

# CHAPTER I

## INTRODUCTION

### 1.1 Background of Study

The initial years of a child's existence, specifically from birth to three years, are crucial for cognitive, social, and physical development (Ginsburg 2007, 182). In this age, children undergo swift development in motor skills, which can be classified into fine and gross motor abilities. These motor abilities are fundamental since they establish the basis for numerous daily activities and subsequent academic pursuits. Nonetheless, despite the acknowledged significance of motor skill development, numerous early childhood schools encounter difficulties in adequately fostering this dimension of growth.

Recognizing Classroom Challenges: In typical early childhood environments, activities designed to enhance motor skills frequently depend on standard play equipment and organized exercises. Observations in toddler programs, such as Nat's Early Childhood Toddler Class, reveal that young children exhibit differing degrees of proficiency and involvement in various activities. Certain children demonstrate proficiency in tasks necessitating fine motor abilities, such as gripping or manipulating small items, whilst others have difficulties, resulting in frustration or apathy. Likewise, endeavors aimed at enhancing gross motor skills, such as climbing or balancing, may be restricted by spatial limitations or the physical configuration of the classroom.

Another identified concern is the inconsistency in interest and motivation among young children, particularly in activities necessitating perfect hand-eye

coordination or the utilization of bigger muscle groups. This discrepancy may arise from various sources, including individual variations in motor skill development, prior experiences, and sensory preferences. Moreover, educators frequently encounter challenges in reconciling structured activities with unstructured play, complicating their ability to address the varied developmental requirements of toddlers.

The variability in children's motor skill performance and engagement can be attributed to several factors. The existing methodologies utilized in numerous early development classes may insufficiently address the varied wants of toddlers. Conventional play activities, although advantageous, may lack the innovation and interactivity necessary to maintain children's interest and thoroughly engage their motor skills. Moreover, in the absence of adequate direction or organized activities designed to develop certain motor skills, children may lack the focused practice required to strengthen their fine and gross motor capabilities successfully.

**Fine Motor Skills:** Fine motor skills involve the coordination of small muscles, particularly in the hands and fingers, with the eyes. These skills are essential for activities like as gripping objects, sketching, writing, and manipulating small items like beads or buttons. Fine motor development is intricately associated with a child's autonomy and preparedness for academic tasks, including writing and tool utilization. The development of fine motor abilities during early life is not consistent. Challenges may emerge from individual variances in sensory processing, insufficient opportunities for focused practice, or lack stimulation within the learning environment. Some toddlers may encounter difficulties with tasks necessitating perfect hand-eye coordination, resulting in frustration or the avoidance of such activities (Piaget 1952, 39; Kolb 2015,10). In environments where fine motor tasks are inadequately incorporated into the curriculum, children may lack the necessary practice to enhance these skills.

Gross Motor Skills: Gross motor abilities encompass bigger muscular groups and are crucial for activities such as walking, running, jumping, and balancing. These skills are essential for a child's physical well-being and social engagement, as they facilitate involvement in collective play and environmental exploration (Whitebread 2012, 49). Gross motor skills development can be impeded by causes including restricted access to safe play environments, inadequate physical activity, or underlying developmental disabilities. In educational environments, spatial limitations and insufficient equipment may hinder children's participation in activities that enhance balance, strength, and coordination (Vygotsky 1978, 86). Moreover, certain children may exhibit hesitance or diminished drive to engage in physical activities owing to differing degrees of confidence or interest (Kolb 2015, 110).

Challenges in Early Childhood Environments: Observations in Nat's Early Childhood Toddler Class indicate heterogeneity in the development of motor skills and levels of engagement among children. Certain children demonstrate proficiency in activities such as scooping and pouring sand, which necessitate fine motor skills, whereas others exhibit reluctance or struggle. Likewise, gross motor tasks like climbing and balance may be constrained by spatial limitations or the lack of appropriate equipment, so impacting the comprehensive development of these skills (Isenberg and Jalongo 2003, 45).

