

Research Paper

Design patterns of kids' spaces Focusing on enhancing their creativity

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Abstract

As recent researches show, creativity is very important in art, technology, science, education, management and etc. Also, preschool ages are a golden time for developing motor creativity. So, it's necessary to enhance creativity of preschoolers. Many scholars have studied cognitional-emotional aspects of creativity. Some, have focused on the creativity process and creativity techniques. But, the relation between creativity and physical environment have been rarely studied. The goal of this research, is exploring design patterns which may help architects to design suitable spaces to enhance kids' creativity. The question is "which architectural variables affect kids' creativity positively". Survey research method is used to gathering questionnaires of kindergarten mentors, architects, psychologist and preschoolers. Factor analysis showed the effective variables (factors) that were known and labeled. Creativity variables were "imagination", "curiosity" and "cooperative play". The variables of physical environment were "flexibility" and "variety". To find the relation between three creativity variables and two architecture variables, the path analysis method was used. The correlation of creativity variables and architectural ones was significantly positive. Then, 72 architects and psychologists were tested with an open end test. Design patterns were extracted from architects and psychologists suggestions. The results were discussed in a session with 20 children to explore kids taste about them. The outcome was design patterns such as: a) Design of modular wide open plan with several corners; b) Design puzzled Shadow maker partitions; c) Using light modular furniture such as light cubes that kids could move and rearrange them to make new furniture/walls; d) Using incomplete paintings, on the wall or on the ground; e) Design vast planting areas that kids could plant in groups.

Keywords: Design patterns, Kids' space, Enhancing creativity.

1. INTRODUCTION

Creativity is a universal human potential that manifests in specific contexts by specific people resulting in specific products, all simultaneously in motion [1]. "Creativity is an area of human development that encompasses the future of our planet. Traditional ways of seeing the world and dealing with social issues no longer seem adequate" [2]. "As part of the innovation process, creativity has become a critical dimension for organizations that wish to maintain their competitiveness" [3]. So, it is necessary to be concerned about promoting human creativity especially in primal ages, because many abilities of an individual start developing in childhood. "Over the past several decades, researchers have explored many of the psychological factors that are considered vital to the creative process and have identified two main components underlying creative performance: divergent thinking and cognitive flexibility" [4]. In recent years, beside emotional-cognitive aspects, many

scholars have investigated educational methods, and educational issues to study effects on promoting kids' creativity. However, the effect of architectural space on creativity development has been seldom studied.

According to the viewpoint that "at preschool ages, kids spend much time practicing motor skills, begin trying to create their world by drawing, are fascinated with the wide variety of colors; are active and eager to learn and self-centered search for ways to represent their ideas" [5], designing special spaces for promoting children's creativity is very important. In addition, during these years, the child takes more effects from environment. The main question is: which architectural factors are affective on kids' creativity? And, how can these factors effect on creativity variables?

The literature review shows that imagination, curiosity and cooperative-play of preschoolers are effective on improving their creativity. First of all, it's necessary to have a look on the relation between creativity and imagination, curiosity, and cooperative play.

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2. A BRIEF HISTORY ON PHYSICAL ENVIRONMENT AND CREATIVITY

2.1 Imagination and Creativity

There is a long history on the literature of imagination ability. "For Aristotle, the imagination – or *phantasia*- was a kind of bridge between sensation and thought, supplying the images or 'phantasms' without which thought could not occur. Kant, on the other hand, held that the imagination was fundamental to the human mind" [6]. "The early correlational studies exploring the relations between imagination and creativity appeared in the 1960s (see Vellera and Gavard-Perret 2012, for a discussion)" [7]. "Creative thoughts start as an imaginary "sense" of how things might be" [1].

"Imagination is the engine of children's creativity [8]" [7]. Some researches show that child's creativity depends on the power of imagination and the best time of development for creativity and imagination occurs in 2 to 10 year olds [9]. Pre-schoolers are highly imaginative, they love pretending to be animals, and acting out creative fantasies about these characters [10]. According to Vygotsky, Creativity exists not only where it creates great historical works, but also everywhere human imagination combines, changes, and creates anything new [1]. So we can say "someone who is imaginative is someone who can think up new possibilities, offer fresh perspectives on what is familiar, make fruitful connections between apparently disparate ideas, elaborate original ways of seeing or doing things, project themselves into unusual situations, and so on. In short, someone who is imaginative is someone who is creative" [6].

