

# **The Power of Play**

A Systematic Review of Play-Based Learning in Elementary School

**Eivind Dybvik & Simen Jæger-Pedersen**

Supervisor: Pravin Tembjerg



---

**University of  
Stavanger**

29.04.2024

## Content

<b>Abstract</b>	<b>1</b>
<b>Introduction</b>	<b>2</b>
Background of the study . . . . .	3
Definition of key terms . . . . .	4
Objective of the study . . . . .	5
Research question . . . . .	6
Theory . . . . .	6
Key developmental psychological theories . . . . .	6
Play-based learning . . . . .	8
Alternative pedagogical approaches . . . . .	11
Overview of the study . . . . .	12
<b>Methodology</b>	<b>13</b>
Research design . . . . .	13
Search strategy . . . . .	14
Inclusion and exclusion criteria . . . . .	15
Study selection . . . . .	17
Quality assessment . . . . .	17
Data analysis . . . . .	18
Bias and limitations . . . . .	18
Bias . . . . .	18
Limitations . . . . .	19
<b>Results</b>	<b>21</b>
Result of the search strategy . . . . .	21
PRISMA flow-chart . . . . .	23

The articles of our systematic literature review . . . . .	24
Developmental themes . . . . .	25
Themes in challenges of implementation . . . . .	30
<b>Discussion</b>	<b>35</b>
Developmental impacts of play-based learning through the lens of psychological theories . . . . .	35
Embracing the Potential of play-based learning . . . . .	36
Implementation challenges . . . . .	37
Future work . . . . .	39
<b>Conclusion</b>	<b>40</b>
<b>References</b>	<b>41</b>

## **Abstract**

This thesis explores how play-based learning (PBL) affects elementary school children's cognitive, social, and emotional development and identifies challenges in its implementation. Through our systematic analysis, we delve into how PBL can nurture a child's holistic development. Gathering insights from theories by Vygotsky, Piaget, and Erikson, the study highlights the efficacy of PBL in fostering developmental gains. Our analysis reveals that while PBL significantly enhances cognitive abilities, social skills, and emotional intelligence, its implementation is often hindered by challenges related to assessment methods, resource constraints, teacher preparedness, and policy alignment. The findings advocate for integrated educational reforms to facilitate the effective implementation of PBL, emphasizing the necessity for a supportive infrastructure and a clear pedagogical framework to realize the full potential of play-based educational methods.

## Introduction

Play as a learning concept has gained both praise and criticism in the learning community. Despite the fact that there are many benefits to play-based learning (which we will cover in great detail), many research studies have highlighted the difficulties presented when attempting to change different beliefs and practices teachers have about play. Moreover, various reviews of play and child development conducted in the USA, have shown that play has declined both in quality and quantity over recent years (Hunter and Walsh (2014a)).

Despite this, the play seems to be an integral part of human development and a cornerstone when learning to socialize with other human beings, and even among animals, the play has been observed and studied in great detail. In fact, play has long been identified as a potential indicator of the current welfare state of an animal and is commonly linked to the experience of positive emotions in animals, just as it has been observed in humans (Held and Špinka (2011)).

Anthropologists have known about the power of play for a long time. More than a century ago, came to discover the intellectual factor in play, in the way children naturally incorporate experimentation and curiosity when they engage in play (Dewey (1910)).

Moreover, Friedrich Froebel (1782–1852) saw play as an important cognitive process and as the highest form of learning (Johansson (2018)).

Froebel was deeply committed to gaining an understanding of young children’s learning in natural preschool settings. In fact, the whole concept of “kindergarten” stemmed from Froebel, as he created the first kindergarten environment, referring to it as a “paradise garden,” where a child was given the responsibility of caring for a small plot in a garden, which was supposed to stimulate their understanding and knowledge about their world and in doing so, provide continuous learning opportunities to develop their knowledge of the community.

