

# Interior Finishing Study of Play Room for Early Childhood

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**Abstract** The development of early childhood education facilities in the form of a playroom at the school of Early Childhood Education (PAUD) in order to provide the best facilities for the children's growth is now increasing. The need for playroom facilities is considered important considering the necessary to improve the quality of child development at an early age. This requires an optimal child comfort in the playroom, which can be supported by good environmental management. One of the most important factors is through the management of interior materials finishing, where there will be interactions between children, caregivers, and the surrounding environment. Good interior finishing can create a safe, comfortable, and appropriate playing and learning situations to support early childhood growth. Nowadays there are a lot of playrooms, especially those in the Early Childhood Education school that have not adjusted to good standards in term of interior design, so there need to be a research regarding interior materials finishing, which can affect and influence physical development and thinking patterns of the early childhood. The approach of this research carried out with qualitative methods, began by observing the reality in the field about the playground conditions in several playroom, then explaining things that are going on and thinking in ways that move towards concepts and theoretical propositions (hypotheses).

**Keywords** interior finishing, playroom, children spaces

## 1. Introduction

Early childhood growth for the community is an important thing that needs attention. Because of various positive impacts gained from this growth process, making people, especially parents, want to use the best facilities for their children early on. One of the facilities to support children development is through their playroom. At present, playroom development is getting more attention, especially the ones for early childhood, because this period is the golden age where children experience many stimulations that could be useful for their lives later, along with the increasing attention and needs of parents to care for their children with the best facilities. Various kinds of public and private institutions pay attention to this, so nowadays they build some playrooms in public areas. One of the playrooms can be found in public retails. One of the things that needs to be considered for improving the quality of playroom services is interior materials that are used as finishing materials based on safety and comfort for early childhood. Playroom is an environment that can be in direct contact with its inhabitants, that is children. Children carry out continuous interactions in the room, from running, staying quiet, sitting, interacting with objects, or interacting with their playmates. Thus, there are some things that need to be concerned by designers when building a playroom. One of them is in terms of finishing materials or interior materials that support children's safety and development. A playroom needs

to have a special treatment because it can affect a child's sensory and motor development. This needs to be considered for the children's safety and for supporting growth in their golden age.

Based on this phenomenon, it is necessary to analyze the characteristics of finishing materials to support the children's quality development in the playroom, as part of the support to improve growth and development of early childhood's brain and motoric. This analysis is needed to improve the quality of users doing activities in the playroom, so that the playroom can develop better as a supporting element of interior design that has an impact on the development of early childhood education.

## 2. Research and Discussion

The method used is an analysis of the elements to form a room based on room-forming materials discussed in the literature study. Application of this material is adapted to the function of existing room. It is then compared to the existing conditions in the field, where finishing materials of the playing room with complex activities needs to be adjusted based on children's room material standards. The purpose of this process is to produce categorization understanding analysis of wall, ceiling, and floor material in the playroom based on children activities and in accordance with their characters. The final result if applied has the potential to be able to solve problems related to the suitability of playroom

materials with children's activity, so a comfort and safety space can be created

Contains theory from the latest relevant and original bibliography (from scientific journals or text books). The theoretical background is written from a global basis to a more specific theory regarding finishing materials in the playroom of early childhood.

## 2.1 Floor Materials

The type of floor materials that can be applied in the child's playroom interior design could be based on the type of activity that will be carried out in the room. In general, as in [2], the type of floor materials that can be used for children's room is divided into 5 categories, namely:

Carpet has a soft characteristic and can create comfort and safety for children when they are on the floor. With this characteristics, the carpet is good to be applied in the active zone and passive zone. Both are areas with dry activities. Carpets can be applied in a corner of the room or in the whole area permanently. Carpets are also very important to be used as floor material finishing for babies room, where babies spend considerable time on the floor to learn to sit, crawl, and walk. Several factors should be considered in choosing carpet material, such as the type and strength of the fiber, the density of the pile, the back part of the carpet, the carpet layer, and the adhesive material used. All of these elements must contain non-toxic ingredients.

Vinyl material is a layer made from a mixture of natural materials and artificial materials [7]. This material has a smooth and easy to clean surface. In addition, because it is coated with cloth or foam on the bottom, the vinyl floor feels more comfortable to stepped on. Vinyl floors are also designed to mimic other materials, such as rocks or wood. Textured vinyl can also make the floor surface not slippery so it is safe for children's activities.

