 1-120]. Such implications have a non-systemic character without enough use of interactive methods and renewed materials due to a weak methodological and material base, lack of translated or adapted courses and supporting information related to climate change issues.

It should be taken into account, that climate literacy foresees an understanding of both climatic processes and social responses in order to realize some positive changes for a sustainable environment with the help of competencies of inquiry-based and problem-based learning [Makrakis, Larios & Kaliantzi 2013: 54-72]. The climate change Education for Sustainable Development is a necessary part of the increasing the climate literacy using innovative teaching methods. Among them, ecological games should be mentioned as an interactive educa-

¹ www.nasa.gov/feature/goddard/2016/climate-trends-continue-to-break-records [access: 18.01.2017].

tional tool which allows involving participants in a more active manner in seeking the practical solutions instead of a passive obtaining the “dry theory” on the problems posed [Wu & Lee 2015: 413-418].

This study represents a case of climate change games translation and adaptation for use in Ukrainian schools and aims to analyze the climate change role games as a tool of the climate change Education for Sustainable Development.

2. Materials and methods

In this study, we have estimated the possibility to implement in Ukrainian formal education a number of games and exercises on climate change and adaptation issues based on materials of international non-governmental organizations dealing with ecological education. These activities have been performed within the social ecological project “While Playing, Change the World” (March-August 2016) supported by Climate Forum East II Program of European Union, Austrian Development Cooperation, and Red Cross. The project aimed improving the capacity of teachers in teaching the topics of climate change and related subjects such as geography, biology, ecology and environmental protection; strengthening the capacity of NGOs to work with schools in their regions; and increasing awareness of climate change and adaptation in schools as well as among young activists of regional NGOs. The main project activities have included: (1) compiling, adaptation, translation into Ukrainian, and distribution the handbook “While Playing, Change the World: A Climate Games Handbook” [Khalaim 2016: 1-44] with a set of games and interactive methods on climate change; and (2) conducting a 2-days all-Ukrainian Forum “Climate Education – 2016” for organizations working in this field, active educators, and other stakeholders with trainings on the games from the handbook.

For the handbook we have chosen 12 free-access “real-time” games which fit the following criteria:

- short duration (15-40 min.) – to an easy inclusion of the games into regular school lessons of a 45 min. duration,
- easy rules – to reduce the time needed for teacher’s preparation and pupils’ understanding,
- any complicated handouts are necessary (black-and-white printing at an office paper only in some cases) – to make the games affordable for teachers from any village school with a poor material base,
- devoted to the climate change issues, including basic facts and general functioning, individual input, possible adaptation and mitigation activities, etc.

The games have been taken from five free informational web sources:

- ATACC “Handbook for action against climate change”, International Falcon Movement-Socialist Educational International [Sudbrock & Pearce 2012],²
- Climate Box: an interactive learning toolkit on climate. Developed for 2-11 school grades by UNDP, Moscow [Berdin, Gracheva & Dobrolyubova 2015],³
- Educational Games. Red Cross Climate Centre with the IFRC’s Department of Community Preparedness and Risk Reduction,⁴
- Communicating Adaptation Role Playing Exercise. © World Wildlife Fund, Inc. [Shaun 2013],⁵
- Participatory Exercises for Adaptation Training. World Wildlife Fund Adapt Learning Resource (2015).⁶

All games have been adapted to Ukrainian auditory by providing specific examples and local cases. Aiming to check its compatibility with the current school curriculum for biological disciplines and to estimate its applicability to pupils’ demands, we have conducted the chosen games in 5 pilot Ukrainian schools in Dnepropetrovksa, Cherkaska regions and Kyiv in May-June 2016 with the help of local teachers (Shvedun Hanna, Sankivska Iryna, and Valantyrets Natalia). The teachers have provided feedback after working with these games, having pointed out:

- age and number of participants,
- how have games been perceived by the participants (indicating likes or dislikes; level of games’ understandability; level of participants’ engagement),
- how much time did it take to play each game,
- recommendations for the games’ further improvement.

