

FURNITURE DESIGN IN CONCEPT LEGO

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Abstract:

Furniture design has changed from traditional to new, original and practical ones. Creation of new furniture design is a challenge. Furniture is not only a part of the interior design but it also should offer comfort, flexibility, functionality and aesthetic appeal. The paper presents an original piece of furniture based on Lego concept. It is made of fir (Abies Alba L.) wood block units assembled by dowels. The furniture structure is designed in such a way that from the basic piece (the table) by combining the component blocks (the cubes and rectangular parallelepipeds) and the plates (superior, inferior) and lateral walls it can be achieved pieces of small furniture like stool, benches and a storage box. The manufacturing steps are also presented and by using imagination and creativity other different pieces of furniture could be made, just play with.

Key words: fir; cube; rectangular parallelepipeds; blocks; lego-furniture; dowel.

INTRODUCTION

Any child starts to play with different objects, the most attractive being those that form the LEGO game. This develops the imagination and constructive spirit: to do together, gather and combine more pieces which have different sizes, colors, figures in a variety of themes.

At the beginning the bricks (the basic unit of the Lego game) were made from plastic. From 1949 until 1963 cellulose acetate was used. Then the polymer was changed in favor of acrylonitrile butadiene styrene (ABS) (<https://www.compoundchem.com/>).

From 60 billion parts manufactured by Lego in 2014, at least 318 million are miniature tyres for Lego vehicles which are made from styrene butadiene styrene (SBS).

History of Lego starts in 1932 in the carpentry workshop of Ole Kirk Christiansen, in Billund, Denmark (<https://www.craftechind.com/>). In 1934, Ole Kirk organized a competition with all staff to find a suitable name for the company offering as a prize a bottle of wine. Christiansen had two names in mind, "Legio" (short for "legions of Toys") and "Lego" (a combination of words from Danish language "leg godt", which means "play well." From plastic toys the company developed the modern brick design and patented Lego brick in 1958 and in 1964 cellulose acetate was replaced by ABS, material which is non-toxic, is less prone to discoloration and deformation and is more resistant to heat, acids, salt and other chemicals. There were developed Duplo bricks (double size of Lego bricks) (1969) safer for small children, these being compatible with Lego bricks (Fig.1)

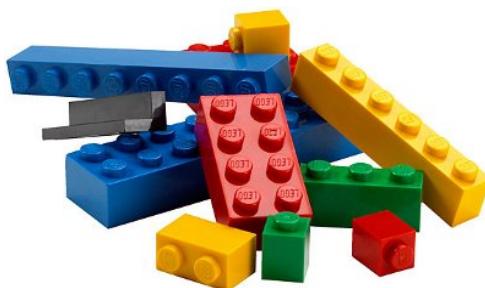


Fig. 1.
Lego bricks (Meers 2017).

In 1980 the Lego group founded the Educational Products Department (Lego Dacta in 1989 from the Greek word "didactic") to expand the educational possibilities of their toys (<https://www.lego.com/>). Lego bricks was named "toy of the century".

In more than 140 countries, Lego toys were sold by 2015 and they have maintained their place in the top of the list of the most popular toys in the world (Rosenberg 2019).

The interest for LEGO system was expanded from toys to furniture area, where designer used their creativity to image and create LEGO furniture or different objects. Among these it can be mentioned staircase- made from lego, coffee table with lego on top, dining table, chair etc. (Fig. 2)



Fig. 2.
Furniture design inspired by Lego system (Homedit 2019).

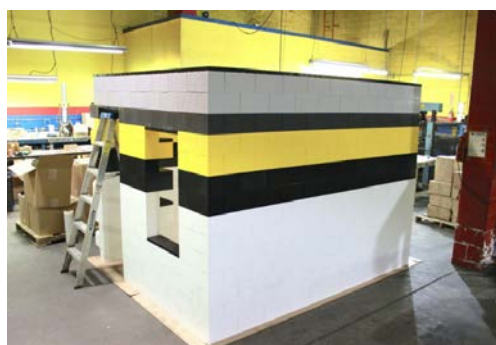
Lego concept represented a challenge and designers used their imagination and built different pieces of furniture without screws or glue. Yusong Zhang designed a table which seems to be made from white bricks, but a lateral view reveals playful layers, like a rainbow of red, yellow and green color, as well as an empty center (Taggart 2018) (Fig. 3 a). LEGO adult projects were developed including sets of blocks with architectural themes, even a bedroom was made of 20 000 colored modules. Among these the most versatile was EverBlock LEGO giant that can be used to build chairs, tables walls and structures (Schulz, 2015) (Fig. 3 b, c, d).