2.2. Curiosity and Creativity

"Curiosity is defined as a need, thirst or desire for knowledge" [11]. Also, Freud referred to curiosity as a "thirst for knowledge" [12] & [13]. "Curiosity has been consistently recognized as a critical motive that influences human behavior in both positive and negative ways at all stages of the life cycle. It has been identified as a driving force in child development and as one of the most important spurs to educational attainment" [13]. However, human is curious at any ages during his/her life but, there is a powerful tendency of curiosity at early ages. "Young children are active and experienced learners with a natural curiosity" [10]. Deci (1975), who embraced White's competence notion and, like White, proposed to subsume curiosity into "the more general realm of all intrinsically motivated behaviors" [13].

Berlyne (1960) believes that curiosity is a motivational prerequisite for exploratory behavior [11]. Researchers have examined the correlation between curiosity and traits such as IQ and creativity. "As Voss and Keller have noted, "exploratory behavior is a major determinant for the development of intelligence," and "exploration is a form of intelligent behavior" (1983, p.122). The same argument can be made for curiosity and creativity" [13]. Other researchers have already found that individual curiosity is

effective on the process of creativity and the creative people are usually curious [14] & [15].

2.3. Cooperative Play and Creativity

2.3.1. Play

Before studying cooperative play, it's needed to understand the nature of play and playing. "Play is not just for fun; it is the work of childhood. Through play, children learn to give meaning to objects, to tease out relationships, to try on and practice different roles, to exercise their growing capabilities (Vygotsky, 1999). "Play is the best preparation for future life play is self-education" [16] & [1]. As such, play helps the child develop symbolizing capacity. Furthermore, goals and rules become a focus of play as children enter school age, and play becomes an early mechanism for self-mastery. "A child's greatest self-control occurs in play" [17] & [1]. Accordance to Vygotsky, Piaget and Freud, play leads to later creativity [1]. And the centrality of freedom and free play is just as important within 3-6 years old kids [18]. There is a possibility to experience environments during play and "Experiential learning is a powerful and proven approach to teaching and learning that is based on one incontrovertible reality: people learn best through experience" [19].

"Singer & Singer's (1990) study found that play allows direct practice of divergent thinking skills and emotional association. Russ's (1993) model of affect and creativity holds that pretend play is important in developing creativity because of the many cognitive and affective processes involved" [1]. "Also, many of the studies in Russ's research program at Case Western Reserve found significant relationships between play and divergent thinking" [20]. "Divergent Thinking, an important ingredient of creative production, involves the ability to generate a variety of ideas [21]" [20] that could lead to creativity. Children are natural creative and often exhibit their creativity in free play [22]. "During play, children also explore imaginative, creative scenarios they find interesting and meaningful. Children employ creative activities and imaginative playfulness [23] to make everyday activities enjoyable and meaningful [24] & [25] and, from a broader perspective, to experience situational involvement [26]" [27]. Other researches in relations between play and motor creativity in pre-school children, have showed that playfulness and motor creativity are interconnected, because the movement during pre-school ages is the primary way of action, expressing, learning and development [28] & [29]. But, "Play has many functions: it gives children a chance to be together, to use their bodies, to build their muscles and to test new skills. Above all, playing is a function of imagination, which is important in creativity progress" [30]. In addition, playing helps children participating actively in group activities and collaboration [31].

2.3.2. Collaboration During Play

"Chateau (1955), in his turn, studied children's

development and found out that the play aspect was always present and necessary, being expressed in different ways during childhood. As a consequence, he underlined the importance of the game activity to allow every child to develop healthy and become socialized. This author has also put the act of playing games in correspondence to adult's work, due to how strictly children consider the challenge and rules, affirming that it influences in their attitudes and behavior. In his view, a child that does not play becomes an adult incapable to think, because of the wasted opportunity to experiment, coordinate, share and develop aspects related to motor activity, moral and social rules, cognitive functions and emotional feelings" [32].

