'SPECTOR – THE SUSTAINABILITY INSPECTOR': PARTICIPATORY TEACHING, LEARNING AND EVALUATION GAME FOR ARCHITECTS, ARCHITECTURE STUDENTS AND PUPILS

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Abstract. *Architects, whether they are researchers, practitioners or teachers need better and improved tools to enable them communicate more effectively, change power relationships, co-construct knowledge and engage in real life problems. It is this that stimulated us to develop our own tool in the form of a game to contribute to the debate. Architects should be able to use their creative potential to design innovative tools for evaluating architectural design, and its sustainable aspects. By using such tools they may also be able to put themselves in a teaching role and create a learning experience for participants. Our experience from testing the game internationally in two primary and one secondary school with pupils made us believe that games need serious attention and consideration as a useful alternative to traditional teaching and research tools.*

Key words: *games, design, teaching and research in architecture, participatory evaluation, sustainable schools.*

1. INTRODUCTION

Using games as part of the participatory design process in architecture is not a new thing.[1] But what is relatively new is using games as a participatory evaluation tool – tool for evaluating the quality of the buildings and in this case, school buildings. Games can

[1] Working alongside architectural design and research practices based at universities such as Die Baupiloten (www.baupiloten.com) and the Bureau for Design and Research (http://www.bdr.group.shef.ac.uk/) it could be seen that such tools exist and are especially used in school design and community engagement.

help architects and researchers create a context in which participants are immersed, and from this more consistent and in depth meanings may emerge (Salen and Zimmerman, 2003: 41). Games are becoming more and more popular with architects as they have a lot in common with the design process. According to Habraken and Gross (1984), playing a game, as well as designing, is a social process that occurs during the course of time in accordance with a set of rules. However, Brandt (2006) argues that games should be altered and tailor-made for the purpose of the project or research goal, and not used again and again in the same format.

The game 'Spector – the Sustainability Inspector' was first developed as a participatory post-occupancy research tool to investigate what was important to young people in their schools. The game was used for discussing sustainability aspects of schools from the primary and secondary school pupil`s point of view. It has been tested internationally - in one secondary school in England, one primary school in Serbia (Brković, 2013) and one primary school in Spain (Brković, Pons and Parnell, 2015). In England and Serbia, Masters students in architecture helped the game workshops to be carried out. After each workshop we discussed with the pupils and students what they liked or disliked about the game.

Analysing and discussing the results we concluded that architects are, and should be able to use their creative potential to design innovative tools for evaluating architectural design, and its sustainable aspects. By using such tools they may also be able to put themselves in a teaching role and create a learning experience for participants. Getting people to participate in a game is not only a good tool for this discussion and for the drawing out of knowledge, views and understandings but can improve both the students' and pupils' knowledge about sustainable environments. The game thus seems to show a potential to be further developed as a research and teaching/learning tool within primary and secondary schools, as well as within the architectural design studio.

Today, designing games as tools for consultation is not entirely new for architects. In majority of cases, games have been used as participatory design tools (Messeter, Brandt, Binder, 2008). They have seldom been used as participatory evaluation tools able to facilitate learning experience at the same time (Lundsgaard, 2011). The problem is that few architects have the time to go back, critically reflect on and write about the participatory design or participatory evaluation technique they employed. Architects should analyse and discuss the games they developed as tools for teaching, research or design, as it is a good way to develop guidelines and principles, and build a critical knowledge on the matter.

Therefore, in the following lines we will discuss what could games bring as new tools for design, research and teaching/learning in architecture; describe the game we created alongside its theoretical background; explain how we tested the game, consulted pupils and architecture students; analyse and discuss the results we obtained, and triangulate it with the existing literature, so as to support our claim that games need serious attention as a useful alternative to traditional teaching and research tools.

2. BACKGROUND: GAMES AS NEW TOOLS FOR DESIGN, RESEARCH AND TEACHING/LEARNING IN ARCHITECTURE

Architects have been variously criticised for a lack of social engagement and responsibility, egocentricity, an over emphasised individualistic creative statement and an underestimation of people's views. Architects are also often criticised for their poor listening skills, communication and teamwork skills, by the general public (Sara, 2003). This could be partly due to the fact that at schools of architecture, and some architectural design studios, a transmission model based on a mechanistic pedagogy, is still alive (Crysler, 1995). Employing the transmission model in schools of architecture means that tutors present a body of knowledge as a series of facts, which do not go through the process of critical discussion between them and students. It seems that architects need tools to help the communication process. Empirical evidence suggests that games are non-traditional tools stimulating communication and discussion (Franklin, Peat, Lewis, 2003). Thus, a part of the architecture studio curriculum could integrate game like tools to stimulate the development of students` abilities to better communicate, criticise and debate over international and local architectural design.

