

# Physical Environment Classroom: Principles and Design Elements of Classroom in Early Childhood Education

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**Abstract**— This study explores the importance of the physical environment on several classrooms early childhood learning center in Sidoarjo, Indonesia. In this study obtained data from an interview with teachers ( $n=10$ ) to understand the importance of the physical environment of the classroom at the learning center. Thematic analysis of the interviews revealed two main themes, namely the principle of the learning environment in the classroom (the principle of classroom arrangement of the environment and principles in children) and the design elements of the physical environment of children's classrooms (lighting, color combinations, doors and windows, sky and walls, furniture or furniture selection: table, chair, shelves). The findings reveal that the principle in terms of spatial arrangement may reflect the distinctive features of each learning center (eg IT centers are identical to technology and computers, religious centers are identical to religious, UKS (school health unit) centers are identical to the role playing doctor and pharmacies), provide opportunities for children's learning activities by providing APE (educational game tools) according to learning activities in the center, providing enough space so that children can move freely, not using a barrier in the center of the room to make it look wider and children can play freely. While the principles applied to children in the form of discipline, responsibility, character, independent, orderly, and polite in the classroom. Meanwhile, the elements of the physical classroom environment design with attention to lighting, color combinations, doors and windows, floors and walls as well as furniture selection (tables, chairs, shelves). Both things are done well so as to create a comfortable and safe atmosphere for the needs of children when involved learning in the classroom.

**Keywords**— *physical environment, design element of classroom, learning center, teacher perception*

## I. INTRODUCTION

There is a growing awareness about the importance of various learning activities that children can do during school so everything is well prepared. Early childhood education institutions can prepare learning models that are used and environments that can support early learning. Learning that children do at school can not be separated from the physical environment of the classroom because almost every day the children will do all the activities in the classroom. However, empirical studies that examine features of physical environments such as colors, wall surfaces, lighting,

acoustics, and vertical spaces and how development designs are rarely encountered.

Children are active observers, discovering, exploring, absorbing information and distinguishing objects within their environment. They can gain rich sources of information that exist in the environment extensively over time and space so as to constantly guide them to see and learn at a higher level. Therefore, learning can not be separated from the physical environment in which it occurs [1].

It is widely recognized that the physical environment also hosts the educational process that has been considered by many renowned educational programs and organizations, respected and even applied. In the context of the Reggio Emilia program, for example, the physical environment is referred to as the "third educator". Other educational programs, such as High Scope and Sure Start on the importance of the physical environment and have set standards on how classrooms should be organized so that program objectives can be met. "Well-designed environments support the emotional well-being of children, stimulate their senses and challenge their motor skills"[2].

Motivated from above explanation, this study explores the importance of the physical environment on several classrooms in early childhood learning center.

The rest of this paper is organized as follows: Section II describes the theoretical background. Section III presents literature review. Section IV describes the materials and proposed methodology. Section V presents the obtained results and following by discussion. Finally, Section VI concludes this work and highlights future work.

## II. THEORETICAL BACKGROUND

This section presents the theoretical background.

### A. Principles of the physical environment of the classroom

Learning in the classroom, there are students with specific goals, different needs and abilities but must share the same resources and materials in completing tasks, and move around the same space. Activities that children do in the classroom are so diverse that it is necessary to adjust the area of activity to the physical needs. Two types in the physical environment of the entry zone and the messy zone and the dry zone (quiet zone and active zone): (a) Entry Zone

(entrance area / corridor) is the entrance area (corridor) to the classroom can be used as a separation line for children and parents, where school information boards, helmet / jackets, shoe shelves, and others; (b) Messy Zone (dirty / cluttered area) is an area or playground that needs material that is wet and prone to dirty like water, sand, or paint. Activities that can be done in messy areas such as art activities, cooking activities, science activities; (c) Active Zone (active area) is an area or place that requires physical activity and motor training such as gymnastics, motion and song play, beam games, and drama games; (d) Quiet Zone (quiet area) is an area or place that emphasizes concentration and focus. Activities that can be done such as reading, math, and writing [3].

