GREEN DESIGN AS A MODEL FOR HEALTHY DAYCARE CENTERS IN LESOTHO: “AN ENHANCING AND NURTURING ENVIRONMENT FOR CHILDREN”

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ABSTRACT

For the average working class family in Lesotho, the children spend eight to ten hours per day in day care centres for the first five years of their lives. With the rise in problems linked to the environment, health and development in children, creating a conducive, nurturing and healthy living space in day care centres is paramount. In the construction of day care centres, care should be exercised to avoid exposing children to substances like chemicals, toxins in building materials and interior finishes. These pose danger to children’s neurological (nervous) system’s development. This study therefore explores the green design alternative since it is an approach to building that minimizes negative impacts on human health and the natural environment by choosing eco-friendly building materials and building practices. The study was a case study of Lesotho Daycare Community Preschool (LDCP) as well as document analysis of day care center development in Lesotho. This included descriptions and explanations from studies related to the subject. Observations, interviews with day care centre owners, interviews with ministry of education and training officials and study of visual documents of community preschool general designs also helped gather information. Findings suggested that the use of non toxic building materials and good designs for ventilation systems enhance children’s physical and mental development.

Keyword: Healthy environment, day care centres, child growth, green design

1. INTRODUCTION

This study is about creation of healthy environments for children in day care centers. The study focused on the importance of healthy environment and how to create healthy living space for children. It was carried out by studying Lesotho Daycare Community Preschool and (Leratong Preschool, ECCD) in Maseru as a case study. Literature related to the development of ideal environments for day care centers was analyzed in depth.

Background of the Study

Childcare centers originated in Europe in the late 18th and early 19th centuries and in England and France they appeared in the 1840s. In the 1950s they were established in the United States of America and they then spread Worldwide even to Africa. The other term for child daycare centers was nursery at around that time.¹

Formation of child care centers in Lesotho

The earliest form of childcare center in Lesotho was formed in 1972, in Maseru district. It was started by nine nurses who were from women associations; Lesotho National Council of Women (LNCW) and the Lesotho Day Care Community Centre (LDCCC) after visiting Israel, where they took the idea from.

For Lesotho to have child care centers, Early Childhood Care and Development unit (ECCD) was first formed. Since then a proliferation of ECCD services called by different names like daycare centers, kindergartens, preschools, nurseries and crèches was experienced. In 1983 the Lesotho Preschool Daycare Association (LPDCA) was set up. It was set up as an Umbrella for such schools as well as liaison with the Ministry of Education.

¹ Michel, 2011
It advocated for the creation of an ECCD unit or department within the Ministry.

In 1995 the Ministry of Education (MOE) then absorbed the preschools into its mainstream and they were officially called ECCD centers. The 1995 Education Act also recognized the existence of the ECCD unit programme in Lesotho.

Child daycare centers are places where young children receive daytime care and supervision from teachers or care takers. ECCD mission was to provide early childhood care to all young children from 3-5 years of age in Lesotho. Secondly, to bring a variety of quality programme options in order to facilitate children’s growth, development and learning.

The first daycare centre was termed Mantloaneng. In Sesotho this is where children take part in all sorts of play and games and mostly imitate the adults they live with and act like them. The Centre was operated to provide primarily physical care of the young children while mothers are at work. The daycare was in the form of a playing place but not educational and parents paid fees for the service given. The childcare centre is now called Lesotho Daycare Community Preschool (LDCP).

Growth of families with both spouses working resulted in large numbers of children needing care throughout the whole day. According to Ministry of Education through Early Childhood Care Department, only children aged 3-5 years were admitted at LDCP. Hours of operation are from 7 a.m. to 6 p.m. during summer and from 7 a.m. to 5 p.m. in winter.

At around 1980, the Likonyaneng day nursery school was established in Lesotho. The school admitted children from 6 months to 5 years of age. The place is now called the Lesotho Government complex building.

The advantages of daycare centers include reliable care with established hours when caregivers or teachers will always be available for parents. Settings present the opportunity for children to interact with many playmates every day. Moreover, the interaction of many playmates helps in the development of young children.  

Statement of the Problem

In Lesotho, anyone with access to finances to start a daycare centre can do so without considering key factors like fitness of the buildings to house toddlers, let alone the building material and the type of finish on the buildings. Such architectural inconsideration can cause harm to children at such a crucial formative stage of their lives.