"Playing gives the children the opportunity to exercise their skills, which they learned during earlier lessons. The purpose is to encourage the children to use their social skills during play" [33].

"Social development and play was linked in 1932 by Mildred Parten, who categorized play stages by describing children's social development. "Parallel Play" occurs when toddlers and two years old use the same toys while sitting next to each other; they may talk to each other but about different topics. Their focus remain on individual play. The pattern described as "Associative Play" occurs during the early preschool years, as children collaborate more, share frequently, and engage in the play of others while still maintaining their own storylines and themes. In "Cooperative Play" older preschoolers share materials and make up stories together, assigning each other parts and roles in creating complex themes" [34].

Pre-schoolers are beginning to form friendships and enjoy short group activities [35]. The importance of collaboration is as Vygotsky emphasized the role of social interaction in development and creativity [36] & [29]. However, some studies say collaboration helps spur creativity; others say it hinders creative production [1]. "Recent researches have begun to paint a more complicated picture of creativity that highlights the importance of social interactions, mentoring and collaboration in creative work" [31] & [37] & [38] & [39] & [40]. "When individuals come together to share their expertise and ideas in order to construct a fresh and innovative way of doing something, they are demonstrating characteristics of fully developed collaboration", during it they can judge each other ideas to do the best, to achieve new ones [41].

A discussion session involving 17 children 5 to 8 years old were conducted in a local school to explore what children like in their classroom. It was noticeable that they liked working together and to use interactive tool to learn [42]. It's believable that "Collaboration can help nurture creative thinking" [43]. However, creativity is so complicated and relates to many abilities but accordance to the literature, Developing imagination, curiosity, play and tendency to collaborations - that we call it cooperative play-could be a window to kids' world at early ages and help them to grow their abilities like creativity [44].

The questions are: Which architectural variables affect

kids' imagination positively? Which one can affect kids' curiosity? And which one can enhance kids' tendency for cooperative play?

2.4. Creativity and Physical Environment

The model of "creativity and architecture" [45] describes coloration between the mentioned creativity variables and two architectural factors "Stimulus of natural elements" and "Flexibility of functions" (Fig. 1). Based on this model, several design patterns have been suggested for kindergartens by researchers, such as: "The multiplicity and dispersion of outdoor green spaces among indoors by designing several small yards in the middle of building; Using natural elements like water, special species of plants, sand areas and etc.; Design open plan and dividing it with folding/revolving/movable light walls for separating different spaces; Creating the atmosphere for playing by using natural elements like colored transparent door/ window/wall" [45]. Using these patterns helps children to experience more various spaces that enhance their curiosity, tendency to play, motivation for collaboration and evoke them to imagine [44]. Also, other researchers have mentioned "some elements of the physical environment that might play a role in enhancing children's creativity could be: Brightness of the space; less use of cool colors and more warm colors [46]; Visual exposure to more children-friendly objects that are composed of basic shapes; The use of low height furniture or no furniture, and an environment that increases the sense of security and protection" [47]. Also, Nair has suggested "Flexible Spaces" for learning environments and illustrates examples such as "cafetorium" as one of the most common multifunctional spaces in school which is a cafeteria with a stage at one end [48]. But why flexible spaces? From the view point of this paper, it seems that "variety" and "flexibility" of physical environment could enhance children creativity by evoking imagination, curiosity and cooperative play.

2.5. Survey Methodology

Based on a survey research, the attitude of 219 kindergarten mentors, 72 architects and psychologist, were gathered to study the correlation between creativity variables and architectural ones.

Since there was no standard questionnaire, researcher-developed questionnaire was used. Reliability and validity of the questionnaire were measured. The Chronbach Alfa number was 0.943, showing desirable reliability of the questions. Then by making factor analysis, the effective variables (factors) on the research were known and labeled. Path analysis method was used for data analyzing. After studying the correlation of variables, 72 architects and psychologists were tested with an open end test. Based on architects test, design pattern were suggested. The patterns were discussed in a session with 20 children to explore kids taste about outcomes of the study.