Architecture as a profession, in many European countries, including Eastern European countries like Serbia, has in the past, been seen as a 'representative of the class in power (De Carlo, 2005: 5). This position resulted in separation of a space where architects work, and space where people live (Lefebvre, 2003). Lefebvre (2003: 181) criticised this 'extraordinary passivity of the people most directly involved, those who are affected by projects,…. influenced by strategies'. Developing architectural designs with, and not only for people will ensure that in the future architects are better prepared for this task, and a changing power dynamic will emerge, both with clients and users and in the studio. Worth (1993: 6) argues that students especially should be empowered to understand relations of power and liberated to ask 'How knowledge is constituted? By whom? For whom? and For what purpose?'. This implies that architects need better and improved research, design, and teaching/learning tools that can contribute to change power relations. Games as such tools could be helpful as they present good basis for mutual learning and understanding between designers and users (Brandt, 2006).

Until recently evaluation and design was reserved for the 'expert'. Acknowledging the important contribution the occupants have to make - some architects are calling for a re-examination of the design process. They stress that design has to be in tune with the occupants' wishes and needs (Sandres, 2002; Coleman et al, 2008). Yet, the way architects take into account these wishes and needs is still problematic. Banham (1972) argues that it is traditionally based on their interpretation of others` perceived needs and not on others' formulation of their own needs. Using games in schools of architecture and architectural practices as tools to support mutual understanding could be useful as games are empowerment tools that enable emphatic interactions (Lee, Timothy, Frazer, 2004).

Salama (2005) argues that when just personal feelings, intuition, imagination and subjective judgments are emphasised, social and professional responsibilities of architects could be neglected. Architects are always working within specific social and cultural context, coping with an understanding of the environment. A wider span of competences and skills need to be developed in the architectural studio in order to think critically; research before a project and evaluation after. The knowledge produced through research

is in no way a substitute for imagination, but if we do not integrate different types of knowing, our profession could 'lose its credibility in the eyes of society' (Salama, 2005: 9). Yet the problem is that in some architecture schools students are still treated as 'blank screens' and there is little room for their previous knowledge and lived experience (Crysler, 1995). Webster (2002: 104) argues that immersing students in studio activities where tutors 'demonstrated correct professional action' and assuming that they will learn is wrong. Previous arguments suggest that architects need tools to help them co-construct knowledge and stimulate critical reflection. Maybe the work of educationalists such as Dewey, Kelly and Kolb could be helpful. They generally conclude that learning entails the transformation of personal knowledge through experience (Dewey, 1992; Kelly, 1955; Kolb, 1984). Additionally, Reeve (2010) argues that 'applying constructivist principles to educational game-based learning activities yields an approach that puts students in the role of active learners and content creators'. Building on constructivist learning theories, and developing game-based learning activities within schools of architecture could stimulate students' critical reflection and help architect pedagogues develop tools to support co-construction of knowledge. Maybe, therefore, those involved in the education of future architects should embrace the constructivist notion that teaching is 'a process of working co-operatively with learners to help them to change their understanding' in order to nurture new generation of critical thinkers (Ramsden, 1992: 114).

Again architectural education can be criticised for not preparing students to respond to complex problems in the real world. Hypothetical design projects, where a myriad of contextual variables are neglected, should be complimented with a different more engaged connection with society. Live projects are again becoming popular in Architecture schools, helping us understand local challenges, practical realities and variables affecting real-life situations and prepare us to make decisions about it (Get Involved, n.d). When non-designers are involved, the design process needs to be demystified and mutual understanding created thereby returning architecture to a position of 'being an expression of society, and arising from within it' (Salama, 2005: 12). This suggests that architects need tools to help them engage in real-life problems. Using games as such tools could be useful as games present social activities for people aiming to understand, conceptualise and improve briefing for new buildings and urban environments (Habraken and Gross, 1987: 1-2).

The problems we are facing are multilayered and interrelated. This suggests that teaching and learning about sustainable development means that all the subjects should be integrated into one 'overarching systems thinking framework' (Dieleman and Huisingh, 2006: 839). New tools are needed to help us understand how one aspect in a specific context affects all the others. Additionally, learning about sustainable development should encourage a familiar and emotional attachment to the subjects of study. In both schools and universities, learning about oils spills and hurricane catastrophes in faraway places, can overwhelm and provoke fear, scaring learners away, instead of stimulating and engaging them to contribute to the solution. We therefore require tools to facilitate multidisciplinary systematic approach to understanding the complex set of challenges. Games can be a '*par excellence*' opportunity for practicing contextual or system thinking; as they can provide hands on experience, empower learners to devise their own solutions, and develop empathy and emotional attachment through working with local people (Dieleman and Huisingh, 2006: 841). Pedagogical tools that can help learners grasp the

complexity, interlink the problems and aid the development of emotional attachment, are indispensable but rare.