Aims of Study

This study aims to sensitize designers in the built environment on sensitivity of material when building daycare centers. They will be aware that designing for children requires a clear understanding of the ways that children develop, learn, play and interact with the world around them. The designers will realize the importance of designing healthy living space in child daycare centers and the impact to the children, the importance of arranging outdoor environments just like the indoor environment.

Objectives of the Study

The study is to evaluate the impact of indoor and outdoor environment on children’s physical and mental development. To investigate how spatial arrangement in day care centre affects the activities held and mainly children’s “play” which is their most important activity and help in growth and development. Lastly, find out how green design contributes to create healthy and comfortable environment for children.

Theoretical Framework

This study is framed by the concept of Green Architecture, also known as sustainable architecture or green building. This is a theory, science or style of buildings designed and constructed in accordance with environmentally friendly principles. The theory guides construction with minimal use of material and emphasizing the use of material that is safe to both the environment and human life.

Literature Review

The interior space protects a man and provides an environment that maintains his well being. Space can be considered in number of view points, it is clearly a permeable volume bounded and formed.

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2 Mrunal, 2018

3 Ragheb, El-Shimy and Ragheb: 2015
by the physical nature of a building. Therefore Architectural Interior space is the volume enclosed by the arrangement of the building. It gives a sense of shelter and enclosure, due to the surrounding walls, floor and ceiling planes of interior space.

There are different activities performed within the interior space of child care centers. Walls, floor and ceiling planes are designed and finished with different materials appropriate for the function of each space. Other finishes are applied for their aesthetic purpose. The classrooms, multipurpose area, eating area and offices are furnished and organized according to their functions.

Unfortunately some finishing and building materials are hazardous to occupants and the environment as well. Pollution caused by some materials such as asbestos, furnishing products and materials with VOCs used therein, affects Indoor Environmental Quality (IEQ) and outdoor air quality.

Employment of green design and sustainable principles help avoid use of hazardous building materials by developing and using mainstream products that are natural or produced from nature, renewable or even recyclable.

**Chemicals and toxins in building materials and finish**

Within a typical child care centre, there are many chemicals and toxins within the interior space, in furniture, toys and building materials that are harmful to the health of children. In different building materials different substances are used in their production. The substances include the Volatile Organic Compounds which is a wide range of organic substances that emit toxic gases.

Selection of materials should be such that one takes into consideration not only the composition and emissions of materials, but also the installation and maintenance requirements. For example, if the specified tile or carpet product has zero emissions but then require an adhesive that contain VOCs, then the extra care that was given to select the safer material tile or carpet is cancelled out.

There are other chemicals like Phthalate; its emissions also put young children at health risk. According to Environmental Protection Agency of America the VOCs are up to ten times more concentrated in the interior environment than in the open space. Some of the chemicals according to earlier researches by GREENGUARD Environmental Institute (2010) are associated with endocrine disorder, reproductive and developmental toxicity, asthma and allergies. In high levels some chemicals may lead to one being in coma or to death.

To protect against toxins, designers must specify inert materials, these are materials that outgas quickly or has had enough time to outgas sufficiently before use. The best route is to avoid and prevent toxins that could occur in the environment. Prevent moisture (which support the growth of microbes and molds), filter air as it comes and goes. The last resort is to seal offending materials completely in non-offending materials.

**Indoor Air Quality**

Indoor air quality is naturally affected by the outdoor pollution. Lisa (2008:37) argues that also indoor air quality is affected by the interior materials and substances. There are different finishing materials within the interior space containing different substances that pollute air. That is why in some cases the indoor space has higher level of pollution than outdoors. Air quality within the interior space is at times affected by the ventilation systems installed in a building, or activities of occupant and poor building design. The size and type of openings and the orientation of openings also contribute to indoor air quality.

In order to keep pollutants load in the room to a minimum, room needs to be supplied with air that is as clean as possible. This can help by natural ventilation, via windows or mechanical means like ventilation systems. If pollution is measured solely in carbon dioxide concentration levels, a person needs at least 20m³ of outdoor air for adherence to the hygienically acceptable critical value of 1500 ppm form carbon dioxide concentration levels in the room.
Indoor Air Quality is one of the several factors considered in defining what makes a building “green”. In addition to improved air quality green buildings include environmentally sensitive setting, efficient use of natural resources and increased use of natural light. Building orientation in relation to landscape and windows orientation and size are major factors that contribute to quality of air indoor.