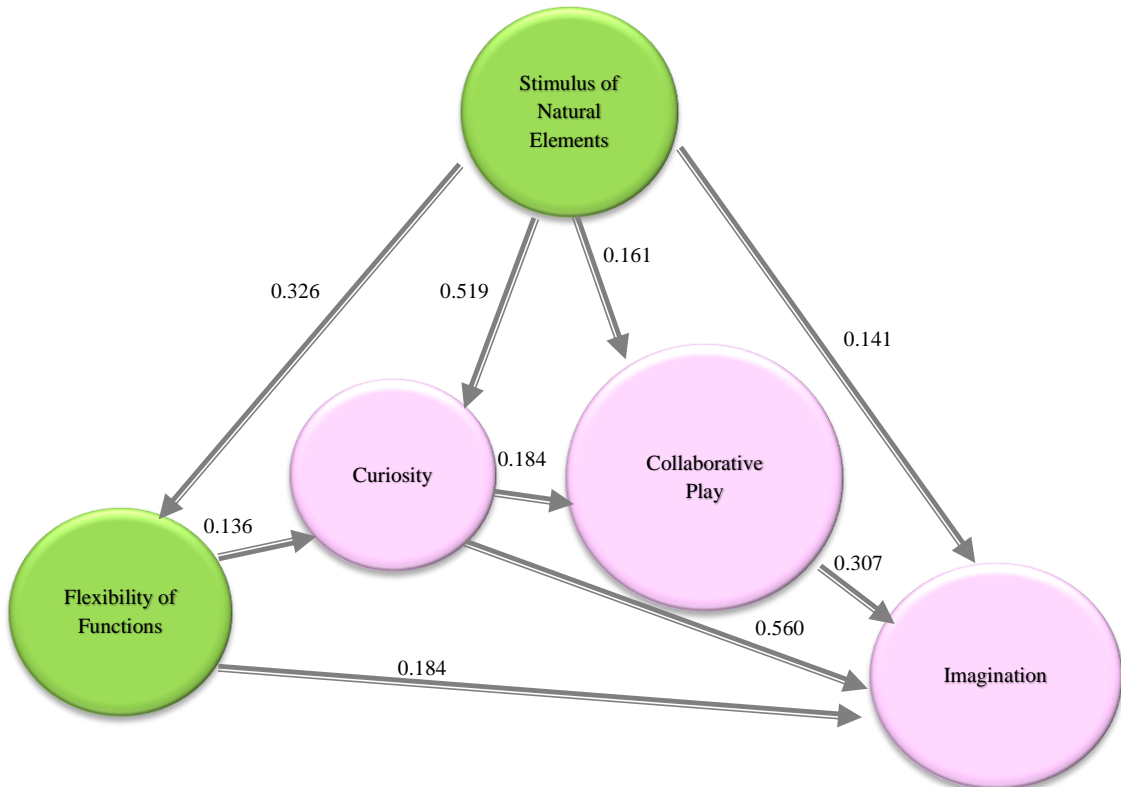


Fig. 1 The Model of relations between creativity and physical environment [45]

3. RESULTS AND DISCUSSION

Factor analyzing appeared five factors: “variety of physical environment”, “flexibility of physical environment”, “imagination”, “curiosity” and “cooperative play”. In this study a significant correlation between imaginations, curiosity, cooperative play as creativity variables and physical factors was found. So, the hypothesis of enhancing creativity by increasing variety and flexibility of physical environment was confirmed. To find suitable design patterns, the result of architects and psychologist test was studied (Table 1).

3.1. Variety of Physical Environment

As table 1 shows, there are several suggestions for every factor. For example, in accordance with architects test, the “variety of physical environment” was translated to “the possibility of changing many times” that lead to modularity, multiplicity of function and movability of elements. Also, they had an example for “variety” such as: different furniture, colors and shadow shapes. As such, psychologist test showed their examples very similar to architects’.

The factor “variety of physical environment” is related to those questions that focus on the relation between any differences/changes in kids physical environment and kids’ “curiosity”, “motivation” and “imagination”.