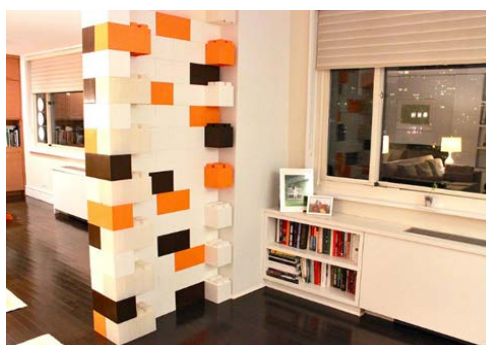
a.



b.



c.



d.



Fig. 3.

Lego-system applied to different pieces of furniture and structures: a - coffee table; b - EverBlock coffe table; c - EverBlock house structure for disaster and military applications; d - Everblock -modular wall; e - MUEBLOCK over -the-shelf bed; f - MUEBLOCK Sofa.

Chilean designer Raab Francis used wood materials as, plywood and pine wood, to create the modular furniture Muebloc. This included blocks that can be combined into various pieces like dressers, sofa, tables, bed (Fig. 3 e, f) (Paul 2015).

What is the magic behind LEGO? It is not a simple game, behind it hides creativity, imagination, innovation, simplicity and desire to create-recreate other systems. It started from a necessity and was developed on complex interactive games. Designers were included the LEGO concept in different furniture pieces, decorative partitions, using vivid or pastel colors. The pieces are designed in a cubist style with rectangular and square shapes jointed together.

OBJECTIVE

Wood is not so much present in Lego system and even more in furniture based on Lego. Wood is warm, lightweight, eco and renewable material that can provide us a wide source of inspiration.

The main objective of this research was to develop a wood furniture piece in concept LEGO using a simple and attractive design. Additionally, starting from the basic structure, other small pieces of furniture could be developed through different assemblies using the system of dowel jointing.

MATERIAL, METHOD, EQUIPMENT

The wooden material used consisted of fir (*Abies Alba L.*) reconstituted panels of 38mm and 24mm, timber of 20mm and scantlings of 60mm thicknesses. The panels were made of 40 mm width strips. The raw material was achieved from the Romanian market. The wood moisture content was in average 11% and the density 450kg/m³.

The wood raw materials were subjected to the mechanical processes by cross-cutting, edging, trimming, planing and sanding in order to straighten and obtain the necessary dimensions and surfaces quality of pieces.



Fig. 4.

The frame and the basic unit for furniture design: a - the frame for the superior plate; b – cube: the block unit.

The inferior (lower) and superior (top) plates and also the lateral walls fitted on the inferior plate were made from the reconstituted panels and the frame was made from 20mm timber (Fig. 4 a).

The frame fixed the superior plate on legs, through dowels. The blocks as the basic unit for the LEGO furniture system, were the cube and rectangular parallelepiped, representing the constructive and assembly elements (Fig.4 b).

The cubes of 54 x 54mm and parallelepipeds of 108 x 54mm were obtained by cross-cutting of scantlings to a circular saw. After a slight sanding in order to remove the chips from the edges, the cubes and parallelepipeds (160 pieces) were drilled on a vertical drilling machine (Fig. 5).

