

# A Study on Exhibition Design of the Playing Environment Based Science Museum for Preschoolers

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**Abstract.** This study is focused on the research of exhibition design for science museum, dedicated to preschoolers aged from 3 to 5 in their crucial developmental phase for wholesome development to help them explore intellectual curiosity through scientific play and experience. In this process, I propose exhibition design types or structures tailored to preschoolers' science material and development features suitable for their each age group along with preferable play environment plan, and attempted to verify the direction for differentiated new hands-on education against average science museums. Based on the direction mapped out in this study, preschoolers' science museum for their scientific thinking and wholesome human development are expected to be established.

**Keywords:** Preschoolers' Science museum, Exhibition Design, Holistic Development, Playing Environment, Hands-on Activity.

## 1 Introduction

Toddlers aged 3 to 5 have inexhaustible energy and presents the crucial and intensive development window through active movement and physical development. Science education for toddlers is referred to the far reaching everyday activities endlessly exploring to find answers to their curiosities, thus it is critically necessary for the growth of toddlers' wholesome development capability and to resolve their intellectual desires.

Despite the recent growth of children museum and playing facilities in Korea, standalone science museum models for toddlers aged 3 to 5 are few and far between. Toddlers need to be exposed to customized environment for science education activities to explore answers to fulfill their innate intellectual curiosity in everyday life and to grow physical development capability through hands-on playing-cum-learning activities.

Therefore, this study suggests the direction of science museums dedicated to toddlers and reviews the possibilities of building such facilities—drawn as preschoolers' science museum exhibition design—based on preschoolers' science resources stemming from hands-on experiences of objects and phenomenon in everyday life.

## **2 Unique Characteristics of Preschoolers' Science Resource**

### **2.1 Direction of Preschoolers' Science Resource**

Preschoolers—fervent explorers armed with intellectual curiosity and interests on objects (Duckworth, 1987)—have inseparable relationship with science as all the interactive activities and the concept between natural phenomenon and material in everyday life, which falls into the category of broader definition of science (Ryu Jin-hee, 1985). Also the science concept for those preschoolers is merely the explanation system to describe their experience rather than the rules of science discovered from the nature. In short, the science concept should be suggested to trigger cognitive paradox in kids and awaken them to better understanding of science. For this reason, when dealing with preschoolers' science as resources for education and hands-on exhibition design, suitable classification system should be in place applying science concept conceived by kids and the children's developmental features and levels based on their intellectual curiosity and interest on the basic scientific phenomenon in everyday objects.

### **2.2 Resource Classification and Features of Preschoolers' Science Museum**

The resource of preschoolers' science museum model that this study proposes is classified into natural phenomenon, biology, objects, and material in basic scientific areas or rather in daily life experience.

Natural phenomenon includes the sun, the moon, stars, and shadow with which we deal with everyday. Shadow is a typical experience that even a toddler aged 3 can experience in daily life and draw the link between objects and their shadows (Piaget, 1966). On the other hand, five year olds can further gain the scientific knowledge in complex representation process, enabling them to understand the subject in video images.

Biology encompasses various animals and plants easily found in kids' everyday life and share interactive responses. Children understands that the biggest features of living organisms are movements (Piget, 1929), and develops intense interest and curiosity toward animals prompting fast understanding. As they get older, kids can comprehend the other features of organisms such as growth, death, respiration, and nutrition (Yoon Bok-hee, 1985), and tends to understand organisms in animal and human centered perspective (Park Ah-cheong, Kwon So-young, 1995)

It is not important for kids to grasp the academic concept of Objects and Material, rather children should be able to enjoy consistent exploration process with interests and curiosity toward various activities involved. They tend to interpret the everyday experiences entirely on the circumstances and their cognitive levels. Therefore, it is important to plan exploratory activities of objects and material at their level.

### 3 Preschoolers’ Science Museum Exhibition Design Plan

#### 3.1 Exhibition Direction for Preschoolers’ Science Museum

Preschoolers’ science museum model is not the exhibition covering the textbook science material. Rather, it is critical for the museum to have customized educational exhibition space offering a variety of active hands-on experiences for children at all developmental stages to answer to scientific questions and curiosities for themselves. Especially the overall theme and design should reflect preschoolers’ developmental features, preference and desires, and playing features. Therefore, the friendliness and familiarity of the theme and the environment should come before rest of the others to attract kids to voluntarily participate in the activities.

