EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE AMONG ELEMENTARY SCHOOL STUDENTS

Research Project Report – 2023 - 2024

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DECLARATION

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I hereby declare that the research work done on the topic **"EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE AMONG ELEMENTARY SCHOOL STUDENTS"** is an original piece of research work done by me. I have specified, by means of references, from where the information has been taken. To the best of my knowledge, this work has not been submitted earlier in full or part for any other research study in this or any other institution. I also declare that no parts of this present work are reproduced from any other source

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CERTIFICATE

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This is to certificate that this Research entitled **"EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE AMONG ELEMENTARY SCHOOL STUDENTS" is** the action research work done by Mrs.A.Vijayalakshmi Lecturer in District Institute of Education and Training, Settikarai, Dharmapuri District during the academic year 2023-2024.

I assure that this action research is an original work of the investigator and has not been submitted in part of any other work.

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INTRODUCTION

1.0 Education and Science

Education is one of the most important factors in achieving the national goals of a country. In the present age of Science and Technology, it has been increasingly realized that one needs to be educated not only to become a better man and better social being, but he should also be a better creative and productive being.

Dewey has regarded that "Life is a byproduct of activities and education is born out of these activities. Hence, education is life itself"

In school, all the subjects are taught because they provide liberal education. They are the part of equipment and preparation for life which we expect the school to give to its pupils, so that they may play their role in the community as intellectual citizens. Science is one among those subjects, which is an essential element in education. Science is of great importance and introduces the new ways of thinking, reasoning and living. It develops the consciousness among the pupils.

Science is a subject which broadens the horizon of an individual and develops various skills and provides opportunities for the professional growth of an individual. New ideas often challenging old one's demand for new Science and technology structure which is the treatment for science. Thus, Science has become a great value in the present day. Science has spreaded its net all over the fields of life.

To learn science is to do science. There is no other way of learning science. Previously teaching meant nothing more than giving information and imparting knowledge to the students. It was the time when teaching was regarded as a bipolar process. The teachers and subject being its two poles. The child was altogether ignored. No attention

was given to his needs and desires. The child was measured by his memory power. The subject matter was readout or told by the teachers and the child simply memorized it.

Science is a practical subject. In the field of science, we find that the use of the laboratory, certain types of directed study, and source material require methods of teaching which are different from those employed successfully in other subject areas.

Science emphasizes three kinds of objectives in teaching and learning process that is cognitive, affective and psychomotor. The correct way to teach science is by using and developing the sense of touch, sight and hearing.

A child learns by his senses in the beginning but later, sensation adds meaning to it and hence it becomes perception, which subsequently leads to ideas and concept. Child takes interest to see and experience concrete things. Learning through senses leaves permanent effect than mechanical learning. Out of five (5) senses it is believed that knowledge gained through hearing and seeing is to the extent of 86%. Interest in the role of the senses in learning was already there in educational circles. It was long recognized that the various senses condition the reception of messages in the communications act. Research done by Cobun (1968) indicated that:

- 1 percent of what is learned is from the sense of TASTE.
- 1.5 percent of what is learned is from the sense of TOUCH.
- 3.5 percent of what is learned is from the sense of SMELL.
- 11 percent of what is learned is from the sense of HEARING.
- 83 percent of what is learned is from the sense of SIGHT.

Science is such a subject which includes the skills, techniques, methods, laboratory experiments, and field study and so on. The teachers are required to teach in such a way that the students will be role to learn better, understand well and also feel interested while learning.

A good method is one which develops interest, curiosity and desire for learning among the students. The students are always interested in performing some kind of activities.

Teacher should provide simple experimental apparatus for the students to perform experiments. Therefore, in every school, there is a need for “Science” laboratory to do experiments and activities to develop scientific attitude, creativity interest and attitude to get knowledge of handling equipment, and to practice skills. Through practical knowledge a child learns better and understands the concepts clearly. Hence play based method of teaching is very essential to develop scientificism among the students at the secondary level.

1.1 PLAY

In the realm of education, innovative methods continually emerge to engage and empower young learners. Among these approaches, the play-based method has gained recognition for its ability to foster holistic development while nurturing a love for learning. In recent years, educators and researchers alike have explored the efficacy of play-based approaches, particularly in the realm of science education within elementary school settings.

1.2 IMPORTANCE OF PLAY

“You can discover more about a person in an hour of play than in a year of conversation."

This statement, attributed to both Plato and Richard Lingard, a 17^{th} century professor of divinity, encapsulates a timeless truth recognized by early childhood educators for generations. In the realm of play, children embark on a journey of discovery, delving into the intricacies of their world, embracing mathematical and scientific concepts, and honing literacy and language skills. Within the playground of imagination, children confront and navigate complex social dynamics, mastering the art of problem-solving along the way. Through play, children realize the boundless possibilities of self-expression, understanding that they can inhabit any role and wield the mighty force of imagination.

The importance of play in the development and education of children cannot be overstated. Play is not just a recreational activity; it serves as a powerful tool for learning, socialization, and overall well-being.

Here are several key reasons why play is crucial for children:

1. **Cognitive Development**: Play provides children with opportunities to explore, experiment, and problem-solve. Through imaginative play, games, and hands-on activities, children develop essential cognitive skills such as critical thinking, creativity, and decision-making.

2. **Social and Emotional Development:** Play allows children to learn important social skills such as cooperation, negotiation, and empathy. By engaging in pretend play and interacting with peers, children develop emotional intelligence and learn to understand and regulate their own emotions.

3. **Physical Development**: Active play promotes physical health and development. Running, jumping, climbing, and other physical activities help children develop gross motor skills, coordination, and strength.

4. **Language Development**: Play encourages communication and language development. Whether through storytelling, role-playing, or group games, children have opportunities to practice language skills, expand their vocabulary, and improve their communication abilities.

5. **Creativity and Imagination**: Play fosters creativity and imagination. When children engage in pretend play or creative activities, they exercise their imaginations, explore new ideas, and express themselves in innovative ways.

6. **Stress Reduction and Well-being**: Play is a natural stress reliever and promotes overall well-being. It allows children to relax, have fun, and release pent-up energy and emotions. Playful activities also promote positive mental health by reducing anxiety and boosting mood.

7. **Motivation and Engagement in Learning**: Play-based learning motivates and engages children in the learning process. By making learning enjoyable and meaningful, play-based activities increase children's intrinsic motivation to explore and discover new concepts.

8. **Cultural and Social Learning**: Play provides opportunities for children to learn about their culture, traditions, and societal norms. Through play, children internalize cultural values, traditions, and social expectations while also developing a sense of belonging and identity within their communities.

9. **Problem-Solving Skills**: Play encourages children to experiment and solve problems independently. Whether it's figuring out how to build a tower with blocks or resolving conflicts during group play, children learn valuable problem-solving skills that they can apply in various contexts.

10. **Preparation for Life Skills**: Play prepares children for future success by teaching them essential life skills such as teamwork, resilience, adaptability, and leadership. These skills are not only crucial for academic achievement but also for success in adulthood and the workplace.

Play is a fundamental aspect of childhood that contributes to holistic development across cognitive, social, emotional, and physical domains. Recognizing the importance of play in education and child development, educators, parents, and policymakers should prioritize providing children with ample opportunities for play-based learning experiences.

1.3 TYPES OF PLAY IN LEARNING

There are several types of play, each serving a unique purpose in children's development and learning. Here are some common types of play:

Symbolic Play (Pretend Play): In symbolic play, children use objects, actions, or roles to represent other objects, actions, or roles. This type of play often involves imaginative scenarios and storytelling, where children take on different roles and engage in make-believe situations. Examples include playing house, pretending to be superheroes, or engaging in imaginative storytelling with dolls or action figures.

Constructive Play: Constructive play involves using materials to build, create, and manipulate objects or structures. Children engage in constructive play when they use

blocks, Legos, clay, or other building materials to construct buildings, vehicles, or imaginative creations. This type of play fosters spatial awareness, problem-solving skills, and creativity.

Physical Play (Active Play): Physical play involves movement and physical activity, such as running, jumping, climbing, and playing sports. This type of play promotes physical fitness, coordination, balance, and gross motor skills development. Examples include tag, hide-and-seek, playing on playground equipment, and participating in organized sports activities.

Sensory Play: Sensory play engages the senses—sight, sound, touch, smell, and taste—in exploration and discovery. Children engage in sensory play when they manipulate materials with different textures, colors, and scents, such as sand, water, playdough, or sensory bins filled with rice or beans. Sensory play stimulates sensory development, cognitive skills, and creativity.

Social Play: Social play involves interactions with peers and adults, fostering social skills, communication, cooperation, and empathy. This type of play includes activities such as sharing toys, taking turns, collaborating on projects, and engaging in dramatic play scenarios with others. Social play promotes positive social relationships, conflict resolution skills, and emotional intelligence.

Exploratory Play: Exploratory play involves experimentation and discovery, as children explore their environment and interact with objects and materials. This type of play includes activities such as investigating natural materials, exploring outdoor environments, and engaging in open-ended exploration with toys or loose parts. Exploratory play encourages curiosity, problem-solving skills, and scientific inquiry.

Games with Rules: Games with rules involve structured play activities with predetermined rules and guidelines. Children engage in games with rules when they play board games, card games, or organized sports with specific rules and objectives. This type of play teaches children concepts of fairness, cooperation, following rules, and strategic thinking.

Each type of play offers valuable opportunities for children's learning, development, and well-being. By providing diverse play experiences that encompass these different types of play, educators and caregivers can support children's holistic development across cognitive, social, emotional, and physical domains.

1.4 EDUCATIONAL IMPORTANCE OF PLAY

The educational importance of play cannot be overstated, as it serves as a fundamental building block for children's learning and development. Here are several key aspects highlighting the educational significance of play:

- **Active Engagement:** Play naturally captures children's attention and motivates them to actively participate in learning experiences. Whether it's through imaginative play, games, or hands-on activities, children engage in play with enthusiasm and curiosity, making it an effective educational tool.
- **Experiential Learning:** Play provides children with opportunities for hands-on, experiential learning. Through exploration, experimentation, and discovery, children gain firsthand experiences that deepen their understanding of concepts and phenomena in various subject areas, including science, mathematics, language arts, and social studies.
- **Social and Emotional Skills:** Play promotes the development of essential social and emotional skills. Through interactions with peers, children learn to communicate, cooperate, negotiate, and resolve conflicts. Play also helps children develop empathy, emotional regulation, and self-awareness, laying the foundation for healthy social relationships and emotional well-being.
- **Creativity and Imagination:** Play encourages children to use their imagination and creativity. Whether engaging in pretend play, storytelling, or artistic activities, children have the freedom to explore new ideas, roles, and scenarios. This fosters creativity, innovation, and divergent thinking, which are essential skills for problem-solving and adaptability.

- **Language and Communication Development:** Play provides rich opportunities for language and communication development. Whether through conversations with peers, storytelling, or role-playing, children practice language skills such as vocabulary, grammar, and syntax. Play also enhances listening and speaking abilities, as children engage in meaningful exchanges to convey ideas and express themselves.
- **Cognitive Skills Development:** Play stimulates cognitive development across multiple domains. Through play, children develop skills such as critical thinking, problem-solving, decision-making, and spatial awareness. Play-based activities also promote memory, attention, and executive functions, laying the groundwork for academic success.
- **Motor Skills Development:** Play promotes the development of both gross and fine motor skills. Whether running, jumping, climbing, or engaging in manipulative activities such as building with blocks or drawing, children refine their motor skills and coordination. These skills are essential for physical health, coordination, and overall well-being.
- **Exploration of Cultural and Social Norms:** Play provides opportunities for children to explore and understand cultural and social norms. Through play, children learn about their own culture and traditions, as well as those of others. They also develop an understanding of societal roles, rules, and expectations, fostering cultural competence and social awareness.
- **Intrinsic Motivation and Love for Learning:** Play-based learning fosters intrinsic motivation and a love for learning. When learning is enjoyable and meaningful, children are more likely to be actively engaged and motivated to explore new ideas and concepts. This intrinsic motivation lays the foundation for lifelong learning and academic achievement.

Play is a powerful educational tool that supports children's holistic development across cognitive, social, emotional, and physical domains. Recognizing the educational importance of play, educators, parents, and policymakers should prioritize providing

children with ample opportunities for play-based learning experiences both inside and outside the classroom.

1.5 SOCIAL IMPORTANCE OF PLAY

The social importance of play extends far beyond mere entertainment; it serves as a vital component of human development, fostering crucial social skills, relationships, and cultural understanding. Here are several key aspects highlighting the social significance of play:

- **Peer Interaction and Collaboration:** Play provides children with opportunities to interact and collaborate with their peers in meaningful ways. Whether engaging in cooperative games, role-playing scenarios, or group projects, children learn important social skills such as communication, cooperation, and teamwork. These interactions contribute to the development of positive relationships and social bonds among peers.
- **Conflict Resolution and Negotiation Skills:** Play offers a safe environment for children to practice conflict resolution and negotiation skills. As they navigate different roles, rules, and perspectives during play, children encounter conflicts and disagreements. Through negotiation, compromise, and problem-solving, they learn to resolve conflicts peacefully and develop important social-emotional competencies.
- **Empathy and Perspective-Taking:** Play encourages empathy and perspective-taking as children step into different roles and scenarios. By imagining themselves in the shoes of others, children develop empathy and understanding for diverse perspectives and experiences. This ability to empathize with others is crucial for building positive relationships, fostering inclusivity, and promoting social cohesion.
- **Cultural Awareness and Diversity Appreciation:** Play provides opportunities for children to explore and appreciate cultural diversity. Through play, children encounter different cultural traditions, customs, and perspectives, fostering cultural

awareness and sensitivity. By engaging in cross-cultural play experiences, children develop respect for diversity and a broader understanding of the world around them.

- **Socialization and Peer Acceptance:** Play serves as a vehicle for socialization, helping children learn social norms, rules, and expectations within their peer groups. Through play interactions, children develop social skills and behaviors that facilitate acceptance and inclusion among their peers. Play also provides a platform for children to practice social roles and identities, contributing to their sense of belonging and self-esteem.
- **Leadership and Communication Skills:** Play offers opportunities for children to develop leadership and communication skills. Whether leading a group activity, organizing a game, or collaborating on a project, children practice effective communication, delegation, and decision-making. These leadership skills are invaluable for navigating social relationships and group dynamics both in childhood and adulthood.
- **Community Building and Citizenship:** Play contributes to the development of responsible citizenship and community building. Through collaborative play activities, children learn the importance of cooperation, shared responsibility, and contributing to the common good. By working together towards common goals, children develop a sense of civic engagement and responsibility towards their communities.
- **Emotional Regulation and Social Confidence:** Play provides a space for children to express themselves, regulate their emotions, and build social confidence. Whether engaging in imaginative play, outdoor games, or creative activities, children learn to manage their emotions, cope with stress, and develop resilience. This emotional regulation and social confidence are essential for navigating social interactions and forming positive relationships throughout life.

Play plays a critical role in shaping children's social development, fostering essential skills, relationships, and values that are fundamental for thriving in society. Recognizing the social importance of play, educators, parents, and policymakers should prioritize

providing children with ample opportunities for social play experiences that promote collaboration, empathy, diversity appreciation, and community engagement.

1.6 LEARNING THROUGH PLAY

"Learning through Play" is an educational approach that recognizes play as a central mechanism for children's learning and development. It emphasizes the integration of play-based activities, experiences, and environments into early childhood and elementary education settings. Rather than viewing play as separate from learning, this approach acknowledges that play is a natural and powerful mode of learning for young children, fostering cognitive, social, emotional, and physical development.

Key principles of the "Learning through Play" approach include:

- **Child-Centered Learning:** Learning through Play places the child at the center of the learning process, allowing them to take an active role in exploring, experimenting, and discovering knowledge. Teachers act as facilitators and collaborators, guiding children's play experiences and scaffolding their learning based on individual interests, needs, and developmental levels.
- **Holistic Development:** Play-based learning promotes holistic development across multiple domains, including cognitive, social, emotional, and physical development. Through play, children develop essential skills such as problem-solving, creativity, communication, collaboration, self-regulation, and motor skills, laying the foundation for lifelong learning and well-being.
- **Hands-On Exploration:** Learning through Play emphasizes hands-on, experiential learning experiences that engage children's senses and curiosity. Whether through open-ended play materials, sensory activities, or interactive games, children have opportunities to explore and manipulate their environment, make discoveries, and construct meaning from their experiences.
- **Imaginative and Creative Expression:** Play-based learning encourages imaginative and creative expression, allowing children to express themselves, explore new ideas, and experiment with different roles and scenarios. Whether

engaging in pretend play, storytelling, or artistic activities, children exercise their imaginations, develop narrative skills, and expand their creative capacities.

- **Social Interaction and Collaboration:** Play provides opportunities for social interaction, cooperation, and collaboration among peers. Through play, children learn important social skills such as communication, negotiation, empathy, and conflict resolution. They also develop interpersonal skills such as sharing, taking turns, and working together towards common goals.
- **Joyful and Meaningful Learning:** Learning through Play prioritizes joyful and meaningful learning experiences that capture children's interest, motivation, and intrinsic curiosity. By making learning enjoyable, relevant, and personally meaningful, play-based approaches foster a love for learning and a positive attitude towards education.
- **Flexibility and Adaptability:** Learning through Play is flexible and adaptable to meet the diverse needs, interests, and developmental levels of individual children. Teachers tailor play experiences and environments to accommodate different learning styles, cultural backgrounds, and abilities, ensuring that all children have opportunities to thrive and succeed.
- **Integration Across Curriculum Areas:** Play-based learning integrates across curriculum areas, allowing children to explore concepts and skills across multiple subject areas such as language arts, mathematics, science, social studies, and the arts. Through integrated play experiences, children make connections between different domains of knowledge and develop a holistic understanding of the world around them.

Learning through Play represents a child-centered, holistic approach to education that honors children's natural inclination to play, explore, and learn. By embracing play as a fundamental mode of learning, educators can create rich, engaging, and developmentally appropriate learning environments that promote children's growth, well-being, and lifelong success.

1.7 GOVERNMENT POLICY REGARDING LEARNING THROUGH PLAY

a) **National Early Childhood Care and Education (ECCE) Policy (2013):** This policy emphasizes the holistic development of children from birth to six years of age and recognizes the importance of play-based learning in early childhood education. It aims to provide integrated early childhood care and education services, including play-based learning opportunities, to all children.

b) **National Education Policy (NEP) 2020:** The NEP 2020 emphasizes the importance of early childhood care and education, recognizing the critical role of play-based learning in the foundational years. It promotes a flexible, multidisciplinary, and play-based curriculum framework for early childhood education that focuses on holistic development and school readiness.

c) **Integrated Child Development Services (ICDS):** The ICDS program, launched by the Government of India, aims to provide comprehensive early childhood care and development services, including nutrition, health, and early learning opportunities, to children under six years of age. While not explicitly focused on play-based learning, ICDS centers often incorporate play-based activities into their early childhood education programs.

d) **Rashtriya Bal Swasthya Karyakram (RBSK):** RBSK is a child health program that includes health screenings and interventions for children in schools and communities. While primarily focused on health, RBSK also emphasizes the importance of holistic child development, including cognitive and socio-emotional development, which may involve play-based learning approaches.

e) **Sarva Shiksha Abhiyan (SSA):** SSA is a flagship program of the Government of India aimed at universalizing elementary education. While not specifically focusing on play-based learning, SSA supports the development of child-friendly and activity-based teaching-learning materials and methods, which may include elements of play-based learning.

