DEVELOPMENT OF CONCEPTUAL ACTIVITIES IN SCIENCE AT UPPER PRIMARY AND ELEMENTARY LEVELS FOR ODISHA USING LOCALLY AVAILABLE TOYS

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CONTENT

Preface

Play holds an important role in children's cognitive, social, and behavioral development. Play helps children to learn, develop, gain confidence, and manage experiences through exploration, creativity, entertainment, and socialization. We may argue that play helps children learn to control their actions, interact with people, and explore the world. Children's play is often mediated by toys. Toys are objects that encourage children's expression, fantasy, interest, exploration, construction, education, cognitive development, and sex-role learning.

In this context, children's toy preferences are of great importance in terms of not only fun but affect the developmental and cognitive stages. Technology-based toys are among children's most preferred options in today's world. Toys exist today in a variety of forms based on the ways in which children interact with them and the sorts of purposeful tasks they initiate. On the other hand, smart toys prompting cognitive tasks mainly emphasize on children's cognitive skills. Indigenous toys on the other hand have a reflection

The project provides general characteristics of toys, the relationship of toys to children's developmental stages and motivation, toy based learning in light of learning through interaction, and toys as cognitive tools. Additionally, the project explores the experiences of children when playing with toys. Hence, this project should be considered in future studies. New studies should be further carried out for children with disabilities, as well.

This project has the sole aims to encourage more researchers, designers, developers, and teachers to come together and conceptualize toys that will transform learning into a joyful endeavor.

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CHAPTER 1

INTRODUCTION

The National Education Policy (NEP) 2020 advocates rethinking curriculum and pedagogy more deeply based on the Indian and local contexts. The NEP-2020 also stresses experiential learning by infusing local flavour into teaching and learning resources. The proposed pedagogical change and the necessity to incorporate local context into teaching-learning make toy-based pedagogy prominent in the curriculum. NEP 2020 incorporates the core of toy-based pedagogy into the curriculum. Toys' prominent position in the curriculum will benefit children's cognitive, emotional, and conative development.

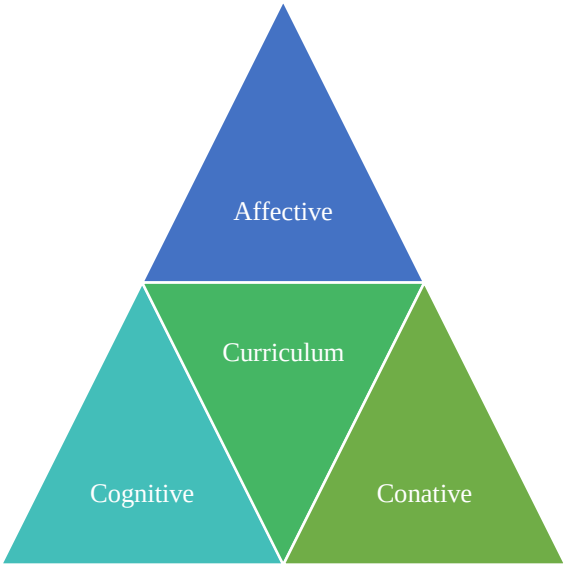

Fig 1.1 The Influence of Curriculum on development

Toys are the keepers of a country's cultural heritage, and the local tradition binds the learner to their homeland, creating patriotism in them. The purpose of adopting toy-based pedagogy in the future NCF, as envisioned in NEP 2020, will change how toys are perceived and allow them to find their proper place in the curriculum.

Creating the toys as teaching tools and incorporating them with the pedagogical methods is the basic aim of the curriculum to gradually develop the spirit of Indian culture within the student. The results yield, and creativity and problem-solving talents will flourish. Analogies, riddles, and games are some kinds of activities that should be included in a lesson plan to teach Science and mathematics. The use of indigenous toys will bring out the local traditions

and character of the student's growing surroundings and will always represent his personality. Going global with Toys also contributes to sustainability by reducing the ever-increasing usage of plastic toys, which has negative environmental repercussions.

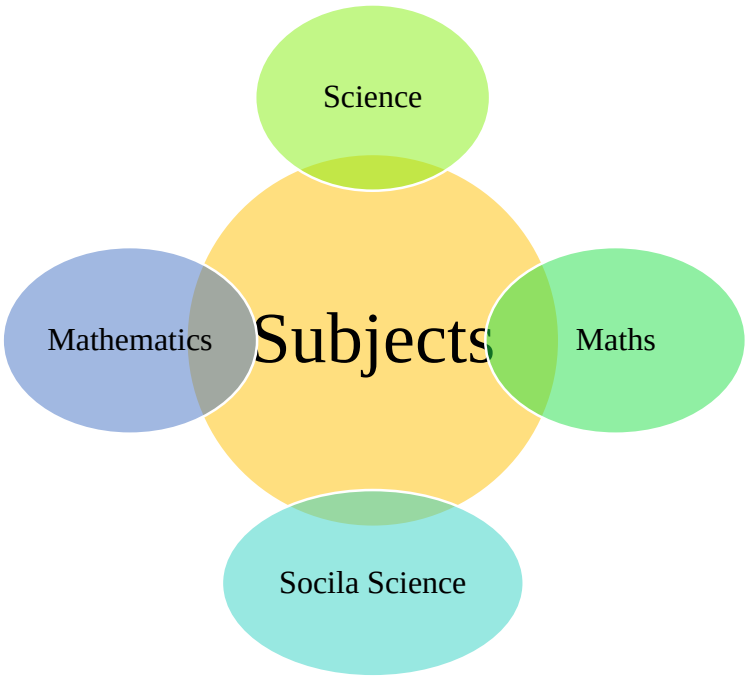

Fig 1.2 The Expansion of toy-based learning in subjects

Furthermore, it may be integrated into existing delivery tools and procedures by incorporating critical thinking, decision-making, and problem-solving into existing delivery tools and procedures. The pre-service teacher should be aware of the skill of embedding, which allows courses to be rethought, restructured, and reimagined using developed pedagogy.

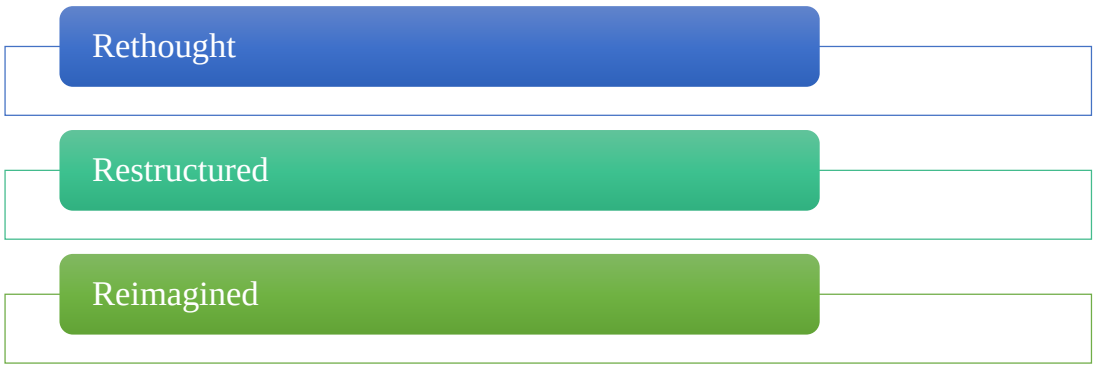

Fig 1.3 The Expansion of toy-based learning through toy based pedagogy

CONTEXTUAL BACKGROUND

A Toy is an object that allows a child to play with. Toys are an important part of every child's development, as they aid in their physiological, mental, and emotional growth. The activities and control required to comprehend and operate various playthings such as toys. They aid in the installation of a sense of shape and colour and the enhancement of cognitive ability and flower creativity. It moulds children's experiences and stimulates their imaginations. Childhood is a time when one can explore the world creatively. Toys and games can help to provide this joy. "When I bring to you coloured toys, my child, I understand why there is such a play of colours on clouds, on water, and why flowers are painted in tints — when I bring coloured toys to you, my child," Rabindranath Tagore said. Again, Tagore stated that a toy should be imperfect so that a child can use his or her imagination to fill in the gaps.

According to a study, learning via play is a vital aspect of a child's growth. Allowing their children to expend some extra energy by exploring toys is a wonderful advantage to families, just as ensuring your child has enough playtime is. A child's intellect expands even at an early age simply by looking about and taking in their surroundings. In addition, toys are commonly used as symbols for other things, and here is where they can help toddlers grasp complex concepts.

The natural propensity of a youngster is to imitate. As a result, youngsters spend most of their time observing the practical work system in their daily lives and creating appropriate toys to play with. At home, for example, children are exposed to culinary tools.

Fig 1.4 The Expansion of toy-based learning on kitchen sets

They subsequently play with a plastic clay kitchen set they made. Toys are an unavoidable aspect of childhood. Children's natural skills to interact with toys have existed since time and remain today. Students in India are familiar with native games and toys because they are rural. Therefore, it is vital to consider and create suitable learning environments for children. Teaching-learning is a complicated process, but when children are given opportunities to acquire knowledge from their local environment and familiar examples, they assume that knowledge can be found there. Toys have a significant role in the development of children's experiences. Children's learning can be boosted when toys are employed as teaching-learning tools. As a result, toy pedagogy is an important aspect of children's learning. In toy pedagogy, the learner's experiences are central to all aspects of teaching and learning. This experience includes the impressions that children form while playing with toys. The experiences may include previous experiences, current experiences, and experiences gained through the learner's participation in activities. The use of educational toys can assist children in learning a variety of skills that they will require throughout their lives.

HISTORY AND TYPES OF TOYS

In ancient Sumerian deposits dating back to 2600 BCE, objects with human and animal forms that could have been toying were uncovered. Around 500 BCE, a Greek reference to yo-yos made of wood, metal, or painted terracotta is the first written historical mention. On the other hand, the yo-yo is thought to have originated in China considerably earlier. In addition, the kite, which is still a popular toy in China, was invented there in 1000 BCE. Clay animal sculptures on wheels and other animal toys have been found in India since around 2500 BCE. Horses and elephants made of brass and bronze became popular among Indians.