Moreover, disparities in motivation and interest across children might exacerbate the challenges of motor skill acquisition. These disparities may arise from distinct developmental pathways, sensory inclinations, or prior experiences. Educators encounter difficulties in reconciling structured activities with unstructured play, frequently finding it challenging to meet the varied requirements of toddlers efficiently (Dewey 1938, 45).

In response to these problems, play-based learning (PBL) has arisen as an efficacious pedagogical method. Utilizing technologies such as the interactive sandbox, which merges tactile exploration with digital feedback, provides a distinctive chance to engage infants in organized yet pleasant activities aimed at developing both fine and gross motor abilities. Engaging in activities like sculpting sand into shapes or maneuvering around obstacles in the sandbox promotes fine motor skills and overall body coordination. The efficacy of these programs relies on meticulous preparation and proactive facilitation by educators to guarantee fair participation and skill development.

By prioritizing regulated play and incorporating interactive tools, early childhood education programs can enhance the holistic development of fine and gross motor abilities, remedying the deficiencies inherent in conventional approaches.

In proposing a solution, the implementation of play-based learning (PBL) utilizing interactive technologies is essential. Considering these problems, it is necessary to explore creative pedagogical approaches that address the identified gaps in motor skill development. Play-based learning (PBL) has proven to be an effective method in early childhood education, combining instructional activities with playful, experiential learning (Bergen 2002, 8). However, the successful application of PBL requires appropriate tools and strategies to actively engage children in targeted motor skill exercises.

The interactive sandbox, combining tactile exploration with digital feedback, provides a distinctive possibility to improve the efficacy of project-based learning in early childhood environments. This technology integrates conventional sand play with augmented reality components, establishing an immersive setting for designing exercises focused on enhancing fine and gross motor abilities. Utilizing the interactive

sandbox, educators may offer organized yet enjoyable exercises that tackle the recognized challenges in motor skill development and engagement.

Despite the significant potential of integrating interactive technologies in early childhood education, there is a lack of empirical research investigating the specific effects of interactive sandboxes on motor skill development, particularly in toddler classes. Contemporary research primarily focuses on general play-based learning or the use of digital technology in older populations, resulting in a lack of comprehension regarding the impact of these methods on motor skills in toddlers aged 18 months to 3 years. This study aims to examine the effect of a structured play-based learning approach employing an interactive sandbox on the development of fine and gross motor skills within a controlled classroom setting.

This study will utilize a quasi-experimental design, a prevalent approach in educational contexts when random assignment is impractical. The study will include pre- and post-tests of fine and gross motor skills in the participating children, facilitating a comparative examination of motor skill development before and after the intervention. The methodology is quantitative, emphasizing observable results via standardized evaluation instruments. Within an interactive sandbox setting, play-based learning offers a distinct environment that facilitates the development of fine motor skills. Children participate in tasks such as scooping, pouring, and moulding the sand, which demand meticulous hand-eye coordination and manual dexterity. Nevertheless, a possible concern that could emerge is the inherent heterogeneity in the current fine motor skill level of each child, which might impact the extent to which they derive maximum benefit from the sandbox activities. Furthermore, the absence of organized direction in play-based learning could result in uneven acquisition of skills if children

are not motivated to participate in activities that especially focus on enhancing fine motor skills.

Gross motor abilities encompass the precise synchronization of major muscle groups, which facilitates basic movements like crawling, walking, and running. These abilities are crucial for a child's holistic physical growth and are commonly cultivated through athletic pursuits that require substantial movements, such as climbing, leaping, and maintaining balance.

The interactive sandbox enhances gross motor skill development by allowing young learners to explore, excavate, and engage with their surroundings. Exercises such as hoisting cumbersome sacks of sand or propelling a toy vehicle through the sand can enhance muscular strength and increase coordination. Nevertheless, a potential obstacle that could emerge is the constraint of physical space and the range of activities offered in the sandbox, which may not comprehensively explore all facets of gross motor development. Moreover, children who have varied degrees of physical activity or motor skill proficiency may encounter variations in their level of involvement, which could result in differences in the improvement of gross motor skills.