In fact, even Plato, more than two thousand years ago, discovered how important play was in education (D'Angour (2013)). Plato saw play as an important influence on how children developed as adults and also regarded it as an important tool to promote social stability. Plato viewed play to be serving as a utilitarian purpose: "For example, if a boy is to be a good farmer or a good builder, he should play at building toy houses or at farming and be provided by his tutor with miniature tools modelled on real ones. . . . One should see games as a means of directing children's tastes and inclinations to the role they will fulfill as adult." (D'Angour (2013)).

### **Background of the study**

It is complicated to answer why play has largely been separated from education in older children and adults. In part, it can be explained by how the current educational system has naturally evolved. The modern education system in the West evolved from religious-based schooling during the High Middle Ages to a more widespread form of education during the Reformation. However, it was the Prussian education system that laid the groundwork for the modern education system we know today (Van Horn Melton (2003)). Initiated by Frederick William I of Prussia in the 18th century, the Prussian system aimed to centralize control over education, standardize curriculum, and introduce tax-funded compulsory primary education.

Further educational reforms were initiated after Napoleon I's defeat of Prussia in 1806, which aimed to strengthen Prussia economically, socially, and militarily (Anderson (2004)). The Prussian system also prioritized teacher training and professionalization, contributing to its success. These reforms were also partly a response to the societal changes brought about by the Industrial Revolution, which necessitated a standardized and mass education system to meet the needs of an industrialized workforce. Prussia's compulsory education laws, enacted in 1819, marked a significant shift towards universal access to education

(Seavoy (2013)).

Various European nations and the United States later adopted the Prussian principles, shaping the primary and secondary education systems across Scandinavia, among other regions. Societal changes may, therefore, be one explanation for the evolution of the modern educational system, which prepares children to become workers. Nevertheless, it is crucial to understand play-based learning and how it can improve the educational system to become more humane and promote enjoyment in the eyes of learning.

### **Definition of key terms**

Following is an explanation of key terms used throughout this thesis.

Cognitive development refers to how children think, explore, and figure things out. It involves the progression of learning skills such as attention, memory, and thinking (Siegler, DeLoache, and Eisenberg (2003), p.119).

Social development involves how children learn to interact with others, including developing friendships, cooperating, and responding to the feelings of others (Parke (2020)).

Emotional development encompasses how children understand and manage their feelings and emotions, as well as their ability to understand the emotions of others (Siegler et al. (2003), p.354).

**Definition of play-based learning (PBL):** Though an exact definition of play is difficult to agree on, play usually refers to activities that children pursue for their inherent enjoyment Siegler et al. (2003), p.461).

In addition, it is usually described as freely chosen, creative, actively engaging, and pleasurable. While numerous concepts have contributed to shaping various understandings

of play, current educational research predominantly revolves around two types of play: children's pretend play and adult-guided play (Pyle and Danniels (2017)). The term "free play" is also commonly used and refers to child-directed, voluntary, and flexible play, often involving pretend scenarios, though it may encompass other forms of play as well. Studies looking at pretend play almost exclusively define this type of play as child-directed or as free play and involves children exploring different roles in pretend situations. In contrast, adult-guided play is often described as lying in-between direct instruction and free play. It involves adults initiating activity or enhancing the experience by playing the role of questioners, commenters, cosplayers, or demonstrators.

Play also includes activities involving board games, card games, programming, or physical play, some of which will be covered in the studies we have looked at. However, it is important to mention that these play activities can still be described as either child-directed/free play or promoted through adult-guided play (Pyle and Danniels (2017)).

### **Objective of the study**

Our concern regarding play-based learning is the lack of enjoyment and meaning experienced by most students in the current educational system. Scientists from the Yale Center for Emotional Intelligence and the Yale Child Study Center discovered that approximately 75% of the students' self-reported emotions concerning school were negative (Moeller, Brackett, Ivcevic, and White (2020)). In fact, negative feelings about school prevailed across all demographic groups, with tiredness emerging as the most prominent feeling across measures and samples. These results are alarming, and they illustrate the predicament the current educational system is facing. We believe that learning should be a challenging yet fun endeavor, and the fact that most students don't feel this way should be a wake-up call for all those who value the educational system and what it represents. If play-based learning could be applied on a broad scale and promote both learning and



enjoyment in school, then it has the potential to revolutionize the educational system, fostering a more engaging and effective learning environment for students of all ages.