**Interior light**

Light either natural or artificial is the most fundamental of all materials. It has a profound effect on the atmosphere of the room. Without it form cannot be visualized, space cannot be appreciated and atmosphere cannot be created. Light can control and direct places, movement can be suggested, objects and places can be illuminated and accentuated. It can be used to change perceptions, both subtly and more dramatically.

Natural light represents the entire visible spectrum of electromagnetic radiation from approximately 380 to 780 nanometers\(^\text{12}\).

Artificial light according to is constant in quantity, colour and direction but is often static. Daylight changes with the weather. It is bright in sunny day, and dull in cloudy day. Its brightness is also affected by time of the day. Artificial light is always the same and does not move. Lighting is taken into account when a color scheme is being determined.

**Green child care facility design**

In sustainable design there is more focus on engaging in practices which will meet the needs of the present without compromising the future generation’s ability to live productive life today and for decades in future. Now that 60% of women in Lesotho work in factories for eight to ten hours, and 40% work in different jobs; children are increasingly spending more time of the day in childcare centers per day, thus making it ever more important to design child settings which provide a healthy and supportive space in which to live, grow, learn and play\(^\text{13}\). The study demonstrates the heightened sensitivity young children have towards the quality of their indoor environments. In America the Environmental Protection Agency has given a report that hundreds of thousands children have experienced elevated blood lead levels resulting from exposure to indoor pollutants. This report indicates how much some building materials are dangerous to children’s lives and other occupants hence green child care design has begun to emerge as an issue requiring serious consideration in designing for children.

In this case green design features include, use of non toxic playing toys which are possibly ones that are produced from natural materials like wood. Toys should be non toxic, colourful, toys produced from readily available materials (fabric), and natural materials. The Department of Education and Early Childhood Development\(^\text{14}\) emphasizes that features that enable children to explore and experience nature include providing excess of natural materials for children to play with.

According to Environmental Protection Agency in America (EPA)\(^\text{15}\) designers cannot limit their focus to the toxicity level of materials and resources when designing an effective green design child care facility. The durability of the material, acoustical performance and its moisture resistance are also important aspects of material selection. Adding on to selecting products and materials with low emissions, adequate artificial ventilation systems are also necessary to improve the indoor air quality (IAQ). Healthy indoor environments: means fresh air circulation, proper and safe ventilation and reduction of pollutants. Increment of air exchange rate so that more fresh air from outdoor is continually circulated through the building, offers an effective approach for improving the Indoor Air Quality while also minimizing chemical emissions within the interior\(^\text{16}\).

**Health concerns for children**

Children’s small size and immature level of physical development clearly indicate how less their internal tissue is to safely absorb pollutants. The liver’s detoxifying system is not yet fully equipped to handle the exposure to pollutants\(^\text{17}\). Their still developing nervous systems are also at risk when regularly exposed to chemicals and toxins that can be found in materials, finishes,

\(^{12}\) Meerwein, Radeck and Mahnke : 2007: 38 Light and Colour

\(^{13}\) LNDG, Annual Report: 2009-10

\(^{14}\) Department of Education and Early Childhood, 2010

\(^{15}\) EPA: 2009

\(^{16}\) Spriggs: 2006

\(^{17}\) Olds: 2001
furniture, cleaning supplies commonly used and toys used in child care centers.18

The combination of indoor contaminants, availability of clean air within the interior space and proper ventilation system has a significant impact on the health of young children. The occurrence rate of asthma, allergies and other respiratory illness is swiftly rising among young children and Olds: 2001 and WHLLG: 2009 believe that the causal relationship exists between these illness and exposure to indoor contaminants. Consequently, not only is present air quality affected by the choice of ventilation systems, but of even a greater concern is how children’s future respiratory health will be impacted by the building which they currently occupy.19

There is an argument from Prescott: 1987:87 about designing for children. Prescott argues that any attempts to design child care spaces are often too simplified and narrow-minded. Rather than thinking strictly about the physical features of these environments, such as the naturalization of the outdoor environment, appropriate playing equipments in terms of material, appropriate size of furniture for young children. The more green characteristics that a product exemplifies, the greener are.20 It is generally necessary to consider the total child-rearing environment and how children can be ensured both stability and enhancement in these settings.

