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New Methodology for the Use of Board Games in the Classroom: Ekopolis Case Study

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Abstract:

Ekopolis is a highly innovative educational project that uses a complex board game to enhance environmental education in grades 5-9. Playing the attractively designed board game is evocative for a diverse set of follow-up activities in the classroom and on the interactive website supporting the project. In the board game, players create their own city from various buildings. The follow-up activities connect their in-game experiences with the specific environment in the cities where they live. The purpose of this article is to present the educational method employed in this project. Special emphasis will be put on the motivational and evocative aspects of the project. The article also presents results from pretesting in 19 schools, with detailed questionnaires from students as well as teachers. It concludes with a discussion of the preliminary results and the potential for employing this method in other educational contexts.

Keywords: board games, environment, motivation, environmental education

1 Introduction

Board games are one of the few remaining activities that have the capacity to fascinate children outside the online virtual world. In comparison with their virtual counterparts, board games include the element of real communication within the group of players. They also require sustained concentration and can produce the feeling of group immersion into the topic of the game. These qualities make them well suited for use in modern classrooms. Especially in situations where lack of student motivation emerges as one the principle obstacles to a more efficient learning process, board games can serve as excellent evocative exercise. When supplemented with carefully designed follow-up activities related to the topic of the game, we expect that they can significantly improve the efficiency of learning, the attitude of children towards school activities, as well as the general atmosphere in schools.

2 Aims and objectives of the paper

The principal aim of this paper is to describe the innovative methodology used in the Ekopolis project, which combines an attractive board game with a number of closely connected follow-up activities for students. The project is designed for students between eleven and fourteen years of age.

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We will discuss the main assumptions behind the chosen approach, as well its strong points and potential pitfalls. The connection between the evocative board game and the diverse follow-up activities will be explored in more detail, with emphasis on broader educational goals covered by the project.

The paper also presents preliminary results from the pilot phase of the project, in which 19 schools participated. We analyzed detailed questionnaires completed by students as well as teachers who participated in the pilot. These give us confidence that the selected method has the potential that we had envisioned at the beginning of the project.

In the concluding section, we will put the results in broader context of using innovative modern educational methods. Prospects for further projects using similar methodology will be assessed as well.

3 Background: Games and Education

Games are complex cultural phenomena that can assume various forms. As analyzed by Johan Huizinga, game concepts provide the underlying structure for diverse social activities from lawsuits to political contests (Huizinga 1955). Games have been prominent in education since antiquity, especially in the form of simulation of adult activities. In the early renaissance period, Comenius clearly postulated that educational content is best presented to students in the form of plays (*schola ludus*) or in graphic educational materials (*orbis pictus*).

The use of games for educational purposes is well known. According to some sources, the German Army used board games for development of strategic thinking already in the 19th century. Clark C. Abt published his Serious Games book in 1970, which pushed the conceptual thinking about games in education to another level (Abt, 1970). Even though Abt focused primarily on card games and board games, the rapid development of computers led to a number of computer games being produced that were utilized also in the classrooms. Several studies assess the results of using commercial computer games such as Civilization III, The Sims 2 or Europe Universalis II in the classroom settings. Authors of these studies confirm that placing the student within a complex fictional setting improves their ability to solve problems, cooperate on their solutions with other players and overall motivates students towards independent research on issues related to the game problems. In the end, however, the authors conclude that the use of existing commercial computer games within formal educational settings is problematic due to the lack of attention to pedagogic aspects within the games and due to oversimplification of real-life processes that can be misleading for students. This led to the development of specialized educational computer games (Gee 2003, 2007).

The educational computer games have several important advantages: they can include sophisticated game mechanisms and large game worlds. Also, players can play one game for months because of the save/load feature. However, educational computer games have important disadvantages. Especially when played by a single player on a single computer, they lack the socialization aspect. Even though some computer games are now constructed as multiplayer games, the provided social connections are still virtual. Moreover, computer games are require complex infrastructure, such as hardware, high-speed Internet connection and other requirements, which some schools may not be able to fulfill. The fundamental differences between computer and board games can be observed even in the commercial gaming industry, where both the computer game market and the board game market increase independently of each other. This demonstrates that computer games are not simply more advanced substitutes for board games.