Architects as researchers, practitioners and teachers need better tools that could enable them to address the specific needs of those they design with and for. Developing and employing such tools and methods in architectural design studios, or our design and research practices could potentially turn them into transformative and empowering forms of teaching and practicing architecture.

It is this debate that stimulated us to develop our own tool in the form of a game to contribute to the debate. We devised game 'Spector- The Sustainability Inspector' as a participatory post occupancy tool for the co-construction of knowledge, through a collective research process, in a real life context. A tool that could:

a. stimulate communication, teamwork and empathy,
b. support all the parties involved to freely and independently express and formulate their opinions,
c. bolster critical reflection.

3. DEVELOPING THE RESEARCH AND TEACHING TOOL: A DESCRIPTION AND ANALYSIS OF THE GAME 'SPECTOR – THE SUSTAINABILITY INSPECTOR'

The literature review revealed that there is not a unanimous definition of a game, although we can establish a set of game characteristics: game rules, goals and objectives, type of a game, a narrative, player roles, puzzles, problems, challenges, interactions, artifacts, and a structure (Prensky, 2001; Rasmusen, 2001; Brandt, 2006). In order to contribute to the existing knowledge about the games as tools for participatory exploration and learning the game 'Spector' will be first described and then analysed and compared against important characteristics found in the literature.

3.1. Description of the game

The game builds on a metaphor of an inspector who is looking for evidence of sustainability in the school by taking photographs around the school. The game 'Spector' is played according to a prepared set of rules (Figure 1), The goal of the game is to provide architects with a participatory post-occupancy tool evaluate with pupils sustainability aspects of a school; and to provide primary and secondary school pupils with a participatory evaluation and learning tool to explore, discuss and document their opinion on sustainable schools and then suggest a change or an improvement (Figure 2). Equally important is to stimulate and actively involve pupils in learning about sustainable aspects of their school. It is designed for maximum of 20 players age from 8 to 15 years. Each pupil can play for him/herself or they can be divided into teams, and guided by, in this case, an architecture student. Estimated playing time is from two to three hours. Additionally, 'Spector' can be played on two different days. During the first day a photographic expedition can take place around the school and during the second day discussion over the board game.

The game consists of four steps. The first step 'suspect' instruct pupils to pick from the 22 cards with 'suspected' sustainability topics (Figure 3). Topics are:

- social (safety and security; health; physical activity; food; sense of a community; participation; inclusion and equity; cultural diversity; sense of a place; education);
- environmental (school grounds; building construction and materials; light; ventilation, cooling and heating; water; waste and recycling; transportation; energy, new technologies) and
- economic (cost-effectiveness; operation and maintenance; and flexibility and adaptability).[2] Each card is divided into two fields. The 'think about' field consists of questions to stimulate pupils to think about the specific topic, and the 'answer and photograph' field gives pupils specific tasks.
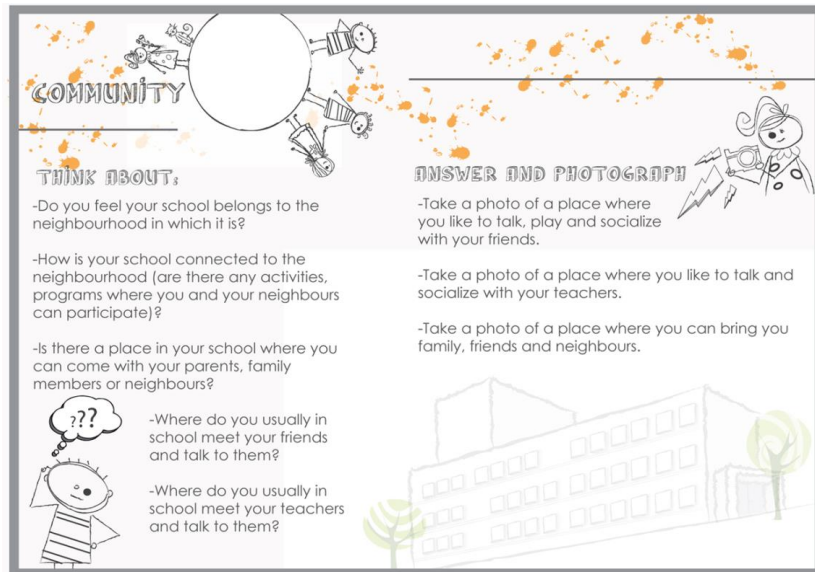

Fig. 1 Rules of the game 'Spector'.

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[2] The sustainability themes have been extracted from an extensive literature review on sustainable schools so that the topics for consulting teachers, pupils, and architects could be created, for the purpose of the first author's PhD (see Brković, 2013).