### **Research question**

What does current research reveal about the impact of play-based learning on children's cognitive, social, and emotional development in elementary schools, and what are the implementation challenges?

Our research question has a dual focus. First, we aim to offer a detailed overview of how Play-Based Learning (PBL) affects children's cognitive, social, and emotional development. This will be done by looking at the description used by current research to describe the benefits of children being in a PBL environment. In the second part of this research question, we will investigate the challenges of implementing PBL in elementary schools. This includes identifying what barriers exist and how these challenges affect the application and efficacy of PBL. Through this review, we intend to offer a nuanced understanding of PBL's role and effectiveness in early childhood education.

### **Theory**

#### ***Key developmental psychological theories***

Various theories have been proposed to explain human development. Play-based learning is an integral part of these theories as they all emphasize the importance of early childhood development. Understanding these theoretical perspectives is essential when approaching the fundamental ideas of play-based educational approaches. In this section, we will delve into the most prominent theoretical perspectives.

Piaget's theory of cognitive development explains how children acquire knowledge and concepts through active involvement and interactions with their environment. In this view,

children gain knowledge through a series of stages, which he called the sensorimotor stage, the pre-operational stage, the concrete operational stage, and the formal operational stage. Piaget's approach to cognitive development is often times labeled constructivist since it depicts children as constructing knowledge for themselves as a result of their experiences (Siegler et al. (2003), p.120). Piaget, therefore, promoted the idea that children shape their own development. In addition, nature and nurture interact throughout the cognitive development, where nurture is provided by parents and other caregivers, and nature through children's maturing body and brain, through their ability to perceive, experience and integrate observations into coherent knowledge (Siegler et al. (2003), p.121).

According to the sociocultural theory, rooted in the early work of Vygotsky, learning is a product of social interactions and culture. Vygotsky's theory underscores the significance of play in the learning process. In his conceptual paper on child play and mental development, Vygotsky expounded on play as a cognitive activity, albeit without empirical support Taylor and Boyer (2020). Vygotsky regarded children as social learners, where interaction with others plays a pivotal role in acquiring skills and comprehension. His perspective on the relation between language and thought strengthened this perception. Vygotsky viewed thought as internalized speech that originates from statements that other people make to children; Piaget, on the other hand, viewed both language and thought as mostly independent (Siegler et al. (2003), p.146).

According to the socio-cultural perspective, the individual does not learn in a vacuum but learns in a social context. Vygotsky is most known for his concept called "the zone of proximal development," which asserts that individuals can acquire a deeper understanding of a subject with the assistance of others and within a social framework, surpassing what they can learn independently (Imsen (2020), p.191). Consequently, the development of individuals should be understood within a social context.

With the help of others, the limit of what an individual can learn can be expanded.

Furthermore, culture will determine what is located in this zone at any given time, while biology sets limits on how large the zone can be. Therefore, Vygotsky considered this development to be both historical and biological (Teigen (2015), p.475).

Erikson's theory of psychosocial development is also worth mentioning. Erikson believed that human development could be categorized into eight age-related stages, where each stage was characterized by a specific crisis related to development that the individual must resolve (Siegler et al. (2003), p.321). Like Piaget, the stages emphasize the importance of exploration, which culminates in children gaining a sense of autonomy. Mastering social skills is also an important aspect of his theory, as well as cooperation with peers in a social environment.

### ***Play-based learning***

Play is widely regarded as an important dimension in early childhood development. However, little is known about its effectiveness compared to other learning methods in childhood education settings (Vogt, Hauser, Stebler, Rechsteiner, and Urech (2020)).

Moreover, since play and the idea of play-based learning is child-centered and focuses on children's development, most research has investigated play-based learning in children in kindergarten, and as a result, there is limited research to connect the benefits of play-based learning to older children in primary school and beyond (Taylor and Boyer (2020)).