Therefore, other principles in creating the physical environment of the classroom for early childhood may take into account, (a) security; (b) color selection; (c) the texture of the materials used; (d) furniture or furniture used by children. Safety and comfort are the top priority because children still need intensive supervision [4]. The physical environment of the classroom is organized with attention to the arrangement of the room, the placement of learning equipment, the selection of furniture used, and attention to the needs of children's play activities at each learning center. Classroom planning can facilitate children to play alone, small groups, large groups, safe, clean, comfortable and accessible to children with special needs [5]. The principle was created because the hallmark of the physical environment of the classroom as a learning center that allows children to learn while playing without pressure. By paying attention to the principle, all aspects of children's intelligence will develop optimally in accordance with the needs of growth and development.

#### *B. Design elements physical environment of the classroom (lighting, color combinations, doors and windows, floors and walls, furniture selection: tables, chairs, shelves).*

Each physical design of the space has independent variables that affect the behavior of the wearer, namely: size and shape, furniture and arrangement, color space, and sound, temperature and lighting. The design elements of the classroom and the facilities contained therein must fit the size of the children. The classroom should also have maximum natural lighting. The selection of colors and textures on the walls of the classroom is very important, because the color and texture of the walls will give the impression of space that can affect the psychology of children who are in the classroom.

##### *a. Lighting*

Lighting is necessary to ensure that the current activity is going well according to its purpose. "The lighting contained in the classroom can be either natural or artificial light" [3]. This type of artificial lighting can use a warm, white light like the light emitted by an incandescent light bulb is a concentrated light source. Variations in lighting not only add environmental interests but also create an atmosphere in support of learning activities.

##### *b. Color Combination*

Inside the classroom there are various play equipment, furniture and room walls with a variety of colors. Color selection in the classroom can use fun color combinations for furniture, floors, ceilings, walls and other interiors [3]. "Color, materials and furniture are important factors in creating the feel of the room as a beautiful, safe, and caring". The use of these colors can provide a comfortable and fun atmosphere to support the development of children.

##### *c. Doors, Windows, Floor and Walls*

Floors, walls, carpet and other surfaces are made of easily cleaned material free of fleas, mold and dust [5],[6]. Meanwhile, windows and doors serve to look from one room to another so that the use of windows and doors should take into account the size, materials and placement that suits the needs of the child. The window is one of the opening of space that serves as a link between the inner and outer space both visually and as the air and light circulation in the space. The window selection takes into account the appropriate materials, sizes, designs and placements. While the doors used can be made of metal, wood, glass or a combination with attention to the appropriate shape and size and placed in the middle or edge of the classroom [3].

##### *d. Furniture: table, chair and shelves*

The furniture used is child-sized, comfortable to use for example wooden benches. Although furniture is "small size" should be adjusted to the ergonomic standards applicable to each age group [6]. The table with respect to variations of different height measures according to the child. Seats adjust height, back seats, armrests and armrest for children [3]. Tables and chairs adapted to the needs of both weight and size children, do not have rough furniture surfaces because they can hurt children [5].

The principles and elements of physical environment design are two aspects related to the physical environment of the classroom for early childhood. The development and readiness of school children is primarily influenced by the preschool environment as they interact with the environment in their schools. The results of research on the design of the physical environment have an impact on the initial learning from the perspective of educators and parents agree that the quality of the staff and the quality of the physical environment program of the initial learning center contribute significantly to the development and learning outcomes of children [5]. Although, the study has not yet demonstrated the physical environment of the classrooms from the different types of learning centers that can support early childhood learning. The results of research on the impact of classroom design on primary school students' learning in the UK reveal seven major design parameters (light, temperature, air quality, ownership, flexibility, complexity, and color) have been identified explaining the 16% variation in student academic progress [4]. The impact of the overall level of analysis provides some support for the importance of "in-out design". Although, the study has not shown classroom design parameters that can be applied to early childhood education institutions by adapting to climate in Indonesia.

Children learn through social interaction, play, and environmental exploration so they need different classrooms and open spaces to be compared to the higher education classrooms. The importance of creating a classroom physical environment in accordance with early childhood development so that they feel more comfortable to interact with their friends. The existence of these learning centers allows students to explore opportunities with a more direct approach. All these available learning centers give children the opportunity to use their imagination and show their creativity. This will certainly be very fun and make the child want to learn more.