India is a diverse country with a rich history and diverse cultures endured over time. Indian toys are important cultural assets that preserve traditional wisdom, cultural heritage, creativity, and imagination. State and cultural variation are very obvious, providing unique sets of toys for children based on material used, such as terracotta, wooden, iron, and cloth-made toys. Rattle, tattoo, dug-dugi, dolls, puppets, and other similar toys are still popular among children and are still in use. The beauty is that Rajasthani toys are distinct from those found in the North East, West, and South. Indian children also make their toys out of locally available materials and waste products as they are beautiful, artistic, and symbolic; they are also used for decorative and entertainment purposes. Given the current situation, such toys have educational value. There is also a high demand because these are simpler, more durable, and safer than modern toys. These toys are based on people, animals, and everyday objects and provide

many hands-on opportunities for face interaction, pretend play, and problem-solving, allowing children to learn faster.

Fig 1.5: Indigenous Indian Toys

STATIC TOYS

The instinct for self-preservation most likely spawned the earliest forms of play. The use of weapons was one of the first things taught to children in many human cultures, and the simple stick or club served as the prototype for later military instruments of play, such as swords and guns. Most games and sports requiring physical action arose from the practice of skills used in warfare and hunting; however, the instruments used for games or sports, such as the small bow and arrow given to a boy in ancient Rome for training, were regarded as weapons rather than toys. However, by the Middle Ages, war-related objects, such as miniature soldiers and weapons, were considered toys. The most recent advances in warfare are represented in modern toys. It portrays the weapons used as war machines and fantasizes in science fiction and motion pictures.

The ball, which all people used, is one of the most ancient toys for adults and children. Other toys are likely to be derived from magical artefacts and fetishes that play an important role in all primitive religions and rituals. Even today, the traditions continue during the Mexican festival of the Day of the Dead. Sugar is formed into elaborate and beautiful skulls, tombs, and angels; many of these forms are essentially religious symbols, but in children's hands, they become toys that are played with and eventually eaten. Christmas tree decorations, Easter eggs, and the Neapolitan presepio (crèche), with its wealth of elaborate figures depicting Jesus' birth,

are other obvious examples of religious toys. The Pueblo Indians' kachina doll, a modern relic of early culture, is played with by children to learn their culture's myths. The doll is one of the oldest and most fundamental toys. Every epoch and culture has given its children miniature versions of humans. Dolls from early Roman and Christian Rome have been discovered preserved in the graves of their young owners. Both the British Museum and the Royal Ontario Museum in Toronto have early Roman dolls dating from the third century CE made of linen and stuffed with papyrus.

Fig 1.6 Static Toys

DYNAMIC TOYS

Moving toys include a broader range of objects. Many experiments with basic physical principles were most likely first realized in the form of moving toys known through the literary description. For example, the Chinese's early use of gunpowder for fireworks resulted in the development of explosive toy weapons and rockets. Toys have used balance and counterbalance, the wheel, the swing, the pendulum, flight, centrifugal force, magnetism, the spring, and various other devices and principles.

Many moving toys date back centuries. Many movable folk toys, such as clay elephants that "drink" water and acrobatic dolls on sticks, are still popular throughout India. On the other end of the order, modern technological advances have enabled the manufacture of sophisticated moving toys such as electric railroad trains and automobile racing tracks and cars. Radio-controlled model aircraft, wheeled vehicles, and dolls that walk, talk, and perform other stunts also form an integral part of toys. Children can also use new toy technology to design, build, and program robots with special sensors, motors, and microcomputers.

Toys sold in developed countries are typically mass-produced and frequently made in developing countries, with technology providing locomotion and other actions. Yet, despite Western commodification, toys frequently reflect the child's cultural environment. For

example, toys popular in eastern India include clay monkeys that climb a string, paper snakes attached to wood, and rattles made from gourds with pebbles inside.

Fig 1.7 Children playing with tire

Fig 1.8 Children playing with lattu-the Indian spin wheel

Integration of toys in teaching-learning of learning concepts

Science is inherently dynamic. It's a growing body of knowledge. It entails observing, investigating, hypothesizing, verifying, analyzing, and interpreting various phenomena around us. Science is a human endeavour, and its body of knowledge is dynamic, organized, and ever-expanding. Thus, Science as a body of knowledge seeks to answer questions about how the physical and biological worlds work. These methods for finding answers are unique to Science, and they provide the most objective knowledge known to humankind. This objectivity, combined with a focus on the process of doing it, is what makes science creative. As a result, science can play a truly liberating role in a progressive society like ours, assisting people in breaking free from the vicious cycle of poverty, ignorance, and superstition.

Toys of various types are available on the market in this day and age of science and technology. When one tries to connect toys that are available locally, on the other hand, this helps the students to connect better to their context. Students in rural areas typically attend 'local fairs (Mela)' and collect toys of their choice. They also make toys out of materials found in their surroundings. Science is the careful search for meaningful patterns and relationships based on inquiry that arose from natural curiosity, logical reasoning, observations, and experimentation. Conceptual models are built on understanding the physical and biological environment based on the patterns and relationships discovered.

What makes Science intriguing is science's methods, which entail thorough observations, experiments, recording data, detecting patterns, creating links, and eventually arriving at theories, laws, and principles. To truly comprehend the concept of Science, learners must have the opportunity to observe, explore, experiment, and so on during scientific teaching and learning. As a result, the experiences that students have are crucial to their comprehension of Science. In upper primary school, Science is initially introduced as a curriculum. Science education should provide a progressive transition from elementary environmental studies to science and technology elements at this point. Activities and experiments must be included as part of the teaching and learning process. Concepts, concepts, and principles are derived from familiar experience and hands-on labour through activities and experimentation. Because children have natural habits of playing with toys, making toys, and playing games with toys, toys as educational materials play a significant role in this context. Pedagogy should include group activities, interactions with peers and teachers, surveys, and data organization.

Implications of toy pedagogy on textbooks and other teaching-learning materials

One form of teaching-learning material utilized in curriculum transactions is textbooks. It is, however, the only available and affordable educational material for the great majority of students and teachers. The content, structure, and presentation technique of the text impact the subject's learning. The proposed instructional approach and classroom processes should be reflected in the textbook. The creation of knowledge and the meaning-making process of the notion presented are heavily influenced by the learners' experiences. As a result, textbooks now incorporate a wide range of real-life experiences, activities, group work, exercises, opportunities to go beyond the text, and much-needed room for learners to actively engage in reflective thinking. Textbooks must be created in a process-oriented manner, with extensive dialogue and reflection taking place throughout the process.

RATIONALE

Toy-based pedagogy is an integrated part of the pedagogy which involves engaging children to look deep into their own experiences when they play with toys and connect them with the content knowledge being given in the school. Using toys in teaching-learning will enhance students' cognitive, affective and psychomotor development and help present school subjects in a lively and interesting way by giving learners hands-on experience and encouraging them to observe, explore, experiment, and question. It is important that learning should not remain confined strictly to the classroom alone but should be intricately woven into the experience in the daily life of the learners. Students can tinker with the toys as they take toys apart, experiment with them, and design and make toys for themselves. Toys, especially regional-based local toys, are an integral part of the growing up of each child.

Thus the use of local toys in the teaching-learning process will help contextualise the concepts taught to students. This will further help them concretize concepts/ideas and enhance their understanding of concepts/ideas.

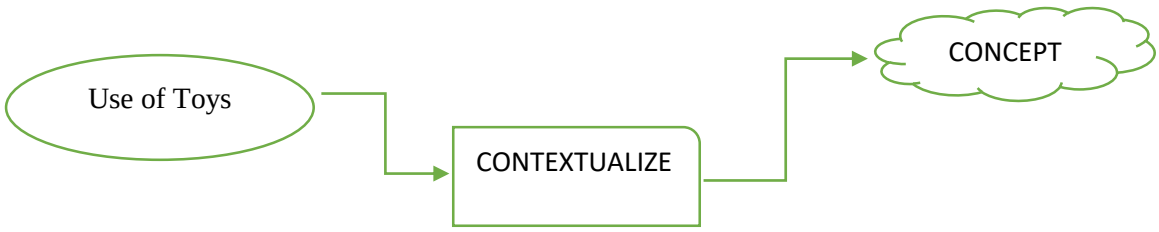

Fig 1.9 The process of concept development

The need is to promote indigenous toys to help children learn with easy and cost-effective access to them. Traditional as well as innovative strategies may be used to promote the use of indigenous toys. It was felt that the curriculum might include indigenous toys as learning resources for preparing them to explain the scientific principles behind them. Thus, taking it in order it was deeply felt that the need of the hour keeping by the vision of the NEP 2020 was to map the concepts that were initiated when playing with the toys and the difference it brought in classroom teaching and learning when used in the classroom.

Under this umbrella Regional Institute of Education, NCERT, Bhubaneswar proposed a developmental research project:

"Development of Conceptual Activities in Science at Upper Primary and Elementary Levels for Odisha using Locally Available Toys."

OBJECTIVES OF THE PROJECT-

- Development of conceptual activities on Science at upper primary and secondary levels of Odisha by using toys.
- Facilitation of joyful competency-based experiential teaching process by using locally available toys.

OPERATIONAL DEFINITION

A toy is a plaything, usually for an infant or child, and often an instrument used in a game. Toys, playthings, and games that survive from the past bring the history of diversification within the culture. The ball, kite, and yo-yo are assumed to be the oldest objects specifically designed as toys. Toys have been created from the simplest to the most complex concepts in history. From the stick selected by a child and imagined to be a hobbyhorse to sophisticated and complex mechanical devices, toys have travelled along with history and constructed history by themselves. Coordination and other manual skills develop from cumulative childhood experiences received by manipulating toys such as marbles, jackstones, and other objects that require the head and the hand. Puzzles of spatial relationships challenge mental agility by forming the base of the child's cognitive development.

DELIMITATIONS OF THE PROJECT

- Only primary and upper primary grades have been considered.
- Toys are collected only from local areas of Odisha.

STEPS OF PROJECT DEVELOPMENT

STEPS	CONCEPT DEVEOPMENT
	TRY OUT IN CLASSROOM
	ANALYSIS OF JOYFUL LEARNING

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CHAPTER 2

REVIEW OF RELATED LITERATURE

A literature review is a compilation of scholarly sources that gives a broad overview of a subject. They are compilations of the most relevant and significant publications on a given topic in order to provide a comprehensive overview of what has been said and by whom. In this chapter toy, how toy is used in play and how playing with toys bring contextualization and concept comprehension is explored.