Nevertheless, despite limited research on older children, PBL's potential in older individuals should not be ignored. Play has been found to significantly impact social-emotional development as children learn cooperation and experiment with social norms. It also offers opportunities to develop empathy and compassion. Additionally, play fosters cognitive growth by enabling children to engage in diverse tasks, enhancing problem-solving abilities, memory retention, and creativity. Furthermore, physical play facilitates the development of motor skills, coordination, balance, and strength. Play also contributes to emotion

regulation and fosters positive emotions, as supported by evidence (Siegler et al. (2003)).

One study looking at the effectiveness of a play-based approach in children in kindergarten found that utilizing card and board games was more effective than a standard training program (Vogt et al. (2020)). In addition, the educators noticed that the children in the training program often became bored and struggled to engage. In the play-based group, however, the children had no issues with boredom and found the games enjoyable.

Further studies have indicated that play facilitates student learning, enabling children to expand and deepen their existing knowledge and skills by engaging with others and/or their surroundings. Moreover, a number of studies have shown that play positively influence children's socio-emotional development and academic learning. The studies mentioned seem to indicate that different form of play have different benefits (Pyle and Danniels (2017)). For example, child-directed play was found to be beneficial to socio-emotional development, while teacher-directed play was advantageous for the development of academic skills.

Learning through play has also demonstrated a positive impact on children's reading and math achievements. Evidence indicates that this approach tends to be more effective than direct instruction. For example, integrating literacy materials into play environments in kindergarten classrooms correlates with heightened engagement and practice of literacy skills among children. In addition to this, teacher involvement in such play scenarios is proven to enhance engagement levels even more. Studies have shown that in pretend play scenarios, where children assume roles and collaborate in directing play, they tend to exercise more sophisticated language skills (Pyle and Danniels (2017)).

Play-based learning approaches have also proven advantageous for children's social development, evidenced by reduced internalizing and externalizing issues noted by teachers (Hunter and Walsh (2014a)). Furthermore, play-based approaches enhance overall

classroom dynamics, including teacher sensitivity and routine management. A curriculum highlighting the role of teachers in fostering children's social play has been shown to enhance self-regulation skills, as evidenced by improved performance on objective tests assessing inhibitory control and cognitive flexibility.

One study conducted in Northern Ireland Hunter and Walsh (2014a) found that nearly all teachers (96%, n=149) held the belief that play contributes to children's holistic development and that significant learning experiences can occur during play. Moreover, PBL strongly supports the development of language, problem-solving, coping and understanding of cultural differences (Ali, Constantino, Hussain, and Akhtar (2018)).

Another important aspect of PBL is the potential to promote motivation and joy among students. One study looked at the performance in mathematics in children aged 12 to 13, and compared different groups applying alternative learning methods involving interaction and modification of a game, and compared it to traditional practice by solving exercises on paper (Garneli, Giannakos, Chorianopoulos, and Jaccheri (2013)). The study found that the groups that played the game or changed the game code became more engaged and found more enjoyment, even though they did not improve their performance in the math post-test.

Even if some play-based learning methods may not cause an improvement in academic performance, they may still be highly beneficial by motivating students, especially those with lower performance. Another study examining early childhood mathematics in kindergarten found that the play-based approach was evaluated more positively, as it was considered more fun and less school-like. Teachers from the same study noted that the play-based approach appeared as both exciting and interesting to the children and that it was highly beneficial for the weaker children (Vogt et al. (2020)).

Moreover, the comparison of pre-and post-tests, conducted with an eight-week intervention

period in between, revealed a notably superior learning outcome for the play-based mathematics group in comparison to the traditional kindergarten setting. However, no discernible effects were observed for the training program. In addition several other studies have shown both board and card games to be effective in the acquisition of mathematical competencies (Vogt et al. (2020)).

Teachers have also endorsed PBL as supporting the personal and social development of the children in their classes. For example, one study noted how teachers perceived play-based learning as an effective way to get children to socialize and learn to engage with each other and work together (Pyle and Danniels (2017)). They also noted that play promoted self-regulation and helped children become more independent, think for themselves, and engage in problem-solving.