Although the use of an interactive sandbox in play-based learning can facilitate the growth of both fine and gross motor abilities, there are certain potential challenges that may emerge. An issue of concern is the possibility of disparate involvement among children, since some may exhibit a greater level of interest in specific activities compared to others, resulting in uneven development of motor skills. Furthermore, the educator plays a vital role in promoting and directing play-based learning. Without adequate supervision, children may not obtain the full advantages of the activities designed to enhance particular motor skills.

An additional obstacle is guaranteeing the safety and accessibility of the sandbox area for all young learners. Specifically, children who have sensory processing difficulties may perceive the physical sensation of sand as overpowering, so restricting their ability to participate and engage. Moreover, the efficacy of the sandbox in facilitating the development of motor skills may also be influenced by the caliber and diversity of tools and materials supplied, together with the length and regularity of practice sessions.

According to Bergen (2002, 53), scholarly investigations suggest that play holds a crucial role in the realm of early childhood education, serving as a vibrant and captivating medium for knowledge acquisition. Play-based learning is an educational strategy that combines pedagogical activities with elements of play in order to promote comprehensive development in children. In recent years, there has been an increasing scholarly and pedagogical focus on comprehending the effects of play-based learning on diverse facets of child development, encompassing motor skills.

Interactive technologies have become increasingly integrated into educational settings, offering innovative ways to facilitate learning experiences. One such technology is the interactive sandbox, which combines tactile exploration with digital elements to create immersive learning environments (Johnson 2016, 299). Interactive sandboxes utilize augmented reality (AR) or projection mapping to transform traditional sand play into dynamic and engaging experiences, allowing children to manipulate virtual landscapes and observe real-time feedback (Torrance 2018, 172).

The time of early childhood, generally spanning from one to three years of age, is regarded as a crucial phase in the progression of motor skill acquisition. Toddlers exhibit a high level of engagement in various activities aimed at investigating their surroundings, which in turn facilitates the development and improvement of both fine

and gross motor abilities (Isenberg and Jalongo 2003, 45). This study will be carried out in Nat's Early Childhood Toddler Class, providing a unique chance to investigate the influence of play-based learning on the acquisition of motor skills in a regulated and well-monitored environment. Within this setting, several phenomena pertaining to fine and gross motor abilities may arise, especially in connection to the young children included in the research.

In a classroom setting, children may demonstrate different degrees of competence in activities that demand fine motor skills, such as grasping and manipulating small items, using tools like crayons or scissors, and participating in activities that need accuracy, such as assembling puzzles or stringing beads. While many children may exhibit exceptional fine motor control, enabling them to effortlessly carry out these activities, others may encounter difficulties with the identical tasks, resulting in frustration or a lack of interest. The variations identified can be attributed to the children's previous experiences, inherent rate of growth, and unique physical talents.

Moreover, the interactive sandbox offers a distinctive environment for the observation and development of fine motor skills. As children manipulate the sand by scooping, sifting, and shaping it, they participate in activities that necessitate hand-eye coordination and the accurate coordination of small muscle groups. Nevertheless, certain children may display hesitancy to participate in these activities if they perceive them as prohibitively difficult or lack the self-assurance to carry them out. The observed diversity in levels of involvement and acquisition of skills may underscore the necessity for customized assistance and motivation from educators.

Gross motor abilities can be effectively assessed within classroom and sandbox settings to identify variations in children's capacity to perform larger physical movements, such as lifting, pushing, and balancing. In this context, some children may exhibit exceptional performance in tasks that require the engagement of major muscle groups, including manipulating heavy quantities of sand or navigating around physical barriers within the play area. Conversely, other children may display lower levels of coordination or physical strength, which could lead to challenges when engaging in activities that demand well-developed gross motor skills. These differences highlight the diverse range of physical abilities among young children and underscore the importance of tailored interventions to support their individual motor development needs.