But there is shortcoming of this material which related to its ingredients. Vinyl is made using polyvinyl chloride (PVC)[7]. PVC is able to release volatile organic compounds (VOC) into the air. For children, of course this will be very dangerous. Although some vinyl manufacturers have reduced this dangerous content since 2010, vinyl material remains a special consideration in certain places for children.

There is alternative material besides vinyl, namely linoleum. This material is classified as material made from natural materials containing flaxseed oil, cork, tree resin, wood powder, clay pigment, and hemp fiber. Linoleum is also available in a variety of colors, motifs and textures. Floors with linoleum surface strongly support the comfort of children's activities, but its maintenance requires special methods.

Based on research on chemicals in ceramics, ceramics are compounds of metal and non metal elements. Because there are many possible combinations of the elements, various ceramics are now available for various industrial and consumer applications. The earliest ceramics were used to make pottery and bricks, around before 4,000 BC. Ceramics have been used for many years in automotive as spark plugs, both

as electrical insulators and as strength to detain high temperatures. They have become increasingly important in robust tools and materials, heatengines, automotive components (such as exhaust-port liners, piston coatings, and cylinder liners). Ceramic crystal structures (consisting of different sizes of atoms) are among the most complex of all material structures. The bond between these atoms is generally a covalent bond (sharing electrons, so this bond is strong) or ion bond (especially the bond between charged ions, so this bond is strong). This bond is much stronger than metal bonds. As a result, ceramic characteristics such as hardness and resistance of heat and electricity are significantly higher than metal. Ceramics can bind in single crystals or in polycrystalline form. The grain size has a big effect on the strength and characteristic of the ceramics, the finer the grain size (so it is said to be fine ceramics), the higher the strength and toughness. Most ceramic-forming materials have ionic bonds, covalent bonds, or both bonds. For example, the ionic bonds in the system are Mg-O, Al-O, Zn-O and Si-O with the quantity of 70%, 60%, 60% and 50% respectively. What is very interesting here is that in ReO<sub>3</sub>, V<sub>2</sub>O<sub>3</sub> and TiO, which are oxides and never show the presence of clay or can be deformed, but have relative electrical conductivity which can be equated with ordinary metals. In complicated crystals, there are various types of atoms and their bonds are mixed bonds in many ways. Crystal structure can be understood if it is remembered that crystals are composed of a polyhedron coordination combination, where one small part of the cation is surrounded by several anions. One example is silicate, which is an important raw material for ceramics.

In some locations that are often exposed to water, ceramics are better to use than vinyl and linoleum [2]. This material has a fairly good level of strength compared to vinyl and linoleum. Maintenance of ceramics is also quite easy. The type of ceramics applied in the child's room is divided into 2, one with small tile sizes (less than 30 cm) and the other one with large tile sizes (more than 30 cm).

This small tile ceramics are considered not too slippery, because there are many lines of grout joints between them. This type of ceramics is good to use in wet areas, especially for the swimming pool area, bathroom, or other messy areas.

Whereas, large tiles ceramics can be applied to the connecting corridor area between rooms, lobby areas, or areas that are quite crowded with children's activities. But this type of ceramic is not suitable for areas that accommodate water play activities because it has a fairly wide slippery surface.

As for concrete, it is a good material and cheaper than large tile ceramics. Concrete can be directly poured, printed, or coloured.

Wood material consists of natural and artificial products. Natural wood material is strong, easy to obtain, easy to clean and maintain, does not cause moisture, and is quite soothing to the atmosphere of the room. But this material is not suitable for messy play zones. Wood material is very suitable for communal areas, family rooms, offices, staff areas, and children's gym areas. Hardwood floors require polyurethane finishing and some require wax coating or resurfacing over time. Artificial wood floor material does not require more

difficult maintenance, but because the surface is synthetic, this floor does not sound like wood when someone walks on it.

Rugs are usually patterned or textured or both. This material requires a base and must be given double tape if the bottom surface is slippery. This is intended to ensure the safety of children's activities. Rug is an effective and fun way to describe an area. Rug can also add visual diversity and softness to the room or corridor.

## 2.2 Ceiling Material

Ceiling design is an important contributor to give life to a room. Ceilings have varying heights that indicate changes in function of a room and different levels of intimacy, to provide diversity and definition in the area [2]. In addition, it also provides diversity in light and sound quality. In narrow corridors or small spaces, high ceilings can give a broad impression and reduce the feelings of confined especially for children.