Fig. 2 Elements of the game 'Spector'.

Fig. 3 One of the 22 game cards.

The second step 'inspect' invites pupils to grab their toughest weapon – the photo camera provided and document their answers with photographs (Figure 4). Instant cameras are obviously more immediate. The third step 'discuss' signals that it is time for the board game (Figures 5 and 6). By throwing the dice a pupil, or team of pupils, moves from one field to the other. When one pupil or team is on one field, everyone reveal their photos taken on that topic and discuss them. After discussion the next pupil or team is ready to throw the dice. During the 'detect' step pupils place the photos and corresponding comments on a provided school plan (Figure 7). A red arrow post-it note denotes a negative comment, a green arrow post-it note a positive comment and a speech bubble post-it note - a new idea or recommendation for improvement (Figures 8 and 9). Pupils play the game until all the photos are revealed and all issues discussed and mapped.

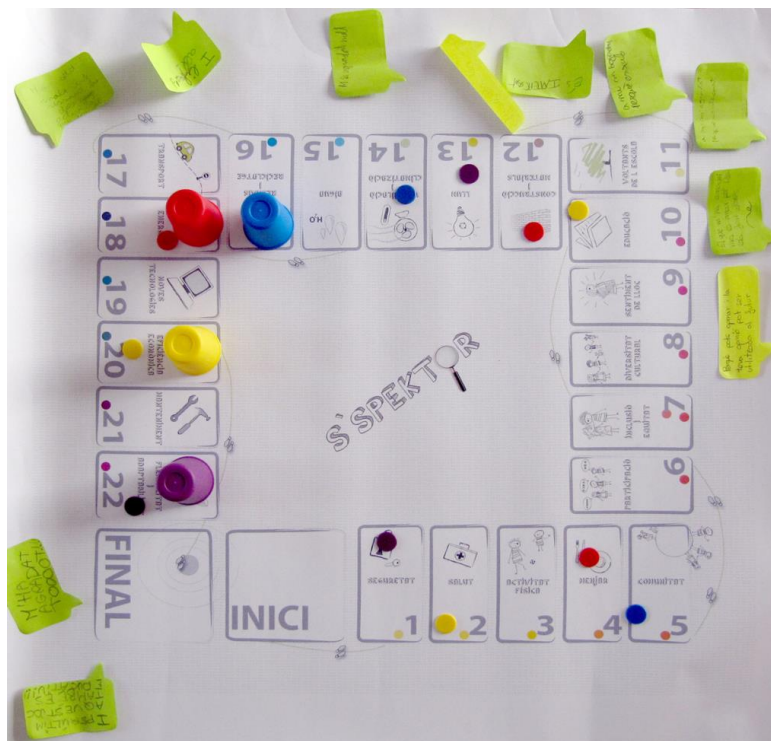**Fig. 4** "Inspect" step of the game. Pupils in a school in Serbia explaining the drinking water accessibility issues and photographing evidence as a part of school photo expedition.

Fig. 5 "Discuss" step of the game. By throwing the dice teams of pupils in a school in Serbia deciding what is the next sustainability topic to be discussed.

Fig. 6 Game board with the 22 sustainability topics - Spanish version.

Fig. 7 "Detect" step of the game. After discussion pupils in a school in Spain pasted photos and comments on a provided school plan, next to detected places to which they correspond.

3.1. Analysis of the game

3.1.1. Type of game

By supporting students to express their opinions and feelings, helping them learn and then stimulating them to make transformative changes in the world, 'Spector' is a 'self-analysis game'. Being a tool for multidisciplinary collaboration that bolsters respect for team members, this is also a 'collaboration and communication game' (Dieleman and Huisingh, 2006: 842). 'Spector' supports an understanding of multitude concrete experiences and realities – and therefore is also a 'negotiation and work flow design game'. Intensifying collaborative experience and problem solving, encouraging students to explore imagination and suggesting new ideas and improvements; this is a "changing perspective game" Lastly, involving people with different roles, in this case pupils, architecture students and architects/researchers, and helping them derive a common understanding of the concepts in building design suggests 'Spector' is also 'concept design game' (Brandt, 2006: 58).

3.1.2. Narrative and players' roles

The narrative behind the 'Spector' is not predetermined as in a book, film or story. In games which are based on a static narrative specific adventures and characters are known in advance, players take up the characters because of their powers or specific characteristics which will give them the advantages throughout the game. (Kim, n.d.). In the quest for answers, students took different tours through the school, thus creating their own adventures. Role playing games have proved to be a very useful tool to discuss their opinion (Barreteau, Bousquet, Attonaty, 2001). Therefore, the role of the inspector is there to liberate students to express their views.