We have collected all feedbacks and have made a generalization on its basis, pointing out the most relevant outcomes.

3. Results

The Climate Change Games conducted in five pilot schools has been well perceived by the participants, raising the level of their understanding of the climate change threats and solutions. The local trainers have concluded that the proposed games can efficiently cover the educational gap in this field.

² www.ifm-sei.org/files/up/ATACC-publication-web.pdf [access: 18.01.2017].

³ www.undp.ru/documents/ClimateBoxEng/Climate-box-ENGLISH_an_illustrated_textbook.pdf [access: 18.01.2017].

⁴ www.climatecentre.org/resources-and-games/games [access: 18.01.2017].

⁵ http://wwfadapt.org/participatory-exercises/Communicating_Adaptation.pdf [access: 18.01.2017].

⁶ <http://wwfadapt.org/participatory-exercises.html> [access: 18.01.2017].

The games have been conducted for a quite wide age range of pupils: from 8 years old (2nd grade) through 13 years old (7th grade) to 17 years old (11th grade and evening school attendees), with 12-25 participants per group. The participants liked the proposed games mostly; more interactive, ice-breaking games were perceived better, encouraging pupils to catch the ideas behind with some accompanying activities. Thus, the game “Answer with Your Feet”⁷ allows participants and facilitators learn about characteristics and composition of the group and a little about one another in a dynamic way by splitting the group in space according to their answers to the climatic questions. It helps to show the influence of climate change consequences on the majority of people in a usual life, especially when it cannot be visible without a generalization. For example, splitting the group according to answers “yes/no” to the question “Did you noticed the snow in Carpathian mountains last winter?” helps participants to observe, what kind of climate-related observations and influences they can experience similarly.

We have selected nine games with feedback from the local trainers and put them in Table 1. The short games’ description and information of the participants’ age and amount allows observing the reasons behind comments and proposals on the games’ improvement.

According to the comments and results of game practice, the games of ATACC Handbook for action against climate change [Sudbrock & Pearce 2012] has been perceived well by the participants and were easy-to-use for trainers. At the same time, a low level of understanding of climatic processes which lie behind the climate change and greenhouse effect by school children in regional Ukrainian schools [Pometun 2015: 1-120] should be taken into account in the work on games’ adaptation to Ukrainian educational process. Introducing such games as Communicating Adaptation Role Playing Exercise, some fundamental knowledge about the mechanisms of climate change should be provided. The exercise foresees practicing the communication skills by trying to persuade a partner to do something that is helpful for climate change adaptation or stop a potentially maladaptive activity, using a prepared scenario and roles [Shaun 2013: 1-3].

The games based on the ecological footprint calculations help participants to estimate their consumption patterns critically and to compare it with best practices. The participants should answer a list of questions related to their lifestyle preferences, thus determining the level of energy and materials consumption to compare it to others and to the Earth’s carrying capacity. The proposed questionnaire has raised some comments by participants indicating the necessity to be adapted to Ukrainian traditional way of consumption and living [Khalaim 2016: 1-44]. For example, the questions about carpooling or following the vegan diet are not so relevant for an average Ukrainian school-aged child and should be re-

⁷ www.climatecentre.org/resources-games/answer-with-your-feet [access: 18.01.2017].

Table 1. Selected Climate Change Games and their approbation in five Ukrainian schools (May-June 2016)

