



Play and preschoolers' acquisition of scientific skills and concepts outside the classroom

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Abstract

Many factors contribute to the acquisition of scientific concepts and skills among preschoolers. Some of these concepts and skills could be acquired inside the classroom during formal teaching and learning. Play is an activity that is spontaneous and satisfying. Children engage in play wherever they find themselves together, and even alone, a child could engage in solitary play. Play to children is as important as food. They get assimilated in it such that sometimes they forget food. Often times, children (preschoolers) play outside the classroom. This paper therefore discussed the role of play outside the classroom on preschoolers' acquisition of scientific concept and skill. To achieve this, the writer discussed briefly on science as a concept, discussed on the benefits of acquiring scientific concepts and skills outside the classroom; discussed on play, advantages of play to children's acquisition of scientific concepts and skills; the theories of play which anchored on Sigmund Freud's theory of play (1954), Susan Isaac's theory of play (1929); Lev Vygotsky's theory of play (1966) and Friedrich Froebel's theory of play (1906). The paper also discussed some of the scientific concepts and skills that could be acquired through play outside the classroom, such as: children's acquisition of the concept and skills of "oral rehydration", children's acquisition of the concept and skill of "air occupies space"; children's acquisition of the concept and skill of "basic electricity-how electricity is produced"; children's acquisition of the scientific concept of "transmission of sound wave"; children's acquisition of the concept of "living and non-living things" and children's acquisition of the concept of "heavy and light objects", through play outside the classroom. These background discussions revealed that there are many benefits derived from playing outside the classroom by children (preschoolers and others). Based on this, it was concluded that children's play outside the classroom is significant to their skills and concepts acquisition. Therefore, it was suggested among others that children should be allowed to play outside the classroom with materials that would enhance their scientific concepts and skills; and that although playing outside the classroom is beneficial to their skills and concepts acquisition, their play must be supervised by more knowledgeable others (MKOs') to prevent accidents and misconducts.

Keywords: Acquisition of scientific skills and concepts, outside the classroom, play, preschoolers

Introduction

The classroom is a place where formal teaching and learning take place. The relevance of the classroom can be likened to the relevance of the hospital wards to doctors and nurses. This statement points to the fact that a classroom is a place where children (learners) are brought together, arranged and controlled in order for learning, acquisition of skills and concepts to take place. From the above assertion, it can be inferred that the classroom is where learning is promoted. Specifically, the learning that is promoted in the classroom is formal learning which involves the strategies of setting rules; use of formal incentive system; behaviour cards; seating arrangement; assertive teaching behaviour, physical proximity; desk arrangement; classroom routines; eye contact; among others (Anero, 2018). In reality however, learning does not only take place in the classroom; learning and acquisition of skills and concepts also take place outside the classroom. Outside the classroom, the child engages in different activities that help him to acquire different skills and concepts, among which are scientific. This entails that before children are taught science in the formal setting (i.e in the classroom, at school), they are possibly familiar with some scientific skills and concepts. Science is one of the most important factors affecting all aspects of human life. It is rationally structured knowledge about nature which embraces systematic methods and positive attitudes for its acquisition, teaching, learning and application. Ola-Bright

cited in Iwowari (2022) sees science as a body of knowledge made of skills, concepts, laws, theories and attitudes about nature. It has been revealed that there are two major components of science, namely, the products (knowledge) of science and the process (methods) of science. The product aspect of science deals with scientific facts, concepts, laws and theories. The process aspect of science deals with the skills which scientists employ in data gathering, transformation and interpretation. These skills are generally referred to as "science process skills". Science process skills on its own as a concept are the processing skills which scientists bring to bear in solving scientific problems. They are therefore techniques which are used in studying science.

The scientific skills and concepts acquired by children at the early childhood and primary school levels consist of experiences derived from the child's environment. These are likely to lead them to experiment and discover things for themselves. Referring to items 'e' and 'g' objectives of the National Policy on Education (Early Childhood Education) document by the Federal Republic of Nigeria (2013) which state as follows

- a. To inculcate in the child the spirit of enquiry and creativity through exploration of nature and the local environment; playing with toys, artistic and musical activities; etc and;

- b. To teach the rudiments of numbers, letters, colours, shapes, forms, etc, through play; it can therefore be deduced that the acquisition of scientific concepts, skills and knowledge are imperative at the early childhood level. The acquisition of scientific skills and concepts introduce children to scientific and reflective thinking; as well as prepare them for elementary science for the primary school level.