### III. LITERATURE REVIEW

This literature shows that two aspects of a physical environment are believed to be influential in the child's early learning center: the physical classroom principles of the classroom and elements of the physical classroom environment design (lighting, color combinations, furniture selection: tables, chairs, shelf). Previous research by Berris & Miller explores the quality and importance of the physical environment of two early childhood learning services on the Sunshine Coast in Queensland [6]. The results of this study indicate that both the educator and the parents agree that together with the staff and the quality of the program, the physical environment of the initial learning center contributes significantly to the development and learning outcomes of the children. However, in our study it explores the importance of the physical environment in some classroom learning centers in an early childhood education service. The learning centers provided include IT center, block center, religious center, and several other centers. The availability of child learning centers. Reflects the distinctive features of each center. Teachers make efforts to create a physical environment in several learning center classrooms to benefit children's development.

The environment must be adapted to the child's development although it varies according to individual growth, the maturation and progress of each child is largely in line with their age. The study Abbas investigated the relationship between the physical environment of pre-school public and children's play behavior by observing the three types of fission environment of 20 classrooms in 10 preschools and five play behavior children were investigated. These results indicate the presence of physical environmental influences on the behavior of children who are supported and recommended for best practice [8]. However, the current study does not investigate the relationship between the physical environment and the behavior of children's play. We investigated regarding the principles of the physical environment of classrooms in accordance with the needs of early childhood. In line with research on the physical environment according to the needs of children, identifies four main foundations for meeting the physical environmental needs of the child's classroom (a) the environment that encourages the child to move by providing opportunities for the child to engage in activities safely but also to be balanced with the limitations that the child understands; (b) an environment that supports the child's enjoyment to explore the surroundings and the

atmosphere of the classroom such as playground; (c) an environment that helps the ability to discover something new, different places of activity, easy to access and easy to understand arrangements for children; (d) the environment that encourages the child to manage his or her control [3].

Other literary studies of the physical environment of the classroom include the implications of wall volume and color, lighting, equipment, playroom settings, environmental comfort, maintenance and security. Research Barret focuses on examining schools and classrooms that link to student academic progress statistics. Researchers assessed 153 classrooms in 27 schools to measure school features and classrooms. Data on the 3.766 students who occupy the space were also collected including the dependent variable of progress in learning. The supporting hypothesis is that students' academic progress will depend on various factors drawn from all three design principles. The three design principles include naturalize, individualization and stimulation level used to develop 10 classroom parameter designs. 10 parameters individually correlated significantly with students' academic progress. Multi-level regression modeling was then used (including student factors) and resulted in seven key designs identified most predicting student progress including are light, temperature, air quality, ownership, flexibility, complexity, and color [9]. However, the current research investigates two key principles in the physical environment of the classroom, namely the principles of physical environmental arrangement and principles applied to children. Both principles are very supportive in creating a comfortable and safe classroom environment for early childhood. While on the physical classroom design elements that support early childhood learning are lighting, color combinations, doors and windows, floors and walls, furniture selection: tables, chairs, shelves.

Structuring the physical environment of the classroom begins with recognizing the needs of early childhood activities and recognizing the existence of a room that will be used as a learning center for children in the classroom. Concerning this, research Rentzou found that child development and the quality of their experience were influenced by (a) the size of school facilities; (b) class size and density - i.e. the space available for each child; (c) the way the environment is governed - is a separate activity area provided; (d) quantity and quality of materials; (e) furniture and appliances (furniture used in children's sizes, comfortable to use) even though the furniture has a "small size" should be adjusted to the ergonomic standards applicable to each age group; (f) the existence of space for private activities; (g) ceiling height, room texture, wall color and made of easily cleaned material; (h) noise level [7].