Nr	Game title and brief description	Participants: age / school grade / amount	Duration (min.)	Feedback / comments / recommendations
1	<p>Impact Game2</p> <p>Everyone stands in a circle; each person chooses another person to copy. When you say go, everyone has to try to hold as still as possible, but people will inevitably make small movements. Each participant should copy their chosen person's movements, but exaggerate them just slightly. The game ends when everyone is jumping in the air or rolling on the floor!</p> <p>This energizer shows how small changes can have a large impact.</p>	<p>12 / 6th grade / 22</p> <p>13 / 7th grade / 12</p> <p>13-14 / 7th grade / 19</p> <p>14-15 / 8th grade / 23</p> <p>15-16 / 10th grade / 18</p> <p>16-17 / 11th grade / 15</p>	10-15	<p>A room size should be enough for active movements. A trainer should be actively engaged in the process. In the case of open-air playing conditions, the involvement of the participants is more active. Under the school educational process, it is impossible to finish the game when "everyone is jumping in the air or rolling on the floor" – chaotic movements could be enough for the demonstration of the "butterfly effect."</p>
2	<p>Globingo2</p> <p>Sit in a circle. One person doesn't have a chair and stands in the middle. The person in the middle says an activity that contributes to climate change. All participants who answer this with yes need to change places. The person in the middle tries to get a chair. Examples: Change places if...</p> <p>You like eating food from other countries; You have ever been abroad by plane; You eat meat; You don't recycle everything you can; You ...</p>	<p>8 / 2nd grade / 20</p> <p>13 / 7th grade / 16</p> <p>14-15 / 8th grade / 24</p> <p>15-16 / 10th grade / 21</p>	10-15 or 30-35	<p>In the case of the limited space (classroom) participants can walk freely between chairs and sit down if they answer "yes"; others keep walking. In the case of open-air playing, chairs are not necessary to use (participants can change marked circles on the asphalt/ground). It is necessary to discuss which processes/actions influence climate change and how.</p>
3	<p>Energy Game2</p> <p>Explain that there are different types of fuel we use to get energy. Some of these are called 'fossil fuels' (coal, oil, and gas). They are dirty to use, and the gases they give off are making the earth warmer. There are sources of energy that do not have a bad effect on the environment (power from the wind, waves, the sun and rivers). Call out different words, and the group,</p>	<p>8 / 2nd grade / 20</p> <p>13 / 7th grade / 16</p> <p>15-16 / 10th grade / 21</p>	10-15	<p>Participants sat on their chairs in the case of 'fossil fuels.'</p> <p>The game is quite simple and easy-to-use; it could be effective for pupils from 2nd to 6th grades. The game is a good energizer in the case of open-air playing; could be used in eco-camps.</p>

	should respond with various actions, as follows: the wind (run around the room blowing), waves (swim around the room), sun (stand still with eyes closed), and rivers (spin arms around each other in front like a turbine). Occasionally shout 'fossil fuels.' At this everyone should sit down in a ball (like a piece of coal) and shout back 'no thank you.'			
4	<p>The World in 2050</p> <p>Tell participants that they will take a trip into the future in their minds. The destination is the year 2050. Ask everyone how old they will be then and what they want to do at that age.</p> <p>What will your town look like? How will people move around?</p> <p>How will you and other people live? What will your homes look like?</p> <p>What will the countryside look like in 2050? What will have changed from now?</p> <p>Tell participants that they will create a newspaper for 2050, using their imagination.</p> <p>In pairs, they should create one or two newspaper items. They can be interviews, point of view columns, news stories, cartoons... all with catchy headlines. Put all news items on a big 'wall-newspaper' displayed on a wall, and give time for everyone to read everything. Later on, you can also lay them out in a regular newspaper format.</p>	<p>8 / 2nd grade / 20</p> <p>13-14 / 7th grade / 17</p> <p>14-15 / 8th grade / 24</p> <p>15-16 / 10th grade / 23</p>	<p>20</p> <p>or</p> <p>70-90</p>	<p>The game could be accompanied with additional information/presentation with the main climate change consequences and prognosis.</p> <p>The game requires more time than it was supposed to; according to the age of participants, it took 70-90 minutes in overall (faster for elder pupils).</p> <p>For more effective playing, a preparatory reading should be asked;</p> <p>The proposed prognosis on 2050 is too pessimistic and should be replaced by more optimistic one, like "In 2050 the new vaccine against AIDS is developed".</p> <p>The game has encouraged and called a high interest among teenagers, who used a creative and sometimes humoristic approach to news' writing.</p>
5	<p>How Bad are Bananas? 2</p> <p>In this activity participants discuss the impact of different actions on their carbon footprint. Impact cards are used; all figures are taken from the book 'How Bad are</p>	<p>12 / 6th grade / 22</p> <p>13 / 7th grade / 12</p> <p>13 / 7th grade / 18</p> <p>15-16 / 10th grade / 25</p>	<p>20-25</p> <p>or</p> <p>70</p>	<p>The number of cards sometimes is bigger than the number of participants; some cards cannot be discussed then. We propose trainer to read/present all cards for participants in advance.</p>