Another potential phenomenon that may occur is the impact of the physical classroom setting on the development of gross motor skills. The limited space or the layout of the play area may impose limitations on specific gross motor activities, therefore affecting the extent of movements that children can attempt. Furthermore, certain children may exhibit higher levels of physical activity and an inherent inclination towards gross motor activities, whereas others may have a preference for quieter and less physically strenuous play, resulting in variations in the development of motor skills.

The occurrences observed in this study emphasize the importance of recognizing the different stages of development and the specific needs of children in Nat's Early Childhood Toddler Class. The diversity seen in the development of fine and gross motor skills among participants suggests that play-based learning activities must be carefully designed to accommodate a broad range of abilities, ensuring that each child benefits from the experience. The initial years of a child's existence, particularly

from birth to three years, are crucial for development in various domains, including motor skills. Fine and gross motor skills play an essential role in early childhood activities and subsequent learning. However, many early childhood education programs struggle to implement activities effectively targeting these motor skills. Play-based learning, especially through innovative tools like the interactive sandbox, offers a promising solution to enhance motor skill development.

## **1.2 Identification of Problems**

The study on the use of play-based learning using interactive sandbox on the development of fine and gross motor abilities in Nat's Early Childhood Toddler Class sheds light on various significant concerns within the domain of early childhood education. The aforementioned concerns serve as the foundation for the identification of issues that necessitate more examination.

### **1) Limited Focus on Motor Skills**

Traditional early childhood education curricula often prioritize cognitive development over motor skills acquisition. As a result, there may be inadequate emphasis on activities specifically designed to promote fine and gross motor skills development.

### **2) Limited Research Specific to Toddler Age Group**

The significance of play-based learning has been emphasized in previous studies; nevertheless, there is a noticeable deficiency in literature that particularly examines the impacts of these approaches on the development of fine and gross motor skills in toddlers (Wood 2013, 184). The lack of knowledge in this area impedes our comprehension of how play-based learning might be maximized during this crucial stage of development.

### **3) Need for Tailored Educational Strategies**

During the early stages of childhood, toddlers demonstrate distinct developmental traits and face specific obstacles. The lack of scholarly investigations centered on customized pedagogical approaches for this developmental stage constrains educators' capacity to enact efficacious interventions that specifically augment fine and gross motor abilities in toddlers.

#### 4) Underutilization of Interactive Technologies

The inadequate use of interactive technologies in early childhood education is concerning, as studies have emphasized the advantages these tools provide in enhancing motor skill development. Despite the growing accessibility of interactive technologies like touchscreens and educational applications, numerous educators exhibit reluctance to integrate them into their classrooms, citing concerns regarding screen time, insufficient training, and the erroneous belief that traditional methods are more effective for early learning (Plowman, McPake, & Stephen 2010, 3). When utilized intentionally, these devices can enhance both fine and gross motor abilities by offering children chances for active involvement, problem-solving, and coordination (Plowman 2010, 4). This underutilization signifies a necessity for enhanced professional development and the incorporation of these tools into early childhood curricula, allowing educators to fully leverage technology for skill enhancement.

#### 5) Age-Appropriate Interventions

Tailoring interventions to meet the developmental needs of toddlers presents unique challenges. Many existing studies focus on older children or mixed-age groups, leaving a gap in understanding how specific interventions, such as interactive sandbox play, may impact the motor skills development of toddlers in early childhood settings (Frey & Carver, 2015).

Addressing these challenges requires a comprehensive understanding of the effectiveness of play-based interventions, particularly those utilizing interactive technologies, in promoting fine and gross motor skills development among toddlers in early childhood education settings. This will provide practical consequences for educators, parents, and policymakers.