The physical environment should provide children with a sense of stability and softness of simple structure designs as well as the use of various textures, colors and lighting [10]. Research Read found that spaces with different ceiling heights and wall colors may be too stimulating for preschoolers, especially when considering small room sizes of differentiation in physical space [11]. Wall color differences are associated with higher levels of cooperative behavior among preschoolers. The table with respect to

variations of different height measures according to the child. Chairs needs of both weight and size children, adjust height, back seats, armrests and armrest for children. The tables and chairs do not have rough furniture surfaces because they can hurt children [5, 4].

#### IV. MATERIAL AND METHODOLOGY

This section presents the material used and the proposed methodology.

##### A. Data

Early childhood education service located in Sidoarjo, a center-based early childhood education service was selected for this study. This educational service is in a residential area by providing five learning centers for 20 students and one teacher in each class. The study was conducted in five learning center spaces namely IT center, block center, cooking center, religious center and UKS (school health unit) center. Research data obtained through structured interviews lasts about 30-60 minutes with educators from each class. All participants are female educators with ages ranging from 26 to 50 years old.

##### B. Methodology

This study uses qualitative research. Research process that is conducting permission to the institution of early childhood education about this research. Educators is required to participate in the interview. Structured interviews cover the following areas: whether the principles of the physical environment and element design of the physical environment classroom are important factors in the child's learning center. All interview results are recorded, recorded and then transcribed.

The transcripts data were analyzed using the Miles and Huberman model approach which is interactive, in which one stage with the other is interconnected. Data analysis is done through three activity paths namely data reduction, data presentation, and conclusion or verification. For this study, inductive codes and categories are determined based on concepts drawn from data collected. For this research, the validity of data can be done with triangulation of research data sources obtained in the field.

#### V. RESULT AND DISCUSSION

This section presents the results obtained and following by discussion.

##### A. Result

TK Aisyiyah Bustanul Athfal Sepanjang is to implement a central learning model by observing four types of physical environment that support learning activities. The four types of physical environment include (1) entry zone (corridor class area) located near the door and used as a place for bags or slipper shelves in each classroom; (2) Messy zone (dirty / messy area) is found in several classrooms and is usually used as a children's playground; (3) Quiet zone (quiet / quiet area) is used as a place of activity that requires calm such as reading and writing activities; (4) Active zone or active area is an area that can train a child's gross motoric. The nine centers owned by this kindergarten include IT centers; center of worship; UKS (school health unit) center; literacy

center; math center; arts center; cooking center; center of body work; science center; and the center of cultivation. Central learning activities are carried out in a moving class every day where children move classes from one center to another according to a predetermined schedule. Efforts are made by educators to be able to support the learning activities of the center in a moving class by paying attention to the principles of the child's learning environment and the design elements of the physical environment of the classroom.

##### a. Principles of arranging the physical environment of the classroom

Educators reveal two principles in the learning environment, namely the principles applied to the arrangement of the physical environment and the principles applied to children. The principle in structuring the physical environment of the classroom is done according to the characteristics of each center by providing facilities according to the needs of centers such as IT centers are identical to technology computers, centers of worship are identical with religion, UKS centers (school health units) are identical to playing the role of doctors and pharmacies. The interviewee's results revealed that:

"To provide a physical environment that provides opportunities for children's learning activities can be done by providing APE (educational game tools)

according to learning activities at the center" (Principal).

"Providing games that make children interested"

(Teacher 1).

The principle of room arrangement must give children the opportunity to do activities safely and comfortably. To create a sense of security in the classroom, namely:

"Specifically, the computer room is restricted so that the child does not pass behind the CPU because there are many electrical cables that endanger the child" (Teacher 3).

"Providing enough space so that children can move, and the teacher does not put dangerous tools and gives insight into dangerous objects so that children can use them well so as not to endanger friends, themselves or even others" (Teacher 4).

"Do not use too many barriers in the middle of the room so that classrooms look wider and children can play freely" (Teacher 5).

In addition to this, the arrangement of seats lined up backwards and semicircular will have different effects for the ongoing learning activities for early childhood. Inside the classroom there are also furniture (tables, chairs and shelves) for children so that furniture arrangement also has an impact on children's activities. The more furniture there is in the classroom, the smaller the room will feel, and the opposite. Thus, the arrangement of furniture in the classroom plays an important role in influencing the activities and behavior of the wearer as shown in Figure 1.