Table 1 – cont.

	<p>Bananas?’ (Berners-Lee, 2010). The numbers are estimates of Carbon Dioxide ‘equivalents’ (CO₂e), also taking into account other greenhouse gases. Ask everyone in the big group to form a line, with high impact carbon items at one end of the room, and lower impact activities on the other end of the room. They should discuss with each other while trying to form an order.</p> <p>When they have decided on a line, ask everyone to say what they are. Then they can put their card on the floor in the same order. Participants can add the numbers to the cards. Ask participants to choose the activities that they can’t have any individual influence on, but that need to be carried out by a higher level (city administration, national politics...) and put them in a separate line.</p>			<p>The game is quite impressive concerning the demonstration of the ecological consequences of the small actions/decisions.</p> <p>The card “Having a child in Europe (373 tones CO₂e on average)” is not understandable for Ukrainian pupils and should be replaced.</p> <p>The group size should be limited to 5-15 participants to avoid loudness during discussions.</p> <p>Cards (actions, items, and their carbon footprint) should be discussed in advance to shorten the necessary time for joint discussions.</p>
6	<p>Answer with your feet</p> <p>An ice breaker for medium to large groups unfamiliar to each other; or a quick and more engaging way to answer specific questions. Participants are asked to stand in an open space.</p> <p>This is a physical game where people arrange themselves across the room according to different criteria that will be called out by the facilitator. The facilitator must call up a subject and the appropriate organizational strategy that the participants must adopt to distribute themselves across the room.</p>	<p>13 / 7th grade / 12</p> <p>13 / 7th grade / 16</p> <p>13-14 / 7th grade / 19</p> <p>14-15 / 8th grade / 17</p>	10-15	<p>For the participants’ redistribution in the room space, we used a rope which separated some parts of the floor for different groups.</p> <p>Participants liked the game very much.</p> <p>The climatic questions should be put into the game; we used the questions from “Globingo”.</p> <p>A number of participants should be limited to 5-15 persons.</p>
7	<p>Icebreaker: How has climate change affected your life? Give to participants a few minutes to think of a response to the following question: “How has climate change or extreme weather affected your life or the lives of people you know? You may draw upon experiences in</p>	<p>13-14 / 7th grade / 19</p> <p>14-15 / 8th grade / 23</p> <p>15-16 / 10th grade / 18</p> <p>17-18 / evening school / 14</p>	20-25 or 45 (one school lesson)	<p>For pupils from one group who know each other well the game could be used after summer vacation or any other big time period without meeting each other frequently.</p>

