Designing using Lego and Uno-Stacko: A Playful Architecture for an Integrated Kindergarten and Elementary School

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Abstract. The integrated kindergarten and elementary school is a public educational facility used for early age and elementary education. Designated for children at 4-12 years of age, the design should meet the standards and requirements, while considering children’s needs in their development phase. This paper discusses the design of an integrated kindergarten and elementary school using the playful theme. Design was explored using LEGO and UNO-STACKO to create spaces that accommodate material exploration for children. The design takes the play concept as a medium of child’s learning in order to improve their ability and awareness of the surrounding environment. The design translates the playful theme into imaginary dimension, constructive-deconstructive shapes, and glide circulations concept. The spatial pattern is applied by considering children’s behavior in the designated ages to trigger their creativity improvement. The design is expected to serve as a model of an integrated kindergarten and elementary school architecture.

1. Introduction
The education of children of early age and elementary age is unique. From 0-8 of age, learning should be part of playing, while in 9-12 of age, learning should be a transition from playing to studying. This level should equip learners with knowledge, skills, and basic attitudes. An integrated facility with an incorporated system is required to support students during their transition period to receive basic education.

Schools are mostly designed to meet the required standards but have not considered children’s learning characteristics. Scholars have studied extensively about play and recreation. Playing is seen as opposed to work and serious life; it is a recreation [1]. However, playing has numerous advantages that not many educators have not identified. The game has caused the flow-release the energy that has not been used and accumulated in children. Moreover, playing trains a variety of physical and spiritual functions [2]. The activity of play might be the best way for children to know place [3]. Playing allows children to explore a place using their senses.

This paper explores the use of playful theme as a design approach for an integrated kindergarten and elementary school. The design is approached used children’s playing blocks, consisting of LEGO and UNO-STACKO, to create playful spaces and architecture. The main material of the building is a container, which also deals the issue of re-using and recycling materials.

The school location is at the Gedebage Adipura Housing Complect (Bandung), considering the city growth and development issues as well as the mapping of the regional need for education facilities. The facility is situated at the intersection of Cemara street and Adi Flora Raya street, which is the main street.
of the housing complex. It is aimed at providing an educational facility that is easily reachable from the complex and its surrounding communities.

2. Design Method

The design process was inspired by children’s blocks, consisting of LEGO (Figure 1) and UNO-STACKO (Figure 2). LEGO is a game that is using a constructive pattern. It generally has compiled patterns, which will turn into more rigid patterns if it is re-arranged. The pattern of playing this is translated into kindergarten building’s form, masses, and spatial pattern, reflecting a period in which a child of the kindergarten age becomes to be interested in constructive form and composition. In contrast to LEGO, UNO-STACKO is a deconstructive game using colored beams, which have symbols and numbers on their sides. The game starts when beams are arranged and stacked neatly, and then released one by one according to certain rules. The game ends when the stack of beams is collapsed. Both games challenge children’s intelligence and logical balance.

![Figure 1. LEGO](http://www.kidstechacademy.org)  
*source: http://www.kidstechacademy.org*

![Figure 2. UNO-STACKO](https://app.slidebean.com/)  
*source: https://app.slidebean.com/

The design of the integrated kindergarten and elementary school employs LEGO and UNO-STACKO approaches. Containers, the main material of the school, is basically a large hollow beam, which possesses certain sizes. As such, their characteristics are simple. Having various colors, containers are a large scale of children’s toy blocks. Thus, the design applies the constructive notion, as inspired by LEGO, and the destructive concept found UNO-STACKO. Both of these game are one types of play for children in development, giving shape game [4]. The spaces of the school are arranged in such a way based on the container’s basic size.

3. Analysis

3.1. Activity and Spaces

Based on the activity program of an integrated kindergarten and elementary school, the school have two kinds of activities; they are main activities and supporting activities. The main activity comprises the education activity for kindergarten and elementary levels. Meanwhile, the supporting activity is the school management. The activities can be classified based on the relational intensity among activities and can be grouped into spatial groups and masses to accommodate the kindergarten activity, elementary school activity, administrative activity, and educational facilities, including the gymnasium.

3.2. Material and Space Study

The decision for using containers as specific and unique building materials fundamentally affects the way the room management standards and needs are translated into design. This is specifically related to the material and room function. The space study mainly considers to achieve room efficiency. The space studies are as follow:
3.2.1. Elementary Classroom Study
The elementary classroom study was conducted by referring to the school curriculum and the model of the teaching method. According to the Indonesian standard, a class should hold at least 15 students. After a study of spatial needs, based on the Architect’s Data, a classroom will use a container of 40ft size and two containers of 20ft size. The classroom can house various learning methods, such as the conventional lecturing method, group learning method, and demonstration method. The class may accommodate 16 students and 2 teachers. This is a disable-friendly classroom as can be seen in the arrangement of the circulation and door openings (Figure 3.)