Play as an activity has always been an essential and integral part of the human culture. The child's involvement with play is vital in early childhood as this has a significant role in the child's physical, psycho-emotional, social and cognitive development. Through play, children can act freely and express their feelings, communicate, explore the world around them and learn in a fun way. Levin and Rosenquist (2001) highlighted that play helps children control their actions and interact with other people and encourage their expression, imagination, and interests. The pedagogical value of play is acknowledged by international organizations teaching children of early childhood and primary education (Catalano, 2018). Such organizations offer educational programs whose quality depends on the stimuli obtain from the environment, which enhance the physical and socio-emotional development. Play is a crucial element in this direction. Regarding the relationship between play and education, in particular, the term "playful learning" is found in the literature referring to the use of play through guided activities aiming at children's cognitive development (Kangas, 2010).

Besides that, educational toys also become an important role for the development of children since they are important in stimulating and prolonging play (Goldstein, 2012). The careful selection of toys can lead children to play with others, to cooperate, or to develop particular skills. In the market, there are various types of education toys that serve different purposes regarding the attributes that needs to be learned by the children. The smart toys used as digital storytelling tools to record children's ideas through playful processes present great research interest. One of the first examples of smart toys introduced was Rosebud [Komis,et al., 2021]. Rosebud is an interface that extracts digital narratives through children's interaction with various technologically enhanced physical objects enabling them to write, modify and share their ideas.

Meiring and Webb (2012) focuses on the impact of pre-service education students being exposed to a range of toys utilized as educational curricular material in order to increase their knowledge of energy.

(Arnott et al., 2019) research focuses on four interconnected toys that are used in a preschool setting. They investigate how the educational potential of Toys is realized in a play setting in an early learning environment by observing and interviewing preschool-aged children and their educators during and after a play test and group interview session.

Komis et al. (2021) work 'Smart Toys in Early Childhood and Primary Education: A Systematic Review of Technological and Educational Affordances' involves a systematic evaluation of records on Smart Toys over the previous 30 years, with an emphasis on toys for children in early childhood and primary education (3–12 years old). The purpose of their research is to examine and classify smart toys (50 items) in terms of their technological and educational benefits. The findings reveal that the toys are created using four major technical affordances and their combinations.

Shin and Rizal (2019) in his work 'Reviews of Educational Toys Designs in Cultivating Social Competence of Preschool Children' examines the features of social development via educational toys design in cultivating social and emotional development among preschool children. The characteristics of social skill development for educational toy designs are examined using a literature review in this study.

The news Indian Express article ‘Learning with toys: More fun and creativity: Arora (2020) state that toys can be used to promote experiential learning in interesting ways and are useful in the teaching learning of mathematics, languages, science etc. In order to make improvement in scientific activities, toys are designed to motivate the children and can be used both in the classroom and at home to encourage creativity and to teach scientific concepts.

Children (and adults) can tinker as they take toys apart, experiment with them, and design toys for themselves. Play is important for the development of life- long interest in science (Bulunuz & Jerrett, 2015, Jerret & Jafri, 2019). A serendipitous study of new middle school students (seventh graders), who thought their required science class was an elective, found that 96% of students who experienced fun, hands- on-science in elementary school signed up to take more science in middle school, compared to 4% of those students who had studied science only from textbooks (Sprague & Wolf, 1983). Teachers who are taught in a fun, playful way may

encourage a next generation of students to become interested in science if they implement the methods they are taught (Bulunuz, 2012a, 2012b; Jarret, 1998, 1999). And children who were allowed to play with and investigate materials daily, showed interest, creativity, and initiative they had not shown in other schoolwork (Jarret & Jafri, 2019). Also those children who were able to tinker daily in addition to their science lessons raised their science test score above the children in other classes at the same school whose science lessons were textbook based (Jarret & Jafri, 2019). This observation and a study with kindergarten students in Turkey (Bulunuz, 2019) strongly suggest that elementary school science experience plays an important role in developing interest in science. Classroom research in both the U.S.A. and Turkey shows a positive motivational effect of hands-on science (Bulunuz & Jarret, 2015).

Therefore, it can be summarized that the relationship of play, educational toys and learning into process, equipment and purpose are integrated and contributing between one another in producing a relevant educational toy design. Play is required as the process for children in order to gain skills, knowledge for their further development. On the other hand, the equipment used to achieve the learning purpose are the educational toys. Educational toys can be used as the tools to develop particular skills in terms of the cognitive development, motor development, social development and emotional development. These three components serve as the significant role in the growth and development of children, which should always be considered for its relationship with intellectual achievement and emotional well-being of the children (Elkin et al. 2018). Thus both play and the toy come together for concept formation and lifelong learning and comprehension.

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CHAPTER 3

METHODOLOGY

Methodology curves the path to determine the answers to the research questions that are proposed in the project. It shapes the project by dictating the procedure the objectives will be attained.

Research Design

The project is a direct application of the concepts that can be built through toys and then applying them in class room to make learning joyful. A case study of the books of science is done to integrate conceptual learning through science. The researcher after the workout goes to field and with the help of class teachers teaches the students using the same toy integration to observe whether this is able to bring any difference.

An exploratory mixed method research is undertaken in this project. Creswell and Clark (2007), draws the design as:

Fig 3.1: The Exploratory Design

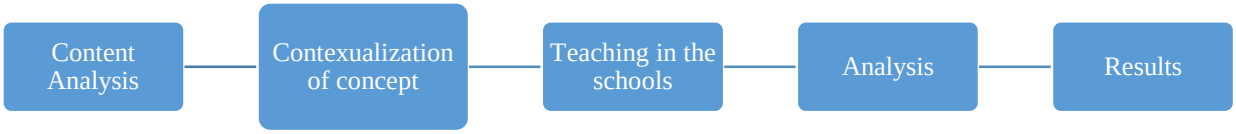

Fig 3.2: The Exploratory Design Used in the study

Sample and Sampling Technique

The sample selected is in two steps:

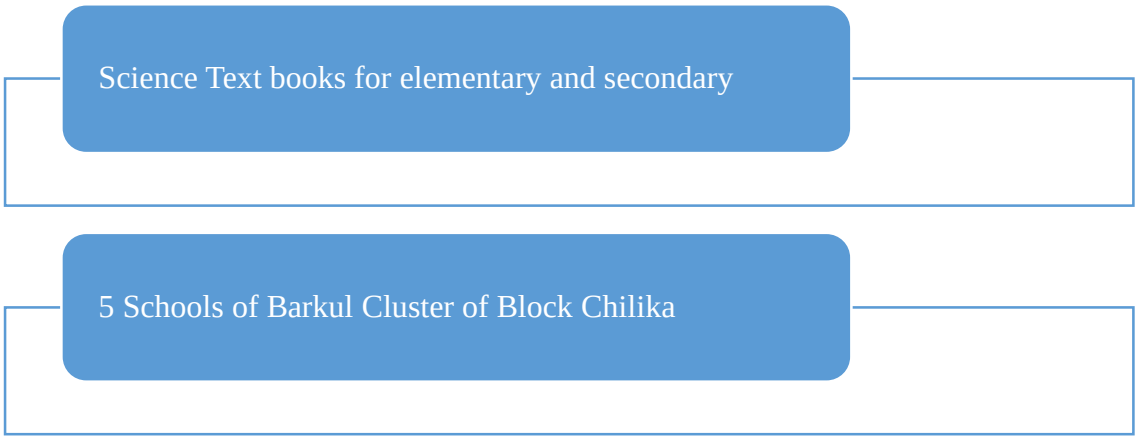

Fig 3.3: Steps in sampling

The technique of sampling is purposive as in both the cases the first by choice and the send due to the convenience of the researcher the samples have been chosen.

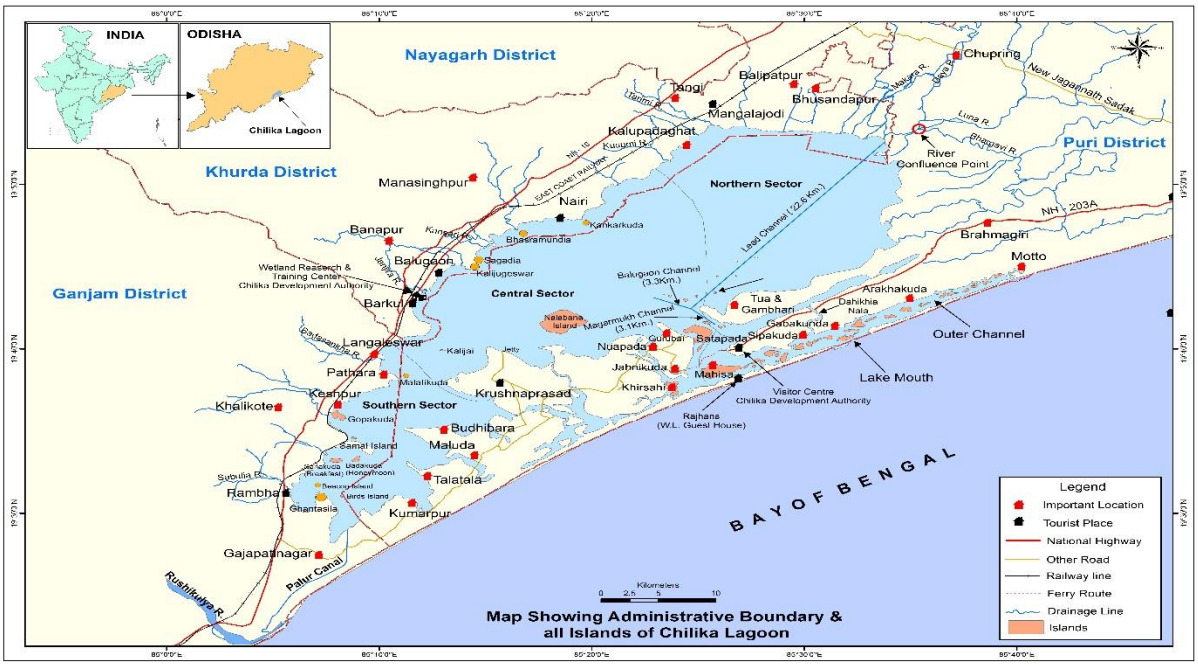

Fig 3.4: Location of Badkul cluster in Map

Table 3.1: The schools from which data was collected (Both for pilot and intervention)

Schools	Teachers	Students
Govt. Primary School, Badkul	Manoj Kumar Nayak (class V)	22
Govt. Primary School, Badkul	Anwesha Mahankudo(Class I-II)	37
Govt. Upper Primary School, Chatragada	Manoj Kumar Nayak (Class VIII)	19
Govt. Upper Primary School, Chatragada	Anwesha Mahankudo(Class I-II)	28
Chilika Govt. Upper Primary School, Injanpur	Manoj Kumar Nayak (Class VI)	30
Chilika Govt. Upper Primary School, Injanpur	Anwesha Mahankudo(Class I-II)	42

Table 3.2 : The action plan

ACTIVITY 1”

- To identify the need of the use of the toys in school at primary & elementary level.