### *Alternative pedagogical approaches*

Montessori education, established over a century ago in Rome, has become widely adopted in modern education. Its core principles, such as mixed-age classrooms, specialized materials, student-directed learning, collaborative methods, and personalized instruction, have been proven effective through research. Studies comparing Montessori schools with other models show better outcomes for Montessori students, including higher test scores, improved social and cognitive skills, and a stronger sense of community. From kindergarten to elementary school, Montessori students demonstrate advanced writing abilities, effective problem-solving, and a deep connection to their school community (Lillard and Else-Quest (2006)).

Moreover, the Reggio Emilia approach to early childhood education highlights the use of educational documentation to enrich children's learning (Hong, Shaffer, and Han (2017)). It involves creating a stimulating learning environment and documenting children's experiences to inform teaching and planning. This process, called *Progettazione*, includes

transcribing discussions, capturing activities with photos, and building models of children's thinking. Teachers use this data to guide future activities, reflecting the collaborative nature of the approach.

Though not strictly based on PBL methods, alternative pedagogical approaches, such as Montessori and Reggio Emilia, demonstrate how alternative learning approaches can be implemented. By focusing on engaging students and allowing them to explore and socialize, development can be nurtured in multifaceted ways beyond traditional educational models. Additionally, by adapting to the diverse needs and interests of learners, they can help foster holistic development through individual experiences, collaborative projects, and reflective documentation. Thus, these approaches offer valuable insights into the potential of innovative educational strategies to foster meaningful learning experiences and promote the overall well-being of students.

### **Overview of the study**

Both authors of this paper have contributed equally to the completion of this thesis. Simen was responsible for writing the Introduction, Background, Definitions, and Objectives of the study. He also crafted the developmental portion of the Results section and the Future Work and Limitations sections of the Discussion. Eivind wrote the Methodology section and the Challenges portion of the Results section. Throughout the development of this thesis, both authors collaborated equally on the remaining sections, having continual discussions and improving each other's contributions.

## Methodology

This section will outline the systematic approach we have taken to gather the data for our thesis.

### Research design

Methodically, this paper is a systematic literature review. A systematic literature review identifies, evaluates, and integrates existing research findings to address one or more research questions. Central to this approach is the development of key concepts or themes, their comparison, and the synthesis of results across studies (Siddaway (2015)).

The research question outlining this thesis will be the foundation for conducting the literature review.

The PICO (Population, Intervention, Comparison, Outcome) framework is important for structuring our systematic review as it clearly defines the key components of our study: who is being studied, what the intervention involves, how it is compared against other variables, and what outcomes are being measured. This will guide our search strategy and selection criteria and ensure our methodology aligns with our research objectives.

**Population:** Elementary school children are our primary population because they are the subjects directly affected by our intervention. However, we also need a secondary population of teachers because their insights, experiences, and knowledge in play-based learning provide valuable data on the observable developmental gains in children and the challenges in implementing PBL in elementary school.

**Intervention:** We examine play-based learning initiatives in the primary school classroom. This encompasses various play-oriented activities aimed at promoting learning.

**Comparison:** The effects of PBL will be compared where possible with the traditional educational methods.



**Outcome:** We are particularly interested in cognitive, social, and emotional developmental outcomes, looking for benefits across these domains. Additionally, we will assess the implementation challenges when integrating PBL into elementary education, exploring what factors affect its success or failure.

The following sections present a concise overview of each methodical step that has guided this study.

### **Search strategy**

**Databases.** We conducted the systematic literature search in three research databases: 1) ProQuest, 2) Google Scholar, and 3) ERIC (Education Resources Information Center).