The principles and approaches of play-based learning are integrated into various early childhood education and development policies and initiatives in India. These policies

reflect the government's recognition of the importance of play in fostering holistic development, school readiness, and lifelong learning outcomes for children.

1.8 VALUES OF PLAY BASED METHOD OF TEACHING

Some of the important values of proper use of Play based method of teaching are given below:

1. Best motivators.
2. Antidote to the disease of verbal instruction.
3. Clarity.
4. Vicarious experience.
5. Variety.
6. Freedom.
7. Opportunities to handle and manipulate.
8. Retentivity.
9. Based on maxims of teaching.
10. Helpful in attracting attention.
11. Helpful in fixing up new learning.
12. Saving of energy and time.
13. Realism.
14. Vividness.
15. Meeting individual differences.
16. Encouragement to healthy classroom interaction.
17. Promotion of scientific temper.
18. Reinforcement to learners.
19. Positive transfer of learning and training.
20. Positive environment for creative discipline.

Thus, having realized the need, importance and values of Play based method of teaching science at the secondary level, the investigator has rightly undertaken the present topic for conducting research.

Some of the activities which are employed in the present study are as follows:

- Play Dough
- Dress-Up and Role Play
- Nature Play
- Demonstration method
- Educational Games and Puzzles
- Structure-Function method

1.Play Dough

Play dough has immense potential for learning. Not only does it strengthen fingers in preparation for a lifetime of writing, it teaches fine motor skills, creativity and hand-eye coordination. Add some beads to the dough for a fine-motor exercise, or get the kids threading beads on to lengths of dried spaghetti held in the dough, for extra play-value.

Some specific examples of using play dough in science education based on research and practical applications:

1. Teaching Physical Properties

Activity: Children use play dough to explore concepts such as texture, malleability, and elasticity.

Outcome: By manipulating the play dough, children learn about the properties of materials, such as how they can change shape but retain volume.

2. Understanding States of Matter

Activity: Teachers can use play dough to demonstrate the concept of solids and how they can be molded into different shapes without changing their state.

Outcome: This hands-on activity helps children grasp the idea that solids have a definite shape and volume.

3. Ecosystems and Environmental Education (amuelsson, I. P., & Carlsson, M. A. (2008))

Activity: Children use play dough to model different ecosystems, such as forests, oceans, and deserts, including plants and animals found in these environments.

Outcome: This hands-on approach helps students understand ecological relationships and environmental concepts.

4. Human Anatomy

Activity: Students use play dough to construct models of human organs and body systems.

Outcome: This tactile activity aids in learning about the structure and function of various body parts.

5. Earth Science Concepts

Activity: Creating models of the Earth's layers (crust, mantle, core) using different colors of play dough.

Outcome: This visual and hands-on method helps students understand the composition and structure of the Earth.

6. Physics and Force

Activity: Demonstrating the effects of force by pressing, stretching, and compressing play dough.

Outcome: Students learn about basic physics concepts such as force, pressure, and elasticity.

II. Dress-Up and Role Play

Let the children loose with a bunch of dressing-up clothes and props such as toy doctor's kits, and let their imaginations run wild. Soon we'll discover the budding doctor, vet, nurse, astronaut, chef or thespian. Dressing-up helps children to begin to make sense of the adult world, roles, and interests, as well as boosting social interaction. Not least, dressing-up helps to reinforce the self-care aspects of self-dressing which is essential for primary school life.

1. Doctors and Human Anatomy

- **Activity:** Children dress up as doctors or nurses and role-play diagnosing and treating patients.

- **Learning Outcomes:** They learn about the human body, different organs, and their functions. This can include using toy medical instruments to "examine" each other or dolls, and discussing healthy habits.

2. Environmental Scientists

- **Activity:** Students dress up as environmental scientists and role-play investigating an ecosystem.
- **Learning Outcomes:** They learn about different ecosystems, the importance of biodiversity, and environmental conservation. They might simulate taking water samples, cataloging plant species, or discussing the impact of pollution.

3. Weather Scientists

- **Activity:** Students dress up as meteorologists and role-play predicting the weather.
- **Learning Outcomes:** They learn about weather patterns, tools used to measure weather, and climate science. Activities might include creating weather forecasts, discussing types of clouds, and understanding weather phenomena.

4. Chemists in a Lab

- **Activity:** Children dress up in lab coats and goggles and role-play as chemists conducting experiments.
- **Learning Outcomes:** They learn about chemical reactions, lab safety, and the properties of different substances. Simple experiments like mixing baking soda and vinegar can illustrate these concepts.

III. Nature Play

Children’s learning is fueled with rocket-fuel when you take the play space out in to the great outdoors. That’s why Forest Schools are so popular and highly regarded. Not only is it healthy, it teaches a respect for the environment, and the beginnings of biology. It also helps children to become more independent and inquisitive.

1. Exploring Local Ecosystems

- **Activity:** Students explore local parks, forests, or school gardens, observing plants, animals, and insects.
- **Learning Outcomes:** They learn about biodiversity, ecosystems, food chains, and the interdependence of living organisms. Activities might include identifying species, keeping nature journals, and discussing habitat conservation.

2. Weather Observation

- **Activity:** Children observe and record weather conditions daily, including temperature, precipitation, and cloud formations.
- **Learning Outcomes:** They learn about meteorology, the water cycle, and climate patterns. This can involve making simple weather instruments, such as rain gauges or wind vanes, and predicting weather changes.

3. Gardening Projects

- **Activity:** Students participate in planting and maintaining a school garden.
- **Learning Outcomes:** They learn about plant biology, photosynthesis, soil science, and sustainability. Activities include planting seeds, watering, weeding, and observing plant growth.

4. Stream and Pond Studies

- **Activity:** Students explore local streams or ponds, collecting water samples and studying aquatic life.
- **Learning Outcomes:** They learn about freshwater ecosystems, water quality, and the organisms that live in these habitats. Activities might include measuring water pH, identifying aquatic insects, and discussing the importance of clean water.

IV. Demonstration Method

A technique that is designed to show or illustrate a procedure, process, phenomenon or a structure is called demonstration. Demonstrations in science are effective and provide excellent learning experiences. Successful demonstration activities carried out in teaching process provide concrete experiences and can be used for structuring future information

for students. However, for a demonstration to be successful, it must have the following characteristics.

- A good demonstration should be visible to all students and the demonstration set up should be at a good height for proper visibility.
- The classrooms must have good lighting and ventilation and provisions must be made to take care of glare, reflections, and so on.
- The size of the apparatus used for the demonstration should be large enough for clear view by all the students.
- There should be a blackboard behind the demonstration table to facilitate summarizing the related principles and concepts.
- To assure that the students follow the demonstrations properly, the pace of demonstration should be accurate. The teacher must take care that the pace is neither too fast nor too slow.
- The teacher must be well versed in handling the apparatus by carrying out necessary rehearsal prior to actual demonstration.
- To avoid floundering during demonstration, the teacher must arrange the apparatus in proper order.
- The teacher must give emphasis to the major points in the demonstration to make students aware of the objectives of the demonstration.
- The students should be given ample time for recording the data.

Asking suitable reflective type questions during demonstration will sustain interest of the students and enliven the demonstration. The teacher should make provisions and allowance for circumstances like power failure, seasonal variations and so on.

Demonstration method of teaching may be used in science in number of ways. It can be used to serve a number of purposes. It is most suitable for the following purposes:

- Demonstration at the start of the lesson or the unit.
- Demonstrations to show method and technique.
- Demonstrations for applying a concept.

- Demonstrations for solving problems.
- Demonstrations for reviewing ideas.

Advantages of Demonstration Method:

Demonstration is a useful method in the teaching of science because it has several advantages as follows:

- It helps in economizing resources as some equipment or items are too expensive and the school may have only one equipment.
- It allows the teacher to guide and channelize learning in a desired direction.
- It enables the teacher to conduct activities that may be too dangerous to students to carry out by themselves. For example, toxic chemicals reactions, using poisonous chemicals, using high voltage apparatus and so on.
- It is the best technique to involve student's participation. Students can take readings under the eyes of the teacher and carefully observe the changes in the demonstration.
- This method saves teachers time and effort. The teacher will definitely find it easier to prepare requirements for one experiment than for the whole class.
- It can promote relevant and useful discussion in the class by providing opportunity for questioning and reviewing.
- This method can at times be one of the best means to illustrate and verify facts related to the subject matter.
- This method can be particularly useful in situation when:
- The apparatus is too expensive
- The experiments involve some difficult and complex procedures. - The experiments involve some risk.
- The experiment has several components to be performed sequentially.

An effective demonstration requires methodological planning considering the aspects of need and relevance; objectives of demonstration; mastery of the subject matter by the

teacher; lesson notes on principles and tentative questions; proper rehearsal before the class; orderly arrangement of apparatus and so on.

V. Educational Games and Puzzles

Integrate games and puzzles into lessons to make learning fun and interactive, Board Games online quizzes, and science themed puzzles can help reinforce key concepts while encouraging teamwork and critical thinking

Advantage of Educational Games and Puzzles

Engagement: Games and puzzles are inherently enjoyable and can capture students' interest and motivation. They provide a dynamic and interactive learning experience that encourages active participation and maintains attention throughout the lesson.

Reinforcement of Learning: Games and puzzles reinforce learning by providing opportunities for students to apply and practice concepts in a fun and stimulating way. They help solidify understanding and retention of information through repeated exposure and reinforcement.

Critical Thinking Skills: Many educational games and puzzles require problem-solving, decision-making, and critical thinking skills. They challenge students to analyze information, make connections, and apply knowledge to solve problems or complete tasks, fostering higher-order thinking skills.

Collaboration and Social Skills: Games and puzzles often involve teamwork, collaboration, and communication among players. They provide opportunities for students to work together, share ideas, and negotiate strategies, promoting social interaction and cooperation.

Differentiated Instruction: Games and puzzles can be adapted to accommodate different learning styles, abilities, and preferences. They offer a flexible learning environment where students can progress at their own pace, receive immediate feedback, and engage with content in diverse ways.

Motivation and Confidence Building: Successfully completing challenges or achieving goals in games and puzzles boosts students' confidence and self-esteem. It fosters a positive learning experience and encourages a growth mindset by emphasizing effort, perseverance, and improvement.

Retention of Information: The interactive and hands-on nature of games and puzzles enhances information retention by providing memorable and meaningful learning experiences. They create mental associations and connections that facilitate long-term memory storage and retrieval.

Intrinsic Learning: Educational games and puzzles promote intrinsic motivation by tapping into students' natural curiosity and desire to learn. They offer a sense of autonomy and control over the learning process, making learning enjoyable and rewarding in itself.

Assessment and Progress Monitoring: Games and puzzles can serve as formative assessment tools to gauge students' understanding and progress in real-time. Teachers can observe students' problem-solving strategies, misconceptions, and areas of difficulty, providing targeted support and feedback.

Cross-Curricular Integration: Many educational games and puzzles integrate multiple subject areas, such as math, science, language arts, and social studies. They provide interdisciplinary learning experiences that reinforce connections between different concepts and promote holistic understanding.

Examples

Word search puzzle

Design a word search puzzle with hidden words related to the human body, such as heart, brain, lungs, muscles, skeleton, digestive, circulatory, respiratory, etc. Students can search for the words horizontally, vertically, and diagonally in the grid.

H U M A N B O D Y S Y S T E M S

S K E L E T O N E N E R V O U S

E Y E A R M U S C L E S L U N G

N A I L T O E I N T E G U M E N

S K I N B R A I N H E A R T L I

K I D N E Y S T E E T H S T O M

N A I L S L I V E R I N T E S T

E T L U N G S T O M A C H B O N

Y E A R I N T E S T I N E S E Y

H A I R B L O O D V E S S E L S

N O S E C E L L U L A R S K U L

E A R S I G N A L S K I D N E Y

Y E A R S S K I N L U N G S H I

Words to find:

HUMAN

BODY

SYSTEMS

SKELETON

NERVOUS

EYE

ARM

MUSCLES

LUNG

NAIL

TOE

INTEGUMENT

SKIN

BRAIN

HEART

KIDNEYS

TEETH

STOMACH

HAIR

VI. STRUCTURE FUNCTION METHOD:

The structure-function method is one of the Play based methods of teaching Sciences and it is an offshoot of the system analysis. This method emphasizes the study of structures and their functions. The structural method emphasizes the need for an ordered and systematic learning of the living body, while the function method emphasizes on learning and teaching. Thus, it is an integrated Play based method of teaching which encompasses both structural method and functional method. Structure-function method focuses on the students' cognitive modeling or mapping of the students learning.

Structure-function method in science is more effective than the traditional method for teaching and provides excellent learning experiences. It provides concrete learning experiences and can be used for structuring future information for students. In Structure-function method understanding structure help us to look for patterns among the diverse sequences that give rise to particular shapes. We can also know how the molecules acquire the structure they have, and how alterations in their structures affect their functions. Thus, this method has got its own significance in bringing first hand learning experiences among the learners in relation to the concept it has been studied.

Examples:

1. Structure and function of a cell:

Cell has a very complex structure and function. The structure of a cell is divided into three parts namely, membrane, cytosol and its contents, and the nucleus. The most important function of a cell is the production of proteins, which control the full organisms function.

2. Structure and function of a Flower:

The structure of a flower is made up of four parts namely, sepals, petals, stamens and pistils. The function of a flower is to achieve sexual reproduction, including pollination and seed formation.

Advantages of structure-function method:

There are various merits of this method and, therefore, structural functional method is preferred as one of the most interesting method compared to other methods.

- The students are able to identify the different parts by naming the structure.
- The students will get the first - hand experience in handling the material.
- The students will be able to learn effectively when he is placed in the position of a discoverer or a scientist by making him to study the specimen independently.

- The students are able to draw the diagram's showing the structure of a specimen and also labeling it.
- This method enables the students to know and understand the detailed information about the organism itself.
- When a student is made to learn himself by observing and handling the specimen and drawing the figure and labeling the parts, it results in successful and meaningful learning among the pupils.

The chief points in its favour are as below:

- Willingness and interest of pupils.
- Initiative, Play and Adventure.
- Attitude of mind, Freedom and,
- Incentive to Creative-Work.

These qualities make structure-function method an item of interest and joy. Learning becomes secondary. Children attempt an activity with vigour, enjoy by doing it and by the time it is over, it is noted that something is created or learnt through structure-function method.

Thus structure-function method as an Play based method of teaching brings about complete and meaningful learning among the children.

The science teacher needs to provide activities and experiences for pupils that are,

a) Purposeful to have pupils perceive reasons for participating actively.

b) Interesting in that the attention of pupils is secured so each may learn, achieve and grow.

c) Goal centered, in order to achieve motivated individuals.

d) Meaningful so that pupils individually may make sense of and comprehend that which is taught.

e) Reflective in nature so that pupils individually ponder over what has been taught.

Most pupils are fascinated with science phenomenon and have an inward desire to learn. Individuals and collaborative endeavors' need to be in the offing. Heterogeneous and homogenous experiences need to be provided to harmonize with a pupil's talents, hobbies and interests. The focal point of instruction should always be the learner and his/her achievement and progress in science.

1.9 STATEMENT OF THE PROBLEM

Despite the recognized benefits of play-based approaches in elementary education, there remains a gap in understanding the effectiveness of implementing such methods, particularly in resource-constrained educational settings. While research highlights the positive impact of play on children's holistic development, including cognitive, social, emotional, and physical domains, there is limited empirical evidence on the specific outcomes of integrating play-based learning into the curriculum, especially in diverse cultural and socio-economic contexts.

Furthermore, there is a lack of comprehensive understanding regarding the implementation challenges, facilitators, and best practices associated with incorporating play-based approaches into formal educational systems. Issues such as limited teacher training, inadequate resources, and competing academic priorities may hinder the successful adoption and sustained implementation of play-based learning initiatives in schools.

Moreover, the existing body of research primarily focuses on the short-term effects of play-based interventions, with limited exploration of their long-term impacts on children's academic achievement, school readiness, and lifelong learning outcomes. Understanding the sustained effects of play-based approaches over time is crucial for informing evidence-based policy and practice in elementary education. The title of this

study is "***Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students***."

1.10 RESEARCH QUESTIONS

The research questions that could be explored in the study titled "Effectiveness of Play-Based Approach in Achievement in Science among Elementary School Students":

1. Do elementary school children who are taught science using play-based learning pedagogies attain higher scores in science tests compared to those taught using traditional practices?
2. How does the integration of play-based learning activities impact elementary school students' achievement in science?
3. What are the specific scientific concepts and skills that elementary school students demonstrate proficiency in as a result of engaging in play-based approaches to science education?
4. To what extent do elementary school students' attitudes towards science change after participating in play-based learning experiences?
5. How do implementation factors, such as teacher training, resource availability, and classroom environment, influence the effectiveness of play-based approaches in science education?
6. How do students' socio-economic backgrounds and cultural contexts influence the effectiveness of play-based approaches in science education?
7. What are the long-term effects of engaging in play-based learning experiences on students' retention of scientific knowledge and skills?
8. What strategies can educators and policymakers implement to optimize the effectiveness of play-based approaches in promoting achievement in science among elementary school students?

1.11 NEED AND SIGNIFICANCE OF THE STUDY

The significance of this study lies in its potential to contribute to the advancement of knowledge and practice in early childhood education. By providing empirical evidence,

identifying implementation challenges, and exploring long-term outcomes, this research seeks to advocate for the importance of play in children's learning and development and inform evidence-based policies and practices that promote the holistic development and academic success of young children.

1.12 OPERATIONAL DEFINITIONS

- **Play-Based Approach:** For the purposes of this study, a play-based approach refers to an educational methodology that integrates play as a central component of the learning process. It involves hands-on, experiential activities, exploration, and discovery within the context of scientific concepts and principles. Play-based activities may include experiments, simulations, role-playing, games, and interactive experiences designed to engage elementary school students in scientific inquiry and exploration.
- **Achievement in Science:** Achievement in science refers to the level of understanding, proficiency, and mastery of scientific concepts and skills demonstrated by elementary school students. It encompasses both conceptual knowledge and practical application of scientific principles, including scientific inquiry, experimentation, problem-solving, and critical thinking skills. Achievement in science may be assessed through various measures, including standardized tests, performance assessments, and observational methods.
- **Elementary School Students:** Elementary school students refer to children typically aged between 6 and 12 years old, enrolled in grades ranging from kindergarten to fifth or sixth grade, depending on the educational system. For the purposes of this study, elementary school students specifically pertain to those within this age range who are engaged in science education within formal school settings.
- **Effectiveness:** Effectiveness refers to the degree to which a play-based approach contributes to improved achievement in science among elementary school students. It involves assessing the impact of play-based learning experiences on students' scientific knowledge, skills, attitudes, and behaviors. Effectiveness may be

measured through quantitative indicators, such as standardized test scores or pre- and post-assessments, as well as qualitative observations, interviews, and surveys capturing students' perceptions and experiences.