Board games are a very specific type of games, combining several game elements as analyzed by Roger Callois in his seminal work Man, Play and Games (Callois 1958). They have several advantages that make them suitable for classroom use, especially when accompanied with adequate methodical support. The most successful modern board games like Agricola, Risk, Monopoly or Settlers of Catan usually combine elements of long term strategic goals, short term tactical objectives, an element of chance, interaction between players as well as immersion within a specific microcosm attractive for the players. The connection between the microcosm of the game and the macrocosm of the real world presents an excellent opportunity for educators to explore. We know that children enjoy playing board games, which is why they can serve as excellent evocative educational material the teachers can subsequently build on.

4 Methods: The concepts behind the Ekopolis project

The Ekopolis project is divided into three interconnected parts. The first part is intended to introduce basic concepts and terminology to students through the attractive environment of the board game. The second part is a handbook for teachers that describes in detail how to use the project effectively in the classroom. The last part consists of an internet portal where students can complete various activities and discuss their individual projects. Such structure follows the "evocation – realization of meaning – reflection" (ERR) model, which has been successfully used in various other projects (Steele, Meredith, & Temple, 1998).

4.1 The Game

The Ekopolis project is based primarily on an attractive environmental board game, which introduces basic concepts and terminology to the students. Because of the necessary simplification of the complex topic of environmental education, the goals of the game had to be clearly and narrowly specified. They are explained in the following sub-sections:

4.1.1 Focus on a single issue within environmental education

The game design required a focus on a single issue within environmental education, as the area is too broad and complex to cover comprehensively. As most children in the Czech Republic live in cities, we decided to focus on the urban landscape and the relations of various city buildings and projects to each other. The motto of the game "We think about our city" clearly reflects this theme. Within this specific theme, the main goal was to demonstrate the key concept of sustainable development in an easily accessible form.

Looking at a city in a simplified form accessible to children, we divided buildings in the city into three broad categories: red, blue and green. Red buildings are needed for economic growth and industrial production, but are not pleasant to live nearby (e.g. coal power plant, car factory, airport). Blue buildings are residential or provide services to residents (e.g. apartment houses, hospital, school). Green buildings are usually not actual buildings, but areas of greenery meant for recreation of residents (parks, gardens, orchards). This corresponds to the economic, social and environmental pillars of the concept of sustainable development.

Players in the game assume the role of Mayors. They start each with a City hall (blue building) and gradually develop their city by adding more buildings. The game is designed primarily for four players, who place their City halls in the corners of the game board. As the game progresses, the cities become interconnected, and players need to observe carefully the development plans of other mayors. The limited space on the gameboard serves to evoke the idea of limited resources and the need for their careful use.

A straightforward game mechanism was developed to make players build their cities meaningfully. Players earn points for placing each building according to how suitable it is to its surroundings. In general, red buildings are well suited next to other red buildings, and earn negative points when built next to blue or green ones. Blue buildings are well suited next to green ones (and to a smaller extent to other blue ones as well). Similar mechanism works for green buildings as well. To clearly demonstrate the idea that in the real world unpopular red (industrial) buildings still often get built, players get extra points for them, demonstrating the income and jobs they create for the city.

Figure 1. Example of a red building from the game (Coal power plant)

To stress the importance of sustainable development and balanced city growth, players earn extra points at the end of a game for every red-blue-green triplet of buildings they placed during the game. This rule penalizes the strategy of placing only buildings of one color (or omitting buildings of one color). It has the effect of making the game more interesting, and it also directly strengthens the main educational goal with the focus on the three pillars of sustainable development.

4.1.2 Focus on evocation

The game purpose is to be primarily evocational, not necessarily self-explanatory. The basic game mechanism described in the previous section was enhanced by special components intended to introduce a wide range of environment-related terms and concepts. The main goal of these additional mechanisms was to introduce players to specific terms as a side effect of game play. Because of the requirement of simplicity, more detailed explanation of the meaning of the introduced terms is designed for the follow-up activities (see section The Handbook below) rather than in the game itself.