According to the results of architects and psychologists test, the difference between shadow and light can make a stimulus various space for kids. So, architects can design shadow maker partitions with various movable shaped pieces. In this case, kids themselves can rearrange pieces to make different shapes by shadow (Fig. 2). According to the kids test, various shapes of shadow on the ground or other walls are very interesting for them (Table 2). Using these shadow maker partitions -considering the content of related questions- can have effect on kid’s curiosity.

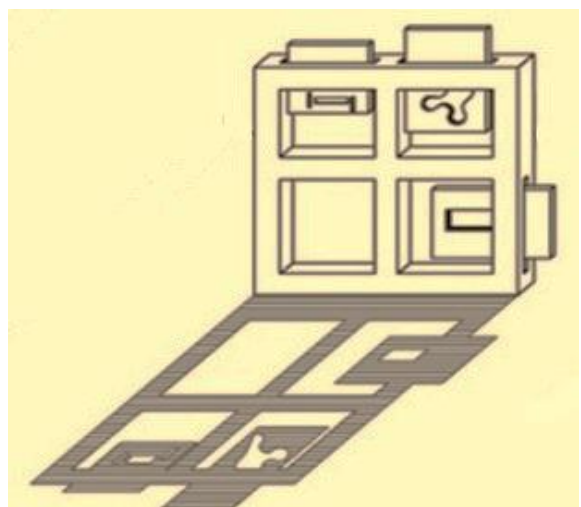


Fig. 2 Partitions with shaped pieces as shadow maker walls

Table 1 The results of architects and psychologists test

Factor	Translation in architecture	Keys leading to patterns	Example
Flexibility	Different use of space in different times	Multi-function vast rooms	A wide place with flexible furniture
	Different activity in different zones at the same time	A modular open plan with several corners	Using movable light walls /partitions to separate each zone
	Flexible furniture	Modular light movable furniture	Light movable cubes
Variety	Variety of shapes	Different shapes created by light and shadow Different paintings	Shadow maker partitions with movable pieces Unfinished paintings
	Changing furniture	Modular movable furniture	Light movable cubes
Imagination	Variety of shapes	Shapes created by light and shadow	Shadow maker partitions with movable pieces
	Different paintings	Using Unfinished paintings	Sheets with unfinished painting on the wall or ground
Curiosity	Variety of shapes	Shapes created by light and shadow	Shadow maker partitions with movable pieces
Cooperative play	Any free group activity	Planting, painting, rearranging furniture or class	Design small garden and painting area

Table 2 The result of kids test

Factor	Example	Limitations	Percentage of Kids Agreement
Variety	Variety of shadow shapes by shadow maker partitions	Making class disordered, Getting hurt during moving partition pieces, Lots of noise	90
	Completing unfinished paintings by kids themselves	Making hands and cloths dirty	100
Flexibility	Moving cubes to rearrange furniture	Making class disordered, Getting hurt, Lots of noise	100
	Planting together	Making hands and cloths muddy and dirty, Lost of noise	100
Cooperative Play	Collaboration in painting	Causing a dirty class, Lots of noise	100
	Collaboration in arranging furniture	Making class disordered, Getting hurt, Lots of noise	100

Also, playing with shapes created by shadows and light, can improve kid`s motivation and imagination. In that case, variety of shapes is a physical element that causes kids motivation for imagination and creativity. The importance of play for preschoolers, causes to notice the “variety of space” from another view. The meaning of variety, here, is not existence of different colorful shapes. Here, the variety means the potential of making changes in the space by kids themselves. For example, they can complete unfinished paintings on the walls which improve their collaboration and imagination (Fig. 3). Or, they can

make various furniture or partitions by composing several cubes (Fig. 4). These cubes must be as light as possible to be rearranged by children. Shadow maker partitions, light “cube-made” walls and painting walls can use for dividing space.

Also, based on psychologists test, planting collaboratively which can occur as a free play, may create more various environment. So, it seems planting area in kids’ spaces is a physical factor to make space more various and motivate cooperative play and creativity if kids, themselves, plant.