1.13 OBJECTIVES OF THE STUDY

The objectives of the study are:

- To identify the effectiveness of play-based approach in Achievement in Science of elementary students.
- To study the improvement in achievement in science before and after play based approach teaching.
- To examine the after effects of play-based approach when compared to ordinary teaching approaches
- To choose the suitable play-based approach like physical, dramatic, nature, art and music, and age appropriate play among the play-based approaches in achievement in science.
- To find out the development of language, motor, social, educational and cognitive abilities among elementary students.

1.14 HYPOTHESES OF THE STUDY

The following hypotheses have been formulated for the study:

1. The level of the effectiveness of play-based approach in Achievement in Science of elementary students is high.
2. There is no significant difference in the mean score of science achievement between the experimental group and control group in pre-test scores.
3. There is no significant difference in the mean score of science achievement between the experimental group and control group in post-test scores.
4. There is no significant difference in the mean score of effectiveness of play-based approach in science achievement among the experimental group with respect to gender.

5. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group.
6. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to gender.
7. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to parent's occupation.
8. There is no significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.
9. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to gender.
10. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's occupation.
11. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's income.
12. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to gender.
13. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's occupation.
14. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's income.

1.15 DELIMITATION OF THE STUDY

- The Sample Size is limited to 60 elementary school students only.
- The study is restricted to Dharmapuri revenue district only.
- The study is restricted to Government elementary schools only.
- Data will be collected through offline mode only.
- Due to limited time, 10 periods of science class were taken.

1.16 ORGANIZATION OF THE WORKS (DESIGN)

The first Chapter gives an introduction and overview of the subject matter of the present investigation, with a short note on the broad objective.

The second chapter refers the reviews about related concepts and meanings with reference to previous studies conducted in India and abroad which helpful for choosing problem and ideas for doing the research.

The third chapter refers the methodology and research tool part to the present investigation.

The fourth chapter deals with the statistical analysis adopted in this investigation thereby testing the hypotheses for the present study.

The chapter five will discuss on the summary, findings, recommendation and conclusions that are given briefly to understand the outcomes of the research work.

CHAPTER – II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

Review of related studies implies locating, studying and evaluating reports of relevant researches, study of published articles, going through the related portions of Encyclopedia and research abstracts. It is one of the pre-requisites of the investigator needed for his chosen problem in a systematic way. It helps the investigator choose a problem and give an adequate familiarity with the work which has already been done in the area of his choice. It gives information in the particular area. Review of literature provides maximum benefit to know the previous investigations, recorded knowledge of the past and brings out a good value to the present investigation of a chosen problem.

2.2 MEANING OF RELATED STUDY

The review of relevant literature is nearly always a standard chapter of a thesis or dissertation. The review forms an important chapter in a thesis where its purpose is to provide the background, and justification for the research undertaken Bruce (1994), who has published widely on the topic of the literature review, has identified six elements of a literature review. These elements comprise a list; a search; a survey; a vehicle for learning; a research facilitator; and a report Bruce (1994)

2.3 NEED FOR THE REVIEW OF LITERATURE

According to **Bourne (1996)** there are good reasons for spending time and effort on a review of the literature before embarking on a research project. These reasons include:

- to identify gaps in the literature
- to avoid reinventing the wheel (at the very least this will save time and it can stop you from making the same mistakes as others)

- to carry on from where others have already reached (reviewing the field allows you to build on the platform of existing knowledge and ideas)
- to identify other people working in the same fields (a researcher network is a valuable resource)
- to increase your breadth of knowledge of subject area
- to provide the intellectual context for own work, enabling to position project relative to other work
- to identify opposing views
- to put work into perspective
- to demonstrate that can access previous work in an area
- to identify information and ideas that may be relevant to project and
- to identify methods that could be relevant to project.

A thorough study gives useful information to the investigator for understanding the problem, and shows a way to solve the chosen problem from different dimensions. It enriches the present study by the past findings and gives a proper insight to the research study by which any one can think creatively.

When to start Reviewing related literature

While the research problem is still being conceptualized, the researchers much already start reviewing literature. In identifying and defining the research problem, the researcher must be able to show evidences that the problem really exits and is worth investigating.

It is important that the researcher knows what is already known about the problem or what earlier researchers have found about it what questions still need to be answered before the research questions or objectives are finalized.

Theories which the researchers use to explain the existence of a research problem and used as bases in analyzing relationship between variables can be generated from reference books on theories or from related studies. The researcher therefore, must have already read adequate literature at the start of the research activity.

General References

Examples are indexes, reviews and abstracts.

Primary sources

Examples are researcher found on published journals.

Secondary sources

Publications where authors cite the works of others examples are books in encyclopedias. Secondary sources are good references for overview of the problem.

Steps in literature review

Review the precise definition of the research problem note the key variables specified in the study objectives and hypotheses.

PURPOSES

This review forms part of a project which the Qualification and Curriculum authority (QCA) is taking forward on creativity across the Curriculum. The purpose of the project is to identified key features that enable the development of pupil's creativity. This review identifies some key messages from the research and literature related to creativity and highlights some issues for further investigation.

2.4 PURPOSE OF SURVEY OF RELATED STUDIES

1. It helps the investigator to find what was already done and what problems remain to be solved in a chosen topic.
2. It is the basis for the foundation upon which all future work will be built.
3. It helps to know the means of getting to the frontier in the field of the research.
4. It furnishes indispensable suggestions about comparative data, good procedures, and likely methods and tried out techniques.
5. It helps avoid the duplication of previous researches.

6. It provides basic structure for formulating valuable hypotheses.
7. It helps analyze locate comparative data which is useful in the interpretation of results.

In this chapter an attempt is made to present a background of research so for in the area on the basis of the review of related literature, the problem was postulated and hypothesis formulated. The review of related literature has been presented under the heading Creativity both in the form of Indian and foreign studies.

STEPS IN REVIEWING OF RELATED LITERATURE

- Determine if a study has already being completed on the proposed research topic.
- Determine if a study of a similar nature is in progress.
- Discover research allied to the problem.
- Provide ideas and theories valuable in formulating problem.
- Identify research procedure and statistical analysis of the data employed.
- Locate comparable material useful in interpreting the results.
- Understand the significance of the research.
- Be included as a background for the writer's research report.

Classification

The investigator has classified the studies reviewed into two major classifications namely.

A. Indian studies
B. Foreign studies

2.5. INDIAN STUDIES RELATED

Chakrabarti, A. et al. (2020): This study examined the implementation of project-based learning in science education in Indian classrooms. The researchers investigated how

project-based approaches can foster inquiry, collaboration, and creativity in learning scientific concepts.

Bandyopadhyay, S. (2019): This study explored the use of storytelling and narrative-based approaches in science education in India. The researcher investigated how storytelling can engage students in learning scientific concepts and promote academic achievement.

Banerjee, P. et al. (2019): Investigating the role of playful learning experiences in promoting science achievement among rural children in India, this study explored how culturally relevant games and activities can facilitate engagement with science content and improve learning outcomes.

Biswas, A. et al. (2019): This study investigated the impact of integrating drama and theater techniques into science education in Indian secondary schools. The researchers explored how dramatic performances can bring scientific concepts to life and deepen students' understanding of complex phenomena.

Chakravarti (2019): Focusing on the role of play in promoting science learning among marginalized children in India, this qualitative study explored how play-based activities can enhance children's understanding of scientific concepts. The researcher observed that hands-on exploration, storytelling, and group activities facilitated children's engagement with science and promoted meaningful learning experiences.

Sarkar, S. et al. (2019): This study investigated the effects of integrating arts-based activities into science education in Indian primary schools. The researchers explored how creative expression through art can complement scientific inquiry and promote holistic learning experiences.

Bhatnagar, N. et al. (2018): Investigating the role of play-based approaches in promoting environmental science education, this study explored how hands-on activities and outdoor

experiences can deepen students' understanding of ecological concepts and sustainability issues in India.

Choudhury, M. et al. (2018): Investigating the use of digital storytelling in science education, this study explored how multimedia narratives can engage students and enhance their understanding of scientific concepts in Indian secondary schools.

Das, S. et al. (2018): Investigating the effectiveness of peer-led learning communities in science education, this study explored how collaborative, peer-to-peer interactions can support knowledge construction and academic achievement in Indian classrooms.

Nair, S. (2018): Investigating the effects of outdoor learning experiences on science achievement, this study examined how outdoor play and exploration can enhance students' understanding of scientific concepts and promote environmental awareness in Indian school settings.

Reddy et al. (2018): This study examined the integration of play-based approaches into science education in Indian primary schools. The researchers explored the effects of incorporating games, puzzles, and interactive activities into the curriculum on students' science achievement and attitudes toward science. Findings indicated that students who participated in play-based science activities demonstrated higher levels of academic achievement and more positive attitudes toward science.

Gupta, V. (2017): Focusing on the use of educational toys and manipulatives in science education, this study examined the impact of hands-on, play-based learning materials on students' science achievement and conceptual understanding in Indian classrooms.

Mishra, S. (2017): Focusing on the use of educational games and puzzles in science education, this study examined how playful activities can engage students and enhance their conceptual understanding of scientific principles in Indian classrooms.

Roy, P. et al. (2017): Examining the effects of inquiry-based learning approaches in science education, this study explored how inquiry-based activities can promote student-led exploration, experimentation, and discovery in Indian classrooms.

Sengupta, D. et al. (2017): Investigating the effectiveness of digital simulations and virtual labs in science education, this study explored how technology-enhanced, play-based learning experiences can improve students' understanding of scientific principles in Indian secondary schools.

Chatterjee, S. (2016): Examining the impact of inquiry-based learning approaches in science education, this study explored how hands-on experimentation and exploration can foster curiosity, critical thinking, and problem-solving skills among Indian students.

Goswami, S. et al. (2016): Focusing on the role of cultural context in science education, this study examined how incorporating indigenous knowledge and practices into the curriculum can promote meaningful learning experiences and academic achievement among Indian students.

Kumar, R. (2016): Focusing on early childhood science education, this study examined the impact of playful learning experiences on children's science achievement and interest in STEM subjects in Indian preschool settings.

Sharma, A. (2016): This study examined the effectiveness of integrating play-based activities into science education in Indian primary schools. The researcher explored how hands-on experiments, games, and role-playing activities can enhance students' understanding of scientific concepts and promote academic achievement.

Singh and Bhan (2016): This study explored the effectiveness of play-based learning in improving science achievement among primary school students in India. The researchers implemented a play-based science curriculum that included hands-on activities, experiments, and games. Results showed that students who participated in the play-based curriculum demonstrated significant improvements in science achievement compared to those in traditional instruction.

Gandhi, S. (2015): This qualitative study explored teachers' perspectives on integrating play-based approaches into science education in Indian primary schools. The researcher investigated challenges and opportunities associated with incorporating playful learning experiences into the curriculum.

Nath, S. (2015): Focusing on teacher professional development in science education, this study examined the role of play-based training workshops in enhancing teachers' pedagogical practices and promoting student engagement in Indian schools.

Bhattacharjea et al. (2014): Focusing on early childhood education in India, this study investigated the impact of playful learning experiences on children's science learning outcomes. The researchers observed that children who engaged in hands-on exploration, role-playing, and outdoor activities showed greater enthusiasm for science and deeper understanding of scientific concepts compared to those in traditional instructional settings.

Sundararajan and Rajan (2013): This study investigated the effectiveness of using educational games as a playful approach to teaching science in Indian secondary schools. The researchers developed and implemented digital games that incorporated scientific concepts and problem-solving tasks. Results indicated that students who played educational science games demonstrated improved understanding of scientific principles and higher levels of motivation compared to traditional instruction.

2.6. FOREIGN STUDIES

Henriksen, D. (2018): Investigating the use of maker-centered learning in science education, this study examines how hands-on, creative projects can promote students' exploration, experimentation, and innovation in STEM fields.

Pyle, A., DeLuca, C., & Head-Reeves, D. (2017): Investigating the effects of incorporating play-based activities into elementary science instruction, this study examines how hands-on exploration and experimentation can enhance students' understanding of scientific concepts.

Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2014): Investigating the effectiveness of digital games in science education, this study examines how game-based learning environments can promote inquiry, exploration, and problem-solving skills among students.

Haden, C. A., & Shillingford-Butler, M. (2014): The authors discuss the importance of adult scaffolding in supporting children's pretend play and exploration. They highlight the role of supportive adults in facilitating children's engagement with scientific concepts during play.

Gresalfi, M., Barnes, J., & Cross, D. I. (2013): Investigating the use of game-based learning in science education, this study examines how educational games can promote engagement, motivation, and learning outcomes among students.

Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013): This study explores the impact of pretend play on children's executive function and theory of mind, which are essential for scientific reasoning and understanding.

Nicolopoulou, A., & Ilgaz, H. (2013): This study examines the role of pretend play in promoting children's language and cognitive development. It discusses how imaginative play scenarios can provide opportunities for children to explore scientific concepts and develop problem-solving skills.

Hirsh-Pasek, K., & Golinkoff, R. M. (2011): The authors discuss the importance of playful learning in fostering cognitive development, including science learning. They highlight the benefits of hands-on exploration, experimentation, and discovery in promoting children's understanding of scientific concepts.

McGonigal, J. (2011): The author discusses the potential of games and game design principles to promote learning and problem-solving skills, including in science education. The study explores how game-based approaches can foster collaboration, creativity, and engagement among students.

Huang, H., Rauch, U., & Liaw, S. S. (2010): Investigating the effects of inquiry-based learning environments in science education, this study examines how inquiry-based approaches can promote students' critical thinking, problem-solving, and scientific reasoning skills.

Hughes, F. P. (2010): This study explores the use of storytelling in science education, examining how narrative-based approaches can engage students and facilitate understanding of scientific concepts and processes.

Van de Pol, J., Volman, M., & Beishuizen, J. (2010): This study investigates the role of collaborative inquiry in promoting scientific understanding among students. It explores how collaborative problem-solving and discussion can enhance learning outcomes in science.

Clements, D. H., & Sarama, J. (2009): The authors discuss the effectiveness of play-based learning in promoting mathematical and scientific concepts in early childhood education. They highlight the importance of hands-on exploration, problem-solving, and collaboration in supporting children's development in STEM areas.

Copple, C., & Bredekamp, S. (2009): The authors discuss the role of play in promoting children's development across different domains, including science. They provide practical strategies for incorporating play-based approaches into early childhood education settings.

Fleer, M. (2009): This study explores the role of play-based learning in promoting scientific concepts in early childhood education. It examines how play can support children's understanding of scientific concepts such as cause and effect, experimentation, and observation.

Pellegrini, A. D. (2009): This study reviews research on the benefits of recess and free play in promoting children's social, emotional, and cognitive development. It discusses how unstructured playtime can contribute to students' readiness to engage in science learning.

Eberle, F. (2008): The author discusses the concept of "games for science" and explores how educational games and simulations can enhance science learning. The study emphasizes the potential of playful approaches in engaging students and promoting deeper understanding of scientific concepts.

Perry, N. E., Määttä, E., & Lehtinen, E. (2008): Investigating the effectiveness of inquiry-based learning in science education, this study examines how inquiry-based approaches can promote deep understanding and conceptual change among students.

Bodrova, E., & Leong, D. J. (2007): This study explores the role of play-based learning in promoting early literacy and mathematics skills, with implications for science education. It discusses how playful activities can foster children's curiosity, creativity, and critical thinking, which are essential for success in science.

Barron, B. (2006): The author discusses the concept of "situated learning" in science education, exploring how authentic, real-world experiences can enhance students' understanding and engagement with scientific concepts.

Squire, K. (2006): The author explores the potential of game-based learning environments to promote engagement and learning in science education. The study discusses how digital games can provide immersive, interactive experiences that support students' inquiry and experimentation.

Pellegrini, A. D., & Smith, P. K. (2005): This study reviews research on the role of play in children's cognitive and social development. It discusses how various forms of play, including pretend play, constructive play, and games with rules, contribute to children's learning across different domains, including science.

Guzdial, M., & Soloway, E. (2004): This study discusses the role of constructionist learning environments in promoting computer science education. It explores how hands-on programming and project-based activities can support students' understanding of computational concepts and processes.

Kuhn, D., & Dean, D. (2004): The authors discuss the development of scientific reasoning skills in children and adolescents. The study explores how playful activities, such as designing experiments, making predictions, and testing hypotheses, can support the development of critical thinking and inquiry skills in science

Blair, C. (2002): The author discusses the relationship between executive function skills and academic achievement, including in science. The study explores how play-based activities that promote self-regulation, working memory, and cognitive flexibility can support children's success in science learning.

Duschl, R. A., & Osborne, J. (2002): Investigating the role of argumentation in science education, this study examines how discourse and debate can promote students' understanding of scientific concepts and reasoning skills.

Ratner, H. H. (2001): This study explores the relationship between play and creativity, emphasizing the importance of playful exploration in fostering creative thinking skills, which are essential for scientific inquiry and innovation.

Rosengren, K. S., Johnson, C. N., & Harris, P. L. (2000): This study explores children's understanding of scientific concepts through pretend play and make-believe scenarios. It discusses how imaginative play can facilitate children's exploration of scientific ideas and promote scientific reasoning skills.

Brown, A. L., & Campione, J. C. (1996): Investigating the concept of "guided discovery" in science education, this study examines how scaffolding and support from teachers can promote students' exploration and understanding of scientific concepts.

Alexander, J. M., Carr, M., & Schwanenflugel, P. J. (1995): This study explores the relationship between playfulness and academic achievement, including in science. It discusses how playful dispositions and attitudes can contribute to students' motivation and engagement in learning.

2.7. CRITICAL REWIEW

The investigator has reviewed 54 studies among which 24 are Indian studies and 30 are Foreign studies. With the views expressed from the above referred Indian and abroad studies, the investigator felt strongly motivated to study about "***Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students***."

2.8 RESEARCH GAP

Analyzing the extensive array of studies conducted in the realm of science education in India, a few research gaps emerge, pointing towards areas that warrant further investigation and exploration:

❖ Long-term Effects: Many studies have assessed the immediate impacts of various pedagogical approaches on science achievement and engagement. However, there's a gap in understanding the long-term effects of these interventions. Longitudinal studies tracking students' progress over time could provide valuable insights into the sustainability of positive outcomes and potential challenges that may arise over extended periods.

❖ Teacher Training and Support: While some studies touch upon the importance of teacher professional development in implementing innovative approaches, there's a need for more focused research on effective training strategies and ongoing support systems for teachers. Understanding how to effectively train and empower educators to integrate these approaches into their teaching practice is crucial for sustained implementation and impact.

❖ Play Dough Play dough has immense potential for learning. Not only does it strengthen fingers in preparation for a lifetime of writing, it teaches fine motor skills, creativity and hand-eye coordination. Add some beads to the dough for a fine-motor exercise, or get the kids threading beads on to lengths of dried spaghetti held in the dough, for extra play value.

❖ Dress-Up and Role Play Let the children loose with a bunch of dressing-up clothes and props such as toy doctor's kits, and let their imaginations run wild. Soon we'll discover the budding doctor, vet, nurse, astronaut, chef or thespian. Dressing-up helps children to begin

to make sense of the adult world, roles, and interests, as well as boosting social interaction. Not least, dressing-up helps to reinforce the self-care aspects of self-dressing which is essential for primary school life.