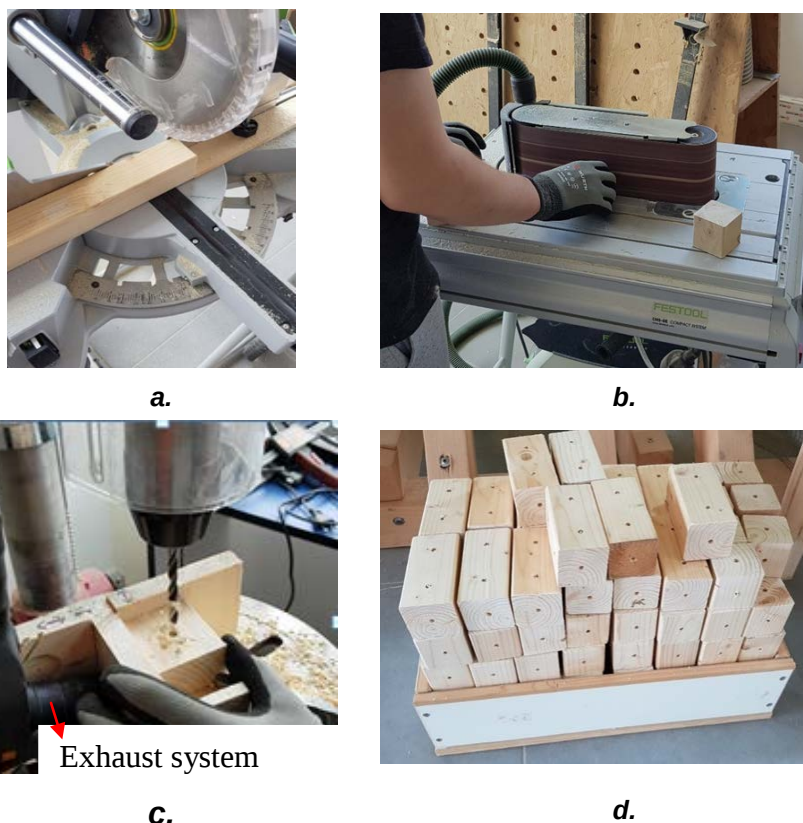


Fig. 5.
Block processing: a - cross-cutting; b - sanding; c - drilling; d - final cubes and parallelepipeds.

To make holes accurately in the middle of all cubes faces, a device for drilling was made. The exhaust system had the aim to keep all pieces in the right/fix position.

In order to accomplish the furniture assembly the lateral walls and the inferior plate were drilled on edges and surfaces (Fig. 6) and the jointing was made by dowels of 6Øx30mm.



Fig. 6.
Drilling the lateral walls and the inferior plate.

The finishing of furniture pieces was achieved by brushing the water based coloured enamel (Evrika) in two layers to a specific consumption of 200g/m². It is odourless enamel and it is recommended for the painting of furniture and carpentry items in living spaces such as children's room, kindergartens, schools, children's toys (<https://www.azur.ro/>).

The cubes were coated with blue color on the sides and yellow on heads and parallelepipeds with yellow on the sides and blue on heads, this helping to easier assembly of all pieces (Fig. 7). After drying the first coat of enamel, a slight sanding with abrasive H 240 was performed, followed by the dust removal and final enamel coat application. After drying, a final sanding was achieved with abrasive H 360, to give a proper gloss to the surfaces.