We chose these three databases for several reasons. We started with Google Scholar<sup>1</sup> because it is user-friendly and familiar to us. Later, we switched to ERIC<sup>2</sup> due to its educational focus, which seemed more likely to give us resources directly relevant to play-based learning and its impact on developmental outcomes in school settings. For ProQuest<sup>3</sup> and Google Scholar, we needed databases that cover a wide range of academic sources across multiple disciplines, giving us access to a broad spectrum of potentially relevant studies we had to navigate. This combination of databases provided us with a diverse pool of studies for screening, and each database contributed at least one of the four articles we ultimately included in our review. Other databases (PSYCHinfo and Oria) were also tested with our search strategy but gave us only a few or zero articles.

**Search strings.** In our research question, we are trying to discover two main things: how children develop their cognitive, social, and emotional selves due to a play-based learning approach and the challenges in implementing play-based learning. The search terms are

---

<sup>1</sup> <https://scholar.google.com/>

<sup>2</sup> <https://eric.ed.gov/>

<sup>3</sup> <https://www.proquest.com/>

derived directly from the components of the PICO framework and related synonyms. These terms were combined using Boolean operators to refine the search results. The search strings were separated into two strings: We searched for articles with the whole string and the first half to find articles related to PBL and elementary school broadly and more narrowly with our focus on the psychological developmental dimensions and challenges.

**The three search strings:**

1): ("play-based learning" OR "learning through play") AND ("elementary school children" OR "primary school students")

2): ("play-based learning" OR "learning through play") AND ("elementary school children" OR "primary school students") AND ("cognitive development" OR "social development" OR "emotional development")

Because we are interested in all English-speaking countries, we needed to search for different spelling ways in elementary school and play-based learning to ensure we found all the relevant literature.

**Inclusion and exclusion criteria**

Specific inclusion and exclusion criteria guide the systematic literature review of this thesis, ensuring we include only studies relevant to our research question. Following is a table of our inclusion and exclusion criteria.

Inclusion Criteria	
Study design	Observational studies, literature reviews, qualitative studies, quantitative studies
Population	Elementary school children (age 6 - 12) and teachers in elementary school
Intervention	Teacher-guided play, free play
Outcomes	Cognitive, social, and emotional development. Challenges in implementing PBL
Geographic location	Western countries
Publication period	2010 - 2024
Language	Norwegian, Swedish, Danish or English

*Table 1: Inclusion criteria*

Exclusion Criteria	
Study design	White papers, opinion pieces, editorials
Population	Kindergarten children (age 0 -6 ) and kindergarten teachers.
Outcomes	Not mentioning cognitive, social, or emotional development in PBL context.
Publication period	Earlier than 2010

*Table 2: Exclusion criteria*

**Thematic focus.** Our review focuses on studies that specifically examine educators' perspectives regarding play-based learning. Included studies investigate how play contributes to children's cognitive, social, and emotional development within the

elementary school context. Studies exclusively focusing on either play or learning without addressing their connection or the potential benefits of play-based learning were excluded from our analysis. While our literature search encompassed a broad range of sources, our final study sample includes research that indirectly addresses the relationship between play and learning, even if it does not explicitly reference play-based learning as a concept.

### **Study selection**

A screening process was done to select the four studies for inclusion in our systematic literature review on the impact of play-based learning in elementary schools on children's development. Initially, titles and abstracts of potentially relevant studies were screened independently by the two authors to determine their eligibility based on predefined inclusion and exclusion criteria.

Following the initial screening, the same reviewers independently assessed full-text articles of potentially relevant studies to ensure their suitability for inclusion. For this stage, we followed the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) to ensure methodological transparency and reliability<sup>4</sup>. Any disagreements between the reviewers regarding study eligibility were resolved through discussion and consensus, with the involvement of a third reviewer (our supervisor) if necessary. This systematic approach to screening ensured that only studies meeting the predetermined criteria were included in our review, enhancing the reliability and validity of our findings (Siddaway (2015)).

### **Quality assessment**

When selecting studies for our review, many articles were eliminated during the initial screening due to our strict inclusion and exclusion criteria. The majority of the articles we

---

<sup>4</sup> <https://www.prisma-statement.org/>

encountered were focused on play-based learning in kindergarten, which made finding studies directly relevant to our research question quite challenging. Ultimately, we selected four studies that provided data on play-based learning in elementary schools and addressed the cognitive, social, or emotional benefits of PBL, as well as the challenges in implementing it. One study, although slightly older than our original date limit, was heavily discussed and ultimately included due to its high quality.