3.1.3. Puzzle/Challenge/ Problem

Salen and Zimmerman (2003) explain that challenge in any game is an important factor impacting player`s pleasure. Difficult challenges may cause anxiety, whilst easy challenges may result in boredom. If a heavy emphasis is placed on winning, players might be distracted from real learning objectives (Avedon and Suton-Smith, 1971). The game 'Spector' does not encompass challenge in a sense that there is something to be won, or certain amount of points to be collected. The main challenge was collecting enough data to document, justify and defend opinions about the sustainable aspects of the school.

3.1.4. Interactions

Playing with a game, a person, an idea, means to interact with it. By playing a game a player makes important choices within the game's system; which are there to support actions and outcomes in a meaningful way (Salen and Zimmerman, 2003). While playing the game 'Spector' following interactions occurred:
- 'Social interactions; and social play community occurred and relationships emerged while pupils, architecture students and us-tutors interacted with each other.
- Players also interacted with the game system on psychological, emotional and intellectual level, which supported 'cognitive interactions'.
- Players interacted with material components of the game – cards, dices, board, and similar which constituted 'functional interactions'.
- Following the game rules, players made photos, moved pieces on the board; such activities presented 'explicit interactions'.
- Interacting outside the designed game system, by suggesting improvements for making their school more sustainable, pupils co-constructed future scenarios, and in this way 'beyond-the-object' interactions occurred (Salen and Zimmerman, 2003: 28, 470).

Interactions between players, the game system, and the context in which the game was played, contributed to the richness of the interactions, which helped a myriad of meanings, understandings and conclusions to emerge.

3.1.5. Artifacts

In 'Spector', game cards, photo cameras, photos, board, counters, dice, school maps and post-it notes, are according to Papert (1980: 11, 182) 'things-to-think-with', or 'important artifacts aiding the thinking process'. Moving them around pupils were able to tell a story and express their opinions. As carriers of meaning they made knowledge and information explicit, tangible, portable and persistent (Gray, Brown, Macanufo, 2010). The game pieces were an inherent part of the language and therefore argumentation. Acting as boundary objects, they involved participants with different opinions, motivation, skills and competences, contributed to a more constructive dialogue, and allowed rich interpretation (Leigh Star, 1989). Pictures and post-it notes were used as evidence to support arguments; they sparked discussion and stimulated pupils to ask their peers further questions, thus deepened the dialogue. Pupils had a chance to explore and interpret field materials collaboratively and negotiate understandings. Taking photos,

placing them on the school plan, and commenting on them via the notes, was a process of creating information artifacts, a rich set of information, interpreted in various ways, which enabled the discovery of multiple perspectives (Figures 8 and 9). The process significantly impacted on the quality of the game as 'the more information we can store in the material objects of the game environment, the more players' 'minds are free to engage with the situation at hand' (Gray, Brown, Macanufo, 2010: 37).

Fig. 8 School plan with mapped photos and comments from a game session in Serbia.

Fig. 9 A close up photo with photos and comments from a game session in England.

3.1.6. The structure of the game

Properly structuring the activities within the game is very important as it can support or hinder accomplishment of the game objectives. The structure of the game Spector will be explained against structure elements established by Ellington, Addinall, and Percival (1982). It consists of:

- linear case studies executed by groups of students (inspecting school by answering questions and photographing answers);
- radial interactive structure (board game during which answers and photographs are discussed); and
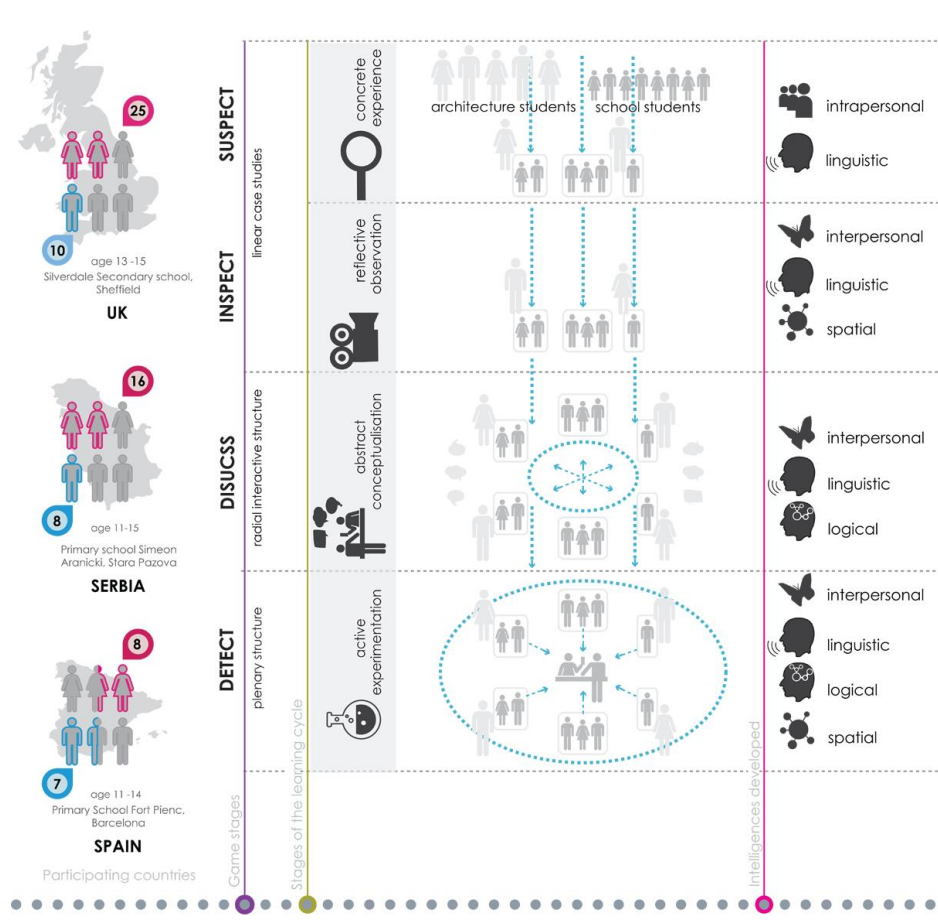- plenary (mapping answers on a school plan) (Figure 10).

