Designing furniture as learning facilities for early young child education in Desa Gunung Sari, Tangerang

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Abstract. Early childhood education is one of the most important stages in the process of child growth. This program was designed in order to prepare young children for further education at the elementary school stage. However, many early childhood education facilities, mainly public school located in villages still have inadequate facilities, based on data from Early Childhood Education Association. From unfit buildings to inadequate learning facilities. Therefore, it is necessary to design an appropriate and suitable learning tool for children in their early childhood age. A community service project was conducted on an early childhood education facility located in a village in Mauk area. The community service process begins with researching data through observation to the facility, interviews with the people in the area as well expert on early childhood education. Data about children ergonomy is collected. The output is twenty multifunction modular furniture named SALA (Sarana Alas Duduk Anak), that can function as table and chair for students, table and stool for teacher, and can be arranged as stage for school performance. It can be stacked up to 3 modules for space-saving. The design is made in home-based furniture maker near the village and as an effort to support and assisting early childhood education nationally.

1. Introduction
Early Young Child Education, as described by the ministry of education, is an essential stage of education for the kids. It is important for every children to participate in this stage of education to prepare and guide them during early education as a preparation before entering elementary school. On this stage, the main goals of early young child education is to build the personal character of the children and allow them to compete in their next stage of education.

Nevertheless, based on research conducted by Early Young Child Education Association, there are huge numbers of inadequate education facilities being use in Indonesia, mostly government-own, located in rural areas. For an example, in 2011, 40% of 8,000 facilities in Central Java classified as inadequate education facilities according to the national standard, released by the ministry of education. Inadequate facility is a facility with inappropriate building, furniture being used by the children, and the learning tools as well.

On this problem, a case study is carried out based on an early young child education facility in Desa Gunung Sari, Mauk, Tangerang, where the facility is located in rural area and in poor condition. Previous building was a room, leased by the local village chief. It was a small room with nearly 30 students having an education from Monday to Friday. Thankfully, by the help of Habitat of Humanity Indonesia and Architecture Major from UPH, a new building built in 2016. However, the children are still using their
old furniture, which is a table one meter by 45 centimeters in size for four to five students. There is no chair available, floor is their only chair, leading them to non-ergonomic seating position. Having a non-ergonomic furniture being used in the facility is a major problem. Where the students will lose focus due to lack of comfort and wrong use of furniture for children especially in early age, which is their current growing stages, could lead to health problem in the future.

2. Purpose
The main purpose of this design process are to increase awareness of how important of having a well built and design learning furniture for children in their early stage of education. It has to be designed based on the children anthropometry to provide better ergonomic seating position to present an adequate learning facility for the education, especially in rural areas.

3. Research study

3.1. Method 1
In-depth observation were conducted in the school.

![Image of observation](Source: Personal data, 2018)

Observations of the building, surrounding area, curriculums, and the learning process were conducted. Interviews also conducted with locals to collect more complete and precise data. Interviews were done to the teachers in the facility, as well with lecturer from architecture major whom leading the project to rebuild a new building for the school.

During the interview, about three teachers were asked regarding the conditions with their current way to teach the children, the main focus is around the furniture, as the main tool for the teacher-student interaction during learning process. The goal is to understand the main problem from the teachers perspective, as they are the one who involved in real-life problem every day.

As the result of the interview, the teachers concern their current furniture for the children, it was hard to maintain the student focus in study because they often lose focus during study because interaction between their friends due to sharing table. Some children also sometime complained because they keep seating on the floor. Their expectation for the new product to have a better sitting position for the child to get more comfortable during the study and to keep them more focus and enjoy the learning process.

The second interview was done with an architecture lecturer, who lead the architecture program to rebuild the building. The goal is to understand the main concept of the new building and the philosophy implied with the design in order to relate the product with the surrounding environment. The design of the new building is mostly build with natural-finished material such as bricks and wood, to give a natural and traditional feeling since the building is built in village area. the classroom is located on the second floor, connected with balcony to give more open feeling and provide fresh air during the learning process and provide spacious feeling to the students and teachers.
3.2. Method 2
Based on extensive internet research to give more in-depth data throughout the internet regarding the problems, it is known that the ministry of education has released an official statement about the standard for furniture being used in early young children education facility, in which the old furniture being used in the Mauk facility is not based on the standard released by the government. There is also a negative impact for children especially in their early age (3–6 years old) for seating on the floor for too long. The data was based on a journal written by a doctor specialized in physical therapy. Children who seat on the floor for too long could lead to serious health problems, especially for their legs, because their seating posture could impact the joints and their muscles. So it is essential for the children for having a proper chair to seat on.

Ergonomic data always needed during designing a product. Research was conducted to have a proper measurement of the children. Based on the data from a student at Maranatha University, the exact precise anthropometry measurement of Indonesian kindergarten children is provided. Giving the data to be used for the design process to provide better ergonomic product for the user.

Due to minimum availability of space in the classroom, the product should be compact and easy to use. Therefore, there are two options for the space-saving system to be used. Either modular or collapsible. Based on the observation done earlier and taking safety factor into consideration, modular technique is the chosen system, due to the durability compared with collapsible system, and the safety for the children as well. Modular system also minimize the set-up time, giving the product to be more ready to use and more time efficient.

Having an ergonomic product and perfect system to be used, the material chosen also need to be the right material for the purpose. The material should tick all the boxes, from the durability, environmental friendly, easy to be found, and does not cost much to be processed. Study was done to few options, including solid wood and processed wood such as mdf, plywood, and particle board. Based on the result, plywood is the chosen material for the product. Because of its durability, cost, and easy to be processed becoming a product. Finishing for the product is going to be a layer of taco sheet.