#### 3.2 Theme Setting and Hands-On Experience of Preschoolers’ Science Museum

The theme of preschoolers’ science museum was chosen as “Burr Burr Vroom Science World,” the adventure based on fairy tales. The main motif from selective fairy tales should be felt close to home for children, not as a distant story so that it can bring about the creativity out of their imagination. Children have the representational ability to make a lot of stories out of one small object, highlighting the need to have selective experience composition for more active and easier management.

The storyline should be planned out based on this. The main theme and smaller theme should be classified and the resources and hands-on play plan can be summarized as below.

Main Theme	Small Theme	Contents	Resources	Experiences
<b>For a Bigger World</b>	Rowdy Animal Farm	Info desk and farm animal play experience	Organisms (animals)	Hands-on, models /block and mobile play
<b>Looking for Master Key</b>	Spin-Spin Curiosity Tunnel	Forest village connecting tunnels become a playing space for everyday curiosity. Master Key purse is issued	Life science, Overall phenomenon	Interactive, Play type video /Games
<b>Forest Village</b>	Hurly Burly Underground Ant’s Nest	The birthday party for ants and other insects in underground spaces and ground surfaces between trees	Organism (plants, insects), objects and material	Hands-on, Model/ Block and Mobile, Plaything, and Role-Playing
	Winding Tree Maze	Maze in nature to get the leads to save duck princess	Organism (Animal), Natural Phenomenon	Hands-on, Models
	Yum-yum Poo-Poo Digestive Tunnel	Air bounce tunnel in human body as food is digested	Organism (human)	Hands-on, Special Planning
	Sweet Cavity Snack House	Kids understand the importance of teeth brushing and health at the snack house where the cavity goblin lives	Organism(human), objects and material	Hands-on,Interactive, Experimental, Model, Diorama, Video/Quiz, Game

	Building New Nest	Make a new nest for homeless cat family	Object and material	Hands-on, Interactive, Participatory, Experimental/Role-playing
Conversion of the Road	Fresh Green Town	Nature's Lounge with an Overpass	Organism, Natural Phenomenon	Model
Underwater Town	Freezing Icy Arctic Village	Understanding the risks of the Arctic area melting down by meeting with Arctic animals	Natural Phenomenon, Organism	Field Sensory Type, Videos/Physical activities
	Hubble Bubble Underwater Town	Video game in air bounce space where you experience the life in deep sea water	Objects and Material	Hands-on, Interactive, Dynamic Video/Physical Activities Game
	Sparkly Desert Oasis	Playing experience space for hologram oasis lotus pond	Objects and Material	Hands-on, Interactive, Game
Treasure Hunt	Stealthily Treasure Hunt	Treasure hunt in a shell type cave wearing blue cloak and fighting pilots with magical power	Objects and Material	Hands-on, Interactive, Model, Special Video/Physical Activities
See You Next Time (or Farewell)	Jumpy Giant Elephant	Reading a large pop-up book reminiscent of adventures in a lounge space where kids can lean against a giant elephant stuffed animal	Organism (Animal)	Hands-on, Physical activities

## 4 Exhibition Design Type for Preschoolers' Science Museum Model

### 4.1 Exhibition Design Type for Preschoolers' Science Museum

The factors for aforementioned exhibition design types were planned out considering the developmental features and preferred designs for each age group of children aged 3 to 5 to emphasize and reflect changes on exhibition media and spaces, operation services, and science hands-on experience education. It will help preschoolers to find answers to their curiosities and imagination actively utilizing their developmental capabilities and sensory factors and fuel the wholesome development for children as a guide to reasonable problem solving methods and knowledge acquisition. The types are as below.