**Spatial Arrangement**

In the first several years of a child’s life, a process of rapid growth and transformation occurs as the child transitions from the helpless form of a newborn baby to an energetic, inquisitive toddler. Eventually a young child prepares to soon enter the unknown world of daycare centre, nursery school or kindergarten. Every year, every month in the first year, always represents a new stage of development, either mentally, physically, emotionally or socially during this time. A comprehensive look at the developmental stages of a child’s life will enable an understanding of the support children require in their built environment in order to properly grow and develop.

The first five years of a child’s life are considered as the most important years in their development21. It is during this time that a distinctive personality begins to emerge as the foundation is laid for the attitude that the children will have towards other people in the world around them. Ittelson, Proshansky, Revlin and Winkel (1974: 638-668) noticed that during this time of first five years, the child possesses a preoperational form of intelligence where he or she must turn this thinking into actions in order to understand them.22

Different stages of child’s development and growth conclude the advantages of separating children in classes according to their age and level of understanding and doing things. Little ones 2-3 years children have less concentrating levels as a result these can disturb the older one 4-5 years. The advantage of dividing children is allowing each child develop mentally in a way appropriate to her age. Child care centers are settings where physical, social and language development occurs and as a result it needs attention to ensure that the proper supports are in place for stimulating developmentally appropriate growth and progression of our young children.

The design and layout of the physical environment has a profound impact on the children’s learning behaviour and caretaker’s ability to do their job, outdoor spaces, selection of equipment and room arrangement. Children are able to explore when the space is less structured and allow free movement. Well informed and purposeful design of the space for children plays an integral role in the way that children interact with their peers, as well as their built environment.

The large open space of classrooms often necessitates the establishment of differentiated activity areas with clear boundaries. These areas should be planned in such a way that children’s competence and sense of self control are encouraged.

**Differentiated activity areas**

An effective environment supports children’s interaction with space, materials and people. Moreover, a well designed environment allows

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18 White Hutchison Leisure and Learning Group: 2009 (WHLLG)
19 Olds: 2001
20 Prescott: 1987:87
21 Woodward: 1966
children to have freedom to move about safely while sampling a variety of curriculum activities. Researchers and child care professionals, agree that daycare centre buildings require different activity areas in order to establish an environment that is truly productive, nurturing, stimulating and engaging for children. Anita Rui Olds states:

“An activity area is a special place that has at hand all the tools and support needed to fulfill that area’s function. Well designed activity areas evoke their own spirit of place.”23

Effective activity areas help children feel welcome and invited to explore and learn and variety of them provide for individualism by allowing children choose their activities.24 Greenman agrees by saying that a child care centre should have an education based programme. Therefore activity areas should be used to establish various learning centers throughout the classroom where specific learning objectives can be addressed. Division within large open classrooms setting prevents children from feeling overwhelmed by the complexity of a large room.26

When designing activity areas, appropriate scale becomes a very influential factor in the way that children utilize the areas. Children oftentimes play in groups of five or less. This makes different activity area or multipurpose area relatively small in comparison to the room as a whole. Active children often engage in play with their entire bodies, which increases amount of space they need in order to have freedom of movement.27 Providing this ability to move freely coupled with number of children expected to use an area will determine the size and scale of an activity area. Different and incompatible areas like quiet and noisy, neat and messy activities should be separated.28 Children will at times prefer to play alone and sometimes seek out interaction with others. As a result, a classroom must offer space where children either work alone or in groups.29

Trancik and Evans (1995:46) suggest that in order to ensure that the various activity areas are successfully utilized, the physical characteristic of an area should correspond with the expectations for that space. For instance, a quiet reading area would not be appropriately located in a portion of the room that has high ceilings, poor lighting and sparse or uncomfortable furniture.

In addition to scale and the density permitted by an activity area, the shape of the area should also be considered.30 Designers tend to create spaces with squared off corners, but unusual shaped areas, like a round, curvilinear or oblong area may bring more delight to children. When the physical features are supportive of the behaviour and activities intended for a specific area, then the activity area takes on a personality of its own.