Fig. 10 Stages and structure of the 'Spector' game.

4. Research Methodology

4.1. Settings and participants

So far we have played the game 'Spector' in three schools – one primary school in Stara Pazova, Serbia, one primary school in Barcelona, Spain and one secondary school in Sheffield, UK. Despite the fact that the schools are for different stages of education, due to the different educational systems, the ages of the children overlap. This provided us with the possibility to consult children of similar age. In UK thirty five pupils participated (age 13-15), in Serbia twenty four pupils (age 11-15), and in Spain fifteen pupils (age 11-14). In England and Serbia, Masters students in architecture helped the game workshops to be carried out, while in Spain two more architects/researchers/tutors participated alongside the first author. One architecture student or one architect was working with one team consisting of two to four pupils.

4.2. Approach and analysis

During the each game play session, we watched both the pupils' and architecture students' reactions and comments about the game, both positive and negative and wrote down short descriptive observations. After each session, in an attempt to consult participants on how they liked or disliked the game, they participated in semi-structured interviews. All participants were volunteers. The interviews were audio and video recorded.

The data analysis process began with recording our written observations, watching recorded interviews and transcribing them. With the help of NVivo -the organisational and analytical software to allow qualitative – classification, sorting and arranging of information; we listen to and reviewed all gathered material for several times in a systematic fashion to identify coding categories, as well as individual, unique and illuminating explanations. From the analysis and coding of information, the following themes related to the success of the game 'Spector' emerged:
- relaxed, friendly and informal learning atmosphere;
- enables motivation, engagement, and enthusiasm;
- allows flexible learning at pupil`s own pace;
- improved understanding and discussion on the consequences of decisions;
- enhanced understanding of the role of the expert architect;
- the role of 'inspector' allowed pupils to express their opinion;
- allowed children to use previous experience and stimulated critical reflection.

All the data related to each theme was separately analysed. In this way key messages were developed under one theme, supported by pupils' and/or teachers' comments and/or our observations. Two types of data collection methods (observations and semi-structured interviews), coupled with the two different participant groups (pupils and students), permitted triangulation of the results. According to Marshal and Rossman this multi-method and multiple informant approach brings the advantage that it can "greatly strengthen the study's usefulness for other settings` (Marshal and Rossman, 1995: 144). Interpretation of the data and the conclusions derived were further supported by existing literature related to our findings under each theme.

5. RESULTS AND DISCUSSION:
'SPECTOR – THE SUSTAINABILITY INSPECTOR': A SUCCESSFUL TOOL?

Playing 'Spector' we confirmed that pupils and students need education that is experiential, intriguing, motivating, empowering, exciting and fun. The game enabled pupils and students to participate in new ways of learning, and take roles that are not accessible to them when traditional teaching methods are employed. According to Oblinger (2006), this allows pupils and students to think, act and talk in new ways. It may not be that just the game itself was a valuable learning tool, but the atmosphere and environment created around it was. The elements that we discovered that made the game successful are discussed in following lines.

5.1. Informal learning atmosphere

Pupils felt they were engaged in creative work and were being productive. In all three countries pupils and students reported that they liked the way learning is organised through the game because it did not resemble the way learning happens in traditional classroom or studio; the atmosphere was relaxed, friendly and they did not have to be seated all the time. They loved roaming around the school and taking photos and saw this was a dynamic way of revealing answers.