Designing the ceiling can help define the room below. The amount and style of the ceiling such as balconies, mezzanine and skylights can also vary. The ceiling material types can also be replaced, for example using plaster, wood, mosaic tiles, cement, and glass. Ceiling choice is very important in the baby's room, because babies are at an age where they cannot sit and crawl, so they will see the ceiling more often. When using acoustic materials, the texture of the material needs to be considered carefully in relation with how wide the room is. Surfaces with multiple points can make small rooms with low ceilings feel very narrow. Changes in ceiling height combined with changes in ceiling material will usually give a strong impression on a room. When costs become a limiting factor in designing a ceiling, the use of creative canopy can vary the ceiling's height and provide attractive aesthetic value.

## 2.3 Wall Material

Noteworthy when designers doing wall processings are some applications of materials that are often applied such as wood, cement, ceramics, rocks, carpets, styrofoam, and the use of exposed bricks to improve texture and color [2]. The texture and color of the wall has an important role for children who are trying to be familiar with their surroundings. The texture of the wall also functions as a sound controller, controlling the area boundaries, helping children to find direction, and can also be used to describe an area (such as the texture and color that applies to the floor).

Sometimes in a building there is an arched wall. This area with curved walls is suitable for lobbying, corridors and corner areas. For rooms with lots of furniture, curved walls are not easy to apply, because the furniture that will be applied may not match the shape of the wall.

## 2.4 Materials that Save for Children's Room (Low Toxic Materials)

Interior building materials or materials used for children's rooms must contain non-toxic materials [1]. The following

will be discussed about the types of toxic chemicals that usually found in certain building materials based on [2].

Emission systems from the withdrawal, production, use and disposal of materials, how the production process of building materials can affect the health system/ patients, visitors, staff, and the greater impact can be on people's health in their homes, offices and playgrounds.

Based on Ismail A's statement, Sept. 2011, a dangerous compound Volatile Organic Compound, or better known as VOC is a carbon-containing compound that evaporates at a certain pressure and temperature, or in a room with high vapor pressure at room temperature. The most commonly known VOCs are solvents, other types of VOCs are monomers and fragrances. Why VOCs are very dangerous and concern many people, so many countries make special regulations to reduce the impact of the VOC? One of the reasons is because VOCs react with Nitrogen Oxide (NO<sub>x</sub>) if it exposed to sunlight, forming ground level ozone and smoke, or fog. At certain concentrations in the air, ozone can affect health and environment.

VOC is regulated by limiting the content amount in products that can be emitted during the process or use. There are several types of regulations that regulate VOC content restrictions such as consumer product regulations, regulatory processes, facility regulations or facility permits. One of the regulations that is widely used or used as a reference by various industries in the world is EPA (Environmental Protection Agency).

VOCs can be emitted as gases from solids or liquids containing VOCs. The effects of VOC on health can be acute or chronic depending on the type of VOC emitted. VOC concentrations emitted in the room are much higher compared to the outdoor ones, because VOC can be accumulated in the room. For example, VOC emissions by new paint applied in the room will feel very bad and can even cause dizziness or pain in the eyes. Some examples of products that emit VOC and are used indoors are paints, cleaning products, building materials and furnishings, photocopiers, ink, glue, markers, and others.

The health effects of VOC include eyes, nose, and throat irritation, headache or dizziness, loss of coordination, nausea, as well as damage to the liver, kidneys, and central nervous system. Some organics can cause cancer for animals, some are also suspected or known to cause cancer for humans. Key signs or symptoms associated with VOC exposures are include conjunctival irritation, nasal and throat discomfort, headaches, allergic reactions on skin, dyspnea, decreased of cholinesterase serum levels, nausea, vomiting, epistaxis, fatigue, and dizziness.

Some ways to reduce the effects of VOC are to increase air ventilation when there is VOC emissions, follow the usage instructions on the label, do not keep the packaging open, dispose former VOC packaging and do not store the VOC more than necessary.

Consumer products that contain methylene chloride are paint, adhesive remover and spray paint. Methylene Chloride is known to cause cancer for animals. Methylene chloride can also be converted to carbon monoxide in the body which

can cause symptoms, such as exposure to carbon monoxide. Be careful when using products that contain Methylene Chloride, carefully read the usage instructions on the label or MSDS, and use the product in an open room.