❖ Integration of Technology: While some studies explore the use of digital tools and simulations in science education, there's a gap in understanding how to effectively integrate technology into play-based and inquiry-driven approaches. Research focusing on the design and implementation of technology-enhanced learning experiences that complement hands-on activities and promote deeper conceptual understanding is needed. Addressing these research gaps can contribute to the development of more robust and effective strategies for science education in India, ultimately fostering a generation of learners equipped with the skills and knowledge needed to navigate an increasingly complex world.

2.9. CONCLUSION

Hence the present study is entitled as ***"'Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students."***

CHAPTER – III

RESEARCH METHODOLOGY

3.0 INTRODUCTION

Research methodology involves the systematic procedures by which the researcher starts from the initial identification of the problem to its final conclusions. The role of the methodology is to carry on the researcher work in a scientific and valid manner. The method of research provides the tools and techniques by which the research problem is attacked. The methodology consists of procedures and techniques for conducting a study. Research procedures are of little value unless they are used properly. The tools and techniques will not get the work done. The proper use of research method must be learned by the researcher **(Sharma, R.A, 2008).**

According to Travers, "Educational research is that activity which is directed towards development of a science of behavior in educational institutions. Thus, ultimate aim of such a science is to provide knowledge that will permit the educator to achieve his goals by the most effective methods" **(Kulbir Singh Sidhu, 1984).**

According to John W. Best, "Research is considered to be the more formal, systematic, intensive process of carrying on the scientific methods of analysis. It involves a more systematic structure of investigation, usually resulting some sort of formal record of procedures and a report of results or conclusions" **(Sharma, R.A, 2000).**

In the earlier chapter/studies which are related to the problem under investigation were reviewed and presented. The present chapter deals with the methodology of the present study under which the following are presented.

3.1 Statement of the Problem

3.2 Variables of the Study

3.3 Definitions of the Terms Used

3.4 Formulation of Hypotheses

3.5 Design of the Study

3.6 Tools Used For the Present Study

3.7 Description of the Tools

3.8 Pilot Study

3.9 Norms for The Present Study

3.10 Procedure for Data Collection

3.11 Population for The Study

3.12 Samples for the Study

3.13 Distribution of the Sample

3.14 Statistical Techniques Used

3.15 Tabulation of Responses

3.1 STATEMENT OF THE PROBLEM

"***Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students***."

3.2 VARIABLES OF THE STUDY

Play based Methods of teaching Academic Achievement of the Students and Gender are the three variables of the study.

- Dependent variable includes Academic Achievement of the study.
- Independent variable includes namely,

  a) Study groups: Experiment and Control,

  b) Play based Methods of teaching.

- Moderate Variable includes Gender: Male and Female.

3.3 DEFINITIONS OF THE TERMS USED

- **Play-Based Approach:** For the purposes of this study, a play-based approach refers to an educational methodology that integrates play as a central component of the learning process. It involves hands-on, experiential activities, exploration, and discovery within the context of scientific concepts and principles. Play-based activities may include experiments, simulations, role-playing, games, and interactive experiences designed to engage elementary school students in scientific inquiry and exploration.
- **Achievement in Science:** Achievement in science refers to the level of understanding, proficiency, and mastery of scientific concepts and skills demonstrated by elementary school students. It encompasses both conceptual knowledge and practical application of scientific principles, including scientific inquiry, experimentation, problem-solving, and critical thinking skills. Achievement in science may be assessed through various measures, including standardized tests, performance assessments, and observational methods.
- **Elementary School Students:** Elementary school students refer to children typically aged between 6 and 12 years old, enrolled in grades ranging from kindergarten to fifth or sixth grade, depending on the educational system. For the purposes of this study, elementary school students specifically pertain to those within this age range who are engaged in science education within formal school settings.
- **Effectiveness:** Effectiveness refers to the degree to which a play-based approach contributes to improved achievement in science among elementary school students. It involves assessing the impact of play-based learning experiences on students' scientific knowledge, skills, attitudes, and behaviors. Effectiveness may be measured through quantitative indicators, such as standardized test scores or pre- and post-assessments, as well as qualitative observations, interviews, and surveys capturing students' perceptions and experiences.

3.4 FORMULATION OF HYPOTHESES

The following hypotheses have been formulated for the study:

1. The level of the effectiveness of play-based approach in Achievement in Science of elementary students is high.
2. There is no significant difference in the mean score of science achievement between the experimental group and control group in pre-test scores.
3. There is no significant difference in the mean score of science achievement between the experimental group and control group in post-test scores.
4. There is no significant difference in the mean score of effectiveness of play-based approach in science achievement among the experimental group with respect to gender.
5. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group.
6. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to gender.
7. There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to parent's occupation.
8. There is no significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.
9. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to gender.
10. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's occupation.

11. There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's income.
12. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to gender.
13. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's occupation.
14. There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's income.

3.5 DESIGN OF THE STUDY

The investigator has adopted experimental method to find out the "Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students."

The two-group research design is the conceptual structure of the research procedure. It provided the plan and procedure for selection of subject's students, the data gathering devices, and data analysis techniques were selected by the investigator, based on the objectives of research.

The experimental method clearly determines the causal effect of an isolated, single variable on the dependent variable. Hence, the two independent/treatment variable of play-based teaching techniques enhanced the science achievement of the elementary students. The science achievement is dependent variable. It provided a systematic and logical way for answering the research questions. This method provided a high degree of control over extraneous variables and the manipulation of variables. The investigator observed how the effective teaching technique enhanced the science achievement, when the play-based teaching was offered by the researcher. The researcher observed each and every stage, the

change of antisocial (or) any other unwanted activities to science achievement. It also helped to test the hypotheses of relationship between variables. It also permits drawing inference about causality.

In experimental studies, observable changes took place, and helped the researcher to establish a cause and effect relationship. The play-based teaching technique was well executed in securing activity in the present experimental research to carry out the experimental process in a successful way.

3.5.1 Two Group Pre-Assessment and Post Assessment Design

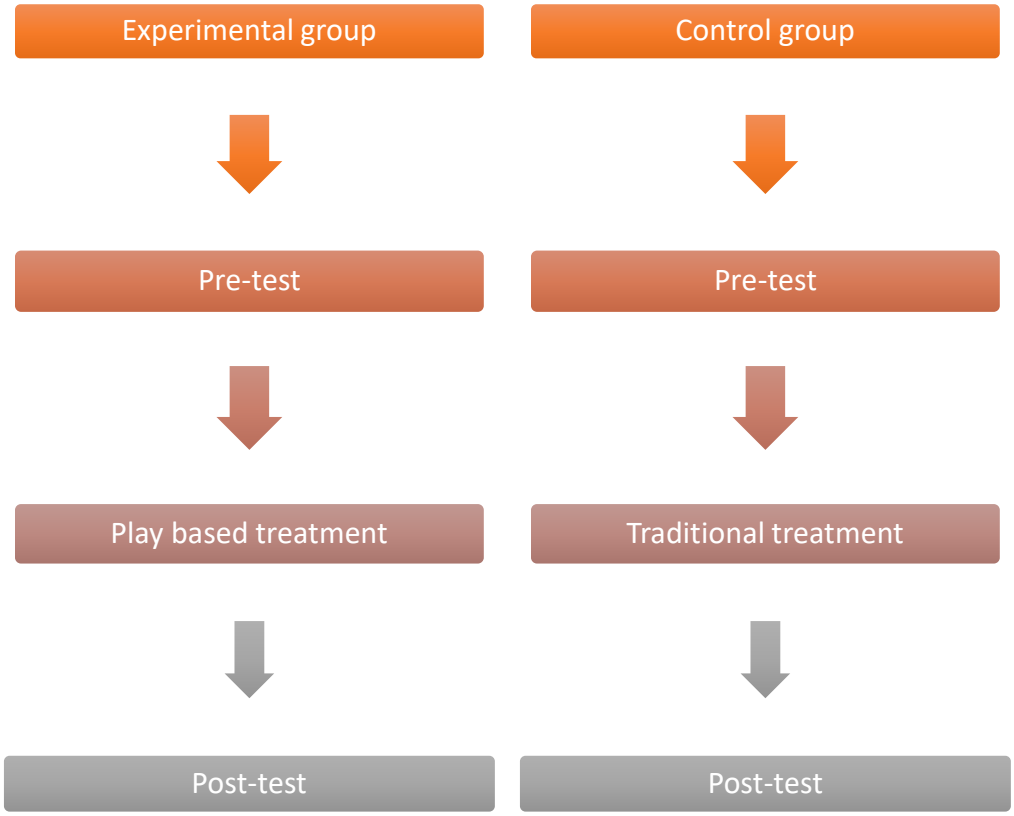
Experimental designs are unique to the experimental method. They serve as positional and statistical plans to designate the relationship between experimental treatments and the experimenter's observation or measurement points in the temporal scheme of the study. Judicious selection of the design improved the probability and observed the change in the dependent variable that was caused by the manipulation of the independent variable. It simultaneously strengthened the generalizability of result beyond the experimental setting. The two-group method was the elementary and least rigorous design. The experimental design was however most important in experimental research work through which observation was done; the effect was analyzed to obtain information. Conclusions were drawn from the experimental design. All these matters are decided in a proper experimentation. So, the experimental design was planned systematically to improve the science achievement.

Figure 3.1: The Two Group Design

1. Control Group

2. Experimental Group

Figure 3.2: Design



This design provided some improvement over the effects of the treatment and were judged by the investigator in observing the difference between the pre-test and post-test scores. However, no comparison with a control group was provided. The main purpose of this design is to establish the cause-and-effect relationship between the effects of play-

based teaching on changing the activities of the students to science achievement. Hence, a group of students was selected to undergo the experimentation. The procedural stages in this design are listed below:

- **Testing the Group**

The investigator identified the play-based concepts known by the students at the elementary school level, to identify at what extent the elementary school students' activities are related to science achievement in pre-testing condition.

- **Introducing the Intervention**

The investigator presented the lesson to the students. The Investigator shows play based teaching models.

- **Giving the Treatment**

Play based activities based on different conceptual ideas taught by the investigator.

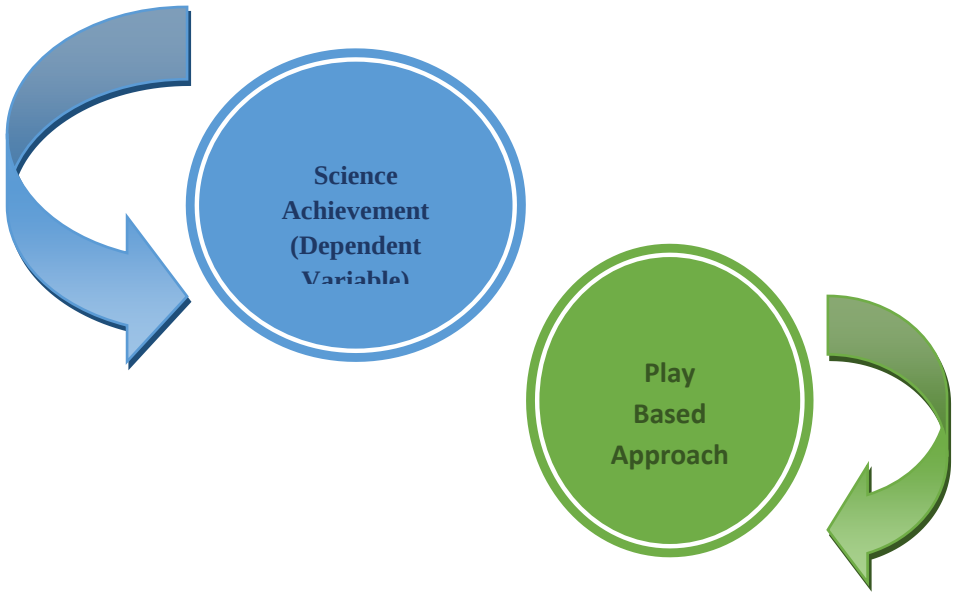
- **Testing Again**

After the treatment was over, post assessment was also conducted by the investigator.

- **Noting the Gains**

There exists a significant difference between students belonging to pre-testing experimental condition and post-test experimental condition and their related to knowledge of science-based concepts and activities among single group students. The knowledge related to science-based concepts and activities found among elementary students in post testing condition was better than the elementary students belong to pre-testing condition. The effect of play-based teaching increased the knowledge of students related to science-based concept and activities at post testing condition among students belonging to a single homogenous group.

Figure 3.3: Independent Variable and Dependent Variable



The present study is an experimental type of study. Experimental research includes collecting data in order to test hypotheses concerning the related variables. Generally, experimental research includes member of groups which are open for treatments. In this study, the students are assigned into two different groups by following the foot step of "pre-test-post-test control group design".

First, selected two schools in Dharmapuri district with the mean scores of science subject are same. One school is considered for control group. Another school is considered for experimental group. This design was selected to control all sources of internal validity and random assignment can be emphasized while selecting two groups, Pre-test controls mortality and randomization and "control group" controls maturation, history, testing and instrumentation. The only weakness in this design is pretest-treatment-interaction. The selected children were randomly divided into two groups through lottery system. Out of the two groups one was randomly allotted to experimental group and the other to control group.

3.6 TOOLS USED FOR THE PRESENT STUDY

The questionnaire was constructed with the guidance and help of experts. It contained 40 items classified under three components in Achievement in Science. They are 1. Knowledge, 2. Understanding, 3. Application.

3.7 DESCRIPTION OF THE TOOLS

1. Personal Data Form (General Information)

It includes general information about the respondents regarding gender; location of the school and parent's income. The general information tool has been appended in the appendix-I.

2. Achievement in Science

The distribution of questions is as follows. 1. Knowledge, 2. Understanding, 3. Application. 17 (42.5%) questions in Knowledge, 12 (30%) questions in Understanding, 11 (27.5%) in Application. It consists of 37.5%, MCQs, 37.5% fill in the blank, and 25% matching type questions to measure knowledge, understanding and problem-solving ability of the students. The tool has been appended in the appendix-I.

SCORING PROCEDURE

The items in the achievement in science included 40 questions. 17 questions in Knowledge, 12 questions in Understanding, 11 in Application.

Table 3.1: No. of Questions

Sl. No	Skills	Number of Questions
	Total_ Achievement in Science	40
1	Knowledge	17
2	Understanding	12
3	Application	11

Thus, the maximum attainable score for achievement in science is 40 and the lowest attainable score is 0. While scoring, all the illegible entries, double entries (two or more choices for an item ticked by respondent) and empty entries (no choice ticked) should not accounted for score.

3.8 PILOT STUDY

After constructing the research tool, the investigator concluded a pilot study in which the investigator administered research tool in PUPS, varanatheertham, Harur block. While administering, the research tool was handed over to elementary school students and elementary school students raised few questions and doubts on items. The doubts and questions raised by the elementary school students were asked to give their responses. Based on the responses of the elementary school students, scores were given.

3.8.1 Item Analysis and Statistical Analysis

After giving scores, the investigator preceded the following process.

- **Statistical Analysis:** This analysis otherwise known as Item Analysis.

- **Procedure:** The main aim of the Item Analysis is to obtain objective information concerning to Item pooled. The information is valuable to eliminate subjective judgment in selecting the Item.

In this study, samples of 30 students were selected and the draft tools of checklist on family background, questionnaire on achievement in science. The score for each respondent was computed and summated.

The Item Analysis has two important characteristics

1) Item Difficulty
2) Item Discrimination Index

Item Difficulty

Item difficulty is defined as a proportion of peoples who answered the item correctly. The item selected by the investigator based on range of difficulty index.

Table 3.2: Difficulty Index

Range of Difficulty Index	Interpretation	Action
0.00 to 0.25	Difficult	Revised or Discard
0.26 to 0.75	Moderate	Include
0.76 to above	Easy	Revised or Discard

Discrimination Index

After scoring the test in the pilot study, as per the total score values, marks are placed in order it is ascending order. Top 26% constitutes the high achievers and the bottom 26% constitutes the low achieving group.

Discriminating power = $P_H - P_L$

Where $P_H \rightarrow$ The proportion of peoples in the high achieving group who answered the item correctly

$P_L \rightarrow$ The proportion of peoples in the low achieving group who answered the item correctly

Based on the calculated values of item's discrimination index and difficulty level, appropriate items are chosen for the final form.

Table 3.3: Discrimination Index

Range of Index	Interpretation	Action
• -1.00 to -0.50	• Can discriminate but the item is questionable	• Discard
• -0.55 to 0.45	• Non-discriminating	• Revised
• 0.76 to above	• Discriminating	• Include

Illustration:

Suppose a item has 22 correct responses out of total 30 items, it ascending order is 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, ,1, ,1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,1, 1, 1, 1, 1, 1, 1, 1, 1

Bottom 26% in Low Achieving Group		**Top 26 % in High Achieving Group**
0, 0, 0, 0, 0, 0, 0, 0	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,1	1, 1, 1, 1, 1, 1, 1, 1

So P_H = The proportion of peoples in the high achieving group who answered the item correctly

$= \frac{8}{8} = 1$

P_L = The proportion of peoples in the low achieving group who answered the item Correctly

$= \frac{0}{8} = 0.00$

Table: 3.4 Position of Item before and after Item Analysis

Nomenclature of the tool	**Total no of Item before Item Analysis**	**Total no of Items Discarded in Item Analysis**
Checklist on family background	5	2
Questionnaire on achievement in science	50	10

A final summary of the Item pooled, Item discard and Item accepted inclusion in the questionnaire is given below in a tabular column.

Table: 3.5 Distributions of Items

Tools	**Total Items pooled**	**Total Items discarded**	**Total Items accepted**
Checklist on family background	5	2	**3**
Questionnaire on achievement in science	50	10	**40**

3.8.2 Validation of Research Tool

In any Research, the quality of Research tool is very important to draw valid information from the respondents. In the process of validation, the investigator used appropriate statistical techniques in order to determine or to improve the validity and reliability of the meaning instrument. The details of validity and reliability measure in the pre-test study are discussed below: -

- Reliability
- Validity

3.8.3 Reliability

Reliability refers to the consistency of scores from one administration instrument to another and from one set of items to degree, to which a test measures accurately that it intends to measure. According to Guilford's (1984) logical definition, the reliability is the proportion of the true variance of test scores. Reliability of the tests established through the following means.

- Test-Retest Reliability

Test-Retest Reliability

The scores on a test will be correlated with scores on a second administration of the test to the same subjects at a later date if the test has good test-retest reliability. It is because individual scores may change as it has taken the test before; one is interested in the relative position of the individual's score.

Table 3.6: Reliability Co-Efficient Values of the Checklist and Questionnaire Used in the Study

Sl. No.	Tools	Methods	Reliability Co-efficient
1	Checklist on family background	Test- Retest Method	0.95

3.9 NORMS FOR THE PRESENT STUDY

For the present study, the norm of the both the tools has been based on the mean ± 1σ distribution property of Normal distribution curve.