Category	Exhibition Media and Space		
Preschoolers	Developmental Features	Body	The scale of the space and media considering the body size
		Cognition	Playing activities for assembly, structure, and layout
		Sociability	Role-playing and imaginative playing environment open to other kids' participation
	Preferred Design	Color	Colorful design with rich primary colors
		Texture	Smooth and sleek surface texture for easier hygienic management and safety
		Shape	Easy to look friendly cervical curvaceous shape
Science Experience Education	Exploration		Role-playing environment leading children to explore media for themselves
	Thinking		The environment that encourages children to create second play through block and creative game
	Observation		The makeup of various media including the real nature which facilitates kids' curiosity and observation
	Physical Capability		It should be organized to help kids to enjoy hands-on experience activities using their bodies with media and space
	Cooperation		Choose the space and media where kids naturally cooperate
Playing Environment	Movement		Utilize motion activated video game and motion control art experience
	Convenient		Media provision for cozy and convenient space
	Self-respect		Materialize the dream and imaginative experience one can create or figure out through step-by-step experience
	Privacy		Media provision for the preschooler to create the space for one's own
	Order		Represent everyday life situation for disciplines like keeping order and straightening things
	Health		Exterior and interior space plan that interfaces with the nature, and offering healthy snacks reminding of the theme
	Smoothness		Offers texture hands-on experience with safety guaranteed various materials
	Challenge		Playing facility posing step-by-step challenges to all age groups
	Safety		All four glass walls ensure open view, and parents' lounge spaces along with safe media are added. All the space design is finalized as curve lines.

#### 4.2 Direction toward Space Structure for Age Groups

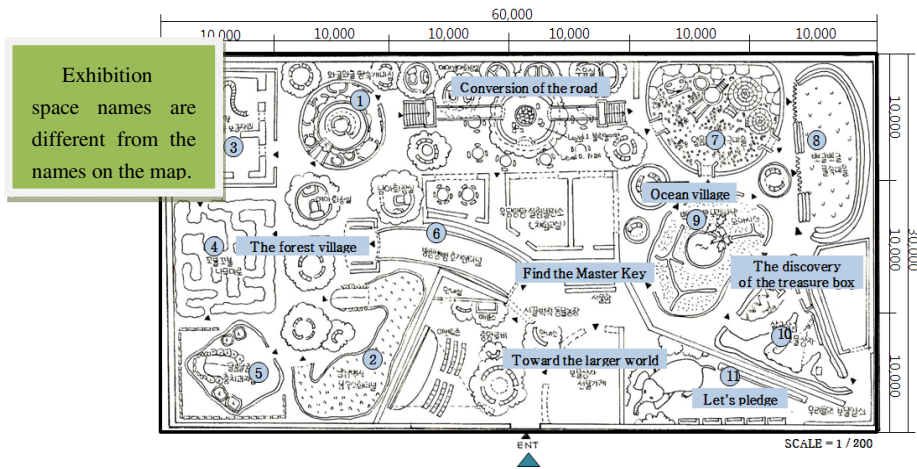
For better effects of concrete educational hands-on experience, the classification of developmental features on each age group of preschoolers should be accounted for. Although preschoolers at age 3, 4, and 5 demonstrate the intensive developmental capability growth, they still show differences in terms of their understanding, behavior, and interests of science experience, space, experience, and play. Three-year-olds prefer direct multi-sensible experiences through movement, exploration, and discovery but their self-centeredness helps them distinctively claim their objects and their spaces. For the same reason, they prefer to have one on one activity with other individuals, parents, or teachers than other preschoolers. Four to five year olds,

however, prefer indirect experiences along with direct experiences. They are also able to enjoy physical activities and to cooperate with and respect others engaging in cooperative plays.

Based on this premise, there should be selective space management plan for both collective experience spaces for kids aged 3 to 5, and the other separate spaces for children aged 3 and another group of kids aged 4 to 5 for. It should be followed up with more systematic plans such as different admission time schedule, booking system, and occupancy limits.

### 4.3 Exhibition Designs for Final Model Type

The final floor plan for Preschoolers’ Science Museum is seen as a sketch as below, which can be divided in to three types as for the exhibition space for 3 year old(①,②), and for 4 to 5 year olds(③④⑤), and the space for 3 to 5 year olds (⑥~⑪).



## 5 Conclusion

This study tried to verify the direction for new hands-on education space which differentiates itself from the average science museum and preschoolers’ facilities with all the smaller age groups taken accounted for. The preschoolers’ science museum model presents experiences through children’s self driven voluntary capabilities, which not only delivers positive fun and thinking but also promotes the wholesome development. Also, as it encourages sociability enhancement with peer group activity and it is expected to establish itself as a family oriented educational cultural space.

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