Several game mechanisms were developed to fulfill this goal. At first we added the concept of environmentally protected zones to the game. Some places of the game board were marked as habitat of locally endangered species in the Czech Republic. Placing a building on such a space carries a penalty. However, some green buildings allow players to declare environmentally protected zones next to them. If a player manages to place the environmentally protected zone on the space with the habitat of a locally endangered species, she gets bonus points.

Figure 2. Detail from the game board with a locally endangered species in the top left corner

The concept of pollution works similarly. If a player places some of the red (industrial) buildings, he must also place a special red pollution token next to it. The pollution token counts as a red building, so it damages the potential for residential areas near it. Environmentally protected zones and pollution tokens add new elements into the game, as students can observe that in some parts of the city there is a lot of the original landscape preserved through the protected areas, but other parts are swamped by pollution tokens. This feature makes it easier to connect the in-game experiences with the follow-up activities focused on the real surroundings.

Figure 3. Example of an Event card from the game (Composting facility)

Event cards are the second evocational and main vocabulary-related mechanism in the game. These contain concepts relevant to environmental education that can be elaborated on in the classroom. Each player has to take an Event card of the same color as the building he just built. Red Event cards include for example smog, industrial accident, fire in the warehouse, annual bonuses for economic performance or other occurrences related to economic life of the city. Blue Event cards include various policies the citizens of the city can do to improve the environment around them. Last but not least, green Event cards contain natural phenomena such as tough winter or blizzard, as well as small-scale environmental projects that are helpful for the city. By drawing Event cards in each turn, the students are exposed to various new concepts and vocabulary. Teachers can subsequently use them and explain the workings of the most important Event cards in real life. This feature also brings a bit more randomness to the game. It is important, as it motivates students who are not so skilled in playing games and who might be unnecessarily frustrated by their poor performance when compared with their peers (Fullerton 2008).

4.1.3. Focus on cooperation, competition and complexity

Ekopolis is offered in two basic variants working with the same underlying game system. The first one is cooperative and is meant for beginners and younger students. Different groups can still compete with one another in the classroom. The second variant is for more advanced players or older students, and it is competitive, as each Mayor on the game board wants to be the most successful.

The issue of complexity of the game is crucial especially in the educational context. On one hand, the game should model the real-life processes that the students can analyze later on. Any simplification in the game model is potentially dangerous, as it ingrains unrealistic connections in student's minds that will be difficult to untangle in the follow-up activities. On the other hand, real life processes (such as city development) are usually extremely varied and complex, and any effort to realistically simulate them within a board game would result in highly complex rules that would be difficult to learn. Ekopolis is therefore based on simple and short game play demonstrating the key principles.

Overall, the game is designed to be fun and fast to play (20-35 minutes per each game), but includes 48 different types of buildings and 60 different Event cards, which are introduced to the students in the course of the game. The concepts of environmentally protected zones and pollution materialize on the game board, which helps to bring attention to them in real life as well. By playing the game, students take full responsibility for their actions and see the consequences of their chosen building strategy. Chance plays a role in the game, which is helpful in motivating all students to participate, as with a bit of luck, everybody can win (especially with the Event cards). However, the game is well suited for experienced players as well, who can devise complex long-term strategies based on the perceived intentions of other players.

4.2 The Handbook

It is extremely difficult to design a board game that would accomplish serious education goals all by itself. Follow-up reflection including discussions and related activities and projects are therefore essential for the project as well. Furthermore, active role of teachers in the classroom is necessary for the project to be successful. For those reasons,

we prepared a comprehensive handbook, which is designed primarily for teachers. Its main purpose is to make the work of teachers with the project easy as well as meaningful with respect to environmental education.

