Designing for Children
- With focus on 'Play + Learn'

Natural Play and Learn - A Morphological Analysis

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Abstract: Play is an essential element in children life, which is initiated by inherent curiosity. Mother Nature uses unstructured methodology to address curiosity and initiates play. At the end of the play, children learn about themselves and others. Learning will be painless when it's executed through play. The cognitive development (Piaget 1990, Burner 1996) is very effective in this natural learning. This varied cognitive development follows the cyclic pattern which is defined through Learn, Explore, Experiment and Contribute (LEEC). Mother Nature addresses this cyclic pattern through its Natural Resources. However the recent concern from the researches pinpoints the lack of interaction between children and Natural Resources (Bunting and Cousins, 1985). Through the structured methodology these Natural Resources can be replicated in the form of toys to bridge the gap. In this paper, Morphological Analysis (MA) is used to map the available Natural Resources in the form of dimensions and its options.

Key words: Natural Learn and Play, Morphological Analysis

Introduction: When the Children play, boundless energy and imagination is shown. During the play children understand that the surrounding is a diversified place with unlimited possibilities. The Natural Resources provide inspiration, motivation, materials and the framework for play (Sinker). With the play the children become sensitized, imaginative and develop the ability to create and learn. With the high curiosity index, children enjoy the newer things and the learning curve will start. Learning is a continuous process for a child and starts from the womb and grows rapidly from birth. No matter how young, children enter to play. As they play freely, they use what they already know and augment it, challenge it, build on it, and reaffirm it. As they rebuild their learning, they Explore themselves (Sinker). Once they complete the peripheral Learning, Exploration stage is initiated. They begin to poke, prod, pour, pound, pinch, and explore the possibilities for

the deep understanding. This Exploration allows them to Experiment where they would like to test and observe the results. Experimentation allows the children to understand the linkages between the Natural Resources. They go to and fro in Exploration and Experimentation to gain the deepest understanding. Children will be motivated to become creative and innovative during the continuous Exploration and Experimentation. With the collective experience the child finally ends up in Contribution. Contribution results in newer invention which is for the betterment. The child must have crossed the child phase by the time they enter into effective Contribution. The strong foundation of Learn, Explore and Experiment will support for the effective Contribution as the child grows.

We propose this cycle, which is characterized by Learn, Explore, Experiment and Contribute (LEEC). This cycle exists at the every stage of a child from the birth. At any given point of time, a child will have the combination of these characters and only difference is variation in the proportions. The LEEC cycle varies and matches every child's taste, style and involvement. This customized and endless process is successfully addressed by Natural Resources. This natural way of learning (Taylor et al., 1998) nurtures the development.

Morphological Analysis (MA) is used to analyze available dimensions and the options. MA is a method to study, represent structure and form of physical or conceptual entities, by deconstructing them into their basic dimensions and options. The method also enables identification of newer or innovative combinations as well as the impossible ones. MA table is a powerful visual tool and serves as a readily available reference. In this paper, we mapped the available Natural Resources for the children to perform multiple LEEC cycles. Further every Natural Resource is mapped with its elements. These elements will contribute for the toy design intend.

Methodology – Morphological Analysis: Morphological Analysis, a term coined by Zwicky (1962), is a powerful method to study and represent, structure and form of physical or conceptual entities. Various combinations of the dimensions and options in the specific context of any entity represent its corresponding manifestations in the real world. The method also enables identification of newer or innovative combinations as well as the impossible ones, and hence serves as a powerful visual tool for systematic creativity and innovation. In the present context of Natural Learn and Play the natural resources can be represented for children specific requirement through Morphological Framework. These requirements help the designers to replicate the natural resources in the form of toys to

meet the children development. Every child development is different; however through this structured exploration the designed toys can replicate the natural resources and engage the child to play and learn.