The activity areas specified for classroom can be quite diverse depending on the curriculum and learning style. There is an opportunity to create a more open floor plan with loose and flexible organization of activity areas or these areas can be more permanent and clearly defined. Olds recommends that the following five categories be used when planning the location, size, and number of activity areas:

- Quiet, calm activities- reading, resting and listening
- Structured activities- manipulative, puzzles, construction
- Craft and sensory activities- water, sand, paint, clay
- Dramatic activities- kitchen and house props
- Gross motor activities.31

Determined by the amount of available space and the number of children in class, the number of activity areas can be few and simply follow the above listed five categories. Again, the activity areas may become much more specialized so that there are multiple areas in the classroom for each type of activity.

Spatial clear boundaries

Clear boundaries between the various activity areas of a preschool classroom provide multiple benefits to the children as well as their caretakers. Boundaries promote coherent environments.32 A
distinctive contrast from one area to the next indicates to children where certain activities are intended to occur, which allows them to better utilize or enjoy the classroom. Children are able to focus on activity materials when different areas are clearly defined. A lack of boundaries may actually lead to sensory over stimulation as children experience visual and aural sensory inputs from multiple activity area. Olds: 1989:13 explains:

“The use of boundaries helps reduce disruptive behaviours caused by activity congestion or the inadequate physical separation of tasks.”

It is recommended that fixed features should be used to guide the space layout of a classroom. Once the layout of the activity areas has been determined, then it is necessary to establish clear pathways and boundaries between each node of activity33. The boundaries can be fixed, created by architectural features or furniture placement or they can be more flexible, suggested by change in flooring or lighting levels. Boundaries that are clear to children can be structural and symbolic.34 Examples of symbolic boundaries include a change in lighting, colour, or flooring material. When boundaries are created within a classroom, they should still provide visual access to the surrounding environment. This allows children the ability to maintain their sight lines of the teachers and be aware of their location within the context of the entire classroom.

It is true that the boundaries should be clearly defined but it is also important that they remain flexible.35 There are some activities that should not be limited to a single area of the room, such as reading which can be facilitated in multiple places throughout the classroom. Some boundaries need to have the ability to expand or be repositioned as the dynamics of the classroom change. Utilising a flexible boundary and recognizing that an activity area does not have to be permanent makes it possible for the learning experiences that take place within a classroom to be ever evolving in order to meet the changing needs of children as they grow and develop.

It is one of important factors of sustainable building to create unstructured interior spaces that will allow multifunctional space. Flexible and flowing interior spaces allow temporary boundaries to create a space different from the norm.

**Environment for children’s mental and physical development**

Environment has a powerful influence on young children. The daycare or preschool classroom should be designed to support the ways in which children move and interact with the world around them. Consideration of their needs may often require unconventional buildings, but their Architecture should be designed-reticent, child development responsive36. This means the environment that both nourishes and inspires in proportions according to age. In an actual fact, children need architecture not to shape them, but to serve them37. Architecture that its design is influenced by children’s basic needs.

Children and adults experience space differently. Adults categorize rooms as single mood places, for example sitting rooms, kitchen, but for children, room can comprise five distinct places- four corners and center. In designing for children, scale needs to be considered sensitively. The furniture, play equipment, all architectural elements included in the design should be scaled for young children.38

This encourages them to act independently and make their own decisions without relying on adults’ support. They develop a sense of ownership of the environment designed. Olds, a psychologist and specialist designer for young children environments says environments that offer a range of options for things to do and places in which to do them reduce intimidating experiences. Children are able to choose the activities and locations that are conducive to their size and abilities. This brings an understanding that when children are able to accomplish tasks on their own and not facing frustrating experiences, they gain confidence in their ability to act on their own.

Earlier researches show that the more child-scaled the environmental space, the higher the quality and complexity of children’s play will be and the longer they will be preoccupied in the play. In other words, a child-scaled environment

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31 Olds:1989:15
32 Trancik and Evans:1995: 43-45
33 Greenman: 2007
34 Bauer, Mosle and Schwarz, 2009: 7
35 Buer, Mosle and Shcwarz: 2009: 8
36 Trancik and Evans 1995:43-58
increases children’s interest and concentration and delays boredom.\(^{39}\) In a large space, children are encouraged through reading the environment to move about from one thing to another, whereas in small contained areas, they are focused. Interior spaces that maintain a high level of predictability and are easily interpreted by young children increase their sense of self control and security.

Placement of large equipment around the edges of rooms gives an allowance to open and altered centre. Open centre lets the children see what activities are available throughout the room. In the same way it gives clear views of windows and doors from multiple places in the classroom thus, informing children about their location in the room and how to enter and exit in the room. The predictability offered by views and visibility throughout a space help ease away the uncertainty of being in a place other than the safety of their home.