The handbook starts with basic overview of the project and the introduction of the topics covered by it. It includes a special section linking mandatory educational goals prescribed by the Czech Ministry of Education with specific elements in the game and with the follow-up activities. Teachers thus know exactly what are their students learning in which phase of the project. The handbook then describes how the rules should be explained both concisely and effectively. It also prepares the teachers for the most frequently asked questions so that they can confidently settle any disputes that might arise.

Next section of the handbook contains two detailed lesson plans. In these lesson plans, playing the actual game covers a little less than half of the allotted time. The rest is devoted to introductory as well as follow-up activities. By following the lesson plan, teachers can be sure that they have the basic educational goals thoroughly covered. Innovative teachers are advised to use these lesson plans as a background and come up with their own ideas and methods.

The following section of the handbook includes a number of worksheets for students that they need to complete in the course of the project. Some of the worksheets are an essential part of the lesson plans, others are optional. The worksheets have themes like “What do we know about our city?”, “Ideal city: where do we want to live?” or “What can I do to improve the conditions around me?”. They include various activities for the students who need to fill them in and subsequently discuss what they wrote with the whole class. The handbook includes worksheets for different age groups, with more complex problems connected to urban planning presented to older students.

An important section of the handbook describes the main differences between the game and the real life. Even though we pretend to simulate the reality of building a city, the game is just a very rough approximation of the complex processes under way. Teachers need to be well aware of the limitations of the game and be able to explain it to their classes. Otherwise, students might get some quite distorted ideas about the process (such as that buildings do not cost anything to build, or that only one mayor decides what gets built where). This section also includes segments explaining the inner logic of the game mechanisms and the way these should be presented to the students. For example, the concept of the pollution token is quite fictitious (there are no pollution tokens on the real landscape), but teachers should discuss with the class what are the different types of pollution, etc. For the sake of simplicity, the game does not include detailed mechanisms for food production, so fields and farmlands are not present. It is important to make students aware of these limitations, while simultaneously drawing valid parallels to the real life.

The whole second part of the handbook is organized as a game. All buildings as well as events from the game are thoroughly described there, including proposed follow-up activities related to them. Environmental impact of each building is covered as well. Teachers are advised to use this resource creatively in the classroom, for example distributing copies of various buildings and make students present their importance as well as consequences for the environment to the class. Locally endangered species from the game board are a part of this section as well, and students can learn more about them and their habitat.

4.3 The Web

We specifically wanted to create a board game, and not an online game. We are convinced that board games are more suitable for classroom use, as students need to prolong their attention span and jointly engage in an activity that involves real face-to-face interactions. In a situation when children spend more and more time playing online, the board games are one of the last remaining attractive activities away from the computer. That said, we felt that the project should have extensive internet support that would be complementary to the main activities.

Diverse follow-up activities that users can do are the most important part of the website (www.ekopolis.cz). To increase student motivation, for each successfully completed activity there is a reward in the form of virtual bricks. These can be used to purchase buildings, from which each user builds his own ideal city without anyone’s interference.

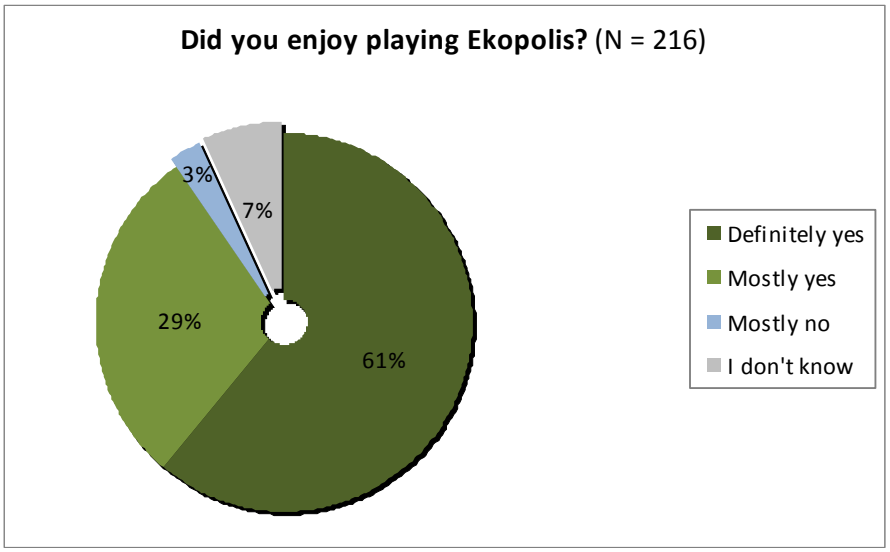
One of the most interesting activities on the website is the ability of users to make photos of buildings in their city, upload them to a specific location in an application based on Google Maps, and post comments about them for all other users to see. Users are able to judge submissions of other users and get credit in the form of bricks for their successful posts. As a result of this activity, we have a map of Czech Republic that gradually gets filled by student posts.