### **1.3 Scope and Limitations**

The study uses a quasi-experimental pretest-posttest design focusing on the use of interactive sandbox play on motor skill development in children aged 18 months to 3 years. Participants are selected using purposive sampling, ensuring they fit specific criteria for age and developmental stage. The setting is Nat's Early Childhood Toddler Class, utilizing an interactive sandbox equipped with AR technology. Data is collected through standardized assessments like the Peabody Developmental Motor Scales (PDMS-2) for fine motor skills and the Test of Gross Motor Development (TGMD-2) for gross motor skills. Analysis involves paired t-tests to compare pre- and post-intervention scores, with observational data providing qualitative insights. The study aims to investigate the extent or range of the research topic:

1) Age Group Focus:

The research specifically centers on children aged eighteen months to three years.

2) Setting:

The study is carried out within the framework of Nat's Early Childhood Toddler Class, Interactive Lab.

3) Educational Approach:

The focus of this study is specifically on play-based learning as the primary educational strategy.

4) Motor Skills Assessment:

The evaluation primarily focuses on the assessment of fine and gross motor abilities.

5) Duration:

The duration of the intervention will be conducted over a period of 1 week. Sessions will be held 2 times a week, lasting approximately 15 minutes each. Each session will include a series of structured activities utilizing the interactive sandbox. This study also has limitations that should be acknowledged. Despite its scale, this study has major limitations, which include sample size. The sample size of the study may be limited to 10 toddler students at Nat's Early Childhood Centre with students who match the inclusion criteria.

6) External Factors:

Individual differences in baseline motor skill proficiency and engagement rates may influence the intervention's outcomes. Controlling these variables may present difficulties, potentially complicating the interpretation of results.

7) Resource Constraints:

The availability of resources, such as time, persons, and equipment, may place practical constraints on the intervention and data gathering operations. Notwithstanding these constraints, the study seeks to provide useful perspectives on the possible advantages of integrating interactive sandbox play into early childhood education environments, namely for augmenting motor skill development in young children.

#### **1.4 Formulation of the Problem**

The research investigates the use of play-based learning using interactive sandbox technology on the fine and gross motor skills of toddlers. It aims to understand

whether structured interactive play can lead to significant improvements in motor skills, addressing gaps in traditional play-based learning methodologies. This study aims to address the following primary research questions:

- 1) Does play-based learning contribute to the development of fine motor abilities in toddlers attending Nat's Early Childhood Toddler Class?
- 2) Does the use of play-based learning influence the development of gross motor skills in toddlers attending Nat's Early Childhood Toddler Class?
- 3) Do interactive sandbox activities influence toddler engagement and motivation in developing motor skills?

### **1.5 Research Purposes**

The primary objective of this study is to examine the use of play-based learning using an interactive sandbox on the development of fine and gross motor skills in toddlers attending Nat's Early Childhood Toddler Class. To achieve this, the study aims to:

- 1) To determine the use of interactive sandbox activities on the development of fine motor skills in toddlers.
- 2) To evaluate the influence of the interactive sandbox on gross motor skills development.
- 3) To examine how interactive sandbox play affects engagement and motivation among toddlers.

### **1.6 Significance of Study**

This study is notable for a variety of reasons, including its goal of providing vital insights into early childhood education, particularly in the area of motor skill development via creative play-based learning approaches. The outcomes of this study

are intended to benefit a wide range of stakeholders, including educators, parents, politicians, and academics.

1) Educational Impact:

- a) Enhanced Teaching Practices: By proving the efficacy of interactive sandbox play in teaching fine and gross motor abilities, this study can help educators incorporate more interactive and technology-enhanced activities into their curriculum. This can result in more engaging and beneficial learning experiences for toddlers.
- b) Curriculum Development: The study's findings can help to shape early childhood education curricula that emphasize the use of interactive technologies, promoting a balanced approach to cognitive and motor skill development.