Repeatedly the research has illustrated that young children’s physical setting is as important as the play equipment, books and lesson plan. A well designed environment for young children provides possibilities for all interactions.\(^{40}\) Due to the powerful affect that the physical environment can wield over its occupants, the spatial layout and physical design of preschool classrooms deserve thoughtful planning. That will help ensure supportive and meaningful environment for children.

On the other hand, Prescott (1987:87) argues that child care designs are often simplified and narrow minded. Rather than strictly thinking about the physical design and child-scaled furniture it is necessary also to consider the total child rearing environment and how children can be ensured both mental firmness and enchantment in these places\(^{41}\).

Sustainable building represents different strategies in design that includes an improvement of occupant’s health and encourages greater design flexibility. The design should always fulfill the needs of the occupants by all means. The interior design and all architectural elements within the space are to be scaled for children to feel a sense of ownership to the environment and space created.

In daycare centers children basic activities are play in all ways we can think of. They also must rest, and have a place to eat. They also learn. To children play is important, as it challenges them mentally and physically as they move from one place to another.

**Colour in Design**

There are three types of colours, the Primary colours, secondary colours and the tertiary colours. Primary colours are red, yellow and blue and colours produced from them are secondary colours. Colour is a sensation produced in the brain, by the light which enters the eye, and while the sensation of a particular colour is usually triggered off by the eye receiving the light of a particular composition. Many other physiological and psychological factors also contribute.\(^{42}\) From these explanation we understand that light is the key factor of human being able to sense colour.

“One widely accepted definition of colour is: a specific visual sensation produced by radiation or “colour stimulus”.\(^{43}\)

It is a property causing visual sensation.\(^{44}\) Colour enhances viewer’s response in different levels; it also heightens the viewer’s perception and intensifies emotional and psychological reaction. It is more emotional and based on one’s opinions or feelings than being objective\(^{45}\).

Adults and young children are affected by colour in many obvious and not-so-obvious ways. It is at times used to describe feelings, for example “she is in blue mood” meaning she is not in good mood, she is feeling exhausted. With color different expressions can be created within a space.

The room can be made to look lower or higher, narrower or broader by means of colour. It is colour which chiefly gives character to a building and by its help we may produce any desirable effects. Poppy and Thomas (2008:140) indicate that beyond words and images, colour communicates instantly and powerfully. They go on to say “a world without colour would be a world without emotion.” The role of colour is

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\(^{39}\) Randy White CEO

\(^{40}\) Olds:1989: 8

\(^{41}\) Prescott, 1987:73-88

\(^{42}\) Rossotti, 1983:16

\(^{43}\) Meerwein, Radeck and Mahnek: 2007:18

\(^{44}\) Encarta encyclopedia: 2009.

\(^{45}\) Poppy and Thomas:2008: 132
literally visual communication and it has a major impact within interior spaces. It creates mood in the interior space and can explain its user. Colour can help identify the purpose of the building. Young children’s bedroom colours are far more different from teenagers’ bedroom colours.

**Impact of colour within the interior space**

The cool colours (blue, green and gray) and the warm colors (red, yellow, and orange, brown) the strong dramatic colors (red, brown, purple and black) and the less prominent colours (beige and pink) can contribute a great deal to the feeling created by a room. Certain colours have the effect of enlarging a space, colours like white, yellow and the cool, light colors. Other colours like black and the warm, dark colours diminish the space.

Certain colours blend unobtrusively with other colours; the same colours in differing intensity or shades can become strikingly emphasized. Psychological studies suggest that colour selection can influence mood or behaviour, stimulate brain and body and even affect one’s health.

**Children and colour**

Children’s aesthetic needs differ from those of adults, bright colors, kids’ art and teddy bear wall paper. Their communication about colour is far more different from adults’ communication. To children colour is the best understood way of communication especially bright colours. In addition, as people reach different life stages they develop feelings about colour that change and evolve as time elapse, and they also relate to colour in different ways during each stage. For example red, yellow, blue and any bright colours are colours to which young children are most responsive. The same red that children are drawn to is the colour that adults perceive as danger.

Bright “lively” colours to children are stimulating, un-subtle and over substantial but not magic or elusive. These colours are used in designing for children as they mobilize children and make them more active. Surprisingly, adolescents are drawn to colors that are most outrageous, effortful or active and used in unusual way.