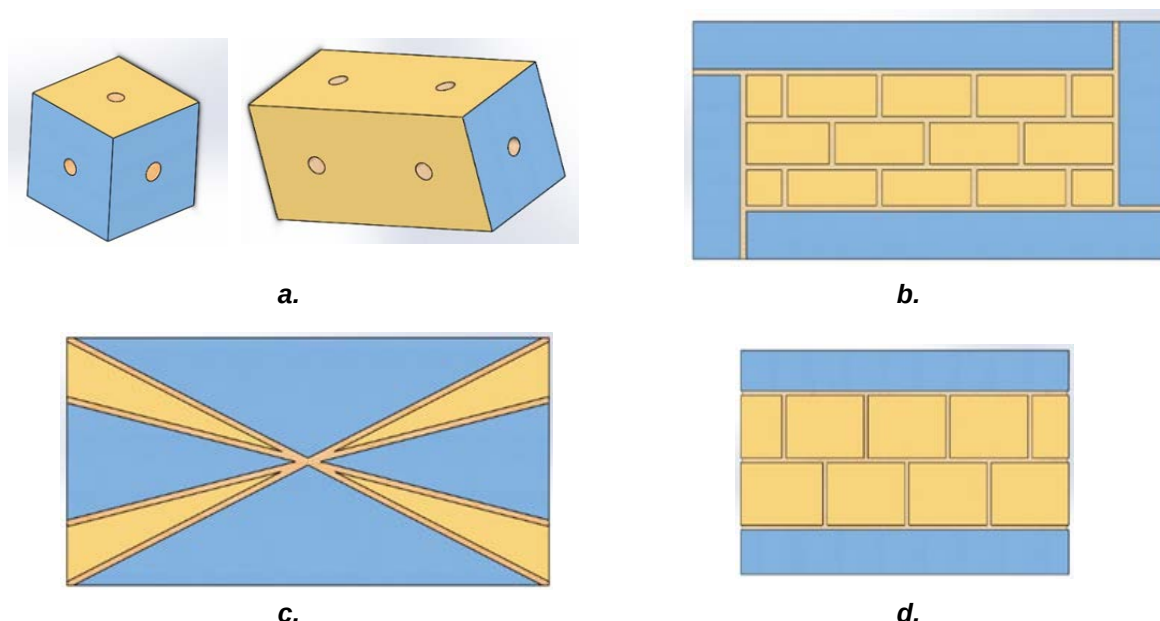


Fig. 7.

Coloring method for cubes, parallelepipeds, plates and lateral wall: a - cube and parallelepipedic units; b - superior (top) plate; c - inferior (lower) plate; d - lateral wall.

For the design of superior and inferior plates, several variants of decoration in the puzzle system were considered (only simulation without puzzle constituent parts).

The colors have been chosen so that to be suitable for both adults and children. Yellow is a cheerful and energetic color, associated with happiness, which stimulates concentration and memory. Especially, the light and warm shades give a sunny and bright appearance and emit hope and optimism. It can stimulate the creative part of the child and adult also.

Blue represents the sky and the sea and has a calming effect, lowers blood pressure, anxiety and aggressiveness. This color is associated with freedom, imagination, inspiration, sensitivity and has a positive effect on the mind and body emanating a refreshing and relaxing light. Psychologists recommend this color around the child because it favors relaxation and helps him to overcome any insomnia and even to calm down. Children in a blue room may play alone, quietly and are satisfied.

It seems that people are more productive when they work in the blue rooms.

RESULTS AND DISCUSSION

Furniture design

The furniture structure was designed in such a way that from the basic piece (the table) (Fig. 8), by combining the block units (the cubes and parallelepipeds) are achieved other pieces of small furniture like stool, two benches and a storage box for Lego pieces (Fig. 9). "M-Cub" name describes practically this LEGO-furniture. These are just some of the possible variants that can be obtained by assembling the block units. By combining the cubes, other small pieces could be created based on imagination.