ACTIVITY 2

- Workshops for finalization of tools

ACTIVITY 3

- Survey of Schools engaged in teaching learning process using locally available toys

ACTIVITY 4

- 5 day workshop for development of conceptual activities using toys

ACTIVITY 5

- Tryout of activities in rural and urban schools of Odisha

Activity 1: To identify the need of the use of the toys in school at primary and elementary level

Date: **11th November, 2021 and 12th November, 2021**

As per the requirement of the first activity, 2 days planning workshop (in- house) was undertaken on by the Programme Coordinators along with ten internal resource persons were involved from concerned subjects. A total of 11 internal resource persons attended the program.

Agenda: Prof. S.K.Dash, (project coordinator) briefed about the aims and objectives of the program followed by sharing of the motive of the programme, objectives and rationale for development of conceptual activities on science using toys at elementary levels. The members present in the meeting shared their views and gave required suggestions. They were asked to collect various locally available toys from Odisha.

Carry out: After the workshop the project fellow visited to the field and collected various locally available toys. Some toys are collected from **Patharagada, Koipur, Talamunda, Parlakhemundi of Gajapati district**. Some more were collected from **Balungaon, local haat, fair (mela) like state level Terracotta haat, Sisira Saras, Unit 1 haat Bhubaneswar and** other places street vendors.

Activity 2: Workshops for finalization of tools

As per the 2nd activity, two days' workshop for the finalization of tools was undertaken by five internal resource persons along with involved project fellow. In this workshop the programme coordinator briefly discussed the objectives of the project and the work done till date. The resource persons along with project fellow collaboratively prepared two semi-structured interview schedules for both students and teachers. They identified the necessity of development of conceptual activities in science by using toys through questionnaires. The tool was finalized for the workshop.

Activity 3: Survey of Schools engaged in teaching learning process using locally available toys

Date: 7th February, 2022 to 10th February, 2022

Agenda:

The objective of this activity is to visit schools and do a survey of teachers and students by using locally available toys. As per the instructions of the programme coordinator the researcher visited different schools of Chilika block. There she interacted with teachers regarding implementation of toy based pedagogy.

Carry out:

I. A survey of teachers and students was taken by using semi structured interview questionnaires. The preliminary data were collected from teachers and students to study their perception and uses by toys in the classroom by employing a semi structured interview schedule.

II. Simultaneously the collection of the toys from various parts of Odisha has been continued. Concept mapping has been done on the scientific concepts existing in class 1 to 8 NCERT textbooks. After reviewing textbooks, the researchers tried to integrate relevant collected toys in those concepts.

Activity 4: A five days' workshop for development of conceptual activities using toys

Date- 14th February, 2022 to 18th February, 2022

Agenda: In this activity the researchers conducted a five-day workshop for development of conceptual activities using toys. After planning the ERPs were invited through email and on phone calls.

Carryout: Ten External Resource Persons and ten numbers of Internal Resource Persons were appointed for the development of conceptual activities. At first the programme coordinator introduced about the aims and objectives of the project. Later on head of the departments explained briefly about toy based pedagogy and its implementation. After the completion of inauguration session Project coordinator Prof. S.K.Dash divided the resource persons in to two

heterogeneous groups. One is for primary section and other is for upper primary. After the distribution of works resource persons collaboratively integrated collected toys with the concepts and documented them.

Fig 3.5: Photographs of ERPs with Investigators and project fellow

After the completion of preparation of a rough draft of the conceptual material, the researcher prepared a tabulated format of conceptual material which contained brief illustration about every toy with its educational implications in a classroom. The workout led to the shaping of the final draft of conceptual material with the help of project coordinator, experts and fellow researchers who contributed in member check for data legitimization.

Activity 5: Tryout of activities in rural and urban schools of Odisha

Date: 21st March, 2022 to 25th March, 2022

Agenda: Researchers planned, collected toys, and did surveys with students and teachers. Then they developed conceptual activities in science at the elementary stage using toys from the local area. In due process they tried to integrate toys with applicable concepts of Environmental science and Science. After the integration of toys in subject matter is over, it was tried out among the learners. In this activity the researcher carried out the tryout of collected toys in the schools.

Carry out: The researcher is visited the Badakula cluster of Chilika block. By following the guidelines of the activity, one of the local teachers was appointed as an external resource person. They carried out the work as follows.

I. Day 1- March 21, 2022

Try out of toys in class I and II

On the first day of tryout, the researcher and the appointed ERP visited two schools of Badkul cluster. At Govt Primary School, Badkul, the researcher had taken one multi-grade class of standard one and two. The concept was to introduce different types of musical instruments. The researcher took a bunch of relevant musical toys to the class. She asked learners to pick any one of the toys from the bag. Curious learners took the toys one by one. They started to play with toys. The researcher enquired the name of those toys. Later the researcher asked them to write down the names on the blackboard. Some of the students wrote down the names correctly, while some of them made mistakes. The researcher corrected them. The interesting part was that learners were participating actively. The researcher encouraced them to make a list of various local musical instruments available in their surroundings. Learners took active part in discussion and made a long list of musical instruments. Like this the researcher tried out the toys in the primary section and tried to touch the learning outcome.

Fig 3.6: Photograph of try-out of toys in class I and II

Try out of toys in class V

In this class the external resource person taught the concept of measurement and balancing of the things. He took a toy coconut shell measuring machine. The students measured and balanced both of the shells by using the machine. The class was active. Learners also wrote

down the uses of the balancing machine. They made a list of various types of balancing machines which they have been observing in their day to day life.

Fig 3.7: Photograph of try-out of toys in class V

Try out of kaleidoscope in class VI

In the 2nd school the ERP tried out a toy kaleidoscope in class VI. Reflection was the topic the ERP discussed in the class. This was made up of cardboards, mirrors and colored beads. Here the learner observed the phenomenon of reflection, angle of incidence and mixing of colors. The learner looked into the eye piece and rotated the chamber to observe various colorful patterns. The learning outcomes were that the learners attempted to construct models using materials from surroundings like waste cardboard, mirrors, beads and trinkets. Students were very curious and participated actively in the class.

It was inferred that the teaching by using toys is really an effective way to make the teaching learning process more flexible and participative. The use of such teaching learning materials will definitely increase the creativity among learners.

II. Day 1- March 22, 2022

On the 2nd day of tryout the researchers again visited two different schools from the Badkul cluster. The researcher entered into the primary section. There she distributed some colored paper-sheets among learners. Learners prepared many paper toys using their creativity. The

researcher as well as the class teacher also participated along with the students who were enjoying and sharing their ideas among with each other. The researcher asked them to make similar groups of paper toys and count them. Most of the paper toys were varieties of paper boat and rocket. The researcher asked learners about the use of boats in their day to day life. Learners promptly replied as being from Chilika which is the harbor of a huge water bidy boats were an integral part of the lives of the students. Then they were asked to list down the other modes of transport in their day to day life. Learners made a list and wrote down the names of vehicles in the black board.

The external resource person tried out a toy in class VI. The concept taught by him was rotational motion. He took some *firki*, spinning wheel and *chakris* to the class. There are various ways to make the toy. The learning concept of the topic is that students will know about the concept of rotaion. Usually students make the *firki* by using coconut sticks and papers etc. They can make varieties of firkis by themselves. The learning outcome of the concept is to understand the concept of rotational motion and give the examples of their daily life. Learners inferred the concept and gave relevant examples.

Fig 3.8: try-out of toys in day II

Thus, the project culminated by the processing of the five workshops. The limitations could be mapped as use of toy based learning extensively in other schools and to equip more teachers in teaching through toy integrated learning. Overall the project opened new aspects of concept formation and joyful learning.

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Chapter 4

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the description, organization, analysis and interpretation of the data obtained through the administration of tools to study student's interest towards the toy based pedagogy. The data was collected in two different phases. At the preliminary stage a pilot study was conducted regarding the use of toys for concept formations from teachers and students to study their perception and uses by toys in the classroom by employing a semi structured interview schedule.

Three major findings emerged from this pilot set up. The first being that the was apprehension among the teachers that toys could be used for concept formation and secondly whether discipline could be maintained in the classroom if toys were used. The third was an inhibition for the acceptance of toys in the classroom for teaching-learning purpose.

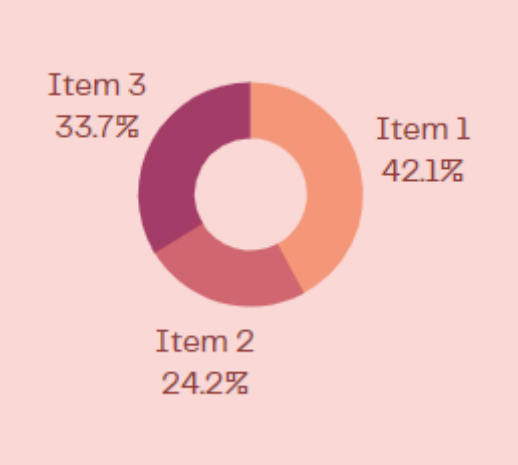


Fig: 4.1: the barriers of introducing toys to classroom

In lieu of this it was decided that the concepts related each of the toys will be first analyzed and then the researcher will carry out the teaching-learning process in the classroom.