“If the end users are young, consider vibrant warms and cools from every color family especially in combination...consider audience, their emotions, and culture and life stage.”

This means that users of the space should be considered in anyways before deciding on colours to use.

**Psychology of colour**

Since the ancient times, colour was used to indicate status, value and it was used for its signal function. Psychologists suggest that color selection can influence mood and behavior, stimulate the brain and body and even affect one’s health. Perception refers to how people become aware of and understand any sensory information that they receive. Scientific studies have found that exposure to certain colours can improve sleep habits, increase memory power and even enhance academic performance. These are excellent benefits for a growing body.

**Warm colors**

Warm colours elicit happiness and comfort, creating intimacy by making large, open spaces feel a little warm. Bold shades of red and yellow can stimulate the mind and have an energizing effect on the body- beneficial for growth and development. Thus warm colours are best used in moderation. Instead of painting an entire room with a bold red or bright yellow colour, pair the warm colour with cooler shades to create a sense of balance and temper any negative effects.

**Cool colours**

Cool colours have a calming effect on the body and can make a child’s room feel spacious and relaxing. However dark, cool colours can produce dull areas and should at least be used in moderation. Despite their soothing nature cool colours are not particularly inviting and can leave people cold and reserved if the atmosphere is too stark. To soften the effect cool colour can be paired with creamy neutrals.

Nevertheless, research can make useful generalization but we should remember that psychological responses are deeply personal. One may feel different about other colours. This is based on cultures, perceptions or an experience with certain colours. Colour can manipulate perception of space.
Outdoor Environment

Green design is about preserving nature, minimizing negative impact on the natural environment. When designing and building green childcare facility, sustainable practices must not end at the building threshold. Outdoor environments that support children’s well-being and healthy development are as equally important as healthy indoor environments. It is important to address more than the building envelope, for the site and surrounding nature has also been shown to be of consequence in young children’s development. Children need freedom to move about and release large amounts of energy that they have, as a result provision of outdoor spaces allow for physical development that cannot always be satisfied in indoor environments alone.

Green design concepts encourage simple ways of creating comfortable living spaces. It is about design ideas that create harmony to the environment and can be easily adapted by users. The outdoor spaces are encouraged to be as natural as possible. Natural in the form of planting variety of plants that will help children explore more. Plants like trees, flowers, vegetables and fruit trees. The playing equipment should be from natural materials such as wood, animal hides as they are nontoxic.

Air quality in relation to plants

Plants absorb carbon dioxide from the atmosphere and give out oxygen while human beings and animals take in oxygen and expel carbon dioxide and water vapour. Plants enhance man and animals and man nourishes plants in the same way. Plants take in carbon dioxide from the atmosphere acid rain (carbonic acid) which corrodes buildings and can harm other forms of life. New research led by scientists from the National Centre for Atmospheric Research, shows that plants clean out air pollution to a much greater extent than thought. Deciduous trees (any type of tree that shed leaves in the fall) consume certain types of air pollution as VOCs more rapidly. VOCs which are emitted from some materials and can have effects on the health of humans and their environment. At the global level, plants are taking up 36% more VOCs than has been accounted for in previous studies.

Connecting children with nature

“Adults admire their environment; they can remember it and think about it- but a child absorbs it. The things he sees are not just remembered; they form part of his soul. He incarnates in himself all in the world about him that his eyes see and his ears hear.”

Maria Montessori- Educator, physician, philosopher

Montessori means that children like owning and understanding their environment. Their behavior and understanding of things is very much influenced by the type of environment they have or always play and live in.

Outdoor spaces provide contact with living things, either plants or animals. It also provides environmental conditions that change with seasons. Wells: 2000:775-795 indicates that children who are exposed to nature experience both psychological benefits and improved cognitive functioning. Outdoor spaces that offer children exposure to nature, rather than only manufactured play equipments can enhance cognitive development, encourage imaginative play and stimulate empathy. It has been recognized that

“Nature, with its inexhaustible opportunities for engagement and exploration, provides an endless space for children’s play and reflection. Nature is unlikely to grow tiresome.”

Natural play and learning environments enrich children’s learning by offering hands-on explorations. There are various benefits of connecting children with nature that benefits young children not only in their current state of development but also in years to come.