Hall (1969) used MA technique to develop a three dimensional morphology of system engineering. Newer, innovative applications of MA have been proposed by some authors. Shurig (1984) introduced the "Category Grid" method while using the idea of Morphology to explore new technologies. From the research literature on New Product Development, it is evident that enough scope exists for using MA effectively. In the present paper, MA is directly used in its classical form to elaborate upon and clarify the developmental need of children requirement in a natural way.

Play: "Play" plays a key and vital role in the development of the children. The Natural Resources encourage the child to play and learn. Child will not be misleading by this play since it's witnessing the natural form to play (Piaget 1962, Wilson and Ruth 1997). The spontaneous play of young children aids to Learn. In their play, children invent the world for themselves and create a place for themselves in it. They are re-creating their pasts and imagining their futures, while grounding themselves in the reality and fantasy of their lives here and now (Jones and Reynolds 1992). The right and well thoughtful toys can help the child to enjoy the replication of nature through which the child can see through the natural resources. One can't restrict the child's imagination with the toys. The child can understand the toy beyond the designer's design intention. This cognitive development of the child is well described by Piaget's Stage Theory. In his view the early cognitive development involves changes in cognitive process and abilities which later progress into changes in mental operations. His study concluded that children were not less intelligent than adults, they simply think differently. The sensation of movement can be developed to an infant by allowing it to watch the movement of animals, small and color full insects. However for all practical purpose and colorful rolling ball can meet the pleasure of movement. This combination of representation can be established through Morphological Techniques and deconstructing them to find an innovative toy. Once this is done the toy labeling will be much more effective than by just specifying the age. Since the children's developmental stage is well analyzed and aligned with natural resources, the toy label will contain the current level of the child's development and upon which the toy will help to play and learn successfully.

Learn: When the child is playing, it's very difficult to differentiate the "Play" component from "Learn" component. As Piaget defines the cognitive development every aspect of

play ends in cognitive learning of a child. Howard Gardner's (1983) Multiple Intelligence theory defines varies forms of intelligent that can be developed within children with their effective learning. Gardner's theory argues that children will establish broader vision with the help of different learning methodologies. Learning should enable the possibilities of thinking beyond linguistic and logical intelligence.

With the help of playing the Learning also takes place. It provides immense amount of opportunities for the child to develop environmental awareness, social and cultural norms (Crain and William 2001). The older the children, their capability of learning and storing information will grow significantly in which the children start Exploring and Experimenting through learning.

Natural Play and Learn – The LEEC Cycle: Natural Play and Learn helps the children to become more informed, engage all their senses of perception. Research has proven that exposure to green outdoor setting helps to reduce symptoms of Attention Deficit Disorders in children (Bunting, T.E. & L.R. Cousins 1985).

The following flow chart represents the natural learning process.