PART I

CONCEPTUAL ACTIVITIES IN SCIENCE AT ELEMENTARY STAGE USING TOYS FROM ODISHA

Table 4.1: Conceptual Activities in Science at Elementary Stage using Toys from Odisha

Sl. No	Area	Name Of Toys	Photograph of toy	Class	Concepts	Details of the toy	Explanation of the concepts using the toy	How children play with the toy	Expected Learning Outcomes
01	Environmental science	Nikiti (weight machine)		III to IV	Role of weighing and measuring	It's made up of used coconut shells and some sticks	Learners will know about the concept of weighing machine in their day to day life.	By weighing sands, leaves and other materials.	Learners weigh surrounding materials by using self-made weight machine.

02	Environmental science	Wooden plough		IV	Process of cultivation	It's made up of wood.	Learners will know about the uses of plow in harvesting of crops.	At villages generally learners make this this type of instruments to play among themselves.	Learners identify the uses of plow in crop field.

03	Environmental science	Clay kitchen set		III	Food items, Process of cooking by using food items	Made up of clay.	Learners will get to know about our utensils.	At many places kids love to play the kitchen and family game.	Learners identify the cooking utensils and the use of the cooking processes.
04	EVS			III	Knowing plants and	The toy is made up of some hard paper or	Learners will able to know about plant parts.	Children generally play with waste plant parts and	Learners play with nest and identify plant parts and how plant is a

		Artificial nest			their parts	thick fallen leaves, some cotton and marbles.	They will know that how plant is a shelter to animals and birds.	make this type of toys by using them.	shelter to animals and birds.
05	EVS	Chakka gadi Rickshaw		III	Modes of transport	The toy vehicles are made up of bamboo, small sticks, clay etc.	Learners will be able to know about different modes of transport.	A child loves to play with vehicle toys.	Learners recognize various modes of transport. They make a list and picture of vehicles.

									
06	EVS	Elephant toys		IV	Elephant	Made up of clay and available at local fairs.	Learners will able to know about elephant.	Children are always fond of clay toys.	Learner define the characteristics of an elephant.

07	EVS	Paper birds , clay birds	 	III	Birds and their body parts	Made up of paper, clay.	Learners will be able to differentiate between various birds and their morphological features.	Children use their creativity to make various paper and clay birds.	Learner identifies observable features of birds.

08	EVS	Puppets	 	IV	Taking care of living being, (plants)	Made up of old clothes, puppets, toys available at market.	Learners will be able to know the value of plants, environment and take care of them.	Learners will make a skit about sensitization of environment by using puppet	Learners define and analyze living organism. Learners develop aesthetic values for environment.
09	Science	Spinning wheel(CHARKHA)		VI	Spinning cotton yarn	Made of wood, nails and string.	Learner explores the spinning of yarn from cotton fibres.	The learner spins flywheel to observe how	Learner identifies plant fibre on the basis of

						Sourced from the market.		the yarn is made from cotton fibres.	observable features such as texture, function etc.
10	Science	Kaleidoscope		VI	Reflection	Made up of cardboards, mirrors and coloured beads.	Learner observes the phenomenon of reflection, angle of incidence and mixing of colours.	The learner peers into the eye piece and rotates the chamber to observe various colourful patterns.	Learners constructs models using materials from surroundings like waste cardboard, mirrors, beads and trinkets.
11	science	Garbage bin		VI	Various types of garbage. Sourcing,	The toy is made up of waste cartons, egg crates etc	Learner will know the use of garbage can and recycling bin.	Children will enjoy making various kinds of garbage bins	Learners make garbage bin using waste cartons, buckets etc.

					collection and segregation of garbage.			by using their creativity.	
12	Science	Paper flexagon		VII	Food chain	The toy is made by folding and painting two pieces of paper.	Children will learn about the concept of food chain.	Children will cut and fold the papers and make the flexagon.	Learners make flow charts of relationship between various organisms.

13	Science	Ferris wheel (Pin wheel) Firki	 	VII	Rotational motion	There are various ways to make the toy.	Children will know about the concept of rotational motion.	Usually children make the firki by using coconut sticks and papers etc.	Learners make concept maps of rotational motion.
Sl. No	**Area /Topic/ Theme**	**Name Of Toys**	**Photograph**	**Stage/Class**	**Concepts/ Skills**	**Details of the toy / Making of the toy**	**Suggested Activities/How the toys can be use/ Explanation of**	**How children play with the toy**	**Learning Outcomes**

							the concepts using the toy		
15	Science	Kendera/ektara		VIII	Sound as vibration	The toy is made up of wooden frame with bamboo and metal strings.	The student will able to learn the concept of production of sound by vibration.	Generally children love to play with various musical instruments.	Learners map concept of sound being a product of vibration. Learners constructs toys using materials from surroundings.

16	Science	Syringe with balloon		VIII	Pressure Changes the shape of the balloon.	The toy is made up of some used syringe, balloon.	Learners will infer how pressure leads to the changes of shape of some materials	Children used to play by using syringe as a pichkari.	Learners try and mix other materials to know more about the concept.
17	Science	Catapult		VIII	Effect of force	The toy is made up of sticks and waste cycle tyre.	Learners will understand the concept of force. They will know that how force causes motion and changes the position.	Children are much fond of catapults. Most of the catapults are self-made of easily available at market. They use them to felling	Learners infer the effect of force by playing catapults. Learners try to make different types catapults by using sticks and elastic.

								hanging fruits from tree.	
18	Science	Rubber ball		VIII	Synthetic fiber	The toy is made up of synthetic rubber ball.	Learners will differentiate in between natural and synthetic fiber. They will know that the ball is made up of synthetic fiber.	Most of the children love to play with balls.	Learners infer that their toy ball is made up of synthetic fiber. Learners differentiate between synthetic and natural fiber materials. Learners collect different rubber toys.

19	Science	Rolling tier		VIII	Force – a push or a pull	The toy is made from waste aluminum /iron wires. And also collected from waste cycle tyre.	Learners will understand the concept of force.	Children at villages collect old cycle tyre and make iron rod wheels. They roll and run behind them.	Learners generalize force and that due to an interaction there is push or pull. Learners infer that a force can change the state of motion. Learners exhibit creativity using toys and know about force.

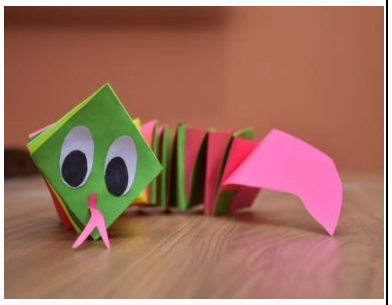
20	Science	Ferris wheel Pin wheel	 	VI	Circular motion	Village children usually make pin wheels by using paper, leaves, stick and pin.	Students will be able to know the concept of circular motion.	Children usually love to play by using pinwheel.	Learners collect more toys relevant to rotational motion. Learners use pinwheel and related toys by using papers, naturally available sticks and leaves.

21	Environment Science	Charkha		III	Fabric made machine	It's available in market.	The charkha can be a best example to show children.	Children often play with toy charkha.	Learners understand the concept that fabric is made by the help of charkha.
22	Science	Bell		VI	Periodic motion	It's available at homes.	The learner will understand the concept of periodic motion.	Children generally play with bells.	Learner uses school bell, puja bell etc to test periodic motion.
23	Science	Firki		VI	Air is present everywhere.	Children make it by using paper, leaves.	The learner will understand the concept of air. Air is present everywhere.	Children make various firkis and run by blowing it on air.	Learner make different types of firkis by using their creativity.

									
24	Science	Paper toys	 	VI	Reversible change	Children make many paper toys by using paper, cardboards etc.	Children will infer that which changes are reversible and which are not.	Children usually play with many self-made paper toys.	Learners make different types of paper toys by using papers, cardboards etc. Learners observe the toys are reversible and which are irreversible.

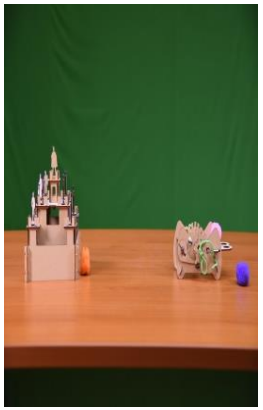
25	Science	Ball		VII	Measuring speed of ball	Rubber ball	Learners will understand the concept of speed. They will measure the speed of ball.	Most of the boys play with cricket balls. Teacher should encourage all of the students to play with ball and cricket.	Learners measure the speed of ball while playing and note down them.

26	Science	Wooden Aeroplane , Paper Aeroplane		VIII	Fluid friction	Children make varieties of paper and buy wooden Aeroplane to play.	Learners will be able to understand the concept of fluid friction. They will infer that frictional force on an object in fluid depends on its speed with respect to the fluid. They will also infer that it depends on nature of the fluid.	Children love to play with many paper Aeroplane, boat, birds etc.	Learners make a list of spindle shape living and non-living organism.

27	Environmental Science	Paper cutting snake		III	Characteristics of snake	It's made up of paper and waste clothes.	Learners will recognize various snakes around their area.	Children used to make many snakes using paper and clothes to play.	Learners make a list of local snakes around their area.
28	Environmental science	Shapes and pegs		III	Different Shapes	It's made up of wood.	Learners will infer various shapes and their characteristics.	Kids get this in preprimary schools. They play this by fitting each shape in its place.	Learners make a list of different objects having related shapes they have studied.

29	Science	Pellet drum		VIII	Sound	Made of wood, leather etc. Usually children buy varieties of pellet drum from the locally available fairs.	Learners will understand that the vibration of the taut membrane due to shaking of pellet drum exerts sound.	Children often play with varieties of damburus.	Learners explore the mechanism behind the sound being produced.

30	Science	Bow and arrow	 	VIII	Conversion of potential energy in to kinetic energy	Village children make many types of bows & arrows by using bamboo or coconut sticks , rope etc.	Learners will infer the concept involved in the conversion of a bow's stored potential energy into the kinetic energy of an arrow.	Village children make bow and arrow and play by using it.	Learners describe how different types of bows can convert stored potential energy in to varying degrees of kinetic energy in to a launched arrow.
31	Science	Gulli danda		VIII	Force makes an object move from rest.	Self-made toy by village children.	Students will infer that force may make an object from rest.	Village children are very fond of gulli danda. They make it and play in a group.	Learners conduct simple investigations to seek answers to queries, e.g., how hitting

									the gulli with the danda, moves it from rest.
32	Science	Catapult		VIII	Effect of force	The catapult is made up of waste paper cardboard .	Learners will understand the concept of force. They will know that how force causes motion and changes the position.	Children are much fond of catapults. Most of the catapults are self-made of easily available at market.	Learners infer the effect of force by playing catapults. Learners try to make different types catapults by using sticks and elastic.

