ICT DESIGN TOOL FOR CHILDREN'S PARTICIPATION ON SCHOOLYARD TRANSFORMATION

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Abstract: "Children's participation" has become increasingly popular the last decades worldwide. Research on children's participation argues for active involvement of children in decisions that affect them, their environment and their lives. There is little evidence of research data that the use of ICT design tools generates children's innovative ideas in a participatory school project. This article focuses on the use of the adapted Tux Paint software to stimulate primary school children's creativity in producing designs for their schoolyard. The adapted Tux Paint proved to be a dynamic, flexible, and innovative participatory tool that involved creative design activities and encouraged positive social interaction. It provided children with a creative and fun opportunity for exploration, free expression and learning.

Keywords: children's participation1, schoolyard design2, ICT3, Tux Paint4, creativity5

1. Introduction

In the last few decades, there has been a growing interest in listening children's experiences and viewports as different and separate from adults [1] as a result of the changing perspectives on their status in society [2]. The adoption of the UN Convention on the Rights of the Child in 1989 [3] brought about change with the formal and explicit acknowledgement of children's right to express their own views freely and have these taken into account in any matters that affect them [4]. Research on children's participation argues for active involvement of children in decisions that affect them, their environment and their lives [5] [6] [7]. Research designs tend to recognize children as social actors who are subjects rather than objects in research and focus on research with, rather than, on children [8].

A surge of interest in empowering children's participation in shaping their environment has led to the development of many participatory methods and techniques (e.g. brainstorming sessions, survey questionnaires and feedback forms, face-to-face discussions with small groups, individual or collective hand drawing, child-led tours, scoring, ranking, tables) [5] [9] [10]. Many studies have explored the development of participatory and creative research methods with children e.g. photography, mapping and modelling, drawings and collages, artefacts, role play and drama [5] [11] [12] [13] [14]. However, Information & Communication Technology (ICT) based tools and processes to support children's participation in environmental planning are not yet so embedded or not used to their fullest

potential in educational practices of school life and there is little evidence of research data focusing on creativity with regard to ICT design tools for schoolyard (re)design [10].

Creativity became of scientific interest in the 1950s; its concept is somehow elusive and its definitions are not straightforward. [15] states that creativity is "*an essential life skill through which people can develop their potential to use their imagination to express themselves, and make original and valued choices in their lives*". [16] believes that "*creativity is a state of mind in which all of our intelligences are working together. It involves seeing, thinking and innovating*". [12] emphasizes that creative methods draw on inventive and imaginative processes, serve as constructivist tools helping research participants to observe and analyse their experiences and engage them in 'knowledge production', and according to [17] ICT and creativity are valuable aspects of learning.

This article focuses on how children make creative use of ICT and how an ICT design tool can nurture their creativity in participatory school activities. Aim of this study is to investigate how the use of the adapted Tux Paint software can help the children express their preferences, ideas and dreams for their schoolyard, while at the same time encouraging their creativity. Moreover, the article details the process and outcomes evaluations of the design tool.

2. Materials and Methods

The present paper is part of research focusing on the empowerment of children's participation in shaping their school outdoor environment. This study was conducted in November 2014 by the Department of Landscape Architecture of TEI EMT centred on school-aged children from nine to eleven years old at a primary school in Drama city, Greece. Data was collected from 57 children in the 5th and 6th grades of the 13th Primary School using digital design.

In an earlier study [10], adapted Tux Paint software was used for the production of digital schoolyard designs and evaluated with respect to different aspects, such as use, functionality, and efficiency. In this study, the central point of interest is the aspect of children's creativity with the use of Tux Paint, as the concept of creativity has reached a different yet important dimension by using ICT tools in education [18] [15] [19] [20] [17].

The study examined the relationship between creativity and ICT design tool for schoolyard transformation. The use of any professional CAD or image processing software was inappropriate, complex and difficult for primary school children and as participatory digital tools (Photo Visioning, Photo Voice, Virtual Participation, Community-Viz etc.) are not built for K-12 schools, they could not be easily used to help children creatively (re)design their schoolyard. Tux Paint, award-winning drawing software for children aged 3-12 [21], was selected through a series of children's drawing software (Cartoonix, Drawing for Children, Magic Whiteboard etc) because of its dynamic and flexible identity. As an open and very adaptable resource, it allows users to change software stamps and add any relative to this end. Due to lack of stamps concerning schoolyard (re)design, children were asked to search for images (landscape elements for their schoolyard) online. 300 web images were downloaded, itemized in 26 different landscape categories (e.g. green, sport equipment, play, and fence), then inserted in software and converted by students into stamps with open source GIMP software. Also, they were asked to take photographs with digital cameras of their schoolyard so as for the best voted photos to become software canvases.

| (a) Area A | (a) Area B | (a) Area C | (a) Area D |

Fig. 1 Schoolyard divided into 4 areas

The adapted Tux Paint software was installed in the PC Lab of the Department of Landscape Architecture and design activity took place during regular school hours. None of the children had used digital design tools before. Children were asked to design in pairs the ideal schoolyard taking into account the existing elements of their schoolyard.