Benefits of Science Skills and Concepts Acquisition outside the Classroom

The outside classroom environment of preschoolers is an important factor that can make or mar their acquisition of scientific skills and concepts. The outside classroom of preschoolers has to be surrounded with objects and materials that will help them to explore, investigate and learn about their environment. It is crucial for the outside classroom environment of children to be where they are constantly exposed to toys and objects (including locally made ones) they can play with; as well as acquire science skills and concepts. Outside the classroom, children should be allowed to touch, manipulate and experiment during play. Providing opportunities for scientific discovery in early years outside the classroom is beneficial in several ways

- Children who are programmed to explore and experiment outside the classroom right from preschool level tend to acquire scientific skills and concepts earlier in life.
- Science in early childhood years outside the classroom can contribute to children's happiness and emotional stability by liberating their mind from fear arising from ignorance and lack of basic science facts and natural forces.
- Through play outside the classroom, science gives a basic grounding in scientific concepts and scientific thinking. Even the very simplest activities outside the classroom can introduce children to scientific skills and concepts, as well as stimulate scientific thinking. This could encourage and direct their natural curiosity and familiarize them with basic scientific vocabulary.

Science has to do with asking questions and finding solutions and answers to the questions in our daily lives. The American Association for the Advancement of Science (AAAS) cited in Ekanem (2012) ^[3] identified fifteen science skills which include; observing, classifying, recognizing spatial relations, inferring, predicting, defining operationally, hypothesizing, identifying and controlling variables, interpreting data, comparing, communicating, using numbers, measuring, experimenting and using models, all these do not just happen but take gradual process; meaning that the child cannot proficiently carry out these scientific skills without emanating from a primary source. Hence, the acquisition of scientific skills and concepts by children depend on some factors, among which is play.

Play most times is carried out outside the classroom. Outside the home and the classroom, children play and through play, many skills and concepts are acquired, including scientific skills and concepts. During play outside the classroom, children engage themselves in many activities and show different levels of concentration, enthusiasm and determination. Play is a powerful learning tool because children develop different skills and acquire

different concepts as they play. Play is a medium that provides for all areas of development in a simultaneous and integrated way. It provides opportunity for children to explore materials and develop concepts of problem-solving abilities, as well as enhances growth.

Play is a natural spontaneous and creative activity through which children learn a lot of things. Ahmad cited in Udede (2024) ^[6] defined play as a structure whereby players commit themselves to specific rules and interactions. The young of all species (including human children) play. Play is their way of learning to live and adjust to their environment. It is something that children spend most of their time doing and it takes up a large part of their lives. When children play, they learn various concepts. Every child is naturally and constantly oriented towards play through curiosity, interest and innate quest for understanding of his world which he needs to interact with in order to explore how the world works, how to experiment and to establish knowledge.

Play presents children with a particular strong opportunity for growth because it meets the needs of the whole individual child. All domains of the children's development (cognitive, emotional, physical and social) are interrelated. Play benefits each of these skills, including scientific skills and concepts in direct and indirect ways. Children learn, practice and acquire cognitive skills, problem-solving, creativity and self-regulation skills. Socio-emotional growth can be seen in children's ability to interact with others, negotiate and compromise. They also practice strategies to cope with fear, anger and frustration. Moreover, block building, drawing, running and jumping, all contribute to the development of fine and gross motor skills.

When children have the chance to direct their own learning through play, especially outside the classroom, they are able to address their own immediate and developmental needs. In play, children develop a lasting disposition to learn and acquire skills or concepts. A single play offers so many benefits that can help in the child's development. For example, when children build with blocks during play, they learn to classify, sort and match. They are also faced with the problem of construction which is scientific. It can therefore be established that play helps children develop and acquire the skills, concepts and attitudes they need to strive, adapt and survive in the future.

Advantages of Play to Children's Acquisition of Scientific Skills and Concepts

Play possesses some properties which make it unique to children. Among such properties are: play is purposeless; it is active; it is voluntary; it is enjoyable, it is interactive; it is therapeutic. There are also different types of play, which include; unoccupied play, physical/motor skill play, language play, exploratory play, constructive play/creative play, fantasy play, dramatic play, manipulative play, social play, structured play, virtual play, among others. Play is a simple joy that makes childhood period so treasured. This is why learning in childhood has to engage play, tapping into the unlimited opportunity that play opens us up to. Play therefore has some advantages to children's acquisition of scientific skills and concepts. Some of these advantages include

- Play makes children learn during play time
- Play is motivating
- Play makes learning become concrete and true to life

- Through play, the complexities of concepts are made simple
- Play aids retention and recall as a result of imagery that could be built from the play activities, especially during play outside the classroom.

Theories of Play

This paper anchored on the following four theories of play:

Sigmund Freud (1954)

Freud himself did not write a great deal about play, but it has been said that he has an important role within the psychoanalytic movement, and especially in play therapy. Freud thought that play provided children with an avenue for fulfillment and mastery of traumatic events. Play produces a safe context for expressing aggressive or sexual impulses which would be too dangerous to express in reality. Small quantity of anxiety is mastered in play, but anxiety of high intensity inhibits play. Both aspects are important in play therapy. First, play expresses the child's wishes and anxieties. Second, play can help overcome such anxieties, by catharsis or by working through them. The relevance of this theory to the present work (paper) rests on the fact that play is seen by Freud as that activity which helps achieve mastery of events.