3.2. Flexibility of Physical Environment

Here, “flexibility of physical environment” has two different meanings: a) the potential of the space to allow kids to have various activities in the same space in different times and b) the potential of the space that allows several groups of kids to have different activities in the same time in different parts of the same space [45]. The example for part “a)” is a large and wide multi-function room that is a suitable place for children to play, to paint on the movable partitions, to sing, to learn numbers and etc., in the same space in different times. According to the definition part “b)” two or three different explained activities can occur in that multi-function room in the same time. For example a small group of children may listen to an imaginative story that the instructor reads for them and in the same time, the other group can make colorful surfaces or paint freely on the movable short partitions, without interrupting each other. These circumstances can exist, if there is a rich flexible space to prepare the necessary environment for each separate activity in every corner. (Fig. 5). While playing in this area, it’s important to arrange passive and active games in different times.

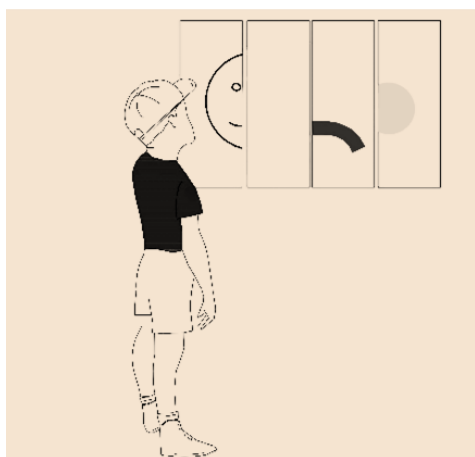


Fig. 3 With unfinished paintings, kids themselves can change their environment and make an interesting variety

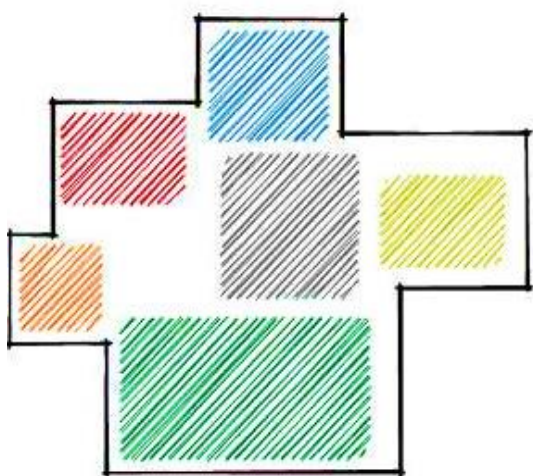


Fig. 4 Modular cubes for arranging partitions or furniture and making a various environment

The result of architects and psychologists test, besides confirming the design patterns such as “open plan” and “using movable walls”, showed that “the flexibility of space” can be achieved by designing wide multi-function rooms, with modular plan and multiple corners to have every corner for every different activity (Fig. 5) & (Fig. 6).

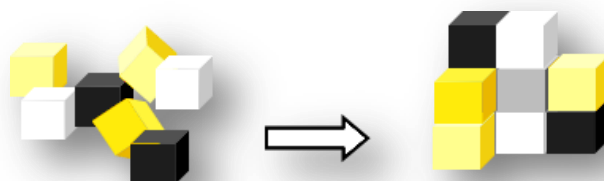


Fig. 5 The different corners make the space more flexible for different activities

Also, using flexible and movable modular furniture could make the space more flexible. Suggestion of architects and psychologist was using

light cubic pieces as furniture which can be moved by kids while collaborate to each other through a play which is organized by the mentor.

The result of kids test was satisfactory enough because more than 90 percent of them were agreed with patterns extracted of architects and psychologists test (Table 2). Although, children discussed about limitations of usage each pattern and referred to noise, disorder and getting hurt (Table 2) but, their high agreement showed the results of this study, could give kids necessary motivation to be curios, to imagine, collaborate and play. According to the literature review, the more increasing imagination, curiosity and cooperative play, the more enhancing creativity.