33	Environmental Science	Pachia, kula, binchana, bhogei etc.		III	Bamboo made items.	These are made up of bamboo. Locally available in market,mela etc.	Learners will infer that our daily life materials made up of bamboo.	Usually children play by using toy winnowing kula and bhogei as a part of their kitchen set.	Learners make a list of daily use materials used up of bamboo.
34	Science	Flute		VIII	Vibration of air column produces various sounds.	Made up of bamboo.	Students will understand that due to the vibration of air column produces various sounds.	Children usually buy different types of flute and play with them.	Learners construct toys using materials from surroundings and explains their working.

35	Science	Seven stones(Pitho)		VII	Physical change	Made up of woods/pot shells.	Learners will infer that many physical changes are reversible.	Pitho is a commonly used toy by group of people.	Learner classifies materials on the basis of physical changes. Learner investigates other toys which are reversible after playing.
36	Science	Marbles		VII	Measuring speed of marbles.	Marbles	Learners will understand the concept of speed. They will measure the speed of ball.	Most of the boys play with marbles. Teacher should encourage all of the	A group of learners measure the speed of ball while playing and note down them.

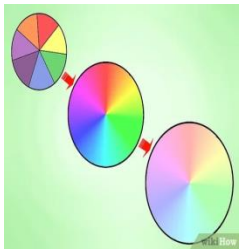
								students to play with marbles. .	
37	Environmental science	Animal puzzle		II	Fitting animals in their respective places.	Available at toy shops.	Learners will infer the shapes and names of animals.	Children play various types of puzzles by using such type of toys.	Learners shuffle and arrange animal toys in their respective places in board.
38	Science	Flying rotor pull string toy. Flying vane.		VI	Rotational motion	Toy available in market.	Students will be able to know the concept of circular motion.	Children usually love to play by using flying vane and pull string toy.	Learners collect more toys relevant to rotational motion.

39	Science	Cap gun		VI	Physical and chemical change	Available in markets.	Learners will understand that when the hammer of gun hit the plate, it happen physical change. When the roll cap hit in between there happen chemical change.	Children usually play with gun and roll cap.	Learners tryout with different cracking places by hitting the roll caps.

40	Science	Hammer striking toy		VIII	Force may make an object move from rest.	Available in market.	Students will infer that force may make an object from rest.	Children hit the balls by hammer.	Learners conduct simple investigations to seek answers to queries.
41	Environmental science	Hammer striking toy		II	Knowing colors.	Available in market.	Learners able to differentiate various colors.	Children love to play with such type of toys.	Learners identify various colors.

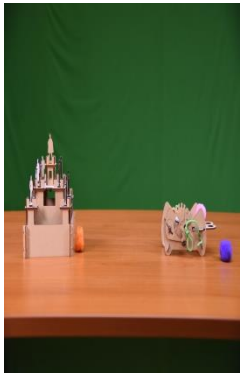
42	Environmental science	Kaudi/kawri	 	I	Counting numbers	Available in sea beach, markets etc.	Learners able to count down counting numbers.	Children usually play various games by using kawris.	Learners count down the numbers by using kawris.
43	Environmental science	Xylophone		I	Musical instrument	Available in market	Students will infer about musical instruments.	Children love to play xylophones.	Learners list one more musical instrument.

44	Science	Bow and arrow Catapult	 	IX	Elasticity	Constructed with bamboo and rubber band.	Students will understand the concept of elasticity.	Children usually make different types of bows and arrows by using bamboo sticks, coconut sticks etc.	Learners identify various elastic items in their surroundings.
45	Science	Self-balancing statuette.		IX	Balance & center of gravity according to in distribu	Sourced from market	Learners will understand the role of centre of gravity in balancing an object.	Children collect all such toys and play among themselves.	Learners observe the center of gravity in various objects.

					tion of mass.				
46	Science	Catapult Bow and arrow	 	IX	3rd law of motion	Self-made by village children.	Learners will infer the relationship between action and reaction of motion.	At villages children usually make catapults and bow and arrow to play.	Learner apply concepts of third laws of motion in day to day life.
47	Science	Newton's disc		VII	White light is composed of	Used CD Disc or self-made newton's disc	Learners will infer about white light consists of seven colors.	Children generally play with used CD.	Learners make a Newton's disc by themselves.

					seven colors.				
48	Science	Bowling set		VIII	Force makes an object move from rest.	Available in market.	Force makes an object move from rest.	Children play by using such type of toys.	Learners conduct simple investigations to seek answers to queries, e.g., how hitting the ball disturbs the bowling pin moves it from rest.

49	Science	Magnetic rattle eggs		VI	Magnetic and non-magnetic materials	Available in market.	Learners will understand which materials are magnetic and which are not.	Children love to collect and play with such magnets.	Learners differentiate between magnetic and non- magnetic materials.
50	Science	Slippery slopes friction slider		VIII	Inclined plane	Available in market.	Learners will infer that when one object is sliding over the other, it starts to slow down because of friction.	These types of toys can be provided to children so that they can collaboratively make the toy and learn by doing.	Learners apply learning of friction in day to day life.

51	Science	Catapult		IX	Projectile motion due to gravity.	Available in market or children make themselves to play.	Learners will able to learn that the pompom goes through a projectile path and returns down is due to gravity.	Children usually play by using various catapults.	Learners list out some other examples of projectile motion from their daily life experience.
52	Science	Smash and topple catapult		IX	Momentum	Available in market.	Learners will infer that the combination of speed and weight is momentum.	Children usually play by using various catapults.	Learners explain the concepts of momentum.

53	Science	Elastic spinning disc		IX	Law of conservation of energy	Self-made by children by using bottle caps.	Learners will understand that the total energy before and after spinning the disc remains the same.	Generally children make themselves such type of toys.	Learners derive formulae, equations, and laws.
54	Science	Elastic spinning disc		VI	Reversible change	Self-made by children by using bottle caps.	Learners will understand that the change occurred.	Generally children make themselves such type of toys.	Learners list out the number of reversible changes in their daily life.
55	Science	Periscope		VI	Reflection	Students can make it by	Students will infer that periscopes used	Children make different	Learners discuss and list down the

						using some broken mirror pieces and waste toothpaste cover.	to see the reflection.	types of periscopes by using waste materials.	uses of periscope in our daily life.
56	Science	Hammer striking toy		VIII	Force may make an object move from rest.	Available in market.	Students will infer that force may make an object from rest.	Children hit the balls by hammer.	Learners conducts simple investigations to seek answers to queries, e.g., how hitting

									the ball with the hammer, moves it from rest.
57	Environmental Science	Birthday cap		II	Shape of a cone	Available in market or also can be made by using cardboards.	Learners will understand the shape of cone.	Children love to wear a birthday cap as well as various caps.	Learners make a list of various cone shaped materials around their surroundings.

58	Environmental Science	Damburu Bell	 	II	Musical instrument	Available at homes, school and market	Learner will infer about various musical instruments. Learners will able to infer about the involvement of different body organs by playing different musical instruments.	Children used to play with many musical instruments and they are fascinated by the sounds.	Learners collect the names of various musical instruments used in their school, home and nearby places.

59	Environmental Science	Damburu Flute	 	V	A snake charmer's story	Available in local market	Learner will know about the local musical instruments used by different band parties for various purposes. Learner will also differentiate the sounds produced by different musical instruments.	Children used to play with many musical instruments and they are fascinated by the sounds.	Learners make a list of musical instruments used in a bean party as well as in other local folk dances.

60	Walls tell stories	Big (gun) canon Bow and arrow	 	V	Walls tale stories	Available in market and also children make them by using sticks.	Learners will able to differentiate traditional and modern war weapons.	Village children love to play with self-made bow and arrow.	Learners make a list of traditional and modern weapons.

PART III

ANALAYSIS OF SURVEY

Analysis of survey

Firstly, data generated by the open-ended questionnaire items completed manually during the field visit. The preliminary data were collected from teachers and students to study their perception and uses by toys in the classroom by employing a semi structured interview schedule. The researcher visited different schools and took interviews of teachers regarding the use of toys as teaching learning resource material in their classes. Teachers gave mixed responses about the uses of toys as a teaching learning material. Interviewing is a commonly used mentioned of collecting information from people. In many walks of life we collect information through different forms of interaction with others. Any person-to-person interaction, either face to face or otherwise, between two or more individuals with a specific purpose in mind is called an interview. In the present study the researcher used semi structured interview questions for students, teacher and parents. The strength of semi structured interviews is the almost complete freedom they provide the terms of content and structure. The researcher is free to order these in whatever sequence s/he wishes. Respondents are asked to answer freely without any hesitation. Their responses were noted down and also recorded with their permission for further use.

Mr. Nrusingh Behera said that he is already teaching by using coconut sticks, clay marbles. According to him toys can be better to be implemented in class one to five. When it comes about upper primary level the use of toy as a teaching learning material is getting narrower. Also he added that he will try to implement locally available toys in classroom.

Mrs. Sarojini Dash, a teacher from Govt. Primary School, Ghiakhalapur informed that she is aware of toy based pedagogy in NISTHA training. She and her staffs are trying to teach through toys. But they use toy as a teaching aids. Purposefully they rarely use toys to teach any concept in Upper primary classes. In upper primary classes they try to do the activities. After understanding the purpose of this research she assured to transact the concepts with the help of toys. Another teacher from Govt. Primary School Badkul said that teaching through toys may enhance children' learning capacities better its better by teaching individually rather than to a whole class. When a teacher takes a toy or two to the class, children will focus more on playing with toy instead of learning the concept. Also he said that by giving little effort he may teach the concepts better by using toys.

Fig: 4.2 Interview with teachers

The researcher did a focused group discussion among primary class students. They love all of the toys they get to play. Now days rarely they make any toys by themselves. So maximum toys they play are from market. Children make kite, kitchen sets, and bow arrow, paper toys etc. In their classes they were never taught by using toys.

Fig: 4.3: FGD with students

In between the conversation Shravani from class two asked, “Toys are meant to play, how we can read with them? My mother scolds me when I play in study time.” Later on many students nodded by supporting her. This type of responses came from majority of primary school students. From this we inferred that since ages it has been a misconception among parents, teachers and in society that those who play are wasting time and they are not interested in studies. So at first this misconception among parents and society should be tried to eradicate.