Susan Isaacs (1929)

The view of play as essential to both emotional and cognitive growth of young children, strong in the British educational tradition, owes much to Susan Isaacs and her successor Dorothy Gardner at the Institute of Education at London University. Isaacs combined a belief in the emotional benefits of play (deriving from psychoanalytic tradition) with a wider view of its benefits for physical, social and cognitive development generally; echoing the evolutionary perspective that animals that learn more, also play more;

"Play is indeed the child's work, and the means whereby he grows and develops. Active play can be looked upon as a sign of mental health; and its absence, either of some inborn defect, or of mental illness". This theory is relevant in the sense that it sees play as one of the leading forces in children overall development.

Lev Vygotsky (1966)

Lev Vygotsky was another combination of the affective and cognitive aspects of development. Like psychoanalysts, Vygotsky saw the affective drive behind play as being amazing, illusory realization of unrealizable desires; not with very specific or sexual impulses, but in a much more general sense, to do with the child's confidence and mastery (for example, in attitudes to authority in general).

"Play is essentially wish fulfillment, not however, isolated wishes but generalized affects". Furthermore, Vygotsky saw play as being 'the leading source of development in the preschool years'. Essentially, this was because the nature of pretend play meant that the child was liberating itself from the immediate constraints of the situation (e.g, the actual object) and getting into the world of ideas (e.g, what the object might become). The child according to Vygotsky is liberated from situational constraints through his activity in an imaginary situation. This theory is relevant because it sees play as an important activity that enhances the child's development during the preschool years.

Friedrich Froebel (1906)

The ideas of Froebel, as expounded in "The Education of Man" was published posthumously in 1906, were influential in the start of kindergarten and nursery school environment. Kindergarten translates from German as 'child-garden', and this aptly sums up Froebel's ideas about play and development. Play, truly recognized and rightly fostered, unites the germinating life of the child attentively with the ripe life experiences of the adult, and this fosters the one through the other. On this view, play exemplifies development from within the child, but can be nurtured by adult guidance and the provision of appropriate materials. Froebel's influence, following that of Pestalozzi (with whom he studied for two years); encouraged a positive evaluation of the educational significance of play, as compared with the rote-learning approach which nevertheless became characteristic of many infant schools at the end of the nineteenth century. This theory is therefore relevant in the sense that it recognizes the importance of play in children's development, including their scientific concepts and skills acquisition (Smith, 2005) [5].

Play outside the classroom and children's acquisition of scientific concepts and skills

- **Children's acquisition of the concepts and skills of oral re-hydration (ORS) through play:**

Materials for the play

- Raw garri (could be one cup, more or less)
- Clean water (could be two cups or less)
- Table spoon
- A bowl
- A clean empty bottle (preferably a beer bottle or two coke bottles of 30cl or a clean container)

Play Procedure

With the guidance of the adult or older child, the children during play, pour the water in the bowl, empty the garri into the bowl of water, turn the garri with the spoon and allow for some minutes (10 minutes for instance), filter out the water into a bottle or a clean container. This solution (water) turns to local oral re-hydration that is capable of re-hydrating a dehydrated person.

- **Children's acquisition of the scientific concept and skill of air occupies space through play**

- Detergent of any kind or dissolved soap of any kind
- Water (one cup)
- An empty cup or glass
- A straw

Play Procedure

Pour the water in a cup or glass, add some detergent or dissolved soap, turn the solution with the straw. Guiding the children; let them insert the straw into the solution and infuse air into the cup. Bubbles are formed; the ascension of the bubbles gives space for infused air. As the bubbles ascend, the cup becomes gradually empty. Shortly, the whole solution evacuates from the cup, indicating that air occupies space.

- **Children's acquisition of the scientific concept and skill of basic electricity (how electricity is produced) through play outside the classroom**

Materials for the play

- Dry cell batteries (two big ones of tiger brand)
- Torch light bulb
- Flexible wire
- Circuit board
- Super glue gum or cello-tape

Play Procedure

Children join the negative terminal of one battery with the positive part of the other battery. The naked part of the flexible wire is attached to the negative part of the dry cell battery; also connect the other end of the flexible wire with the torch bulb and attach on the positive part of the other battery, when this is done, current flows through the wire into the bulb (filament), the wire then becomes ignited and the bulb lights. This play outside the classroom helps children acquire the scientific concept of basic electricity or how electricity is produced.