Table 3.7: Norms for the Present Study

Sl. No	Norms	Interpretation
1	Mean + 1σ	High
2	Mean - 1σ to Mean + 1σ	Average
3	Mean - 1σ	Low

3.10 PROCEDURE FOR DATA COLLECTION

Investigator visited to the schools in person. A planned schedule by the investigator helped him to collect the data in an orderly manner, with the prior permission of head of the institutions. The investigator visited selected schools in Dharmapuri

district of Tamil Nadu. After giving a brief introduction about the investigator, the investigator established a rapport with schools teachers. And explained the purpose of research and encouraged them to be free and frank in giving the responses.

The investigator distributed the paper/s of research tools to the respondents and they were asked to read all the items carefully after filling the personal data form given in first page about the details of the schools and family. Then they were asked to put the tick mark and write the necessary information in the scale. In administration of tools, schools' students have taken 60 minutes to complete the research tools by reading carefully and answering the statements. After their answers, the investigator thanked to the respondents and collected the filled questionnaire. Thus, the investigator collected the data.

Table 3.8 Time for Administrative of Tools

Sl. No	**Research Tools**	**Time (in min)**
1	Achievement in science	60
Total		**60**

3.11 POPULATION FOR THE STUDY

The population for the present study consists of elementary school students studying in various elementary schools in Tamil Nadu.

3.12 SAMPLES FOR THE STUDY

The investigator has used purposive sampling technique for selecting the sample from the population. The present study consists of elementary school students studying in Dharmapuri district of Tamil Nadu.

3.13 DISTRIBUTION OF THE SAMPLE

The distribution of the sample is given as follows:

Table 3.9 Group -Wise Distribution of the Sample

Sl. No	Group	No. of Sample	No. of Sample
1	Experimental Group	PUMS, Rayappankottai	30
2	Control Group	PUMS, Jammanahalli	30

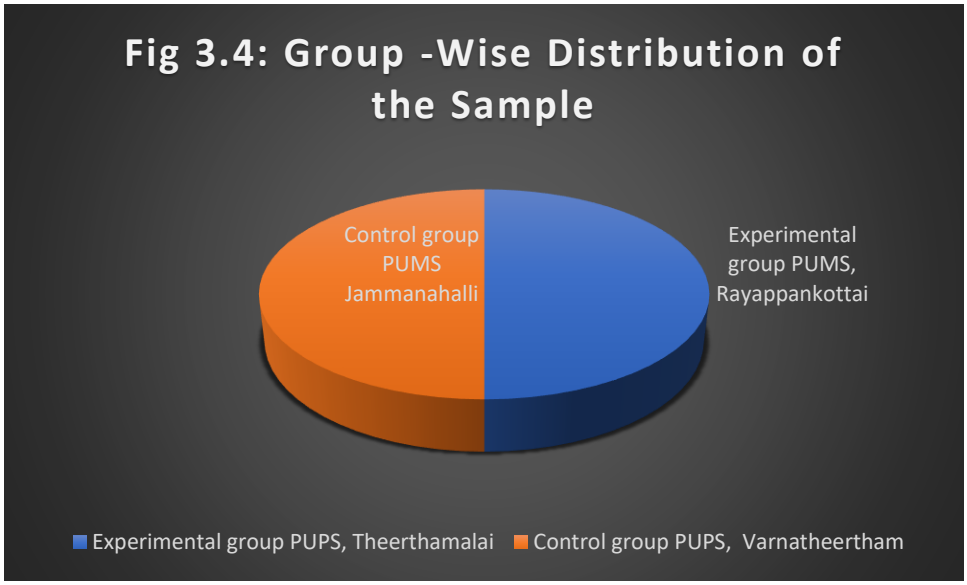


Table 3.10 Gender-Wise Distribution of the Sample

Sex	Experimental group	Control group	No. of sample
Girls	13	12	25
Boys	17	18	35
Total	**30**	**30**	**60**

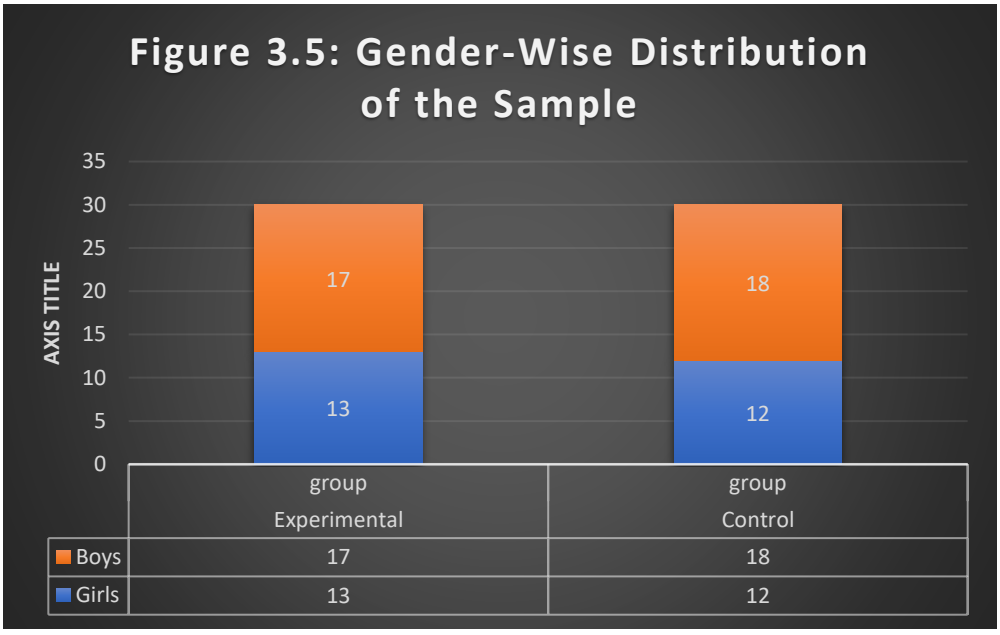


Table 3.11 Parent's Occupation-Wise Distribution of the Sample

Parent's Occupation	Experimental group	% of Experimental Group	Control group	% of Control Group
Self	19	63	20	67
Private	9	30	9	30
Government	**2**	7	**1**	3
Total	**30**	**100**	**30**	**100**

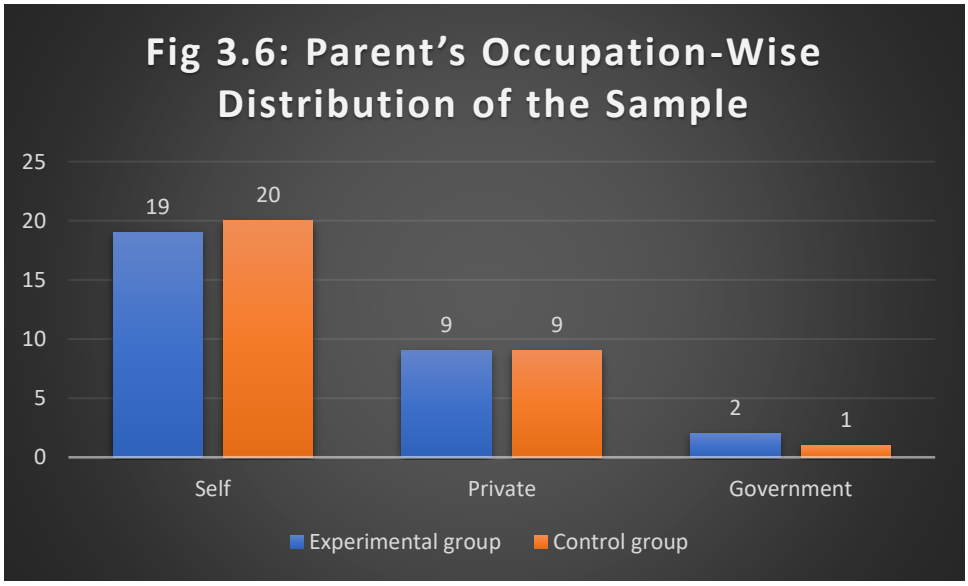
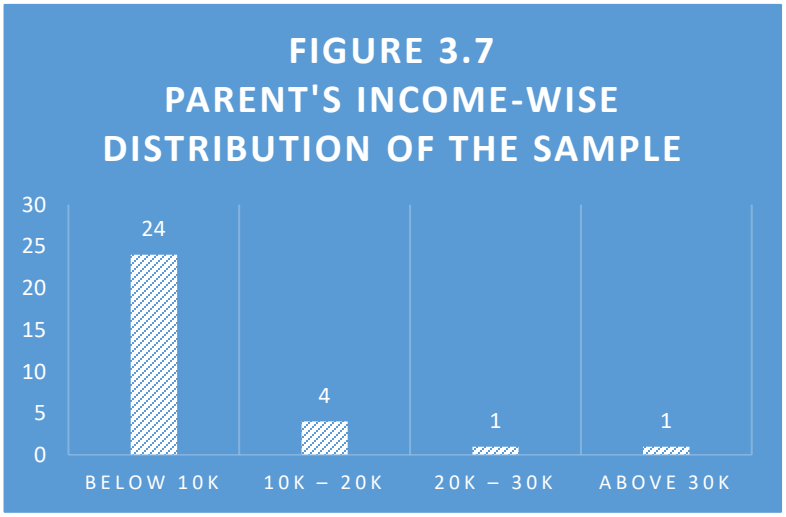


Table 3.12 Experimental Groups' Parent's Income-Wise Distribution of the Sample

Parent's Income (Rs)	No. of Sample	Percentage
Below 10k	24	53
10k – 20k	4	13
20k – 30k	1	3
Above 30k	1	3
Total	**30**	**100**



3.14 STATISTICAL TECHNIQUES USED

"Statistics is the scientific study of handling quantitative information. It embodies a methodology of collection, classification, description and interpretation of data obtained through the conduct of surveys and experiments" **(Aggarwal, 2000).** The investigator used the following statistical techniques for analyzing and interpreting the data based on the descriptive and differential analysis.

1. Percentage Analysis

The percentage analysis has been used to find out the percentage of teachers having low, moderate and high level of achievement in science.

Levels

High Level = The scores above mean + 1 SD

Moderate Level = The scores between mean ± SD

Low Level = The scores below mean – 1 SD

2. Arithmetic Mean

The average computed for a series is known as mean. If the grand total obtained by adding all the scores in a series is divide by the total number of scores, then the obtained figure is known as mean **(bhandarkar and Patan, 2006).**

The investigator has used the following formula for calculating arithmetic mean.

$$\overline{X} = \frac{\sum x}{N}$$

Where,

$\overline{X}$ = Arithmetic mean

$\sum x$ = Sum of scores

N = Number of Scores

3. Standard Deviation

The square root of average of squares of all deviations of scores from means of given series or frequency distribution is known as standard deviation.

The investigator has used the following formula for calculating standard deviation.

$$SD = \frac{1}{N}\sqrt{N\left(\sum x^2\right) - \left(\sum x\right)^2}$$

Where,

x = Individual score

$\sum$ = Sum of scores

N = Number of items

4. 't' test

A *t*-test is the most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were known. When the scaling term is unknown and is replaced by an estimate based on the data, the test statistics (under certain conditions) follow a Student's *t* distribution. The *t*-test can be used, for example, to determine if the means of two sets of data are significantly different from each other. Theoretical work on 't' distribution was done by W.S Gosset was employed by the guiness brewery in dulbin, Ireland which did not permit employees to publish research findings under their own names, so gusset adopted the pen name student and published his findings under this name. There after the 't' distribution is commonly called students 't' distribution or simply students distribution **(Aggarwal, 2000).**

The investigator has used the following formula for calculating 't' test.

$$t = \frac{M_1 - M_2}{\sqrt{\frac{{S_1}^2}{N_1} + \frac{{S_2}^2}{N_2}}}$$

Where,

M_1 = Mean of the first group

M_2 = Mean of the second group

S_1 = Standard deviation of the first group

S_2 = Standard deviation of the second group

N_1 = Number of cases in the first group

N_2 = Number of cases in the second group

5. ANOVA (Analysis of Variance)

The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. The technique of analysis of variance was first devised by Sir Ronald Fisher, an English statistician who is also considered to be the father of modern statistics as applied to social and behavioral sciences. The analysis of variances, as the name indicates, deals with variance rather than with standard deviations and standard errors **(Aggarwal, 2000).**

The investigator has used the following formula for calculating ANOVA.

$$F = \frac{MSV_b}{MSV_w}$$

Where,

MSV_b = Mean square variance between the group

MSV_w = Mean square variance within the group

3.15 TABULATION OF RESPONSES

The data collected was scored as per the norms established and the responded items were scored on the basis of scoring key in the form of matrix table. The scored data's were fed into the computer and analyzed using IBM SPSS Statistics version 16. The tabulation of analyzed data is given in the following chapter.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

4.1 INTRODUCTION

Analysis of data is one the basic steps of research process. It is the process of collection, analyzing and interpreting and numerical data. It is studying the tabulated materials in order to determine inherent factors or meanings. It involves breaking down existing complex factors into simple parts and putting the parts together in new arrangement for the purpose of interpretation. Data analysis is the process of looking for patterns in data and figuring out what they might mean. Data interpretation is the process of explaining the patterns that were discovered.

't test' was used in order to study the significant difference between any two means of the background variables involved in the study.

The 'F' test was used in order to study the significant difference among the means of the background variables involved in the study.

In this study, the investigator has used Mean, Standard deviation, t-test, and ANOVA.

4.2 *EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE AMONG ELEMENTARY SCHOOL STUDENTS.*

4.2.1. HYPOTHESES TESTING

Hypothesis: 01

The level of the effectiveness of play-based approach in Achievement in Science of elementary students is high.

Table 4.1

LEVEL OF EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE OF ELEMENTARY SCHOOL STUDENTS

Achievement in Science Score	N	**Mean**	**Percentage**	**Level**
0-17	4	23.56	13.33	Low
18-32	7	30.58	23.33	Average
33-40	19	37.62	63.33	High
Total	**30**	**35.78**		**High**

It is inferred from the above table that, 63.33% of them have scored 33-40, 23.33% of them have scored 18-32 and 13.33% of elementary school students have scored 0-17. Therefore, it is interpreted, 63.33% belongs to high level, 23.33% belongs to average level and 13.33% belongs to low level. For the whole respondents, the mean levels of effectiveness of play-based approach in achievement in science of elementary school students are high.

Hypothesis: 02

There is no significant difference in the mean score of science achievement between the experimental group and control group in pre-test scores.

Table 4.2

DIFFERENCE IN THE MEAN SCORE OF SCIENCE ACHIEVEMENT BETWEEN THE EXPERIMENTAL GROUP AND CONTROL GROUP IN PRE-TEST SCORES

Statistical technique	**Experimental group**	**Control group**
Mean	22.33	22.33
S.D	5.55	4.99
SE_D	1.362	
t-value	0.367**	
df	58	

** *No Significant at 0.05 levels.*

The obtained t-value is 0.367 for 28 degrees of freedom is less than the table values of 1.67 at 0.05 level of significant. It is clear that there is no significant difference between means scores of experimental group and control group in pre-test.

Inference: No difference between means scores of experimental group and control group in pre-test.

Hypothesis: 03

There is no significant difference in the mean score of science achievement between the experimental group and control group in post-test scores.

Table 4.3

DIFFERENCE BETWEEN EXPERIMENTAL GROUP AND CONTROL GROUP ELEMENTARY SCHOOL STUDENTS' SCIENCE ACHIEVEMENT WITH RESPECT TO PLAY BASED APPROACH

Statistical technique	**Experimental group**	**Control group**
Mean	36.14	27.58
S.D	3.45	6.14
SE_D	1.362	
t-value	3.58**	
df	58	

** Significant at 0.05 level

The obtained t-value is 3.58 for 58 degrees of freedom is greater than the table values of 1.67 at 0.05 levels of significant. It is clear that there is a significant difference between two means scores of experimental group and control group in post-test.

Inference: There is difference between two means scores of experimental group and control group in post-test.

Hypothesis: 04

There is no significant difference in the effectiveness of play-based approach in science achievement among the experimental group with respect to gender.

Table 4.4

DIFFERENCE BETWEEN BOYS AND GIRLS ELEMENTARY SCHOOL STUDENTS' SCIENCE ACHIEVEMENT WITH RESPECT TO PLAY BASED APPROACH

Skill	Gender	N	Mean	SD	Calculated 't' Value	Remarks at 5% Level
Science achievement	Boys	17	35.17	4.593	0.031	NS
	Girls	13	37.11	4.399	0.009	NS

(At 5% level of significance the table value of 't' is 1.960)

It is inferred from the above table that there is no significant difference between boys and girls elementary school students with respect to Science achievement at 5% level.

While comparing the mean scores of boys (mean = 35.17) and girls elementary school students (mean = 37.11) in their science achievement, the girls elementary school students are better than the boys elementary school students.

Inference: Boys and girls do not differ in their achievement in science in the post test experimental group.

Hypothesis: 05

There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group.

Table 4.5

DIFFERENCE IN EFFECTIVENESS OF PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF KNOWLEDGE BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Statistical technique	**Experimental group**
Mean	15.485
S.D	2.47
SE_D	1.362
t-value	1.02
df	28

The obtained t-value is 1.02 for 28 degrees of freedom is less than the table values of 1.67 at 0.05 level respectively of significant. It is clear that there is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group.

Inference: Boys and girls do not differ in their achievement in science of knowledge-based item's post-test scores of experimental group.

Hypothesis: 06

There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to gender.

Table 4.6

DIFFERENCE BETWEEN BOYS AND GIRLS ELEMENTARY SCHOOL STUDENTS' EFFECTIVENESS OF PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF KNOWLEDGE BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Gender	N	Mean	SD	Calculated 't' Value	Remarks at 5% Level
Science achievement * knowledge Questions	Boys	17	15.23	1.3	0.003	NS
	Girls	13	15.74	2.4	0.004	NS

(At 5% level of significance the table value of 't' is 1.960)

It is inferred from the above table that there is no significant difference between boys and girls elementary school students with respect to science achievement at 5% level.

While comparing the mean scores of boys (mean = 15.23) and girls elementary school students (mean = 15.74) in their science achievement, the girls elementary school students are better than the boys elementary school students.

Inference: Boys and girls do not differ in their achievement in science of knowledge-based item's post-test scores of experimental group.

Hypothesis: 07

There is no significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to parent's occupation.

Table 4.7

DIFFERENCE AMONG THEIR PARENT'S OCCUPATION SELF, GOVERNMENT AND PRIVATE WITH RESPECT TO PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF KNOWLEDGE BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Source of Variation	df = 2, 28		Calculated 'F' Value	Remarks at 5% Level
		Sum of Squares	Mean Square		
Science achievement	Between	237.499	118.75	3.156	S
	Within	9332.00	37.629		

(At 5% level of significance, for (2, 28) df the table value of 'F' is 2.99)

It is inferred from the above table that there is significant difference among their parent's occupation self, government and private with respect to play based approach in science achievement.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of knowledge-based item's post-test scores of experimental group with respect to parent's occupation.

Hypothesis: 08

There is no significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

Table 4.8

DIFFERENCE AMONG THEIR PARENT'S INCOME LESS THAN RS 10 k**, BETWEEN RS 10** k **TO 20** k**, BETWEEN RS 20** k **TO RS 30** k **AND ABOVE RS 30** k **WITH RESPECT TO PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT KNOWLEDGE BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP**

Skill	**Source of Variation**	**df = 3, 247**		**Calculated 'F' Value**	**Remarks at 5% Level**
		Sum of Squares	**Mean Square**		
Science Achievement	Between	231.844	77.281	4.044	S
	Within	9337.66	37.804		

(At 5% level of significance, for (2, 28) *df* the table value of 'F' is 2.60)

It is inferred from the above table that there is significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

Inference: There is significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

Hypothesis: 09

There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to gender.