![Figure 3. Elementary Classroom Study](image)

3.2.2. Kindergarten Classroom Study

![Figure 4. Kindergarten Classroom Study](image)

A similar procedure was applied in the kindergarten classroom study. The classes should be able to accommodate two teachers, 16 students, a storage area, and an area for the display of works. A kindergarten classroom uses four pieces of container of 20 ft size (Figure 4.)

4. Concept and Design
4.1. Basic Concept
The design concepts of the integrated kindergarten and elementary school start from the elaboration of a theme, which employs children’s behavioral approach at elementary school and kindergarten. These concepts were developed according to children’s types of play [4]. The basic concepts are as follow:
4.1.1. Imaginary Dimension

Imaginary dimension concept is a translation of illusion game. The concept should be impulse for children imagination. This concept will affect the interior and the materials used. The use of different materials expected to change the atmosphere of the school is basically formal covered with informal nuances. Container material gives simple shape for children, this shape is look like children toys and easy to understand (Figure 5).

4.1.2. Constructive and Destructive Concept

Constructive and Destructive concept is the translation of the game to give shape play. Basically, children playing this only make both patterns, constructive and destructive, it is repeated.
1. Constructive Concept
Children's games with a pattern of constructive which one is the LEGO. Generally LEGO has compiled pattern, change becomes rigid and there is a typical element on a particular side. The pattern of playing on this translates into shape, mass, and patterns of kindergarten building. This form describes a period in which the child became interested in composing and giving constructive form. The facade of the building have to make into a rigid impression. Window opening made a circle and give the frame on around it so it looks like the LEGO typical side. Building mass consider to the function of the building and other basic concepts (Figure 6).

![Figure 7. Constructive Concept for Kindergarten](image)

2. Destructive Design
Destructive concept follows the pattern of the UNO STACKO game. The process of forming patterns of this game is destructive to end a game. Generally UNO STACKO is played by one by one retracting and re-stacking and is made loose (Figure 7). The pattern of the playing is translated into the shape, mass, and the building patterns of the elementary school. This form describes a period in which children demonstrate elicit intelligence. Based on the spatial study and material, the elementary classroom is made of a 40ft container and two 20ft containers. It gives the impression of a loosely arranged building mass (Figure 8).

![Figure 8. Constructive Concept for Elementary School](image)
4.1.3. Cyclic/Endless Circulation

![Endless Circulation](http://kumpulanfotogratis.com/)

Figure 9. Endless Circulation

source: [http://kumpulanfotogratis.com/](http://kumpulanfotogratis.com/)

Studies show that children tend to move in a circular motion while playing. In this design, this is translated into an endless circulation to show something that is unbreakable and always connected (Figure 9).

4.2. Design

The integrated school is grouped into 4 (four) buildings, i.e. the elementary school, the kindergarten, the administration office and the gymnasium (Figure 10). Their placement considers the characteristics of the accommodated activities and the surrounding environment’s features. Considering the fact that most noise is produced by the traffic on Adi Flora Raya Street, the learning area is located on the inner side of the site.

![Site Plan](http://example.com/site_plan.png)

Figure 10. Site Plan

The design, inspired by LEGO and UNO-STACKO, combines the vertical stacks and the horizontal arrangement of the reused containers (Figure 11 and Figure 12). In the interior, the ceiling and the wall are layered with gypsums to insulate the heat (a and b in Figure 13). The floor is covered with the anti-slip vinyls to ensure children’s freedom in movement (c in Figure 13).
5. Conclusion
The design of the Integrated Kindergarten and Elementary School is the result of explored using LEGO and UNO-STACKO to create spaces that accommodate material exploration for children, container material, as impulse for children imagination. The Methode makes the child-friendly impression. The design takes the concept of children’s play as a medium of child’s learning in order to improve their ability and awareness of the surrounding environment.

References
[1] Evans B and Horton J 2016 Introduction to Play Recreation, Health, and Wellbeing in Geographies of Children and Young People Play and Recreation, Health and Wellbeing 1-14.
[2] Adiloglu F and Akinci S T 2011 Interdisciplinary Design Studio Education: Place through the Activity of Play. Cypriot Journal of Educational Sciences 6(3) 140-149.
[3] Kartono K 1990 Psikologi Anak (Psikologi Perkembangan. Bandung: Mandara Maju jitunews. (n.d.). Retrieved from http://cdn.jitunews.com/dynamic/article/2016/03/11/32874/sg6fp0UHan.jpg?w=632)
[4] kidstechacademy. (n.d.). Retrieved from http://www.kidstechacademy.org/Lego1.jpg
[5] http://kumpulangfotogaris.com/wp-content/uploads/2012/10/anak-bermain-ular-tangga.jpg
[6] https://app.slidebean.com/p/lK2QZgNReF/BIODIVERSITY-CONSERVATION