Fig 1. The layout physical environment of the classroom

The principle applied to the arrangement of the physical environment of space is done in order to create an atmosphere of classrooms that provide opportunities for children to conduct activities safely and comfortably but also balanced with limits that can be understood by children. While the principles applied to children are discipline, responsibility, character, children can be independent, orderly, and polite in the classroom. As explained that the efforts of educators to create a sense of comfort in the classroom:

"The teacher gives understanding to students not to fight while playing, the teacher has a patient and friendly attitude, instilling the character of mutual sharing, mutual respect and discipline to children" (teacher 1, teacher 8, teacher 4, teacher 7).

The results of the study on the principle of the physical environment of the classroom are carried out by arranging classrooms that reflect the characteristics of each center. Efforts to provide a physical environment that gives children opportunities to do activities in the classroom can be done by providing APE (educational game tools) according to daily learning activities, providing games that make children interested, providing space that is free enough for children to move, and providing games with rules. Whereas the principles applied to children are discipline, responsibility, character, children can be independent, orderly, and polite in the classroom. This is done to meet the needs, security, and comfort for children when participating in learning activities in the classroom so as to create maximum development according to the age of the child.

**B. Design Element of the physical environment classrooms (lighting, color combinations, doors and windows, floors and walls, furniture selection: tables, chairs, shelves).**

The quality of the physical environment can be associated with positive learning outcomes when designed with regard to interior design (eg room size, furniture, layout, lighting, and noise) and exterior design (eg outdoor space, nature, and playground equipment) space in a child's learning environment. Design elements in the physical environment in the classroom must support various teaching strategies for early childhood learning. Regarding this, the findings in the field explain some elements that support the physical environment in the classroom including:

**a) Lighting**

There are two types of lighting, natural lighting and artificial lighting. Natural lighting comes from the sun through windows, ventilation, etc., while artificial lighting uses lights, candles, etc. Lighting must be adjusted to learning activities and available space. The lighting found in the classroom is artificial lighting with 2 - 4 lights and natural lighting through vents and windows. In the interview results the educator explained that:

"The natural lighting of classrooms is obtained from sunlight through ventilation while artificial lighting is obtained from white luminous fluorescent lights" (Principal, Teacher 4, Teacher 8, Teacher 2) as shown in Figure 2.



Fig 2. Lighting in the classroom

Lighting comes from the sun through vents and windows, there are two windows on the right and left side of the classroom, with 2 natural light sources, natural lighting can be used optimally. While artificial lighting uses lights as support when the weather is cloudy or dark.

**b) Color combinations**

Color is also an important element in classroom arrangement for children. Color helps in terms of visualization and the impression of a psychologist for the appearance of characteristics of a space. Findings showing colors on the classroom walls tend to use green. Educators reveal that:

"The green paint used is an icon of UKS (school health units) and as a healthy school" (Principal, Teacher 3, Teacher 4).

However, some classrooms have wall color combinations with learning theme paintings such as my homeland, my needs, work, and animals.

"The wall uses learning theme paintings such as science center classrooms with the theme of work and transportation, literacy centers with fruit themes and needs, arts centers with the theme of my homeland, and a math center with animal themes" (Teacher 5).

In addition to the color of the walls of the room, the findings show the tables and chairs are green, yellow, blue, red, dark brown and light brown. While the shelf also has a variety of colors including yellow, green, red, blue and yellow as shown in Figure 3.



classroom, in the form of discipline, responsibility, character, children can be independent, orderly, and polite in the classroom. Some of these principles are the efforts of educators to create a sense of comfort and sense of belonging when children are in the classroom. Human comfort because the physical environment is proven to influence children's play behavior, thus affecting learning [7]. Educators give understanding to students not to scramble while playing, the teacher has a patient and friendly attitude, instilling the character of mutual sharing, mutual respect and discipline to children.