3. Results and Discussion

Examining the quality of children's digital designs, it became evident that:
- All children (100,0%) realized original compositions distinct from each other and produced new and original landscape designs, developing their creative skills.
- All children (100,0%) used their expertise and engaged in meaningful learning experiences with the adapted Tux Paint software providing a school outdoor environment that reflect their views, ideas, and desires.
- The majority (60,0%) of children did not appear to mechanically apply landscape elements when they designed their yard, but used their pre-existing knowledge about the schoolyard and spatial skills, and applied - instinctively or not - principles of landscape design. They created spaces with proportion, order, repetition, and unity (Fig. 2).

(a) Formal balance, repetition, and order in design (Area D) by Grade 6, 2 girls

(b) Proportion, order, repetition in design (Area A) by Grade 6, 2 boys

Fig. 2 Children's digital design with landscape design principles

- 60,0% of them used a wide range of elements (stamps) and various patterns producing complex relations between school landscape and outdoor recreation (Fig. 3).

(a) Complex schoolyard design (Area A)   (b) Complex schoolyard design (Area B)
by Grade 5, 2 boys   by Grade 6, 1 boy and 1 girl

Fig. 3 Children's digital complex landscape design

- More than half (52,0%) of children were inspired by the various pallets of elements (stamps) and accomplished flexible and organized landscape designs including various subspaces (Fig. 4).

(a) Thematic spaces in school landscape   (b) Multi-purpose schoolyard (Area B)
(Area A) by Grade 6, 2 girls   by Grade 5, 1 boy and 1 girl

Fig. 4 Children's digital design with subspaces

- 15,6% of children designed their schoolyard, regardless of whether their ideas could be realized, thereby demonstrating creative imagination and a strong will for play and green areas in the yard (Fig. 5).

(a) Many but unconnected to reality   (b) Many but unconnected features in
features in design (Area C) by Grade 5, 2   design (Area A) by Grade 5, 1 boy and 1
boys   girl

Fig. 5 Children's digital design full of play and green activities

- The majority (69,5%) of the participants used various means of drawing tools, features, and effects in order to add the element they could not find in the palettes (categories) provided or could not design (e.g. they reduced the size of a shrub - stamp and placed multiple shrubs next to each other in order to create grass), externalizing in this way their imagination and creative expression (Fig. 6).

(a) Grass floor created by multiple shrubs in design (Area A) by Grade 5, 1 boy and 1 girl

(b) Basketball field floor with brush tool in design (Area B) by Grade 6, 1 boy and 1 girl

Fig. 6 Children's digital design with combination of drawing stamps and brushes

- 6,2% of the children expressed their feelings by adding stamps, text or symbols. Some of them expressed their need for unscheduled play time while others an intensive environmental sensitivity (Fig. 7).

(a) Bird feeders in design (Area A) by Grade 5, 2 boys

(b) Need for time and play activities in design (Area C) by Grade 5, 1 boy and 1 girl

Fig. 7 Children's digital design with messages for play and nature education

- All the participants (100,0%) made creative interventions on the facade of the school building and/or on the walls and fence surrounding the school complex, although they were not asked to, combining different software tools, showing that they consider the school building to be an integral part of their schoolyard (Fig. 8).

| (a) Makeover of school's facade and walls in design (Area D) by Grade 5, 2 girls | (b) Happily painting school walls and school fencing with climbing plants in design (Area C) by Grade 6, 2 girls |

Fig. 8 Children's digital design with school wall and fence renovation

Examining Tux Paint as a creative tool in a participatory design process, it became evident that:

- Adapted Tux Paint proved to be a dynamic tool as children involved in the planning process, worked successfully in pairs, interacted with other pairs, exchanged ideas, and shared their dreams for their schoolyard.
- It proved to be an innovative tool helping children design a new and original schoolyard full of play and green activities.
- It provided a comprehensive range of drawing tools, brushes and effects and a wide range of landscape elements (stamps), supporting children to make their own decisions in their artwork and show clever and creative school outdoor space ideas and solutions.
- It allowed children to go back and forth between their design sets to find possibilities for their new schoolyard and gave them opportunities to experiment.
- It provided a creative and fun opportunity for exploration, free expression and learning.

4. Conclusions

The purpose of this paper was to study children's creativity through the use of the adapted Tux Paint software and Tux Paint ability to stimulate their creativity within a participatory schoolyard redesign process.

The findings of the study are quite encouraging. The results showed that the adapted Tux Paint tool had the potential to engage children in participatory design within school context. The adapted Tux Paint software proved to be a dynamic, flexible, and innovative participatory tool that involved creative learning and design activities, and encouraged positive social interaction.

Children expressed themselves in creative and playful ways with the use of the adapted design tool which gave them multiple opportunities to experiment. There was joy and self-exploration in self-expression. Through this art activity, children focused, and made choices for the ideal schoolyard. They demonstrated sensibility, creative skills and innovation and cultivated their spatial skills. Most of them tested all the stamps, brushes, and effects out showing a great will to make schoolyard a better place for them.

In terms of landscape architecture, children's digital designs of schoolyard were structured and designed realistically. Children created a functional and aesthetically pleasing

extension of indoors to the outdoors and most of them tried to blend school building into the school ground. They used and combined elements of art (e.g. line, shape, form, texture, colour) and appeared to follow landscape design principles (e.g. unity, balance, proportion, rhythm, repetition, pattern, variety), thus producing an organized system with clear and clever subspaces.

5. Acknowledgments

6. References

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