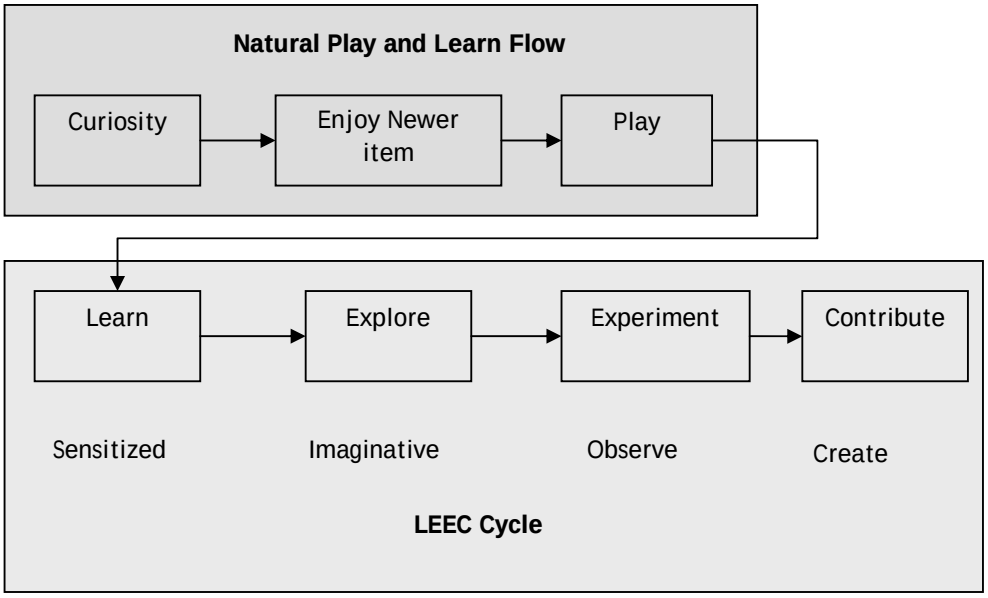

Fig 1

In an age crammed with TV, computers, and electronic gadgets, children are isolated from the simple pleasures of exploring Natural Resources. As it is, academics, along with classes and extra-curricular activities, leave children with little time to play outdoors. And

even if they do, there are almost no green spaces left for them to play. Even parks and playgrounds are manicured, and do not invite curious, open-ended exploration. Children today are thus robbed of a very essential part of childhood: of connecting on a one-to-one basis with nature.

One of the ways to overcome this gap is by mapping the Natural Resources through toys. Linkages between the toy and Natural Resources play an important role in this. The entire Natural Resources are linked in one or the many ways. With the help of such toys, the child should understand the linkages and the learning should support the children for the required development. Before toy design it's important to understand the unique propositions with respect to LEEC cycle, along with the current status of the children.

Methodology for Designers: Morphological table provides systematic way to map the requirements which will be in line with the Natural Resources. However with the systematic process most of the possible options and combinations can be included. This table can be upended and updated at any given time. The following process steps are followed for an effective toy designing.

Step 1: Understand the stage of a child in LEEC cycle

In this step, the current stage of the child with respect to LEEC Cycle is understood. The current status and the stage at which the child stands are mapped with the help of LEEC Cycle. The dimensions are listed and options are explored for this step. This provides the designer to map the current boundary and at the same time every option can be further deconstructed.

The table start with the understanding of stage, for example, children under a year the learning component will be higher than experimenting component (Sometimes the stages might get equal composition as well). The next step is to understand the proposition of the stage for LEEC. Sometimes the child development might be of advanced or normal. After which the type of intelligence the child is undergoing is understood upon which the development is required is also realized. Like wise the capabilities, curiosity, fitness level is mapped. However at the same time the current available products are also identified and the gaps are analyzed. With all these considerations the current boundary is mapped for the toy design.

Table 1: **Analyzing LEEC Stage**

Dimension	**Options**				
Stage	Learn	Explore	Experiment	Contribute	
Stage Propositions	Known	Unknown			
Stage Level	Initial	Intermediate	Advance		
Stage Growth	Normal	Challenged	Abnormal		
Intelligence Type	Kinesthetic	Interpersonal	Verbal	Logical	
	Intrapersonal	Visual	Naturalistic	Musical	Ecological
Playing Capability	Normal	Challenged	Abnormal		
Learning Capability	Normal	Challenged	Abnormal		
Curiosity Initiation	Visual	Movement	Sound	Scientific	
Target Component	Learning	Playing			
Fitness Requirement	Physical	Mental			
Available Products	Known	Unknown			
Psychological Requirement	Analyzed	Not Known			
Fitness Status	Fit	Unfit			
Exposure	Varied	Limited			
Limitation	Exists	Not Exists			
Previous Learning	Relevant	Irrelevant			

Step 2: The expected developmental stage on LEEC cycle

Once the current status is mapped, the next step is to understand the expected development for which the toy item is indented for. The futuristic scenario is mapped at this stage to identify the gap. The main objective in this step is to identify the futuristic LEEC stage or proposition. The time line in which the target can be achieved is also identified. The toy should be designed in a way that it develops the eagerness for the child to play during the expected time line. One to three months is generally mentioned as short term and beyond which considered to be long term.