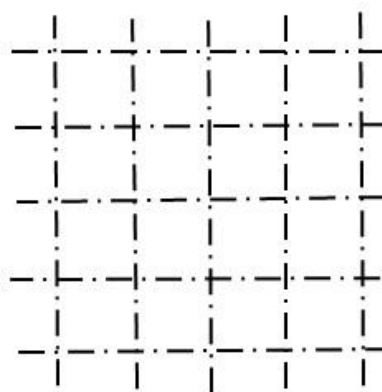


Fig. 6 Open modular plan

4. CONCLUSIONS

However, creativity is a vast domain that include many variables but from the view point of this research “imagination, curiosity, collaboration and play” are most related to “creativity”. Also, physical environment is complex of too many factors, but, here, “flexibility” and “variety” of physical environment was discussed in

relation with creativity variables. The results confirmed the positive correlation between these two architectural factors and creativity variables. In accordance with architects' test, the design patterns for kids' spaces which enhance kids' creativity through variety and flexibility of physical environment, could be suggested such as:

a) Design of modular wide open plan with several corners to make different zones for different activities;

b) Design puzzled Shadow maker partitions (with shaped pieces) that every parts of it easily moves to make an entertainment for kids while evoking their curiosity and imagination.

c) Using light modular furniture such as light cubes that kids could move and rearrange them to make new furniture/wall in accordance with educational schedule;

d) Using incomplete paintings, on the wall or on the ground that children could complete them based on their imagination.

e) Design vast planting areas that kids could plant in groups.

1. All of these patterns may be summarized and integrated in a graphical pattern (Fig. 7). As creativity and architecture are related to human, they are complicated domains. There are more factors than imagination, curiosity and cooperative play related to creativity. As such physical environment (here architecture) is a large system with many components. So, it seems the research on the relations between creativity and physical environment needs to more studies, yet.

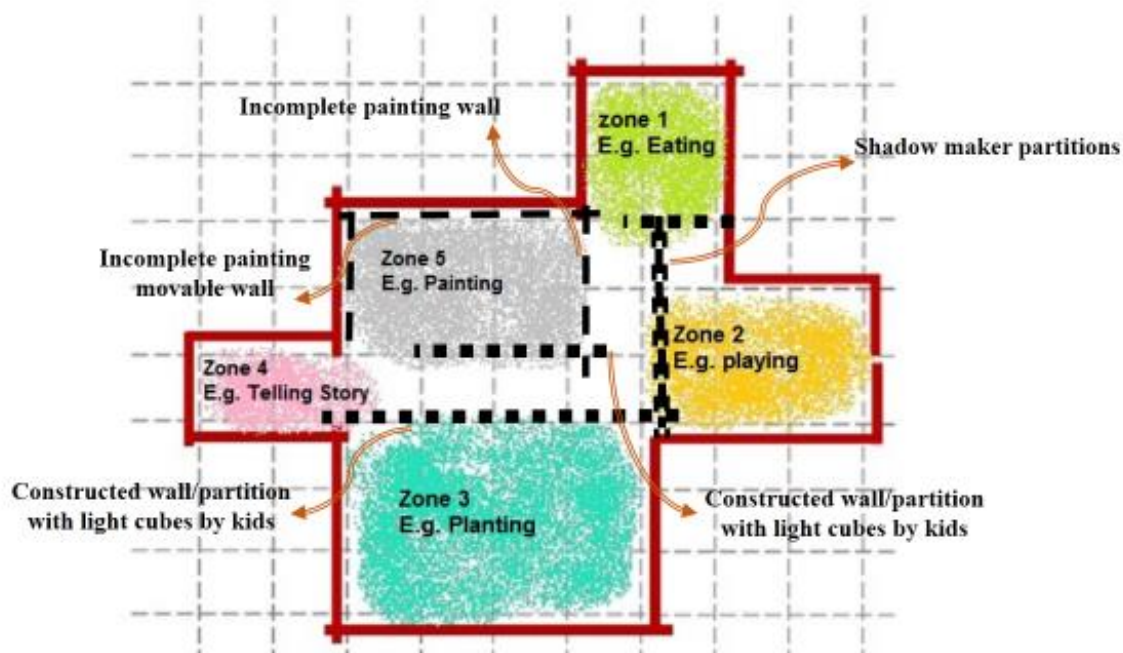


Fig. 7 Graphical pattern of a modular plan with different corners which cause multifunction area

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest regarding the publication of this manuscript.

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