	<p>either your personal or professional lives or both.” After a few minutes have passed, ask participants to introduce themselves to others at their respective tables and briefly tell their colleagues the answer to the above question. Allow about 15-20 minutes for this to happen. Stop the discussion and ask each table to select one response to tell all participants in the workshop. Participants may tell their stories or tell a story of one of their colleagues at their table. Give each table about 1-2 minutes.</p> <p>The game developed by Eliot Levine, WWF</p>			<p>The game foresees that all participants know well the main consequences and evidence of climate change; if they are not well-prepared, first questions should be simpler, f.i.: “What kind of abnormal/extreme weather events have you observed in your town recently?”</p>
9	<p>Understanding Your Climate</p> <p>We often discuss climate change as if we already thoroughly understand the historic climate, its role in local ecology, culture, and economies. It is difficult to see change if we do not understand where we are starting from. Through this participatory exercise, participants will use their current knowledge to jointly develop a visualization of the historical annual climatic cycle for their region of interest (usually where they live or work). This activity also helps facilitators and trainers to understand better the climate of a region that they may be unfamiliar with. This will be helpful in facilitating subsequent discussions about local climate change. For more details see the source⁵.</p> <p>The game developed by Shaun Martin, © World Wildlife Fund, Inc. 2013</p>	<p>15-16 / 10th grade / 21 16-17 / 11th grade / 22 17-18 / evening school / 15</p>	<p>20-25 or 45 (for 11th grade) and 60 (for 10th grade)</p>	<p>Tape was not used, we wrote our observations on the blackboard with colored chalk.</p> <p>The game is more efficient for elder pupils; in the case of middle school makes sense to discuss general ecological problems of each month after the creation of the climatic calendar. Finally, a schedule of eco-friendly activities could be created on the base of previous data written on the board.</p>

Source: own elaboration.

placed with more familiar tasks (like frequency of meat consumption for their family and public transport use).

In general, the comments and recommendations provided to the games have highlighted the necessity to ensure the process of games' adaptation to the national educational and sociological context. Even in the case of high-quality game materials developed by experienced and practically oriented organizations like WWF and Red Cross, misunderstanding can occur for participants on game tasks or questions. It can be explained by the difference in Eastern and Western socio-cultural and living background and educational values, which historically influenced the lesson tasks' formulation within the school study process.

4. Conclusions

The introduction of climate games in the educational process in Ukraine can cover the need in the practical knowledge, linking global processes with the local consequences and providing suggestions how to deal with / adapt to / solve the problem of climate change for the school youth.

Climate change games effectively ensure a practical involvement of participants in a "simulated" decision-making process, linking causes and consequences. "Learning by doing" approach has approved its effectiveness during the pilot games conducting.

Implementing of ecological games to the teaching process can improve the capacity of teachers on the topics of climate change and related subjects such as geography, biology, ecology, and environmental protection in an innovative and interactive way. This universal and technically accessible educational tool contributes effectively to raising awareness of climate change and adaptation in schools as well as among volunteers, activists of regional NGOs, and youth.

At the same time, a basic knowledge of climatic processes, greenhouse effect, mechanisms, and scenarios should be provided at the beginning of game activities. The necessity to adapt foreign materials to Ukrainian socio-cultural context, as well as to the post-Soviet educational school system, should be taken into account.

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Gry symulujące zmiany klimatyczne jako skuteczne narzędzie w edukacji dla zrównoważonego rozwoju

Streszczenie. Zmiany klimatyczne to jeden z najważniejszych problemów, przed jakimi stoi obecnie ludzkość. Tymczasem programy nauczania w szkołach na Ukrainie w większości przypadków nie zawierają aktualnej, praktycznej wiedzy na temat zagrożeń wynikających ze zmian klimatycznych. W artykule przedstawiono przykłady stosowania w szkołach znanych na świecie gier symulujących zmiany klimatyczne. Przeanalizowano je pod kątem przydatności jako narzędzia w edukacji dla zrównoważonego rozwoju (EZR). W badaniu poddano ocenie 12 gier pochodzących z pięciu źródeł działających na zasadzie otwartego dostępu (m.in. WWF, Red Cross Climate Centre). Gry wykorzystano w badaniu pilotażowym przeprowadzonym w pięciu ukraińskich szkołach w celu oceny ich przydatności w programie nauczania w ramach przedmiotów biologicznych. Zastosowanie gier przyniosło istotne efekty w postaci większego zrozumienia zagrożeń wynikających ze zmian klimatycznych oraz wiedzy na temat możliwych rozwiązań. Proponowane gry mogą skutecznie wypełnić lukę edukacyjną w tej dziedzinie.

Słowa kluczowe: edukacja na temat zmian klimatycznych, gry ekologiczne, edukacja dla zrównoważonego rozwoju, gry fabularne