Table 2: Expected LEEC Stage

Dimension	**Options**			
Stage	Learn	Explore	Experiment	Contribute
Time Line	Long Term	Short Term		
Stage Propositions	Known	Unknown		
Natural Resources	Identified	Not Identified		
Pier Status	Lagging	Leading		
Developmental Need	Basic	Advanced	Moderate	
Natural Play	Exists	Not Exists		
Intelligence Level	High	Medium	Low	
Environmental Support	Supportive	Lagging		
Requirement Need	Special	Generic		
Accomplished Development	Known	Unknown		

Step 3: Mapping of Natural Resources to Fulfill the Gap

Once the required futuristic level is mapped, the target is to understand to map the natural resources to fulfill the requirements. This is very critical step since; it can be called for sensible combinations to nurture the development.

For visual sensory developmental need the following example illustrate mapping of available Natural Resources. Development stage of a child is observed by Learning Component through, 1. Child recognizes face and start smiling 2. Able to follow the moving objects with eye balls, the child's sensation of movement has been initiated. In this stage Learning dominates than the Exploring and Experimenting. The child will be curious enough to look into the objects with the different movements for the learning purpose. The following table illustrates the natural resources available for the child to fulfill the pleasure of movement.

Table 3.1: Movement Types

Dimensions	**Options**				
Movement	Regular	Irregular			
Type	Slow	Fast	Interval		
Regular	Linear	Circular	Rolling	Wave	Vertical
	Flying	Oscillation	Rhythmic	Spiral	Jumping
Irregular	Haphazard	Zig Zag			

Table 3.2: Natural Resources – Mapped to Dimensions

Dimensions	**Options**		
Linear	Moving Ants	Snail	
Zig Zag	Snake	Worm	Caterpillar
Haphazard	Clouds		
Circular	Peacock Dance		
Rolling	Rolling Rocks		
Wave	Sea Waves	Tree leafs	
Vertical	Rain Drops	Water Falls	Falling leafs
Flying	Bee	Birds	
Oscillation	Monkey Tail	Dog Tail	
Rhythmic	Fish Movement	Elephant Walk	Cow
Spiral	Spider		
Jump	Frog	Monkey	

Step 4: **Understanding the elements of the natural resources**

Once the key Natural Resources are identified and successfully mapped, the elements of the key resources will be listed so as to bridge the gap. The key elements needs to be identified which are inline with the developmental need. For example, for a learning child, the representation of butterfly with the key elements of fly, colorful, smooth open and close, engaging with flowers fulfill the requirements. However for an experimenter, the entire life cycle illustration from cocoon to butterfly helps to understand the life of the butterfly and with that the child will observe. These elements can be considered very well during the design, however the not to do elements can also be mentioned. For example, the butterfly element should not include funny noise to attract the child.

Limitation: This paper gives a methodology to replicate the natural resources for a child to develop through LEEC cycle. The examples and illustrations are listed for the specific need however for the every stage the child psychology needs to be referred. The toys should replicate the natural resources and for which the cost of development is not considered in this paper. The tables provided here are to mention the way to explore the methodology and it can be updated.

Conclusion: Children development is very crucial since it lays the foundation for the future Contribution. Natural resources are very simple in nature and engage the child for LEE in a long term. There is no replacement to natural resources to the child development (Hughes, Fergus P, 1992).

The Morphological table is made to understand the basic requirements by mapping it in a systematic way. The different dimensions and options will be deconstructed further to form the clear boundaries. The mapped elements of the Natural Resources give way to the elements of the toy so as to replicate. With these the required elements are identified and unwanted elements are eliminated. And with the structured exploration the play will be initiated with fun and ends up in learn. With the help of effective Learn, Explore and Experiment when the child grows will contribute back for the betterment.

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