In the focused group discussion Pratap, a learner from class VIII said that, if we will be taught science concepts by using local toys, we will learn the tough topics easily by enjoying the class. After the survey the researcher gathered different views on toy based pedagogy. Teachers were interested to implement toys in the classroom. Children are curious to read by playing with toys.

Analysis of intervention

The tryout was done at 5 different schools of Badkul cluster of Chilika Block. The researcher along with one assigned external resource persons was involved in tryout. They took toys to the classroom and taught the concepts. After trying out toys in classroom they gave the feedback form to the students and teachers.

The dependability of research findings is not only determined by planning, methodology, data analysis and interpretation but also by tools that are used to collect information or data. In a research study, while selecting research tools many considerations have to be kept in mind-such as objectives of the study, the time to be devoted to the study, availability of suitable tools etc. In the present activity, a self-prepared 5-point Likerts’ scale was used in the feedback from. Likert’s scale is one of the attitudinal scales designed to measure attitudes. This scale is based upon the assumption that each statement/item on the scale has equal attitudinal ‘value’, ‘importance’ or ‘weight’ in terms of reflecting attitude towards the issues in question.

In the study the researcher at first decided to measure the attitude by using a self-prepared 5-point Likert’s Scale. There are 5 different categories (Strongly agree, Agree, Neutral, Disagree, Strongly disagree). Likerts’ scales are prepared to measure the views of teachers and learners' view point towards toy based pedagogy. Each question of the item on the research instrument has a link with the research objectives. As there is an establishment of link between the objectives and items of the tool, thus the ‘face validity’ is established. Again the items and questions cover the full range of the issue or attitude being measured. The semi structured

interview questions and self-prepared 5-point Likert's scale are judged by the researcher's guide (expert in the field). Hence the 'content validity' is established.

Then the students' and teachers perceived change on the five-point rating scale of their understanding of the concept of energy over the period of intervention was calculated. While self-reporting does, in many instances provide weak evidence, in this case the objective was to assess students' own perceptions of their understanding of energy. Thereafter, the students' comments on the remarks on feedback form have specifically influenced the change in their perceived confidence while taking part in the toy based classroom.

Table 4.2: Teachers' Feedback

Items	**% of SA**	**% of A**	**% of N**	**% OF DA**	**% OF SDA**
Teaching with toys made to understand the lesson simpler.	80%	20%	nil	nil	nil
Teaching with toys facilitates in asking conceptual questions quickly.	70%	30%	nil	nil	nil
Teaching with toys helps in illustrating with appropriate daily life examples.	70%	30%	nil	nil	nil
Teaching with toys was not able to use them contextually in every concept.	20%	60%	0%	20%	nil
Teaching with toys in the class is time consuming	10%	50%	0%	10%	30%
Teaching with toys inhibits issues in classroom management.	10%	30%	20%	10%	30%
Teaching with toys made the students towards critical thinking.	60%	20%	0%	0%	10%
Teaching with toys made students more participated in the class.	100%	nil	nil	nil	nil

Teaching with toys helps teachers to professionally sound.	70%	30%	nil	nil	nil
Assessment of learners through toys makes learning more concrete.	90%	10%	nil	nil	nil

Teacher has a vital role in transacting a classroom. Teachers should be friendly with students and facilitate them in learning. They will teach the concept by giving proper guidance, so that students are able to understand the concepts easily and make meaning from it. When teachers were asked "Is teaching with toys made to understand the lesson simpler", 80% of the teachers strongly agreed and 20% of them agreed with the statement. Approximately 70% of teachers accepted that, teaching with toys facilitates in asking conceptual questions faster than normal classes. They make easy to explain the abstract concepts by giving contextual examples. Majority of teachers said that teaching with toys made the students towards critical thinking and more participated in the class. It's not only about the enhancement of learning capacities of learners; it also helps teachers to clarify their misconceptions and makes them professionally sound. Ninety percent of teachers agreed on the statement, "Assessment of learners through toys makes learning more concrete."

Around 60% of teachers accepted that by teaching with toys was not able to use them contextually in every concept and sometimes it is time consuming. In primary section, it's relevant to use more toys but when move towards the higher classes through upper primary to secondary, the need of toys getting narrower. But, the use of toys makes easier to explain many abstract concepts of science. So, they can use toys in those concepts.

Teachers can build on children' play by providing and engaging them with toys. Toys help kids become interested in science, while also being a source of entertainment. They can plant the seeds for future scientific exploration and even a career in the sciences. Thus, toys are one of the better material resources required in the classroom, with rapidly changing scientific ideas. By introducing science toys in the classroom, children get enjoyable experiences in science learning. So, there is a need to develop science learning activities for informal learning settings outdoors and indoors, in which science toys become very handy. In addition to being very educational, the right toy based on science can mesmerize children for hours, as they learn how

it works and figure out the nuances of its operations. It is wise to make use of toys as the basis for experiments.

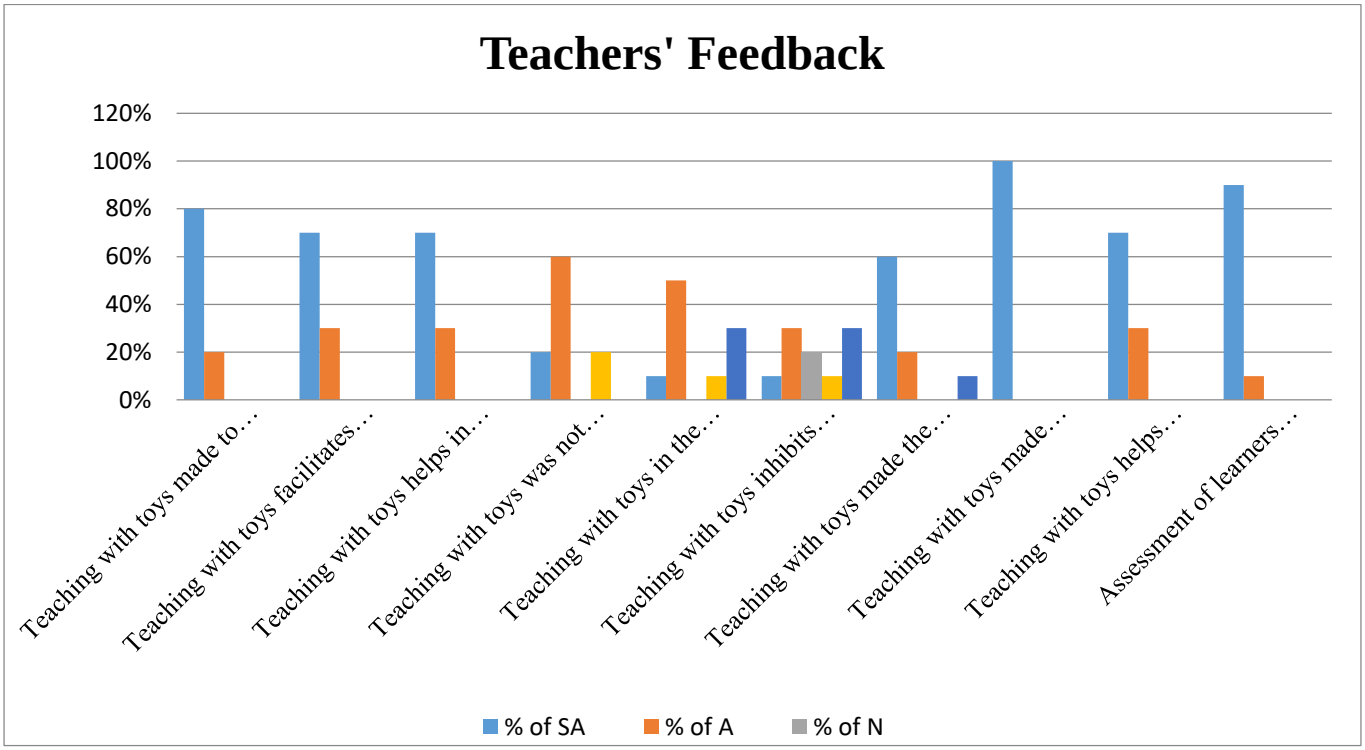


Fig: 4.4: Teacher's feedback after intervention

Feedback of learners

Toys are an important part of the life of every child. Almost everyone likes to play with toys and such a desire continues throughout an individual's life. Psychologists inform us that playing with toys is not just a filling in of an empty period, or just a relaxation or leisure activity, but it is an important learning experience. Playing with toys is also seen as a means of working off aggression; as a means of learning basic skills; as a means of informing social behaviour; as well as commonly accepted means of relaxation. Generally, they play with toys at home. When they come to school full of books and notebooks, they might be missing the toys at home. Most of the parents and teachers also made a notion that toys are meant to only play. If someone plays, s/he will not give mind towards studies. Thus there exists a huge gap between toys and studies. If we try to integrate both of them and give learners a chance to learn by playing with toys, we may reduce the gap in between. Students are acquainted with toys. When we try to teach them some science concepts through toys, this may help to squeeze their

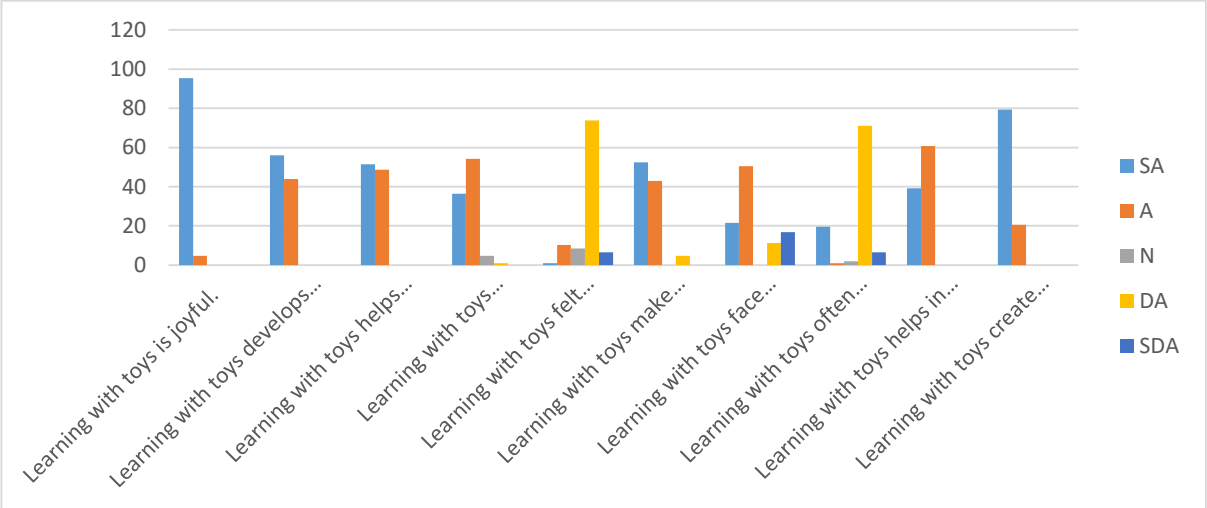
prior knowledge. Prior knowledge plays an extremely important role in organizing information from new experiences. The more one knows, the more one can know (Mukunda, 2018)