2) Parental Insights:

- a) Understanding Child Development: Parents will learn more about the importance of motor skill development and how interactive play may help their kid thrive. This understanding may motivate parents to support and advocate for interactive learning opportunities at home and in schools.
- b) Informed Decision Making: The findings can help parents make educated selections about early childhood education programs, focusing on those that use creative and effective teaching approaches.

3) Policy Implications:

- a) Early Childhood Education Policies: Policymakers might use the study's findings to create policies that encourage the use of interactive technologies in early education. This can help guarantee that educational standards and funding objectives encourage the use of effective, evidence-based strategies.

b) Resource Allocation: The study can emphasize the importance of investing in interactive learning tools and educating educators to use these technologies successfully, directing resource allocation decisions at the institutional and government levels.

4) Research Contributions:

a) Filling Knowledge Gaps: The study looks at the little research on the use of interactive sandbox technology in early childhood education, specifically its impact on motor skill development. By offering actual evidence, the study adds to the increasing body of knowledge in this area.

b) Future Study Directions: The findings can serve as a starting point for future study, encouraging more studies on the long-term impacts of interactive play-based learning and investigating its impact on other aspects of child development, such as cognitive and socio-emotional skills.

5) Practical applications:

a) Implementation Guidelines: The study provides practical advice and best practices for adopting interactive sandbox activities in early childhood education settings. This can aid educators in properly incorporating these tools into their instructional techniques

b) Educational Technology Development: The study's findings can help developers of educational technologies create more effective and user-friendly interactive learning aids targeted to the needs of young children.

Overall, the goal of this project is to increase the understanding and application of interactive sandbox technology in early childhood education, resulting in better developmental outcomes for toddlers and more effective teaching techniques for educators.

## **1.7 Organization of Study**

This thesis is structured into six chapters, each addressing a critical component of the study on the impact of play-based learning with an interactive sandbox on the development of fine and gross motor skills in toddlers enrolled in Nat's Early Childhood Toddler Class.

Chapter 1 introduces the study by providing an overview of the importance of early childhood motor skill development and the potential benefits of play-based learning combined with interactive technology. It also identifies the research problem by describing specific obstacles and gaps in existing early childhood education practices that affect motor skill development and the use of interactive technologies. The chapter defines the scope and constraints of the study, including participants, interventions, and assessment methodologies, while acknowledging potential limitations. It formulates the primary research questions and sub-questions that drive the investigation, outlines the research objectives, and highlights the significance of the study for educators, parents, policymakers, and researchers. Finally, it provides an overview of the organization of the thesis.

Chapter 2 focuses on the literature review, exploring relevant theories and concepts related to motor skill development, play-based learning, and the role of interactive technologies in early childhood education. It examines previous studies that investigate the effects of play-based learning and interactive technologies on motor skill development, identifying gaps in the current research and positioning the study within a broader academic framework.

Chapter 3 describes the methodology, outlining the overall research design, including the type of study, variables, and setting. It details the participant selection

criteria and recruitment process, the intervention through interactive sandbox activities, and the methods used to collect data on motor skill development. The chapter also explains the statistical and qualitative methods used for data analysis and addresses ethical considerations when conducting research with young children.

Chapter 4 presents the results, beginning with descriptive statistics that summarize participants' demographic and baseline characteristics. It reports findings on the development of fine and gross motor skills based on pre- and post-test evaluations, compares motor skill improvements between the intervention and purposive sample groups, and provides observations on toddlers' engagement with the interactive sandbox.

Chapter 5 offers a discussion of the results, interpreting them in the context of the research questions and objectives. It compares the findings with past studies, considers their practical implications for educators, parents, and policymakers, and acknowledges the limitations of the study. Recommendations for future research are also provided based on these findings.

Finally, Chapter 6 concludes the thesis by summarizing the principal findings and drawing conclusions about the overall impact of interactive sandbox activities on motor skill development. It discusses practical applications of the findings for early childhood education and concludes with reflections on the study's contributions and potential directions for future research.