Table 4.9

DIFFERENCE BETWEEN BOYS' AND GIRLS' EFFECTIVENESS OF PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF UNDERSTANDING BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Gender	N	Mean	SD	Calculated 't' Value	Remarks at 5% Level
Science achievement * Understanding Questions	Boys	17	10.38	2.1	0.047	NS
	Girls	13	10.42	1.8	0.074	NS

(At 5% level of significance the table value of 't' is 1.960)

It is inferred from the above table that there is no significant difference between boys and girls elementary school students with respect to Science achievement at 5% level.

While comparing the mean scores of boys (mean = 10.38) and girls (mean = 10.42) in their science achievement, the girls elementary school students are little better than the boys elementary school students.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to gender.

Hypothesis: 10

There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's occupation.

Table 4.10

DIFFERENCE AMONG THEIR PARENT'S OCCUPATION SELF, GOVERNMENT AND PRIVATE WITH RESPECT TO PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF UNDERSTANDING BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Source of Variation	df = 2, 28		Calculated 'F' Value	Remarks at 5% Level
		Sum of Squares	Mean Square		
Science achievement	Between	64.37	32.14	3.156	S
	Within	234.25	12.81		

(At 5% level of significance, for (2, 28) df the table value of 'F' is 2.99)

It is inferred from the above table that there is significant difference among their parent's occupation self, government and private with respect to play based approach in science achievement.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's occupation.

Hypothesis: 11

There is no significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's income.

Table 4.11

DIFFERENCE AMONG THEIR PARENT'S INCOME LESS THAN RS 10 k**, BETWEEN RS 10** k **TO 20** k**, BETWEEN RS 20** k **TO RS 30** k **AND ABOVE RS 30** k **WITH RESPECT TO PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF UNDERSTANDING BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP**

Skill	Source of Variation	df = 2, 28		Calculated 'F' Value	Remarks at 5% Level
		Sum of Squares	Mean Square		
Science Achievement * understanding	Between	86.234	31.50	3.044	S
	Within	937.66	12.804		

(At 5% level of significance, for (2, 28) *df* the table value of 'F' is 2.60)

It is inferred from the above table that there is significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's income.

Hypothesis: 12

There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to gender.

Table 4.12

DIFFERENCE BOYS AND GIRLS STUDENTS' EFFECTIVENESS OF PLAY BASED APPROACH OF KNOWLEDGE BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Gender	N	Mean	SD	Calculated 't' Value	Remarks at 5% Level
Science achievement * Application Questions	Boys	17	10.36	2.39	0.023	NS
	Girls	13	9.12	2.46	0.054	NS

(At 5% level of significance the table value of 't' is 1.960)

It is inferred from the above table that there is no significant difference between boys and girls elementary school students with respect to science achievement at 5% level.

While comparing the mean scores of boys (mean = 10.36) and girls elementary school students (mean = 9.12) in their science achievement, the boys elementary school students are better than the girls elementary school students.

Inference: Boys and girls do not differ in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group.

Hypothesis: 13

There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's occupation.

Table 4.13

DIFFERENCE AMONG THEIR PARENT'S OCCUPATION SELF, GOVERNMENT AND PRIVATE WITH RESPECT TO PLAY BASED APPROACH IN SCIENCE ACHIEVEMENT OF APPLICATION BASED ITEM'S POST-TEST SCORES OF EXPERIMENTAL GROUP

Skill	Source of Variation	df = 2, 28		Calculated 'F' Value	Remarks at 5% Level
		Sum of Squares	Mean Square		
Science achievement * application	Between	56.25	23.78	3.256	S
	Within	235.87	18.67		

(At 5% level of significance, for (2, 28) df the table value of 'F' is 2.99)

It is inferred from the above table that there is significant difference among their parent's occupation self, government and private with respect to play based approach in science achievement.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's occupation.

Hypothesis: 14

There is no significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's income.

Table 4.14

DIFFERENCE AMONG THEIR PARENT'S INCOME LESS THAN RS 10 k**, BETWEEN RS 10** k **TO 20** k**, BETWEEN RS 20** k **TO RS 30** k **AND ABOVE RS 30** k **WITH RESPECT TO PLAY BASED APPROACH**

Skill	**Source of Variation**	**df = 2, 28**		**Calculated 'F' Value**	**Remarks at 5% Level**
		Sum of Squares	**Mean Square**		
Science Achievement * application	Between	78.66	30.25	3.125	S
	Within	896.55	13.25		

(At 5% level of significance, for (2, 28) *df* the table value of 'F' is 2.60)

It is inferred from the above table that there is significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

Inference: There is significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's income.

4.3 CONCLUSION

In this chapter, the researcher presented the defined objectives and developed hypotheses, along with the statistical methods used to analyze the data. The subsequent chapter will focus on interpreting the findings and drawing conclusions based on the results obtained.

CHAPTER V

FINDINGS, INTERPRETATIONS, RECOMMENDATIONS AND SUGGESTIONS

5.1 INTRODUCTION

Education is one of the most important factors in achieving the national goals of a country. In the present age of Science and Technology, it has been increasingly realized that one needs to be educated not only to become a better man and better social being, but he should also be a better creative and productive being.

Science is a practical subject. In the field of science, we find that the use of the laboratory, certain types of directed study, and source material require methods of teaching which are different from those employed successfully in other subject areas.

Play is a fundamental aspect of childhood that contributes to holistic development across cognitive, social, emotional, and physical domains. Recognizing the importance of play in education and child development, educators, parents, and policymakers should prioritize providing children with ample opportunities for play-based learning experiences.

Play is a powerful educational tool that supports children's holistic development across cognitive, social, emotional, and physical domains. Recognizing the educational importance of play, educators, parents, and policymakers should prioritize providing children with ample opportunities for play-based learning experiences both inside and outside the classroom.

Hence play based method of teaching is very essential to develop scientificism among the students at the secondary level.

Some of the play-based activities which are employed in the present study are as follows:

1) Play Dough

2) Dress-Up and Role Play

3) Nature Play

4) Demonstration method

5) Educational play games and puzzles and,

6) Structure-Function method

In chapter 2, the investigator has reviewed 54 studies among which 24 are Indian studies and 30 are Foreign studies. With the views expressed from the above referred Indian and abroad studies, the investigator felt strongly motivated to study about "*Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students*."

Chapter 3 Methodology briefly explained about the research design, Data Collection Methods, and Data Analysis.

Chapter 4, analysis and interpretation of data, 't test' was used in order to study the significant difference between any two means of the background variables involved in the study. The 'F' test was used in order to study the significant difference among the means of the background variables involved in the study. In this study, the investigator has used Mean, Standard deviation, t-test, and ANOVA.

In this chapter 5, the investigator, through the present survey studied the 'Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students'. The findings of the study are based on the analysis of the data collected through the tools on a sample of 30 elementary school students. The findings of the present study are given below.

5.2 FINDINGS

5.2.1 FINDINGS BASED ON OBJECTIVES & HYPOTHESIS

a. 63.33% of elementary school students have high level of effectiveness of Play Based Approach in Achievement in Science.

   63.33% of student's have an excellent approach effectiveness of play based approach in achievement in science! The Play-Based Approach is effective because it capitalizes on children's natural inclination to play, creating a rich and meaningful learning environment that promotes holistic development and deep learning experiences.

b. 23.33% of elementary school students have average level of effectiveness of Play Based Approach in Achievement in Science.

   23.33% of student's effectiveness of play-based Approach in Achievement in Science is OK. They have a good understanding of the basics, but now they need to improve their process and be more proactive. T Focus specifically on the areas where their lost points, and develop a system that will work for them across a wide variety of situations**.**

c. 13.33% belongs to low level of elementary school student's effectiveness of Play Based Approach in Achievement in Science.

2. No difference between means scores of experimental group and control group in pre-test.

3. There is difference between two means scores of experimental group and control group in post-test.

4. Boys and girls do not differ in their achievement in science in the post test experimental group.

5. Boys and girls do not differ in their achievement in science of knowledge-based

item's post-test scores of experimental group.

6. Boys and girls do not differ in their achievement in science of knowledge-based item's post-test scores of experimental group.

7. There is significant difference in effectiveness of play-based approach in science achievement of knowledge based item's post-test scores of experimental group with respect to parent's occupation.

8. There is significant difference in effectiveness of play-based approach of in science achievement knowledge-based item's post-test scores of experimental group with respect to parent's income.

9. There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to gender.

10. There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's occupation.

11. There is significant difference in effectiveness of play-based approach in science achievement of understanding based item's post-test scores of experimental group with respect to parent's income.

12. Boys and girls do not differ in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group.

13. There is significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group with respect to parent's occupation.

14. There is significant difference in effectiveness of play-based approach in science achievement of application-based item's post-test scores of experimental group

with respect to parent's income.

5.3 RECOMMENDATIONS

- Special opportunities should be given to the elementary school students to develop their play-based approach for science achievement.
- Innovative teaching techniques should be adopted how to teach through play based.
- The special program like quiz, puzzles, should be conducted to develop the play based approach through science achievement.
- Provide hands-on materials and activities that allow children to explore scientific concepts through experimentation, observation, and manipulation. For example, use magnifying glasses, microscopes, or simple science kits for hands-on exploration of natural phenomena.
- Encourage inquiry-based learning by posing open-ended questions and encouraging children to ask their own questions about the natural world. Support their curiosity by guiding them in designing experiments, making predictions, and drawing conclusions based on evidence.
- Integrate scientific concepts into play-based activities, such as setting up a pretend science laboratory or creating sensory bins related to different scientific themes (e.g., water exploration for learning about states of matter).
- Take advantage of outdoor environments for science exploration and discovery. Allow children to engage with nature, observe plants and animals, and investigate natural processes firsthand. Incorporate nature walks, gardening, or outdoor experiments into the curriculum.
- Incorporate age-appropriate technology tools, such as educational apps, interactive simulations, or virtual reality experiences, to supplement hands-on

learning and provide additional opportunities for exploration and experimentation.

- Use role-playing activities or storytelling to introduce scientific concepts in a playful and engaging way. Encourage children to take on roles such as scientists, explorers, or inventors, and create narratives that incorporate scientific ideas and discoveries.

- Foster collaboration and teamwork by organizing group projects or experiments where children work together to solve problems, conduct investigations, and present their findings to peers or caregivers. This promotes communication skills, critical thinking, and cooperative learning.

- Encourage reflection and discussion after play-based science activities to help children consolidate their learning, articulate their observations and ideas, and make connections between their experiences and scientific concepts.

- Ensure that play-based science activities are inclusive and accessible to all children, regardless of their background, abilities, or interests. Provide a variety of materials, adapt activities as needed, and create a supportive environment that celebrates diversity and encourages participation from all learners.

- Involve parents and caregivers in children's science learning by sharing resources, providing ideas for extension activities at home, and inviting them to participate in science-themed events or workshops. Engaging the community can enrich children's learning experiences and foster a sense of excitement and curiosity about science.

5.4 SUGGESTIONS FOR FURTHER RESEARCH

On the basis of the limitations and findings of the present study, the following suggestions are offered for further research.

1. Conduct longitudinal studies to examine the long-term effects of a Play-Based Approach on children's science achievement. Follow a cohort of students over several years to assess their science knowledge, skills, attitudes, and career aspirations resulting from early exposure to play-based science learning.

2. Compare the effectiveness of different play-based strategies (e.g., structured play vs. unstructured play, indoor vs. outdoor play) in promoting science achievement among children of varying ages, backgrounds, and abilities. Investigate which play-based approaches yield the most significant gains in science learning outcomes.

3. Explore the impact of teacher training and professional development programs focused on incorporating play-based science activities into the curriculum. Assess how well-prepared teachers are to implement play-based strategies, their attitudes towards play-based learning, and the extent to which professional development influences student outcomes.

4. Investigate the integration of technology tools (e.g., educational apps, digital simulations, and interactive whiteboards) into play-based science activities and its impact on science achievement. Compare traditional play-based approaches with technology-enhanced play to identify best practices for incorporating digital tools effectively.

5. Explore the role of inquiry-based learning within a Play-Based Approach and its effects on children's science inquiry skills, critical thinking abilities, and problem-solving strategies. Investigate how guided inquiry activities during play contribute to deeper understanding and retention of scientific concepts.

6. Examine the influence of parental involvement in play-based science learning on children's science achievement. Investigate the types of support and resources provided by parents at home, their attitudes towards play-based approaches, and the correlation between parental involvement and children's

science outcomes.

7. Conduct cross-cultural studies to explore how play-based science approaches vary across different cultural contexts and their impact on science achievement among diverse student populations. Investigate cultural perspectives on play, learning styles, and the adaptation of play-based strategies in multicultural educational settings.

8. Investigate the effectiveness of play-based science interventions for students with diverse learning needs, including those with disabilities or special educational requirements. Explore inclusive play-based practices that support equitable access to science learning and promote positive outcomes for all students.

9. Use neuroscientific methodologies (e.g., brain imaging techniques, cognitive assessments) to study the neural mechanisms underlying learning during play-based science activities. Investigate how play impacts cognitive development, neural plasticity, and brain networks involved in scientific reasoning and problem-solving.

10. Conduct meta-analytic reviews to synthesize existing research on play-based approaches to science learning and identify overarching trends, best practices, and areas for further investigation. Explore the overall effectiveness of play-based interventions on science achievement across diverse populations and educational contexts.

5.5 EDUCATIONAL IMPLICATIONS:

- Play-based learning can increase students' engagement and motivation in science.
- Play-based approaches encourage active learning, where students are directly involved in exploring scientific concepts rather than passively receiving information.

- Play-based learning supports the holistic development of students by addressing not only cognitive skills but also social, emotional, and physical aspects.
- Collaborative play activities promote teamwork, communication, and problem-solving skills, while hands-on experiments enhance fine motor skills and coordination.

5.6 CONCLUSION

In conclusion, the Play-Based Approach has shown great promise in enhancing science achievement among children. Through hands-on exploration, inquiry-based learning, integration with play, outdoor experiences, and collaborative projects, this approach engages children in meaningful and enjoyable science learning experiences.

The recommendations for further research outlined in this context aim to deepen our understanding of the Play-Based Approach's impact on science achievement. Longitudinal studies, comparative analyses, teacher training evaluations, technology integration assessments, and cross-cultural investigations will contribute valuable insights into best practices and effective strategies for implementing play-based science education.

Moreover, exploring the role of parental involvement, inclusive practices, neuroscientific approaches, and conducting meta-analytic reviews will further enrich our knowledge and inform evidence-based practices in play-based science education.

In summary, continued research and implementation of the Play-Based Approach in science education hold tremendous potential for nurturing children's curiosity, fostering scientific inquiry skills, and promoting a lifelong love for learning in the field of science.

APPENDIX

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ABSTRACT

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Title: Effectiveness of Play Based Approach in Achievement in Science among Elementary School Students.

1.Introduction:

"You can discover more about a person in an hour of play than in a year of conversation". his statement, attributed to both Plato and Richard Lingard, a 17th-century professor of divinity, encapsulates a timeless truth recognized by early childhood educators for generations. Play is a fundamental aspect of childhood that contributes to holistic development across cognitive, social, emotional, and physical domains. Recognizing the importance of play in education and child development, educators, parents, and policymakers should prioritize providing children with ample opportunities for play-based learning experiences.

2. Need and significance of the study:

The significance of this study lies in its potential to contribute to the advancement of knowledge and practice in early childhood education. By providing empirical evidence, identifying implementation challenges, and exploring long-term outcomes, this research seeks to advocate for the importance of play in children's learning and development and inform evidence-based policies and practices that promote the holistic development and academic success of young children.

3. Objectives of the study:

General objective

- To identify the effectiveness of play-based approach in Achievement in Science of elementary students.

Specific objectives

- To study the improvement in achievement in science before and after play based approach teaching.
- To examine the after effects of play-based approach when compared to ordinary teaching approaches
- To choose the suitable play-based approach like physical, dramatic, nature, art and music, and age appropriate play among the play-based approaches in achievement in science

- To find out the development of language, motor, social, educational and cognitive abilities among elementary students.

4. Hypothesis of the study

The following hypotheses have been formulated for the study:

1. The level of the effectiveness of play-based approach in Achievement in Science of elementary students is high.
2. There is no significant difference in effectiveness of play-based approach in achievement in science among elementary school students belonging to experimental and control groups.
3. There is no significant difference in effectiveness of play-based approach enhanced the achievement of science than the traditional methods with respect to knowledge-based items.
4. There is no significant difference in effectiveness of play-based approach enhanced the achievement of science than the traditional methods with respect to understanding based items.
5. There is no significant difference in effectiveness of play-based approach enhanced the achievement of science than the traditional methods with respect to application-based items.

5 Methodology

a) Method - Experimental method would be adopted for the study
b) Sample - A sample of 60 elementary school students control group – 30, experimental group – 30, in Vth standard students would be selected as the sample for the study by simple random sampling technique.
c) Intervention –
d) Tool - pre and post-test question papers will be developed by the investigator.
e) Data Analysis - Analysis was done with the help of descriptive and differential analysis.

6 Major Findings

a. 63.33% of elementary school students have high level of effectiveness of Play Based Approach in Achievement in Science.
b. 23.33% of elementary school students have average level of effectiveness of Play Based Approach in Achievement in Science.

c. 13.33% belongs to low level of elementary school student's effectiveness of Play Based Approach in Achievement in Science.

7 Conclusion:

In conclusion, the Play-Based Approach has shown great promise in enhancing science achievement among children. Through hands-on exploration, inquiry-based learning, integration with play, outdoor experiences, and collaborative projects, this approach engages children in meaningful and enjoyable science learning experiences.

8 Educational Implications:

- Play-based learning can increase students' engagement and motivation in science.
- Play-based approaches encourage active learning, where students are directly involved in exploring scientific concepts rather than passively receiving information.
- Play-based learning supports the holistic development of students by addressing not only cognitive skills but also social, emotional, and physical aspects.
- Collaborative play activities promote teamwork, communication, and problem-solving skills, while hands-on experiments enhance fine motor skills and coordination.

DIET PROJECT

PERSONAL INFORMATION

இனம் : ஆண் / பெண்

பெற்றோரின் மாத வருமானம் : 10K / 20K / 30K / 40K / 50K

பெற்றோரின் தொழில் : சுய தொழில்/ தனியார் / அரசு

PRE –**TEST /POST –TEST**

Time : 60 Minutes **40 X 1 = 40 Marks**

I. **சரியான விடையைத் தேர்ந்தெடு.**

1. உணவுப் பொருள்களைக் கெட்டுப் போகச் செய்யும் உயிரிசார் காரணி

அ) காய வைத்தல் ஆ) வெப்பநிலை

இ) ஈரப்பதம் ஈ) பாக்டீரியா

2. கீழ்க்கண்டவற்றில் எது உணர்வு உறுப்பு அல்ல?