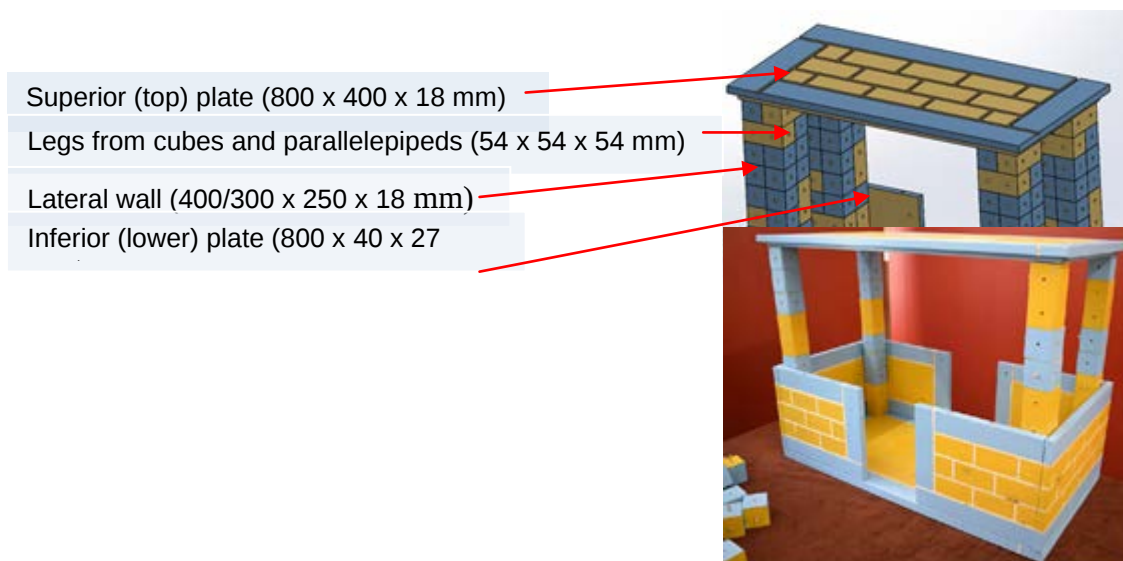
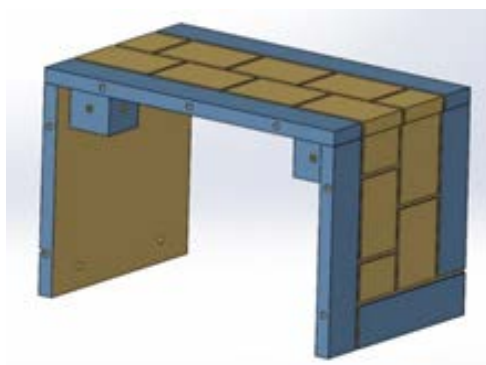


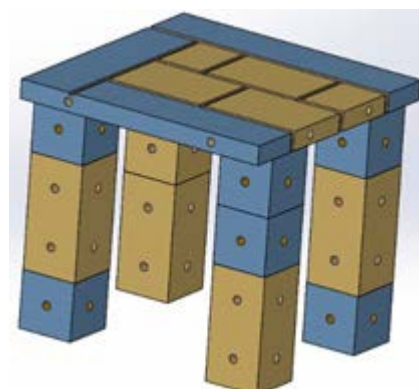
Fig. 8.
The basic piece of furniture: the table.



a.



b.





c.

Fig. 9.

Design of different variants of LEGO- furniture “M-Cub” derived from the basic piece: a - benches made from the lateral walls; b - stool made from lateral walls and cubes or parallelepipeds for legs; c - storage box.

Consumption of raw material

The raw material consumption (including wood and others materials) used to carried out the furniture pieces is showed in Table 1.

Table 1

Raw material consumption

I. Raw wood material consumption, in m ³		
1.1.	Timber, 24 mm	0.035538
1.2.	Timber, 38 mm	0.022154
1.3.	Timber, 20 mm	0.002498
1.4.	Scantlings, 60 mm	0.064601
Total wood raw material consumption, m ³		0.124791
II. Wood dowels and screws		
2.1	Dowel (Ø6x30 mm), in pieces	400
2.2.	Screw (3.5 x 20 mm), in pieces	12
III. Finishing materials		
3.1	Disc sanding paper (P80, P120), set	4
3.2	P240, P360 (sheets of 230x280 mm), set	2
3.3	Water based enamel, in l	1.5

The wood raw materials (Table 1) are the representative items included in the calculation of the furniture price. Most of people assume that “custom” furniture is too expensive and generally is out of the ordinary furniture price range. The custom hand-made furniture includes much effort and time for conception, choosing the materials, thus a high labour work is necessary to create the personalised furniture pieces.

CONCLUSIONS

This unique furniture piece namely “M-Cub” represent not only a simple table, it could be viewed as a complex design that can be transformed in different small pieces through imagination and creation. The design is a friendly one, the colors used are saffron yellow and celest blue, colors both being energizing and relaxing in the same time. The assembly (the basic furniture) is based on combinations of the constructive block units (the cubes and rectangular parallelepipeds) through dowels. It is a removable constructive system which can be assembled easier into different ways using creativity. The diversity of the assemblies that could result is limited only by imagination.

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