The aspect of using locally available toys in the classroom is to connect the class with the natural environment of the child. The local environment consists not only of the physical and natural world but also the socio-cultural world. All children have a voice at home, and it is essential for the school to ensure that their voices continue to be heard in the classroom as well (NCF, 2005). After the implementations of toys in the classes, students filled the feedback form. The feedback form consists of ten different statements on toy tryouts in classes. Almost 90% of students strongly agreed with the statement, "Learning with toys is enjoyable." Almost 50 to 60 % percent of students strongly agreed and 43% of them agreed that learning with toys develops clarity in abstract concepts. Almost all of the learners accepted that learning with toys helps them to enhance their creativity. Eighty percent of learners are accepting that by teaching through toys they will be able to develop critical thinking, problem solving skills. This way helps them to question, enquire and to think about the concept. Learning with toys makes new groups and new friends which binds them together to read collaboratively. Teaching with toys also makes connections across disciplines and brings out the interrelatedness of knowledge.

Table 4.3: Percentage analysis of students' feedbac

QUESTION	**SA**	**A**	**N**	**DA**	**SDA**
Learning with toys is joyful.	95.3271	4.672897	nil	nil	nil
Learning with toys develops clarity in abstract concepts.	56.07477	43.92523	nil	nil	nil
Learning with toys helps to connect our everyday activities.	51.40187	48.59813	nil	nil	nil
Learning with toys enhances creativity	36.4486	54.20561	4.672897	0.934579	

Learning with toys felt more like playing than studying.	0.934579	10.28037	8.411215	73.83178	6.542056
Learning with toys makes new groups and new friends.	52.33645	42.99065	nil	4.672897	nil
Learning with toys face difficulties in collaboration due to scarcity of toys.	21.49533	50.46729	nil	11.21495	16.82243
Learning with toys often felt distracted by the use of toys by the teacher.	19.62617	0.934579	1.869159	71.02804	6.542056
Learning with toys helps in critical thinking and problem solving skills.	39.25234	60.74766	nil	nil	nil
Learning with toys creates interest in studying multidisciplinary topics using toys.	79.43925	20.56075	nil	nil	nil



4.5: Percentage analysis of students' feedback

MAJOR FINDINGS

The major findings of the research are:

- Concept mapping to integrate toys in relevant concepts of Environmental Science and Science at elementary level.
- Maximum numbers of learners are enjoying and are interested to read by using toys as a learning material.

CONCLUSION

At the conclusion of learners' active learning experience, they successfully exchanged ideas with themselves and others who were self- reflective and self-directed in their learning. Learning through toys enhances their powers of observation, and brought their ideas to fruition via an excellent product. Innovation, technology and design (e.g. of science toys) are all important elements of creativity, and a multidisciplinary approach as well as creative skills is required to create new products and to generate new information. Such experiences promote scientific inquiry and knowledge construction in a way that no textbook or lecture could; an active learning methodology is challenging, engaging, and enlightening. It is our belief that all students would benefit from exposure to scientific inquiry through an active learning model, and it is our hope that future STEAM education includes the resources and training to promote authentic, hands-on learning within classrooms by using toys.

SUGGESTIONS FOR FURTHER STUDY

- As per the above study the researcher only integrated toys in the primary and elementary class science concepts and emphasized its integration in higher classes.
- The tryout was done at only Badkul cluster of Chilika block. It can be undertaken in various parts of India.
- Further it can be implemented in all of the schools among different boards. The curriculum should be prepared by keeping an eye on learner with respect to class and context.

Reference

Mukunda, K. V. (2018). What Did You Ask at School Today? HarperCollins Publishers India.

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APPENDIX

APPENDIX I

TOOLS FOR SURVEY OF SCHOOLS ENGAGED IN TEACHING LEARNING PROCESS USING LOCALLY AVAILABLE TOYS

Semi structured questionnaire for students-

1. **How much do you enjoy your classroom?**
2. **Have you performed any activities in your classroom?**
3. **Are those activities enjoyable?**
4. **What materials do you and your teacher use while performing activities?**
5. **While reading, do you play inside the classroom?**
6. **How many toys are there at your home?**
7. **If toys are given to you while reading, would you like to play in the classroom?**
8. **What kind of toys are you using in your classroom activities?**
9. **Are toys helpful for enhancing academic performance?**
10. **Have you prepared any handmade toys for your classroom learning?**
11. **Do you enjoy making new toys with your peers?**
12. **Classroom is enjoyable with toys or without toys? How**

Semi structured questionnaire for teachers-

1. **In the classroom which type of TLMs are you using?**
2. **Do you show the topic related activities inside the class?**
3. **How do learners react to an activity based classroom?**

4. Do you practice the play way method in the classroom?

5. Do you use any toys to teach the concepts?

6. Those TLMs you are using are handmade or readymade ones?

7. Are there any changes in response among learners during demonstration of concepts by using toys?

8. Are those toys relevant to their daily life experiences?

9. Are those toys available at the learner's locality?

10. As per the direction of NEP-2020, inclusion of toys will enhance learning performance of students. What's your view in this context?

11. How can you integrate toy pedagogy in your everyday classroom interaction?

12. How can you prepare the children for developing toys

APPENDIX II

TEACHERS' FEEDBACK FORM

Name of the teacher-

Designation-

Gender-

Name of the school-

QUESTIONS	STRONGLYAGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	REFLECTIONS
1. Teaching with toys made to understand the lesson simpler. **2.** Teaching with toys facilitatesin asking conceptual questionsquickly. **3.** Teaching with toys helps in illustrating with appropriatedaily life examples. **4.** Teaching with toys was not able to use them contextuallyin every concept. **5.** Teaching with toys in the classis time consuming. **6.** Teaching with toys inhibitsissues in classroom management. **7.** Teaching with toys made thestudents towards critical thinking. **8.** Teaching with toys made students more participated inthe class. **9.** Teaching with toys helps teachers to professionallysound. **10.** Assessment of learners through toys makes learningmore concrete.						

STUDENTS' FEEDBACK FORM

NAME OF THE STUDENT (ନାମ)-

NAME OF THE SCHOOL (ବିଦ୍ୟାଳୟର ନାମ)- CLASS (ଶ୍ରେଣୀ)-

QUESTIONS	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	REFLECTIONS
1. Learning with toys is joyful. **୧) ଖେଳନା ଦ୍ୱାରା ପାଠ ପଢିବାକୁ ମଜାଲାଖେ।**						
2. Learning with toys develops clarity inabstract concepts. **୨) ଖେଳନା ମାଧ୍ୟମରେ ପାଠ ପଢବାରୁ କଷ୍ଟପାଠ ସହଜରେ ବୁଝି ହୋଇଥାଏ।**						
3. Learning with toys helps to connect oureveryday activities. **୩) ଖେଳନା ମାଧ୍ୟମରେ ପଢି ଆମେ ଦୈନନ୍ଦିନ ଜୀବନକୁ ପାଠସହ ସହଜରେ ଯୋଡିପାରୁଛୁ।**						
4. Learning with toys enhances creativity. **୪) ଖେଳନା ମାଧ୍ୟମରେ ପଢି ଆମସୃଜନଶୀଳତା।**						

ବୃଦ୍ଧି ଖହାଉଅଛି **5.** Learning with toys felt more likeplaying than studying. **୫) ଖେଳନା ମାଧ୍ୟମରେ ପଢିବା ଦ୍ୱାରା ଆମେପାଠ ଅଖପକ୍ଷା ଖେଳରେ ଅଧିକ ମଜ୍ଜି ସମୟ ନଷ୍ଟ କରୁ ଅଛୁ** **6.** Learning with toys make new groupsand new friends. **୬) ଖେଳନା ସହ ପଢିବା ଖ4ାେ6ୁ ନୁଆ Gଳ ଓସାଙ୍ଗ ଖହାଇପାରୁ ଛୁ**						

7. Learning with toys face difficulties incollaboration due to scarcity of toys. **୭) ଖେଳନାର ଅଭାବ ଖ4ାଇ ଖେଳନା ମାଧ୍ୟମରେ ପଢିବା ଖବଖଳ ଆଖମ ହଇରାଣଖହାଇଛ।**						
8. Learning with toys often felt distractedby the use of toys by the teacher. **୮) ଖେଳନା ମାଧ୍ୟମରେ ପଢାଇବା ଖବଖଳଶକ୍ତି ୟ୍ଟା/ଶକ୍ତି କଙ୍କ ଖେଳନା ବ୍ୟବହାର ଆମକୁ ଅନ୍ୟମନସ୍କ କରାଉଛି।**						
9. Learning with toys helps in critical thinking and problem solving skills. **୯) ଖେଳନା ମାଧ୍ୟମରେ ପଢିବା ଦ୍ୱାରା ଆମରସମସ୍ୟା ସମାଧାନ ଖକୌଶଳ ଓ ଜଟିଳ ଚିନ୍ତନ ବୃଦ୍ଧି ଖହାଉଅଛି।** **10.** Learning with toys create interest in studying multidisciplinary topics usingtoys. **୧୦)ଖେଳନା ମାଧ୍ୟମରେ ପଢିବା ଦ୍ୱାରା ବହୁବଷୟ ଏକା ସହ ଜାଣିବାକୁ ଆମ ମନଖରଖୌତୁହଳ ସୃଷ୍ଟି ଖହାଉଅଛି।**						