அ) கண் ஆ) காது

இ)தோல் ஈ) கல்லீரல்

3. _____ குறைபாடு காரணமாக இரத்தசோகை நோய் தோன்றுகிறது.

அ) வைட்டமின் ஏ ஆ) வைட்டமின் பி

இ) இரும்பு ஈ) வைட்டமின் டி

4. அதிகப் படியான கொழுப்பு உடலில் சேர்வது _____ என அழைக்கப்படுகிறது.

அ) உடல்பருமன் ஆ) தலைவலி

இ) காய்ச்சல் ஈ) வயிற்று வலி

5. கார்போஹைட்ரேட்டுகள் எதில் அதிகம் காணப்படுகின்றன?

அ) நெய் ஆ) பழங்கள்

இ) அரிசி ஈ) எண்ணெய்

6. கீழ்க்கண்ட நுண்ணுயிரிகளுள் எது நீரால் பரவும் நோய்களைத் தோற்றுவிக்கின்றன?

அ. பாக்டீரியா ஆ. வைரஸ்

இ. புரோட்டோசோவா ஈ. அனைத்தும்

7. ---------- இல் நீரானது அதிக அளவில் நீராவியாகவும் மேகங்களாகவும் காணப்படுகிறது.

அ. வானம் ஆ. பூமி

இ. வளி மண்டலம் ஈ. மழை

8. _____ நீரில் மாசுக்கள் இருக்காது.

அ. கடல் ஆ. கினற்று

இ. ஆற்று ஈ. நிலத்தடி

9. ---------- நீர் கடலிலும் பெருங்கடலிலும் காணப்படுகிறது.

அ. 97% ஆ. 87%

இ.47% ஈ.77%5.

10. ---------- என்பது கடல் நீரை தூய நீராக மாற்றும் செயற்கையான செயல்பாடாகும்.

அ. பின்னக் காய்ச்சி வடித்தல் ஆ. தெளிய வைத்து இறுத்தல்

இ. தலைகீழ் சவ்வூடு பரவல் ஈ. உப்புத் தன்மை நீக்குதல்

11. மலரின் ஆண் இனப்பெருக்க உறுப்பு

அ) அல்லிஇதழ் ஆ) புல்லிஇதழ்

இ) மகரந்தத்தாள் வட்டம் ஈ) சூலக வட்டம்

12. காற்றின் மூலம் நடைபெறும் மகரந்தச்சேர்க்கைக்கு _____ என்று பெயர்.

அ) அனிமோஃபிலி ஆ) ஹைட்ரோ ஃபிலி

இ) எண்டோமோஃபிலி ஈ) ஆர்னிதோஃபிலி

13. நீர் மூலம் விதை பரவும் முறைக்கு _____ என்று பெயர்.

அ) அனிமோகோரி ஆ) ஹைட்ரோகோரி

இ) ஸூகோரி ஈ) ஆட்டோகோரி

14. எண்டொமோஃபிலி என்பது

அ) பூச்சிகள் மூலம் நடைபெறும் மகரந்தச் சேர்க்கை

ஆ) காற்றின் மூலம் நடைபெறும் மகரந்தச் சேர்க்கை

இ) நீர் மூலம் நடைபெறும் மகரந்தச் சேர்க்கை

ஈ) விலங்குகள் மூலம் நடைபெறும் மகரந்தச் சேர்க்கை

15. கீழ்க்காண்பவற்றுள் எதில் காற்றின்மூலம் மகரந்தச்சேர்க்கை நடைபெறுகிறது?

அ) புல் ஆ) வாலிஸ்னேரியா

இ) ஹைட்ரில்லா ஈ) தாமரை

II. கோடிட்ட இடத்தை நிரப்புக.

16. மாலைக்கண் நோய் _____ சத்துக் குறைவினால் ஏற்படுகிறது.

17. மராஸ்மஸ் என்பது _____ குறைபாட்டு நோய் ஆகும்.

18. உணவில் ஏற்படும் கெட்ட வாசனைக்குக் காரணம் _____.

19. காற்றில் காணப்படும் ஈரப்பதம் உணவு கெட்டுப்போவதற்கான ஓர் _____ காரணி ஆகும்.

20. தரம் குறைந்த வாயுக்குழாய்களை உபயோகிப்பது _____ கசிவதற்கு முக்கியக் காரணம் ஆகும்.

21. பூமிக்கு அடியிலுள்ள நிலத்தடி நீர் ---------- வடிவில் புவியின் மேற்பரப்பிற்கு வெளியே வரும்.

22. நீரானது சூரிய வெப்பத்தினால் ஆவியாக மாறுவதற்கு -------- என்று பெயர்.

23. மழை நீரால் உருவாக்கப்பட்ட நீரோடை மற்றும் -------- ஆகியவை ஒன்றிணைந்து ஆறாக

உருவாகின்றன.

24. மழை நீரைச் சேகரித்து அதைச் சேமிக்கும் முறைக்கு --------- என்று பெயர்.

25. காலரா நோய்யைத் தோற்றுவிப்பது _____.

26. விதை ஒரு இடத்திலிருந்து மற்றொரு இடத்திற்குப் பரவுவதற்கு _____ என்று பெயர்.

27. கனி வெடித்து விதை பரவுவதற்கு _____ என்று பெயர்.

28. விதையானது கருத்தரித்த _____ ஆகும்.

29. நெல்லானது _____ மண்ணில் நன்கு வளரும்

30. பெரிய அளவு மண் துகள்களைக் கொண்டது _____ ஆகும்.

III. பொருத்துக.

31. மண்புழு – கொசுக்களின் முட்டை மற்றும் லார்வாக்களை அழிக்கின்றது

32. பறவைகள் – தேன்

33. தேங்காய் – பறவைகள் மூலம் மகரந்தசேர்க்கை

34. தேனீக்கள் – நீரின் மூலம் பரவுதல்

35. தட்டான் – மண்புழு உரமாதல்

36. எண்ணெய்க் கசிவு – மேகம்

37. நீர்த் தேக்கம் – தாவர வளர்ச்சி

38. பின்னக் காய்ச்சி வடித்தல் – கடல் வாழ் உயிரிகளை மாசுபடுத்துதல்

39. மழை நீர் சேகரிப்பு – இன்புளுயன்சா வைரஸ்

40. பன்றிக் காய்ச்சல் – அணைக்கட்டு

EFFECTIVENESS OF PLAY BASED APPROACH IN ACHIEVEMENT IN SCIENCE AMONG ELEMENTARY SCHOOL STUDENTS

Research Project Module – 2023 - 2024

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Submitted to

State Council of Educational Research and Training Tamilnadu

2024

விளையாட்டின் மூலம் அறிவியலை
ஐந்தாம் வகுப்பு மாணவர்கள்
கற்றுக்கொள்வதற்கான கட்டகம்

மாவட்ட ஆசிரியர் கல்வி மற்றும் பயற்சி நிறுவனம்
செட்டிக்கரை, தரும்புரி

நன்றி

முதல்வர்
மாவட்ட ஆசிரியர் கல்வி மற்றும் பயற்சி நிறுவனம்
செட்டிக்கரை, தரும்புரி

முன்னுரை:

விளையாட்டு அடிப்படையிலான கற்றல் முறை குழந்தை பருவ கல்வியில் இன்றியமையாதது. அறிவியல் பாடத்தில் பயன்படுத்தப்படும் போது ஒரு ஆசிரியர் எதிர்பார்க்கும் கற்றல் விளைவுகள் குழந்தைகளிடம் ஏற்படுகிறது. விளையாட்டு அடிப்படையிலான கற்றல் குழந்தைகளிடம் இயற்கையான ஆர்வத்தையும் ஆராய்வதற்கான விருப்பத்தையும் மேம்படுத்துகிறது, மேலும் அறிவியல் பாடத்தை மிகவும் ஈடுபாட்டுடனும் சுவாரஸ்யமாகவும் ஆக்குகிறது. இது குழந்தைகளிடம் விரிச்சிந்தனை மற்றும் சிக்கலைத் தீர்க்கும் திறன்களை வளர்க்க உதவுகிறது. குழந்தைகள் அறிவியல் கருத்துக்களை சுருக்கமாக புரிந்துகொள்ளவும், உண்மையான அனுபவங்களை பெறவும் உதவுகிறது. உதாரணமாக, தொகுதிகள் கொண்ட கட்டமைப்புகளை உருவாக்குவது குழந்தைகளுக்கு இயற்பியல் மற்றும் பொறியியலின் அடிப்படைக் கொள்கைகளைப் புரிந்துகொள்ள உதவுகிறது. விளையாட்டின் போது பொருட்களைக் கையாளுதல் மற்றும் பரிசோதனை செய்வது அறிவியல் கொள்கைகளை ஆழமாகப் புரிந்துகொள்ள வழிவகுக்ககிறது.கற்பனை விளையாட்டில் ஈடுபடும் குழந்தைகள் பெரும்பாலும் புத்தகத்திற்கு வெளியே சிந்திக்கவும், பிரச்சனைகளை ஆக்கப்பூர்வமாக அணுகவும் வழிக்காட்டுகிறது. ஒரு விளையாட்டு அடிப்படையிலான அணுகுமுறை புதிய கருத்துக்களை ஆராய்வதற்கும் புரிந்துகொள்வதற்கும் உகந்தது ஆகும். விளையாட்டின் மூலம், குழந்தைகள் சுய கட்டுப்பாடு மற்றும் பொறுமை, அறிவியல் ஆய்வுகளை நடத்துவதற்கு முக்கியமான திறன்களைக் கற்றுக்கொள்கிறார்கள்.

விளையாட்டின் அடிப்படையிலான கற்றலில் ஈடுபடும் குழந்தைகள் அறிவியலில் சிறந்து விளங்குகிறார்கள் என்று ஆராய்ச்சி காட்டுகிறது. எடுத்துக்காட்டாக, ஆரம்பகால குழந்தை பருவக் கல்வி இதழில் வெளியிடப்பட்ட ஒரு ஆய்வில், பாரம்பரிய அமைப்புகளுடன் ஒப்பிடும்போது விளையாட்டு அடிப்படையிலான கற்றல் சூழல்களில் குழந்தைகள் அறிவியல் பகுத்தறிவில் அதிக முன்னேற்றத்தைக் காட்டியுள்ளனர் என்பதனை நிருப்பித்துள்ளானர். அறிவியல் கல்வியில் விளையாட்டு அடிப்படையிலான அணுகுமுறை ஈடுபாடு, சிந்தனை, கருத்தியல் புரிதல் மற்றும் சமூக திறன்களை மேம்படுத்துவதில் மிகவும் பயனுள்ளதாக இருக்கிறது. இது குழந்தைகளின் இயற்கையான கற்றல் போக்குகளுடன் நன்றாக இணைகிறது, அறிவியலை வேடிக்கையாகவும் கல்வியாகவும் ஆக்குகிறது. அந்த வகையில் இந்த கட்டகம் ஐந்தாம் வகுப்பு மாணவர்களுக்கு ஏற்றவாறு அமைந்துள்ளது.

செயல்பாடுகள்

செயல்பாடு – 1 களிமண்ணை பயன்படுத்தி பொருட்களை உருவாக்குதல்

அறிமுகம்

ஐந்தாம் வகுப்பு அறிவியல் பாடத்தில் பருவம் 2 ல் உணவு என்ற தலைப்பினை களிமண் அல்லது வண்ணம் பூசப்பட்ட களிமண்ணைப் பயன்படுத்தி பொருட்களை உருவாக்குவதன் மூலம் மாணவர்களுக்கு உணவின் வகைகள், சரிவிகித உணவுகள் மற்றும் பல்வேறு உணவுகளில் காணப்படும் ஊட்டச்சத்துக்களின் கருத்துகளைப் எளிதில் புரிந்துகொள்ள உதவும்.

இந்த செயல்பாட்டை செய்வதற்கான படிநிலைகள் கீழே கொடுக்கப்பட்டுள்ளன.

நோக்கங்கள்

- களிமண்ணை பயன்படுத்தி உணவு மாதிரிகளை உருவாக்குதல்.
- மாணவர்கள் பல்வேறு உணவு வகைகள், சரிவிகித உணவின் முக்கியத்துவத்தை அறதல்.
- ஊட்டசத்துக்களின் முக்கியத்துவத்தை அறிதல்.

தேவையான பொருட்கள்:

• வண்ணம் பூசப்பட்ட களிமண்.

• பிளாஸ்டிக் கத்திகள் மற்றும் ஊசிகள்

• காகிதத் தட்டுகள் அல்லது பிளாஸ்டிக் தட்டுகள்

• குறிப்பான்கள் மற்றும் லேபிள்கள்

• உணவுவைக் குறிக்கும் படங்கள் அல்லது வரைபடங்கள்

• உணவின் வகைகள் மற்றும் ஊட்டச்சத்துக்கள் பற்றிய கையேடுகள் அல்லது பணித்தாள்கள்

செய்முறை (30–40 நிமிடங்கள்):

- மாணவர்களை 5 குழுக்களாகப் பிரித்து அக் குழுவிற்கு பெயர்களை இடவேண்டும். (எடுத்துக்காட்டாக குழுக்களின் பெயர்கள் பழங்கள், காய்கறிகள், தானியங்கள், புரதங்கள் மற்றும் பால் பொருட்கள் என பெயரிடலாம்)

- ஒவ்வொரு குழுவிற்கும் வண்ண களிமண்ணை வழங்கி உணவு மாதிரிகளை செய்ய சொல்லல். (எடுத்துக்காட்டாக கேரட், ஆப்பிள், கொண்டைகடலை, மீன்... போன்றவை)
- உணவு மாதிரிகள் தயாரிக்கப்பட்டதும், ஒவ்வொரு குழுவும் தங்கள் படைப்புகளை ஒரு காகிதத் தட்டு அல்லது பிளாஸ்டிக் தட்டில் வைக்க வேண்டும்.
- தட்டில் வைக்கப்பட்ட உணவுப் பொருட்களில் உள்ள ஊட்டசத்தினைப் பற்றி குறிப்புகளை குறிப்பான்கிள் எழுதி ஒட்ட வேண்டும்.
- ஒவ்வொரு உணவுப் பொருளையும அது வழங்கும் ஊட்டத்தையும் (எ.கா., ஆரஞ்சுக்கு வைட்டமின் சி, கோழிக்கு புரதம்) அடையாளம் காண குறிப்பான்கள் மற்றும் லேபிள்களைப் பயன்படுத்தவும்.

முடிவு

இச்செயல்பாட்டின் மூலம் மாணவர்கள் உணவு மாதிரிகளை மாணவர்களே செய்து பார்க்கும் போது பாடக் கருத்தை எளிதில் புரிந்து கொள்ள முடியும்.

செயல்பாடு: 2

பங்கேற்று நடித்தல் மற்றும் போலச் செய்தல் மூலம் உடல் பருமன் பற்றிய விழிப்புணர்வு பெறுதல்

நோக்கம்:

பங்கேற்று நடித்தல் மற்றும் போலச் செய்தல் மூலம் உடல் பருமனுக்கான காரணங்கள் மற்றும் விளைவுகளைப்பற்றி புரிந்து கொள்ளுதல்

தேவையான பொருட்கள்:

பல்வேறு கதாபாத்திரங்களுக்கான ஆடைகள் (எ.கா., மருத்துவரின் கோட், ஊட்டச்சத்து நிபுணர் பேட்ஜ், விளையாட்டு பயிற்சியாளரின் விசில், ஆரோக்கியமற்ற/ஆரோக்கியமான உணவு மாதிரிகள்).

உடல் பருமன் பற்றிய தகவல்களுடன் போஸ்டர்கள் அல்லது ஃபிளாஷ் கார்டுகள்.

உடல் பருமன் தொடர்பான பல்வேறு நிஜ வாழ்க்கை சூழ்நிலைகளைக் கொண்ட காட்சி அட்டைகள்.

கதாபாத்திரங்கள்:

1. மருத்துவர்/செவிலி: உடல் பருமனால் ஏற்படும் மருத்துவ தாக்கங்களை விளக்குகிறார்.

2. ஊட்டச்சத்து நிபுணர்/உணவியல் நிபுணர்: ஆரோக்கியமான உணவுப் பழக்கங்களைப் பற்றி விவாதிக்கிறார்.

3. தனிப்பட்ட பயிற்சியாளர்/விளையாட்டு பயிற்சியாளர்: உடல் செயல்பாடுகளின் முக்கியத்துவத்தைப் பற்றி பேசுகிறார்.

4. நோயாளி: உடல் பருமன் தொடர்பான தனிப்பட்ட அனுபவங்களைப் பகிர்ந்து கொள்கிறார்.

5. பெற்றோர்/பாதுகாவலர்: உணவு மற்றும் செயல்பாட்டு நிலைகளில் குடும்ப தாக்கங்களை விவரிக்கிறார்.

பங்கேற்று நடித்தல் மற்றும் போலச் செய்தல் நிகழ்த்துதல்

1. கதா பாத்திரங்களை உருவாக்குதல்

மாணவர்களை சிறு குழுக்களாகப் பிரித்து ஒவ்வொரு குழுவிற்கும் வெவ்வேறு பாத்திரங்களை வழங்குதல்.

நிஜ வாழ்க்கை காட்சியை உருவகப்படுத்த, ஒவ்வொரு குழுவும் சமமான கதாபாத்திரங்களைக் கொண்டிருப்பதை உறுதிசெய்யவும்

2 காட்சி அமைப்பை உருவாக்குதல்

ஒவ்வொரு குழுவிற்கும் ஒரு காட்சி அட்டையை வழங்கவும். எடுத்துக்காட்டுகள் பின்வருமாறு:

ஒரு குடும்பம் ஆரோக்கியமான உணவுத் திட்டங்களைப் பற்றி ஊட்டச்சத்து நிபுணரிடம் ஆலோசனை செய்கிறது.

ஒரு நோயாளிக்கு உடல் பருமனால் ஏற்படும் உடல்நல அபாயங்களை மருத்துவர் விளக்குகிறார்.

உடல் பருமனுடன் போராடும் ஒரு மாணவருக்கு ஒரு விளையாட்டு பயிற்சியாளர் ஒரு உடற்பயிற்சியை உருவாக்குகிறார்.

ஒரு பெற்றோர் தங்கள் குழந்தையை ஆரோக்கியமான பழக்கவழக்கங்களைக் கடைப்பிடிக்க எப்படி ஊக்குவிப்பது என்று விவாதிக்கும் காட்சி அட்டைகள் மாணவர்களிடம் வழங்கப்படுகிறது.

3 பங்கேற்று நடித்தல்

ஒவ்வொரு குழுவும் அவரவருக்கு ஒதுக்கப்பட்ட காட்சி அமைப்பில் உள்ள சூழலுக்கு தகுந்தார் போல் ஆடைகளை தேர்ந்தெடுத்து அதில் உள்ள கருத்துக்களை நடித்துக்காட்டவும்.

எடுத்துக்காட்டு காட்சி அட்டைகள்:

காட்சி 1: குடும்ப உணவுத் திட்டம்

பாத்திரங்கள்: பெற்றோர், ஊட்டச்சத்து நிபுணர், குழந்தை

சூழ்நிலை: குழந்தையின் எடையை சிறப்பாக நிர்வகிக்க உதவுவதற்கு ஆரோக்கியமான உணவை எவ்வாறு திட்டமிடுவது என்பது குறித்த ஆலோசனையைப் பெறுவதற்கு பெற்றோர் மற்றும் குழந்தை ஊட்டச்சத்து நிபுணரைச் சந்திக்கின்றனர்.