3.3. Design criteria
Based on observation and research conducted, the product is going to be a kids furniture adapting main keyword adaptable and compact. Product designed to be use in school facility not only in Mauk area but also in other facility with same problems. The main material for the product is plywood, finished with taco sheet and being manufacture manually by workers with simple tools in order to be able push the local community to build the product as well. In order to achieve that, product does not have any complex shape and easy to be manufacture in home industry. The design follows the government criteria, no sharp edges, smooth finishing, and child friendly. Product targeted to be use by the children within age three to six years old during their school time in the classroom as indoor furniture.

3.4. Design process
To start the design process, there are different approach to the design in order to find the suitable form for the product. First approach was to apply knock down system with dowell joint based on the function. This was done to give variety to the product.
Second approach was to combine material, metal and wood. Metal used as the main support in order to provide better structure, but the product becoming too heavy and not suitable for kindergarten children.

Third approach was to design a separated desk and chair, not combining them into one unit. Where the desk is switchable to a visual learning board or games, but this approach was mark non effective because the difficulty that could cause the learning process throughout the school time.

The fourth was to use collapsible product, a foldable product to help storing the product much easier. However, the system use would cost higher production cost and the product will have less durability compare with the modular products.

In other words, this is a non safety approach towards the children because of the system which could lead to possibility their fingers trapped because of the complexity of the system for early age children. The final approach was to design a product consist of a desk and a chair, together as one single product, not separated between each other, in order to provide better solution for the space-saving problems, and as well to make the product to be more effective and less time consuming during the set-up.
After considering the factors in each design approach, the best approach to be followed based on its strength, weakness, efficiency, the fifth approach was considered as the most suitable design approach and could solve the problems.

3.5. Ergonomics
The design process for the product based on the data for early age children, between four years old to six years old. The data was taken from Indonesian children, by doing direct measurement towards several different children.

The measurement used is based on the anthropometry for p50 Indonesian children. Product designed to help the child sits comfortably and not harming their health because the product is not an ergonomic product like their previous products.

3.6. Prototype
After the design has been approved, the next step of the process is to make the prototype. Several study was done. The studies were to define the colors, final size, as well as the cost to product the prototype.

Figure 2. First Prototype (Source: Personal data, 2018).
The first prototype, or called dummy, was made from plywood, without finishing. It was made to produce the product in to real life size, and to do the measurement of the product – user before the final prototype was made. This dummy was made in order to fix any imperfection of the product.

The color chosen for the product is natural finish color, to let the product blend in with its surrounding environment. Dark and light color taco sheet was chosen to provide variety of color to the product. The measurement of the product is 50 cm in length, 45 cm in height, and 45 cm as well in width. The product is not really big, perfect size for kindergarten student, and does not take a lot of space.

The production process begin with the search for the material. The main material is plywood. The plywood then cut into pieces, to produce the proper size for the product. After its being cut, taco sheet is applied to the product, to give simple and easy to maintain finishing. After that, the final process is to joint each part with screw. Total production cost for two prototype is 979,000 rupiah. The cost could reduce for mass production.

3.7. Final phase
In the end, after long process of designing the product, it is finally completed. The product will be donated to a school in Mauk area, which has been case study for this project. In total, there will be 20 products for the student. 10 left-side product, 10 right-side product. While the production is on going, the prototype was brought to the school to be reviewed by the teachers and the students.

![Figure 3. Final Prototype (Source: Personal data, 2018).](image)

Based on the review, in conclusion, it got 4.1 score in total out of 5. They compliment the design, practicality, and its comfort. Positive respond has been receive as well, the students also excited for their new desk and chairs for their school.

The product will be use in the classroom in the second floor. The choice of material is blending in with the room environment. Makes it a suitable product for the room, as well as for the student.
4. Conclusion
In conclusion, the product has delivered as problem-solving for the school. It delivers as a perfect furniture for the students around three to six years old, and capable to be store as modular stackable product. In other point, in the local business, there is no similar product, where the desk and the chair combined together as one single unit. Most of the other local competitor always have separated the desk and the chair. The cost of production for the product also a positive point for the product, it is cheap and using wood as its main structure instead of plastic.

However, there are some weaknesses to the product. In which the method of production still need attention to detail to produce neat and tidy product, specifically when taco sheet application process. The product also limited to early age children, and not suitable for elementary age children.

Despite the weaknesses, there are opportunities for the product in the market. Where the product could potentially distributed nationally, because based on the data, there are a lot of school especially outside the java island need help to improve their learning facility.

But due to less awareness from the public of having a decent and safe product for the children, could make them ignore all of the safety warnings and using non-suitable products for early aged children. This cause a stigma where the furniture for children is not important, because the society still thinks saving money is more important than providing a safe and proper product for the children, in fact, those are really a mistake.

Lots of things still could be improve in the process of designing a proper children furniture. This product is far from perfect and only a problem solving to a specific case study problem, therefore, further study needed to be conducted in other facility, not only in Jakarta area, but also nation wide so the product could be more improved as a national standard for to be use in Indonesia. Because in other area might have different method of learning due to different culture.

Public awareness also need to be improved to realize how important a furniture for children. To provide a better product for their growth and their future.

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Reference
[1] Kroemer, Karl, Henrike Kroemer dan Kathrin Koemer 2001 Ergonomics How to Design for Ease and Efficiency 2nd Edition. New Jersey: Prenctice Hall
[2] Tilley, R. Alvin dan Henry Dreyfuss Associates 1993 The Measure of Man and Woman-Human Factors in Design New York: Whitney Library of Design