Similarly, Hofstein and Rosenfeld (1996) also concluded that informal learning atmosphere affects learning process and motivation.

5.2. Motivation, engagement and enthusiasm

During the four-hour workshop in Serbia we suggested to take a lunch break. From twenty-four children just three went out and Sanja, 14 asked:

'Can I eat in the classroom; I do not want to miss something'.

Moreover, after the long workshops pupils were allowed to go home early, and not return to regular school classes. Interestingly, none of the pupils wanted to leave and Ivan, 12 commented:

'What...is it already over? If we could learn like this I come to school on Saturdays and Sundays also!'.

Pupils and students liked the game because it provided them with the opportunity to be involved in interactive and immersive activities. Our conclusions coincide with Gees (2007) observation that games can spur enthusiasm, increase motivation and attain students' interest through fantasy, challenge and curiosity. Motivation, engagement and enthusiasm are seen as crucial because when learners are not fully and deeply engaged, serious learning might not happen (Malone, 1981).

5.3. Flexible learning at your own pace

The pupils and students reported to like the opportunity to contribute to the group work at their own pace, when having something important to say. During the discussion after the game in England, Sara, 14 explained:

'No one pointed a finger at me and said now you answer...when I had to add something important I just said it'.

Evidence from interviews suggests that the game allowed flexibility and supported individual learning styles. Using the words of Avedon and Sutton-Smith (1971: 214) the game 'Spector' presented an 'adventure of non-hazardous nature'; where students and pupils could grow, play along, develop according to their own speed and wish.

5.4. The consequences of decisions

By playing the 'Spector' game both pupils and students had the opportunity to see how present actions could influence the future and vice-versa. They liked the opportunity to discuss with their peers, students, and us- architects and researchers how their proposals for improving sustainable aspects of their school could be developed in the future. After playing 'Spector' players' confidence was increased, even their posture changed, they were standing with their backs straight, looking taller and enjoying the opportunity to deal with real life problems.

Games have the ability to simulate real life conditions. By playing games players make decisions, solve complex society's problems, and learn to live with the consequences of their decisions.

5.5. Diminished teacher role

Sima, a 23 years old Serbian Architecture student said:

'I am amazed how responsive the children were. I thought that they would be silent all the time, you know scared because of us, because they see us for the first time in their life...and it is our job to design and evaluate buildings'.

Instead, pupils seemed to be enjoying, willingly expressing their opinions and learning simultaneously; the pressure was off. The pupils explored themes of sustainability that they felt were important, and not because a teacher told them so. They also saw us as friends and equal colleagues.

The hierarchies of expert-user, tutor-student, and adult-child were not simply reversed, but transformed through the game into relations of mutuality. According to Avedon and Sutton-Smith (1971), the teachers and tutor's role in games is turned from the one of a judge or jury, which causes a feeling of servility, to the one of partners in the learning process. The reverse of roles is very important because when the teacher/tutor is the only one making decisions learners tend to be mentally passive (Freigenberg, 1991).

5.6. Role play

Taking the role of the inspector was quite important for the younger pupils (age 11) and in a setting where the student`s voice is rarely heard, such as Serbia. In Serbia this was the first systematic exploration of students' opinion about their learning environments. Kaja, 11 years, from Serbia asked:

'So... the inspector should tell you everything they think and see?'.

By taking the role of inspector, pupils could express their opinion not explicitly using 'I think'. This took the pressure off pupils and liberated them to say what they think and feel.

The role of the teacher adopted by both students and pupils was also important. On a corridor Mike, 14, England, said:

'*We are exploring how sustainable our school is...today we decide how good the school is*!'.

Pupils reported to like the opportunity to teach each other how to make good photographs, discuss the best way to argue their opinion, and jointly select photos to support their statements. Architecture students enjoyed leading groups of pupils. They advised each other how to communicate better, how to adjust the complexity of the sketches so that the pupils could understand them.

Independent explorations increased both the students and pupils pride and confidence. Guiding their peers they developed models of mutually beneficial learning. The knowledge was exchanged and skills developed with ease. Students and pupils were acknowledged as carriers of expertise; and it was astonishing how the pace of knowledge exchange was accelerated for both. Kirriemuir and McFarlane (2004: 19) explain that 're-conceptualisation of children as bearers of expertise, as capable of acting in the role of expert, raises serious questions about how we currently structure learning experience'.

5.7. Experience and reflection

Playing 'Spector' the students had to recall already learned information about sustainability from various subjects. Evaluating aspects for a sustainable school they also had to seek new information, and alongside the previously acquired knowledge, used it to demonstrate their opinion. Knowing which previous information and technique to combine with the new ones, enabled the participants to solve problems and respond to challenges. They were able to transfer knowledge from other spheres – school, life, family, etc. into the game; by encompassing experience and reflection, the game supported learning. 'Spector' blended conditional with experiential - the rules and learning goals with the enjoyment of play, exploration and experimentation.