காட்சி 2: மருத்துவரின் வருகை

பாத்திரங்கள்: மருத்துவர், நோயாளி, செவிலியர்

சூழ்நிலை: உடல் பருமனால் ஏற்படும் உடல்நல அபாயங்களைப் புரிந்துகொள்வதற்கும், பாதுகாப்பாக எடையைக் குறைப்பதற்கான ஆலோசனைகளைப் பெறுவதற்கும் ஒரு நோயாளி மருத்துவரை சந்திக்கிறார்.

காட்சி 3: உடற்பயிற்சி வழக்கம்

பாத்திரங்கள்: விளையாட்டு பயிற்சியாளர், மாணவர், பெற்றோர்

சூழ்நிலை: உடற்பயிற்சியை மேம்படுத்துவதற்கும் எடையை நிர்வகிப்பதற்கும் ஒரு வேடிக்கையான மற்றும் பயனுள்ள உடற்பயிற்சியை உருவாக்க ஒரு மாணவர் மற்றும் அவர்களது பெற்றோர் விளையாட்டு பயிற்சியாளரை சந்திக்கின்றனர்.

காட்சி 4: மளிகைக் கடை பயணம்

பாத்திரங்கள்: பெற்றோர், குழந்தை, மளிகைக் கடை ஊழியர்

சூழ்நிலை: பணியாளரின் உதவியுடன் ஆரோக்கியமான உணவுகளை எவ்வாறு தேர்வு செய்வது என்பதை அறிய பெற்றோர் மற்றும் குழந்தை மளிகைக் கடைக்குச் செல்கின்றனர்.

முடிவு

இந்தச் செயல்பாடு மாணவர்களுக்கு உடல் பருமனைப் பற்றி பல கோணங்களில் ஆழமாகப் புரிந்து கொள்ள உதவுவதோடு, அவர்களின் உடல்நலத் தேர்வுகள் குறித்து விமர்சன ரீதியாக சிந்திக்க அவர்களை ஊக்குவிக்கும்.

செயல்பாடு – 3

கட்டமைப்பு மற்றும் செயல்பாடு முறையில் உணவு சங்கிலியை உருவாக்குதல்

நோக்கங்கள்

கட்டமைப்பு மற்றும் செயல்பாடு முறையில் உணவு சங்கிலி உருவாக்குதலைப் பற்றி அறிதல்

சரிவிகித உணவின் முக்கியத்துவத்தைப் பற்றி புரிந்துகொள்ளுதல்

ஆரோக்கியமான உணவு பழக்கத்திற்கு உணவுப்பிரமிடின் முக்கியத்துவத்தை அறிதல்

தேவையான பொருட்கள்

- சுவரொட்டி பலகை அல்லது பெரிய காகிதம்
- குறிப்பான்கள், கிரேயன்கள் அல்லது வண்ண பென்சில்கள்
- கத்தரிக்கோல்
- பசை குச்சிகள்
- உணவு இதழ்கள், பல்வேறு உணவுகளின் அச்சிடப்பட்ட படங்கள்
- ஒவ்வொரு உணவுக் குழுவிற்குமான லேபிள்கள் (பழங்கள், காய்கறிகள், தானியங்கள், புரதங்கள், பால் பொருட்கள், கொழுப்புகள் மற்றும் எண்ணெய்கள்)

செய்முறை

வகுப்பை சிறு குழுக்களாகப் பிரித்து தேவையான பொருட்களை மாணவர்களிடம் கொடுக்கவும்.

ஒவ்வொரு குழுவிற்கும் சுவரொட்டி பலகையில் தங்கள் சொந்த உணவு பிரமிட்டை உருவாக்க ஒதுக்கவும்.

பத்திரிகைகள் அல்லது ஃபிளையர்களில் இருந்து வெவ்வேறு உணவுகளின் படங்களை வெட்டி அவற்றை உணவு பிரமிடு பிரிவுகளின்படி வகைப்படுத்த அவர்களுக்கு அறிவுறுத்துங்கள்.

அவர்கள் தங்கள் பிரமிட்டின் ஒவ்வொரு பகுதியையும் தெளிவாகக் குறிக்க லேபிள்களைப் பயன்படுத்தவும்.

முடிவு

இந்தச் செயல்பாடு மாணவர்களுக்கு ஊட்டச்சத்து மற்றும் உணவுப் பிரமிடு பற்றி அறிவியல் திறன்களையும் மேம்படுத்துகிறது.

செயல்பாடு – 4 விளையாட்டு மற்றும் புதிர்கள் மூலம் நீரினால் பரவும் நோய்களை விளக்குதல்

நோக்கம்

விளையாட்டு மற்றும் புதிர்கள் மூலம் நீரினால் பரவும் நோய்களைப் பற்றி புரிந்து கொள்ளுதல்

தேவையான பொருட்கள்

பெரிய சுவரொட்டி பலகை அல்லது வெள்ளை பலகை

குறிப்பான்கள்

குறியீட்டு அட்டைகள்

வண்ண காகிதம்

கத்தரிக்கோல்

பசை குச்சிகள்

நீரில் பரவும் நோய்த் தகவல்களின் அச்சிடல்கள் (படங்கள் மற்றும் விளக்கங்கள்)

குறுக்கெழுத்து புதிர் டெம்ப்ளேட்

வார்த்தை தேடல் புதிர் டெம்ப்ளேட்

பொருந்தும் விளையாட்டு டெம்ப்ளேட்

பொருத்துக மற்றும் குறுக்கெழுத்து புதிர்கள் மூலம் நோய்களை விளக்குதல்

1. நீரின் மூலம் பரவும் நோய்களை பொருந்தும் விளையாட்டு மூலம் விளக்குதல்

பொருந்தும் அட்டைகளின் தொகுப்பை உருவாக்கவும். நீரில் பரவும் நோய்களின் பெயர்களைக் கொண்ட ஒரு தொகுப்பு மற்றும் அதனுடன் தொடர்புடைய அறிகுறிகள் மற்றும் தடுப்பு முறைகள்.

அட்டைகளை கலந்து, மாணவர்கள் நோயை அதன் அறிகுறிகள் மற்றும் தடுப்பு முறைகளுடன் பொருத்த வேண்டும்.

வகுப்பில் சரியான பொருத்தங்களைப் பற்றி விவாதித்தல்.

2.குறுக்கெழுத்து புதிர் (15 நிமிடங்கள்):

• "மாசுபாடு," "பாக்டீரியா," "காலரா," "தடுப்பு," போன்ற நீர்வழி நோய்கள் தொடர்பான சொற்களைப் பயன்படுத்தி குறுக்கெழுத்து புதிரை உருவாக்கவும்.

• ஒவ்வொரு வார்த்தைக்கும் புதிர்களை வழங்கவும், மேலும் மாணவர்கள் குறுக்கெழுத்து புதிரை தனியாகவோ அல்லது சிறிய குழுக்களாக முடிக்க வேண்டும்.

3 நீர்வழி நோய்கள் வார்த்தை தேடல் புதிர்:

நீரினால் பரவும் நோய்கள் தொடர்பான சொற்களைக் கொண்ட வார்த்தை தேடல் புதிரை வழங்கவும்.

புதிரில் உள்ள சொற்களைக் கண்டுபிடித்து வட்டமிட மாணவர்களை ஊக்குவிக்கவும்.

அவர்கள் சொல் தேடலை முடித்தவுடன், அவர்கள் கண்டறிந்த சொற்களில் ஒன்றைப் பற்றி ஓரிரு வாக்கியங்களை எழுதுவார்கள்.

முடிவு

இந்த விளையாட்டுகள் மற்றும் புதிர்களை இணைப்பதன் மூலம், மாணவர்கள் நீரில் பரவும் நோய்களைப் பற்றியும் அவற்றைத் தடுப்பது பற்றியும் அறிந்துகொள்ள ஒரு வேடிக்கையான வழியைப் பெறுவார்கள்.

செயல்பாடு: 5 இயற்கையோடு இயைந்து மகரந்தச் சேர்க்கை உருவாவதை விளக்குதல்

நோக்கங்கள்

- இயற்கையில் மகரந்தசேர்க்கை நடைபெறுவதைப் பற்றி அறிதல்
- மகரந்த சேர்க்கையாளர்களைப் பற்றி புரிந்துகொள்ளுதல்

- தாவர இனப்பெருக்கத்திற்கு மகரந்த சேர்க்கையின் பங்கை பற்றி புரிந்து கொள்ளுதல்

தேவையான பொருட்கள்

• மலர்

• பூதக்கண்ணாடிகள்

• சிறிய வண்ணப்பூச்சுகள் (தேனீ மகரந்தச் சேர்க்கையை உருவகப்படுத்த)

• ஒட்டும் குறிப்புகள்

• வண்ண குறிப்பான்கள்

மகரந்த சேர்க்கை நடைபெறுவதை இயற்கை நிகழ்வில் உற்றுநோக்கல்

மாணவர்களை ஒரு தோட்டம், பூங்கா அல்லது பூக்கள் உள்ள ஏதேனும் ஒரு பகுதிக்கு அழைத்துச் செல்லுங்கள்.

• ஒவ்வொரு மாணவருக்கும் ஒரு பூதக்கண்ணாடி, பெயிண்ட் பிரஷ் மற்றும் ஃபீல்ட் ஜர்னலை வழங்கவும்.

• மாணவர்களை வெவ்வேறு பூக்களை உன்னிப்பாகக் கவனிக்கச் சொல்லுங்கள் மற்றும் விவரங்களைப் பார்க்க பூதக்கண்ணாடியைப் பயன்படுத்தவும்.

• ஒரு பூவின் மகரந்தத்தை மெதுவாக தொடுவதற்கு வண்ணப்பூச்சு தூரிகையைப் பயன்படுத்தவும், பின்னர் மகரந்தச் சேர்க்கை செயல்முறையைப் பிரதிபலிக்க பிஸ்டில் செய்யவும்.

• மாணவர்கள் தாங்கள் பார்க்கும் பூக்களின் வகைகள், எந்த பூச்சிகளைக் கவனிக்கிறார்கள் மற்றும் பூவின் பாகங்களைப் பற்றி அவர்கள் கவனிக்கும் விஷயங்கள் உட்பட, அவர்களின் கள இதழ்களில் பதிவு செய்ய ஊக்குவிக்கவும்.

பங்கேற்று நடித்தல் மூலம் மகரந்தச் சேர்க்கை விளக்குதல்

வகுப்பறையிலோ அல்லது திறந்தவெளியிலோ, மாணவர்கள் மகரந்தச் சேர்க்கை செயல்முறையைச் செயல்படுத்தக்கூடிய பங்கேற்று நடித்தல் செயல்பாட்டை ஒழுங்கமைக்கவும்.

• தேனீக்கள், பட்டாம்பூச்சிகள், பூக்கள் மற்றும் காற்று (காற்று மகரந்தச் சேர்க்கை உட்பட) போன்ற பாத்திரங்களை ஒதுக்கவும்.

• செயல்பாட்டை மேலும் ஈடுபாட்டுடன் செய்ய கதாபாத்திர ஆடைகள் பயன்படுத்தவும்.

• மகரந்தச் சேர்க்கையாளர்களால் ஒரு பூவில் இருந்து மற்றொரு பூவுக்கு மகரந்தம் எவ்வாறு மாற்றப்படுகிறது என்பதை விளக்கி, செயல்முறையின் மூலம் மாணவர்களுக்கு வழிகாட்டவும்.

முடிவு

இந்த இயற்கை விளையாட்டுச் செயல்பாடு மாணவர்களுக்கு மகரந்தச் சேர்க்கையைப் பற்றி நேரடியாகவும் ஈடுபாட்டுடனும் அறிய உதவுகிறது, இது இயற்கை உலகத்தைப் பற்றிய ஆழமான புரிதலையும் பாராட்டையும் வளர்க்கிறது.

செயல்பாடு 6 பங்கேற்று நடித்தல் மற்றும் போலச்செய்தல் மூலம் பல்வேறு மாவட்டங்களில் உள்ள வேறுபட்ட மாடுகளை பற்றி தெரிந்து கொள்ளுதல்

நோக்கம்

பங்கேற்று நடித்தல் மூலம் மாடுகளின் பல்வேறு இனங்கள், அவற்றின் குணாதிசயங்கள் பற்றி புரிந்து கொள்ளுதல்.

தேவையான பொருட்கள்:

வெவ்வேறு மாட்டு இனங்களைக் குறிக்கும் ஆடைகள் (எ.கா., வண்ண வடிவங்கள், கொம்புகள், காதுகள்)

பசு வடிவிலான தொப்பிகள் அல்லது முகமூடிகள் அல்லது கைவினைப் பொருட்களால் செய்யப்பட்ட மிகவும் விரிவான ஆடைகள்

• அடையாளங்களை உருவாக்க பெரிய காகிதம் அல்லது அட்டை

• குறிப்பான்கள், வண்ண பென்சில்கள் மற்றும் வண்ணப்பூச்சுகள்

• அடையாளங்களை இணைக்க சரம் அல்லது டேப்

• வெவ்வேறு மாடு இனங்களின் குறிப்புப் படங்கள் அல்லது வரைபடங்கள்

• மாட்டு இனங்கள் மற்றும் விவசாயத்தில் அவற்றின் பங்கு பற்றிய பணித்தாள்கள்

• ஒவ்வொரு இனமும் பொதுவாக எங்கு காணப்படுகிறது என்பதைக் காட்ட பல்வேறு மாவட்டங்களின் வரைபடங்கள்

பங்கேற்று நடித்தல் மற்றும் போலச்செய்தல் மூலம் பல்வேறு மாவட்டங்களில் உள்ள வேறுபட்ட மாடுகளை பற்றி தெரிந்து கொள்ள தயார்படுத்துதல்

ஆடைகள் உருவாக்கவும்: பல்வேறு மாடு இனங்களுக்கு எளிய உடைகள் தயார் செய்யவும். உதாரணமாக

கிர் மாடு: தனித்துவமான கொம்புகள் மற்றும் கூம்பு, சிவப்பு மற்றும் வெள்ளை தோல் வடிவங்கள்

சாஹிவால் மாடு: சிவப்பு–பழுப்பு நிறம், தளர்வான தோல்

ஹோல்ஸ்டீன் மாடு: கருப்பு மற்றும் வெள்ளை புள்ளிகள், பெரிய உடல்

ஜெர்சி மாடு: வெளிர் பழுப்பு, சிறிய உடல் அளவு

ரோல் ப்ளே அறையை அமைக்கவும்: ரோல்–பிளே செயல்பாட்டிற்காக வகுப்பறையில் மாணவர்கள் நடமாடுவதற்கு போதுமான இடவசதியுடன் ஒரு இடத்தை ஏற்பாடு செய்யுங்கள்.

வகுப்பை குழுக்களாகப் பிரித்து, ஒவ்வொரு குழுவிற்கும் ஒரு குறிப்பிட்ட மாடு இனத்தை ஒதுக்கவும் அல்லது மாணவர்கள் தங்களுக்குப் பிடித்த இனத்தைத் தேர்ந்தெடுக்க அனுமதிக்கவும்.

மாணவர்கள் தங்கள் ஆடைகள் உருவாக்குவதற்கான பொருட்களை வழங்குதல்.

அவர்களுக்கு ஒதுக்கப்பட்ட மாட்டு இனத்தை பிரதிநிதித்துவப்படுத்துவதில் படைப்பாற்றல் மற்றும் துல்லியத்தை ஊக்குவிக்கவும். தேவைப்பட்டால் குறிப்பு படங்களை பயன்படுத்தவும்.

மாணவர்கள் தங்களுக்கு ஒதுக்கப்பட்ட மாட்டு இனத்தின் சிறப்பியல்புகள், அவர்கள் பொதுவாகக் காணப்படும் மாவட்டம் மற்றும் அவற்றின் முக்கியத்துவம் உள்ளிட்டவற்றைப் பற்றிய சுருக்கமான விளக்கத்தைத் தயாரிக்க வேண்டும்.

ஒவ்வொரு மாணவரும் (அல்லது குழு) முன் வந்து, தங்கள் மாட்டு இனம் இது என்று தங்களை அறிமுகப்படுத்திக் கொண்டு, அவற்றின் பண்புகள் மற்றும் முக்கியத்துவத்தை விளக்குவார்கள்.

உதாரணமாக, கிர் மாடு போல் உடையணிந்த ஒரு மாணவர், "நான் ஒரு கிர் மாடு. எனக்கு தனித்துவமான கொம்புகள் மற்றும் கூம்பு உள்ளது. நான் குஜராத்

மாவட்டத்தில் காணப்படுகிறேன், நிறைய பால் சுரப்பதில் பெயர் பெற்றவன்" என்று கூறலாம்.

ஒவ்வொரு இனமும் பொதுவாக எங்கு காணப்படுகிறது என்பதைக் காட்ட மாவட்ட வரைபடத்தைப் பயன்படுத்தவும். மாணவர்கள் தங்களுக்கு ஒதுக்கப்பட்ட இனத்தின் மாவட்டத்திற்கான மார்க்கர் அல்லது லேபிளை வரைபடத்தில் வைக்க வேண்டும்.

முடிவு

பல்வேறு மாவட்டங்களில் உள்ள பல்வேறு மாட்டு இனங்களின் முக்கியப் பாத்திரங்களை மாணவர்கள் நன்கு புரிந்து கொள்ள உதவும் வகையில், இந்த ஆடை அணிதல் மற்றும் பங்கு-விளையாட்டு செயல்பாடு, பசு இனங்கள் மற்றும் விவசாயத்தில் அவற்றின் பங்களிப்புகள் பற்றி அறிந்துகொள்வதை ஈடுபாட்டுடன் மற்றும் மறக்கமுடியாததாக ஆக்குகிறது.

முடிவுரை

அறிவியலைக் கற்பிக்க விளையாட்டு அடிப்படையிலான கற்றல் முறை என்பது ஒரு புதுமையான மற்றும் பயனுள்ள அணுகுமுறையாகும், இது கற்றலுடன் விளையாட்டை ஒருங்கிணைத்து, கல்வியை மாணவர்களுக்கு அதிக ஈடுபாட்டுடன் மற்றும் அர்த்தமுள்ளதாக மாற்றுகிறது. இந்த முறையானது அனுபவமிக்க கற்றல், படைப்பாற்றல் மற்றும் ஆய்வு ஆகியவற்றை வலியுறுத்துகிறது, இது மாணவர்களின் செயல்பாடுகள், விளையாட்டுகள் மற்றும் சோதனைகள் மூலம் அறிவியல் கருத்துக்களை கண்டறிய அனுமதிக்கிறது. பாடத்திட்டத்தில் விளையாட்டை சேர்ப்பதன் மூலம், மாணவர்கள் அறிவியல் கோட்பாடுகளை ஆழமாகப் புரிந்துகொள்வதுடன், அவர்களின் சிக்கலைத் தீர்க்கும் திறன்களை மேம்படுத்தி, கற்றல் மீது ஒரு பிணைப்பை உருவாக்குகிறது.