Benzene is also one of the VOCs. Benzene can cause cancer for humans. Benzene emission sources include cigarette smoke, fuel, paint, and emissions from cars or motorbikes. To avoid benzene emissions, do not smoke inside rooms or public places, prepare adequate ventilation when painting, and dispose used paint or fuel packaging.

There is no standard made to regulate VOC emissions for non-industrial purposes, generally the existing standard is for industrial. OSHA specifically regulates Formaldehyde as a carcinogenic substance. OSHA set a threshold value (permissible exposure level-PEL) for formaldehyde is 0.75 ppm. There are many products used at home that can release or emit VOCs, i.e. carpets and adhesives, composite wood products, paints sealing caulks, solvents, upholstery fabrics, varnishes, and vinyl floors [7].

### 2.5 Kidzoona Children Playroom, 23 Paskal

Kidzoona is a fairly wide playground. The types of games provided here are playing sand prints, forming foam sequences, stringing bricks, doll houses, and others. Another interesting game that can be enjoyed while playing at Kidzoona is role playing. Children can actively participate in role playing as in the police station toy area where there are police uniform shirts that can be used by children. There is a mic that might be used for announcements (information desk). There is shooting practice, and also prison. In addition, in front of the police station there is a miniature police car that the sirens and lights can be turned on. Just like the police uniforms, firefighters uniforms and hats were also provided. There is a typical pole used for gliding officers (in role play) from the top to the bottom. Behind it there is also a fire truck that the sirens and lights can be turned on. Children can stand on the back of a fire truck to play water spray, so they can practice putting out fires on buildings.

### 2.6 Result

Based on a literature review of materials that are safe to used in the children's playroom, the ceiling, wall and floor material have their respective roles. This needs to be considered, so when children play in the room they can feel comfort and security, and also it can be useful to support their growth. The following will be discussed about the comparative analysis of materials used in children's playroom in the shopping area in Bandung.

#### 2.6.1 Floor Material Analysis and Result

Based on a theoretical review of floor material [8], there are 5 categories of safe material, namely carpet that has soft surfaces, vinyl and linoleum, ceramic, wood, and rug. But for using vinyl material, it is important to note the adhesive type used. Generally vinyl uses adhesives that contain chemical substances VOC (Volatile Organic Compound) which can endanger children's health, so in the study of safe flooring materials, vinyl is not recommended for children's play-

rooms. If the designer wants similar material, it is advisable to use linoleum which contains natural ingredients.

Carpets can provide a quiet and warm effect to a room thanks to its general nature as an absorptive materials. For children, this material has an important role to sharpen sensitivity to texture and provide a long comfort in the room. Linoleum is a floor coating material made from a mixture of linseed oil with wood flour, cork powder, and strong fibrous fabric. With these ingredients, linoleum becomes an environmentally friendly coating because it can be recycled and easily broken down. Linoleum has elastic properties, making it easy to install, very easy to clean and not flammable. This elastic material is also anti-termite, making it more durable than porous parquet floors. Linoleum has a smooth, but not slippery surface. So that it can support the safety of children in activities and improve children's motor movements.

Ceramic is known to be easily broken because it is made of a mixture of metal and nonmetal elements, but ceramics are resistant to high temperatures. Ceramics have high compressive strength. Its surface is rich in various types, patterns, textures, prices, and forming materials, so it can stimulate children to recognize a variety of colors and motifs. Maintenance is also quite easy because it has high physical strength, the color lasts very long, and is easy to clean. The surface is waterproof and resistant to knife scratches and heat resistance (i.e. fire). This material is suitable for children's playroom with high intensity of dirty activities, such as playing sand, gel, water, and so on.

Wood are often used for flooring materials are usually Teak wood and Merbau wood. Wood has good durability. Wood can absorb heat and store it for a while so the room will feel warmer. Wood floor is safe for children doing activities on it and prevent them getting rheumatic disease because it has a warm nature. The surface is not too hard so that it can minimize injury if the child falls on it. If the color of the wood floor surface starts to fade it can be renewed so that it becomes like new again by repainting it without having to replace it with a new one.

Rugs has the same characters as carpet. But the rug can be moved around. Rugs also have a role in determining children's playing areas.

These five materials can be applied in children's play rooms. Every material has its own pattern and role. This can be seen from the results of the case study analysis in an indoor children's playground in one of the shopping centers in Bandung, known as Apple Bee: Kids Playground. The following picture is one example of linoleum material application on the floor in a mini kitchen room.