Other projects on the website are based on the discussion platform, where users can upload content (including images) and comment on them. Students can for example propose projects for real mayors of their city, or create new buildings and Event cards for the game. Some projects are universal for all the users, but teachers can devise their own projects just for their classes. Discussion posts are generally available for other users for comments as well as for inspiration, but can also be made private only for members of a specific class. Teachers can thus use the web to communicate with students, collect their homeworks and provide feedback on their projects.

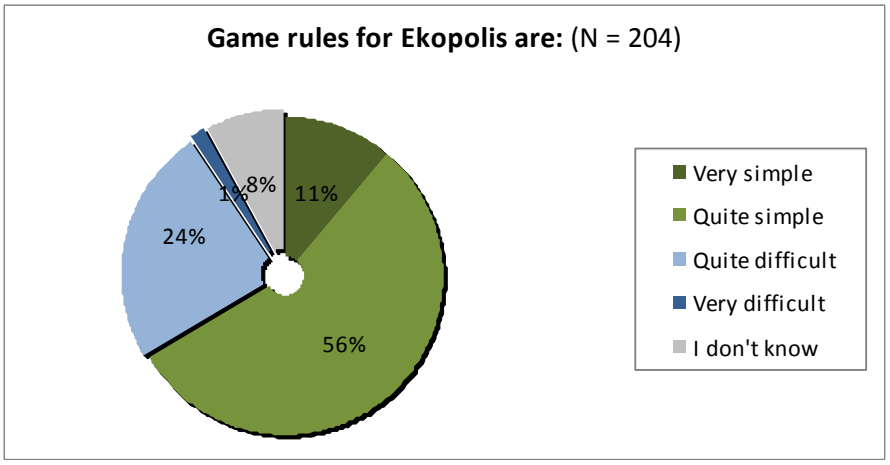
5 Results

We have extensively pretested the game in several schools and collected anonymous questionnaires from students of the target age group at the end of the class. In general, students were enthusiastic about the game during the class and even those that otherwise have problems in cooperating in groups (as the teachers told us) took part in the exercise. The environment in the class was lively, but constructive, as players were communicating about the proper rules and adequate strategies. There were no major disruptions of the class, although the discipline was relaxed.

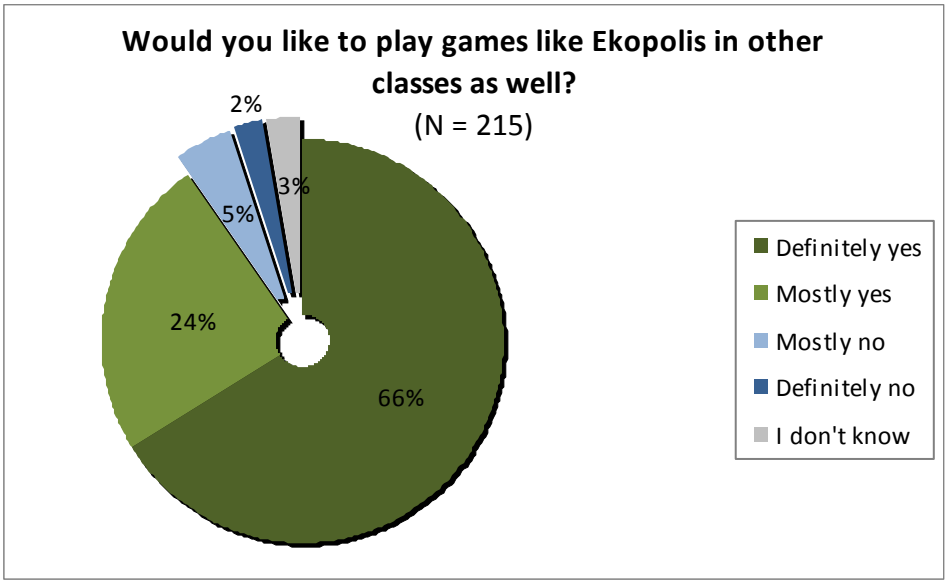
Following are the principal findings from the questionnaire for students with questions relevant to the project as a whole.