- **Children's acquisition of the scientific concept of transmission of sound wave through play outside the classroom**

Materials for the play

- Plating thread (not plastic type)
- An empty can of milo or powdered milk
- A nail
- A hammer or a strong heavy stick
- Short sticks of broom
- Two people
- An empty box of matches

Play Procedure

With the nail and the hammer or the strong heavy stick, a small hole is opened at the bottom of the empty can of milo or powdered milk. The thread is tied at the middle of the stick of broom and passed through the small hole and the thread stretched about five to ten meters long. The other end of the thread is tied at the middle of the other stick of broom and passed through the middle of the small hole at the middle of the empty box of matches. Now the two people, one holds the empty can of milo or milk and the other, the box of matches and placed on the ear.

Now the one with the empty can makes a speech; it will be observed that the one with the empty box of matches placed on the ear hears the speech or speeches. This process is known as sound wave transmission.

Through this play, children acquire the scientific concept and skill of wave transmission (Amadi-Ali, 2011).

- **Children's acquisition of the scientific concepts of living and non-living things through play outside the classroom**

Materials for the Play

- A dead lizard
- A life lizard
- A living insect
- A dead insect
- Two transparent containers

Play Procedure

The dead lizard is put into a transparent container; the life lizard is also put into a transparent container. The lizards (life and dead) inside separate containers are shaken, and the life lizard makes some move; while the dead lizard does not make any move. Through this play, the children understand

that living things respire and move, while non-living things do not respire and move. The same play procedure could also be employed for a life insect and a dead insect to further demonstrate that living things respire and move while non-living things do not.

- **Children's acquisition of the scientific concept of heavy and light objects, things that sink in water and things that float in water**

Materials for the play

- Balloon (blown and tied)
- A basin of water
- A piece of block
- An empty plastic bottle
- A breakable bottle

Play Procedure

The blown balloon is dropped on the basin of water; the empty plastic bottle is also dropped on the basin of water; as well as the breakable bottle and piece of block. Children observe and realize that the blown balloon floats on the basin of water; same applicable to the empty plastic bottle; while the piece of block and the breakable bottle sink in water. The things that float in water are light; while things that sink in water are heavy (Iwowari, 2023) [4].

Conclusion

Science is an important subject that needs to be embraced by both children and adults. Science cannot be acquired abruptly, it can be embraced through the acquisition of scientific concepts and skills which have to commence from preschool age. This then means that the teaching of science has to begin as early as possible, employing the right methods of teaching. Having discussed some of the scientific concepts that can be acquired through play outside the classroom connotes that play is an indispensable activity in children's life. Therefore, play should not be overemphasized. Children have to be encouraged to play even outside the classroom because while playing they acquire meaningful and gainful concepts that would be of significance in their lives later in life.

Suggestions

Based on the envisaged importance and significance of science and play, the following suggestions are proffered

1. Children should be allowed to play with materials that could instigate in the scientific concepts and skills outside the classroom.
2. Children should be allowed or encouraged to play outside the classroom with more knowledgeable others who would inculcate meaningful concepts and skills, thereby expose them to successful future scientific knowledge.
3. Children should be provided with stimulating and challenging environments where they can observe, compare, classify, manipulate objects, communicate and explore.
4. An understanding of the theories of early childhood education and play such as those of Lev Vygotsky, Sigmund Freud, Friedrich Froebel, among others is important in structuring the contents and methods of science for young infants.
5. Children exposure to science should start early to enable them develop scientific attitude, concepts and

skills necessary in doing science and tackling daily life problems through scientific approach.

6. Although playing outside the classroom is capable of enhancing necessary concepts and skills acquisition in children, the play outside the classroom has to be supervised by a more knowledgeable other (MKO) to prevent accidents and misconducts.

References

1. Amadi Ali BO. *Teaching of basic science in primary schools: The constructivist approach*. Unpublished workshop article organized by ELF/Total's teachers' development workshop titled: Using constructivist approach towards content delivery in primary schools, 2011.
2. Anero N. *Approaches to the teaching of science in primary schools*. Rodi Printing and Publishing Company, 2011.
3. Ekanem IE. Teaching science, technology and mathematics in early childhood education. In Q.I. Obinaju & J.U. Ibiam (Eds.), *Early child care and education for universities and colleges of education*. Soulmate Press and Publishing Company Limited, 2012, 179-197.
4. Iwowari AIC. Science in early childhood and primary education. In B.O Amadi-Ali and P.O. Ejekwu (Eds.), *Current issues in early childhood and primary education: Establishment, administration, management, theories and philosophical perspectives*. Emmanest Publishing Venture, 2023, 147-173.
5. Smith PK. *Understanding children's development* (4th Ed.). Blackwell Publishing Company, 2005.
6. Udede AT. Dramatization and preschoolers' acquisition of numeracy skills in public early child care centres in Obio/Akpor Local Government Area of Rivers State. Unpublished PGDE project submitted to Department of Early Childhood/Primary Education, Faculty of Education, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria, 2024.