Overall, current research finds two principles in a child's learning environment, namely the principle of structuring the physical environment of the classroom and the principles applied to children. The two principles applied are expected to achieve the goal of providing an appropriate learning environment for early childhood. This principle can significantly strive for educators in creating a physical environment of classrooms that are safe and comfortable for children's development. These findings are in line with previous research that the development of children and the quality of their experiences are influenced by (a) the size of school facilities; (b) class size and density; (c) the way the environment is regulated is a separate activity area provided; (d) quantity and quality of materials; (e) furniture and equipment; (f) the existence of space for personal activities; (g) ceiling height, room texture, and wall color; and (h) noise level, [6]. Likewise redesigning the classroom environment tends to contribute to children's psychosocial and psychomotor development if the game settings are designed to meet the needs and interests of children [14]. The right redesign of the classroom environment can support students through the development stage and help in achieving their potential better.

A physically designed environment usually has abstract and emotive responses to space and seeks to clearly articulate specific or general design features such as scale, shape, organization, quality of light and air enabling children's development and learning. The design elements of the physical environment of the classroom include (1) artificial lighting with 2 - 4 fluorescent lamps and natural lighting through vents and windows, (2) color combinations in space including wall colors, furniture colors such as green, yellow, blue, red, dark brown and brown young, (3) doors and windows are made of wood, the door is located in the middle of the room and windows with wide openings, and serves as a comfort factor in the classroom, (4) selection of furniture: tables, chairs, shelves chosen according to children's comfort and physical needs especially table height, made of materials that are safe, easy to use by children. Careful consideration of the type, material and size of furniture used by children in the classroom is very important. Tables and chairs with attention to variations in size of different heights according to the child [3]. In line with the findings of other studies, in adulthood students consider a high level of physical environment compatibility for furniture, facilities, and lighting aspects; while the moderate level for indoor air quality and color [13].

Thus, it is clear that the physical aspects of the learning environment must be well planned because they reflect the

expected ideas, values, behaviors and culture in the classroom. A well designed institution for early childhood education, equipped with good spatial and aesthetic quality, safety features, proper use of materials, the right touch of furniture will contribute to a physical environment conducive to teaching and learning activities. Emphasis on both aspects of the learning environment will maximize children's development and learning.

## VI. CONCLUSION AND RECOMMENDATION

Researchers and teachers can obtain a more complete understanding of the physical environment of the classroom for children by paying attention to the principles and design elements of space in the learning center. The principle of the learning environment and the design elements of the physical environment of the classroom are important in the learning process so that it supports aspects of child development. Overall research findings show that (1) the learning environment, especially early childhood classrooms, has two principles, namely the principle of spatial planning and the principles that are applied to children when participating in classroom learning; and (2) design elements of the physical environment of the classroom include lighting, color combinations, doors and windows, furniture selection: tables, chairs, shelves.

In the principle of the child's learning environment shows that the arrangement of classrooms can reflect the characteristics of each learning center, providing opportunities for children's learning activities by providing APE (educational game tools) according to learning activities in the center, providing enough space so that children can move freely, not many use a barrier in the middle of the room to make it look wider and children can play freely. On the other hand, educators apply the principle to children when in the classroom in the form of discipline, responsibility, character, independence, orderliness and courtesy. In the design element of the physical environment of the classroom includes natural and artificial lighting, color combinations in space, doors and windows made of wood as a factor for the class room's occupancy, furniture used is made of wood and adjusts the physical needs of children.

The physical environment of the classroom is designed to meet children's interests and needs, allowing children to take advantage of their potential. In addition, the objectives of the learning environment must also be designed to guide children towards a self-regulated process, provide opportunities for active learning, and develop all aspects of development that children have. Thus, classrooms in early childhood must encourage learning, create a sense of belonging, convey the message that the classroom is a trusted, safe and friendly place for children. The efforts of educators in creating the physical environment of the classroom are carried out to meet the needs, security, and comfort when doing activities in the classroom so that it supports the maximum development according to the child's age.

### A. Future Work

Limitations of the study were mainly on the relatively small sample size of 15 participants who participated in an early childhood education institution. Future research can be carried out with larger and more diverse samples to fully understand the important role of the physical environment of classrooms in various early childhood education institutions. In assessing the physical environment, further research can use the Early Childhood Environment Rating Scale - Revised (ECERS-R) so that the results obtained are more optimal and supportive.

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