First we wanted to make sure that the students enjoy playing the game. The questionnaires confirmed our feelings from the classroom. The data clearly demonstrate that children enjoy playing games like Ekopolis within the classroom setting.



We than wanted to know was whether the game rules are not too complex for the target age group. The data show that on the whole, children find the game rules either quite simple or very simple. Only 1 per cent of respondents thought that the game rules are very difficult.



We were interested also in the prospects for further educational board games, so the questionnaire included also a question whether the students would like to play games like Ekopolis in other classes as well. The results demonstrate the motivational potential of board games that could be channeled towards related educational activities and goals.

5.1 Implications

The preliminary research results as well as our direct experiences from pretesting have several important implications. First of all, carefully designed educational board games have a great motivational potential for students, who enjoy this form of alternative activity in the classroom. The game thus excellently fulfills the evocative phase of the learning project. This needs to be supplemented by realization of meaning and reflection in the follow-up activities, which are prepared for teachers in the handbook and on the web portal. This fulfills the model of evocation, realization of meaning and reflection (ERR) mentioned above.

Construction of a city within a board game opens a wide range of possibilities for connecting the experiences of the in-game microcosm with actual cities in which the students live. Drawing these comparisons provides a useful platform for reflection, as it opens a range of questions that the students usually do not ask themselves. The ensuing reflective discussion can stay on the level of environmental awareness about their surroundings, but can also lead to more complex topics, such as modern urbanism.

5.2 Possible Applications

The positive experiences with Ekopolis demonstrate the promising potential of the selected method for other educational topics as well. Board games with simple rules and limited time for game play can serve as excellent evocative activities that introduce basic concepts and vocabulary. For the attainment of educational goals it is important to devise also detailed methodical tools and workbooks that support the realization of meaning and reflection within the project. In the follow-up activities in the class, the discussion can move from in-game experiences to real-life situations.

6 Conclusions

Overall, the project clearly demonstrates the promise of using specifically designed board games in the classrooms. These have excellent evocative potential and motivate students with respect to the selected topic. By playing the game, students acquire the knowledge of basic concepts and key vocabulary. It is important to stress out that just by playing the board game, the educational goals are not automatically attained. The role of follow-up activities is essential for the realization of meaning and reflection. The role of teachers at this stage is very important, as they need to structure questions and conceptualize diverse problems that the students encounter in the game. The handbook for teachers, which includes detailed workbooks and activities, is thus necessary for successful completion of the educational objectives.

Appropriate design of the board game can greatly improve the chances of educational success, as students start their reflections based on events that occurred during the game. Cooperation of game designers with experts on teaching the specific topic is thus highly advisable. The experts need to specify the primary educational objectives and supervise the game design process so that it can be easily used for the follow-up activities.

The selected methodology behind the Ekopolis project thus ensures the fulfillment of educational goals from the area of environmental education. It does so by a combination of evocative board game, a detailed handbook for teachers and an interactive internet portal, the latter two components ensuring appropriate realization of meaning and reflection. Such approach can be replicated in other educational contexts, thus improving the learning experience for both students and teachers.

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