By playing such games students can identify and endorse their preferences, make their own choices and mistakes, and then learn from that (Kirriemuir and McFarlane, 2004).

6. CONCLUSIONS AND RECOMMENDATIONS

Playing the game Spector, analysing the data obtained from pupils and students, and triangulating the findings with the contemporary literature on this matter, suggest that games can help architects to create informal and relaxed atmosphere, increase participants' motivation, engagement and enthusiasm, support participants' flexible learning, simulate real life conditions and discuss consequences of decisions, transform expert-user and tutor-student hierarchies into relations of mutuality, acknowledge participants as carriers of expertise and accelerate the pace of knowledge exchange, encompass previous experience and stimulate reflection. Playing games can facilitate 'situated' practice. The constructivist idea that useful learning takes place in an authentic real life context, whilst supporting students in contextual learning is seen as situated practice whereas separating pupils from the context into classrooms is regarded as potentially divorcing students' from valuable experience. Games, such as 'Spector', provoke experimentation, exploration, discussion, imagination, role-play, simulation, emotional attachment and understanding (Dieleman and Huisingh, 2006). They increase, as Sutton-Smits (1968: 157) explains, 'combinational powers and the range of novel

responses'. Being immersed in playful activities provides participants with the opportunity to exercise system thinking and problem solving. Learning through different types of playful activities showed to be a powerful learning tool, when activities that constitute play are interesting, engaging, thought provoking, age appropriate and meaningful. Games like 'Spector' are a promising turn for architects wanting to develop new tools for teaching and research, to help them better communicate, promote mutual learning and understanding, enable emphatic interactions, support co-construction of knowledge and critical reflection, engage in real life problems, support contextual and system thinking and in this way respond to the criticism presented in the introduction.

Although it is not the remit of this paper to discuss all the issues of sustainability arising it was interesting to note that the criticisms and suggestions to make the schools more sustainable were revealing and cogent. In all countries they spoke about the paucity of interesting and sustainable materials, the lack of fresh air and acoustic separation. The lack of interesting and fun spaces. The need for their parents and neighbours to get more involved was common as was a desire for the pupils to get more involved; for example in new initiatives of re-cycling. Finally, and perhaps most interestingly, they mentioned a lack of joined-up thinking to achieve better sustainability - the very thing a game encourages.

'Spector' is not finished. In order to further develop it we need to organise an in-depth multidisciplinary critique. Also, we need to think about making the game more time-efficient. Though the pupils enjoyed playing the game on two different days, the teachers preferred the game to be played during one, instead of two days. We would like to investigate further how it can be integrated into schools and architecture schools curricula. The aesthetics of the game could also be developed. Many claim that digital games will have the greatest impact on teaching and learning (Aldrich, 2003). Therefore, we would like to explore the possibility of digitalising the game, in a flexible way so it can be changed and developed as needs be, for each individual case.

We hope that this paper will act as stimulus and an invitation to others interested in participatory games to critically reflect on their own experience and publish their results. Establishing systems for evaluating games as research and pedagogical tools will create a rich critical discourse resulting in innovation. We believe this is important because games need serious attention and consideration as a useful alternative to traditional teaching and research tools.

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'SPEKTOR – ODRŽIVOSTI INSPEKTOR': KOLABORATIVNA IGRICA ZA NASTAVU, UČENJE I EVALUACIJU ZA ARHITEKTE, STUDENTE ARHITEKTURE I UČENIKE

Arhitekte, bilo da su istraživači, projektanti ili predavači, imaju potrebu za boljim i usavršenim alatkama koje im mogu omogućiti da efektivnije komuniciraju, promene odnose moći, zajedno stvaraju znanje i uključe se u stvarne životne probleme. Upravo ovo nas je stimulisalo da razvijemo našu igricu koja može doprineti debati na ovu temu. Arhitekte bi trebalo da budu u stanju da koriste svoj kreativni potencijal kako bi stvarali inovativne alatke za evaluaciju arhitektonskih projekata, i njihovih održivih aspekata. Koristeći takve alatke takođe, arhitekte bi mogle uzeti ulogu predavača i stvoriti obrazovno iskustvo za učesnike. Naše iskustvo koje je proizašlo iz korišćenja ove igrice na intenacionalnom nivou, u dve osnovne i jednoj srednjoj školi sa učenicima, uverilo nas je da igrice zaslužuju posebnu pažnju i razmatranje kao korisne alternative tradicionalnim alatkama za učenje i istraživanje.

Ključne reči: *igrice, projektovanje, predavanje i istrašivanje u arhitekturi, participativna evaluacija, održive škole*