#### 2.6.2 Wall Material Analysis and Result

Some materials are often applied to walls, such as wood, cement, ceramics, rocks, carpets, styrofoam, and exposed bricks, to improve the wall's texture and color [3]. The texture and color of the wall has an important role for children who are trying to be familiar with their surroundings. The

texture on the wall also functions as a sound controller, controlling the area boundaries, helping children to find directions, and can describe an area. The following are the analysis results of the wall materials characteristic that is suitable to be applied in the early childhood playroom.

Wallpaper has advantages in the quality of the design, and the details of the images displayed are very diverse. However, wallpaper from paper material has the ability to absorb stains, making it easy to get dirty. In addition, because the material is made of paper, this material is easy to tear as well. So specifically for children's playrooms, it's better to choose vinyl wallpaper material. But as has been discussed in the analysis of floor material, it is necessary to note that the type of vinyl adhesive must be free of chemicals. Wallpaper is good for children's development when they play, because children will be helped to recognize shapes and colors through the wallpaper motif provided.

Wall covering has characteristics similar to general fabrics such as silk fabrics, weaving, cotton, and linen. This material has various motifs, textures, and colors. For wallpaper that comes from a very fine fabric, it needs extra precision in the installation so that it would not be damaged. One of the way is by using a special base paper. For this reason, it should be carried out by pairs of experts who are experienced in this field. This material is safe for children's playroom, where children will be protected from hard wall surfaces.

Multicolored wood is caused by different fillers in the wood. In general, wood has calming effects, viewed from its visual color. This material is recommended for passive playing areas, such as reading book areas, drafting areas, and writing or drawing areas.

### 2.6.3 Ceiling Material Analysis and Result

The material used on the ceiling can make its own variations in the room. Although it is located above and far from the reach of children who are playing in the room, the material can still provide stimulants for children's play activities. The effects that arise can come from colors, shapes, and heights. The following is a more detailed analysis of the ceiling material in the children's playroom.

Gypsum board has a relatively larger size compared to other materials. With dimensions of 120 cm & 135 cm wide and 2.4 m & 3.6 m long making gypsum can be quickly applied to cover a large ceiling area.

Assembling gypsum is very easy, it only requires a few tools. Gypsum can be cut with a knife or various saws, and can be connected with various tools, such as screws, nails, and staples. This material has a light weight, making it safe to used in children's play areas. Gypsum can be made into a dynamic pattern, so it can provoke the children to play actively. The paint used to coat gypsum has now also developed a lot using anti-toxic materials.

Acrylic ceiling material is considered safer than glass. Just like gypsum, acrylic can be patterned as desired, both geometric and dynamic. This material is recommended for playing areas specifically that support the motoric activities of children, because of its bright and transparent material characteristics.

Multicolored wood is caused by different fillers in the wood. In general, wood has calming effects, viewed from its visual color. This material is recommended for passive playing areas, such as reading book areas, drafting areas, and writing or drawing areas.

Based on the results of the analysis explanation regarding materials that is safe for the children's playroom above, it is necessary to look at the material applied in case studies in the field. One example of the case discussed is Kidzooona at Paskal 23 Shopping Center, Bandung.

With the diversity of activities provided in the playroom, the interior materials used need to support these activities. Here is the material analysis in Kidzooona playroom:

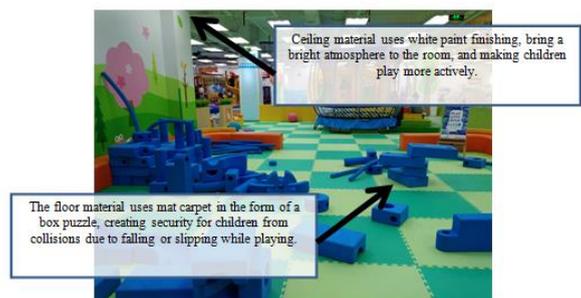


Figure 4.1 Floor and Ceiling Materials in Kidzooona



Figure 4.2 Wall and Furniture Materials in Kidzooona

## 3. Conclusion

Based on the case study of the Kidzooona play area by field observations, the interior material in the playroom is currently well applied, as seen from the application of materials on wall, floor, ceiling, and furniture elements. Finishing material for this room element becomes an important part of child's environment while doing activities and playing in the playroom. They can support the child's growth process, especially in terms of material stimulation of children's play activities. This can also help children freely explore all corners of the room.

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