Exposure to nature

- Enhances cognitive ability- proximity to views of and daily exposure to natural

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48 White Hutchison Leisure and Learning Group: 2009
49 Moore and Marcus:2008: 153-204
50 Encyclopedia explanation: Trees that shed their leaves in the fall
51 Wells: 2000:775-795
52 Moore R.C : 1978: 83-130
53 Wells: 2000: 791
settings increases children’s ability to focus and enhance cognitive abilities.54

- Improve eyesight- more time spent outdoors is related to reduced rates of nearsightedness, also known as myopia, in children and adolescents.55

- Increases physical activity- children who experience school grounds with diverse natural settings are more physically active, more aware of nutrition, more civil to one another and more creative.56

Exposing children to nature at this early age lays the foundation for sustainable lifestyle and awareness of their planet as they mature into adults. Outdoor learning and play spaces provide an appropriate setting for teaching children about the impact their actions can have on the environment.

Methodology

The study employed content analysis; reviewing literature on the ideal infrastructure for safe Day Care Centers by scholars of architecture. Content analysis is the analysis and interpretation of content of verbal or visual communication messages.57 This study scrutinized architectural documents on the plans for preschool construction in Lesotho in order to determine the type of material used for the infrastructural construction. The study also carried out face to face interviews with day care center owners in Maseru as well as with ministry of Education and Training officials from the ECCD. Unstructured or in-depth interviews were used because the subject was limited to architectural design and material for pre-school construction in Lesotho. The intention therefore, was to obtain a ‘rich picture’58 of how the pre-schools in Lesotho are constructed and how the government, through the ministry of education and training, ensures compliance. The study also observed the infrastructure at day care centers in Maseru whose owners were interviewed.

Findings and Analysis

Owners of day care centers just build without paying particular attention to whether the material is specific to health special recommendations for material suitable to the creation of the most conducive environment for toddlers or day care centers. For starters, day care owners can partner with industry in Maseru urban for the development of green environments and nip it in the bud by inculcating the green environment culture in the preschool children in their infancy. Development agencies can be approached to create the green outdoor environment for preschool infrastructure. The ministry of education and training can facilitate this by approaching, for instance, the UNDP and other development related agencies. Partnerships can be developed with countries with a like mind abroad; for instance the USA where educationists are championing the green environment course, “environmental education in green infrastructure can offer nature-based opportunities for place based environmental education, help to build sense of place, and use spaces that otherwise may not be perceived as educational”59.

Ministry of education and training officials are mainly concerned with space (outside and inside the buildings of day care centers) without paying particular attention to the material used for building the day care centers infrastructure. In addition to these concerns, the ministry of education and training can assist mobilize resources for research and exploration of the idea of pairing/twinning Lesotho schools with overseas schools that are venturing into green infrastructure and green environment, starting at preschool level? School owners and leaders need to be educated on the long term benefits of green infrastructure and the green environment and the ministry of education and training can be effective in advocacy and facilitation of the education, research and training of the educational fraternity on the idea and practice.

Conclusion

Interior space of day care centre buildings, because of the finishing materials used is likely to be polluted by VOCs from some of the materials. The activities held in the space also contribute to the indoor air quality as human beings expel carbon dioxide and take in oxygen. The indoor quality affects the development of children

54 Wells: 2000
56 Bell and Dyment: 2006
57 Parveen and Showkat: 2017
58 Mathers, Fox & Hunn: 2000
59 Cole, McPhearson, Herzog and Russ: 2017
because some materials are harmful to their still growing nerves and can lead to problems in breathing.

The spatial arrangement of in day care centers affect children’s play. Open, flowing space with toys arranged in an easily accessed place enhances children and improve their development. Furniture and equipment designed for children must be scaled to children.

The conclusion drawn to this study is that:

Designers should pay a lot of attention in children’s basics in day care centres. Architecture for children should serve them. The time children spend in day care centres really shapes their life for the future. So, their setting should be able to connect them with the world around them.

**Recommendations**

Day care owners need to be sensitive to the fact that toddlers are vulnerable and therefore the infrastructure for day care centers should be special in order to protect the children as well as to aid their early development/growth.

The ministry of education and training through the ECCD should enforce or oversee more than just space and curriculum, but also the material, colours, spatial arrangement of the day care centers infrastructure as these also impact the growth and development of toddlers.

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facilities for children’s development, learning and play.


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