Some studies appeared promising based on their titles and abstracts and met our inclusion criteria but were inaccessible either because they required a payment or were not yet published, with a release date set for 2025. We also encountered white papers on play-based learning and development in elementary schools, however, these lacked the scientific rigor needed to meet our inclusion criteria.

### **Data analysis**

From the data we collected, we conducted a thematic analysis, which involved identifying and analyzing themes that emerged across the different studies. The process of selecting themes involved each of us deeply engaging with the articles individually to create themes. We then compared and discussed these themes together, choosing a few that we felt were most representative of all or some of the studies. This data is presented in tables and as descriptive text.

### **Bias and limitations**

#### ***Bias***

Several biases and limitations might influence the interpretation of the findings and their generalization. Firstly, most of the studies reviewed originate from Western educational settings, which may not reflect the diversity of educational practices globally. This geographic bias could limit the conclusions' applicability to non-Western settings where educational norms and practices vary significantly.

Secondly, the search for relevant literature was confined to articles published in English, potentially excluding significant research published in other languages. This language bias may overlook important studies that could provide additional insights into the effectiveness and challenges of implementing play-based learning.

Thirdly, the availability bias influenced by the accessibility of full-text articles may have skewed the selection of sources. Articles behind paywalls or unpublished at the time of research were excluded, which might have limited the scope of analysis to more readily available but possibly less diverse perspectives.

Lastly, the methodology used to select studies for review has an inherent selection bias. While the inclusion and exclusion criteria are necessary for maintaining research focus and quality, they might also exclude relevant studies that do not meet the strict criteria which could offer valuable insights, especially concerning the implementation challenges and less common outcomes of play-based learning.

### ***Limitations***

The biggest challenge was finding substantial evidence to robustly support the effectiveness of play-based learning in older children, as the existing literature often focuses more heavily on early childhood education and lacks substantial research into its efficacy in later developmental stages. The authors of (Taylor and Boyer (2020)) also noted that the majority of studies looking at the benefits of play-based learning have been conducted on children in kindergarten. As a result, there was limited research on the topic we wanted to investigate, which involved the effectiveness of play-based learning in older children and beyond. This scarcity of relevant studies necessitated a comprehensive review and synthesis of available literature, supplemented by empirical data and qualitative insights, to form a compelling argument for the possible integration of play-based approaches into educational practices in primary school and beyond.

Moreover, the broad definition of play makes it challenging to fully measure the benefits and connect them to play-based learning, which encompasses various activities from physical play to board games. This complexity further complicates the issue and potential findings.

## Results

This section presents the results from our systematic literature review. First, we present the search results. Then, the characteristics of the four articles are presented. Lastly, the data from the analysis of the four studies of both the developmental themes and the themes that emerged from the challenges in the implementation of PBL is presented.

### Result of the search strategy

The table below shows the search strings, the number of articles hit, the number of articles screened, and how many we included and from which database.

Search strategy				
Database	Searching string	No. of articles	No. of articles screened	No. of articles included
ProQuest	Play-based learning OR learning through play AND elementary OR primary school	1,654,871	23	0
ProQuest	Play-based learning OR learning through play AND elementary OR primary school AND Social, cognitive and emotional development AND challenges	130,469	12	1



Google Scholar	Play-based learning OR learning through play AND elementary OR primary school	19 400	40	2
Google Scholar	Play-based learning OR learning through play AND elementary OR primary school AND Social, cognitive, and emotional development AND challenges	16 800	13	0
ERIC	Play-based learning OR learning through play AND elementary OR primary school	3240	20	1
ERIC	Play-based learning OR learning through play AND elementary OR primary school AND Social, cognitive, and emotional development AND challenges	252	15	0

*Table 3: Search strategy*

## PRISMA flow-chart

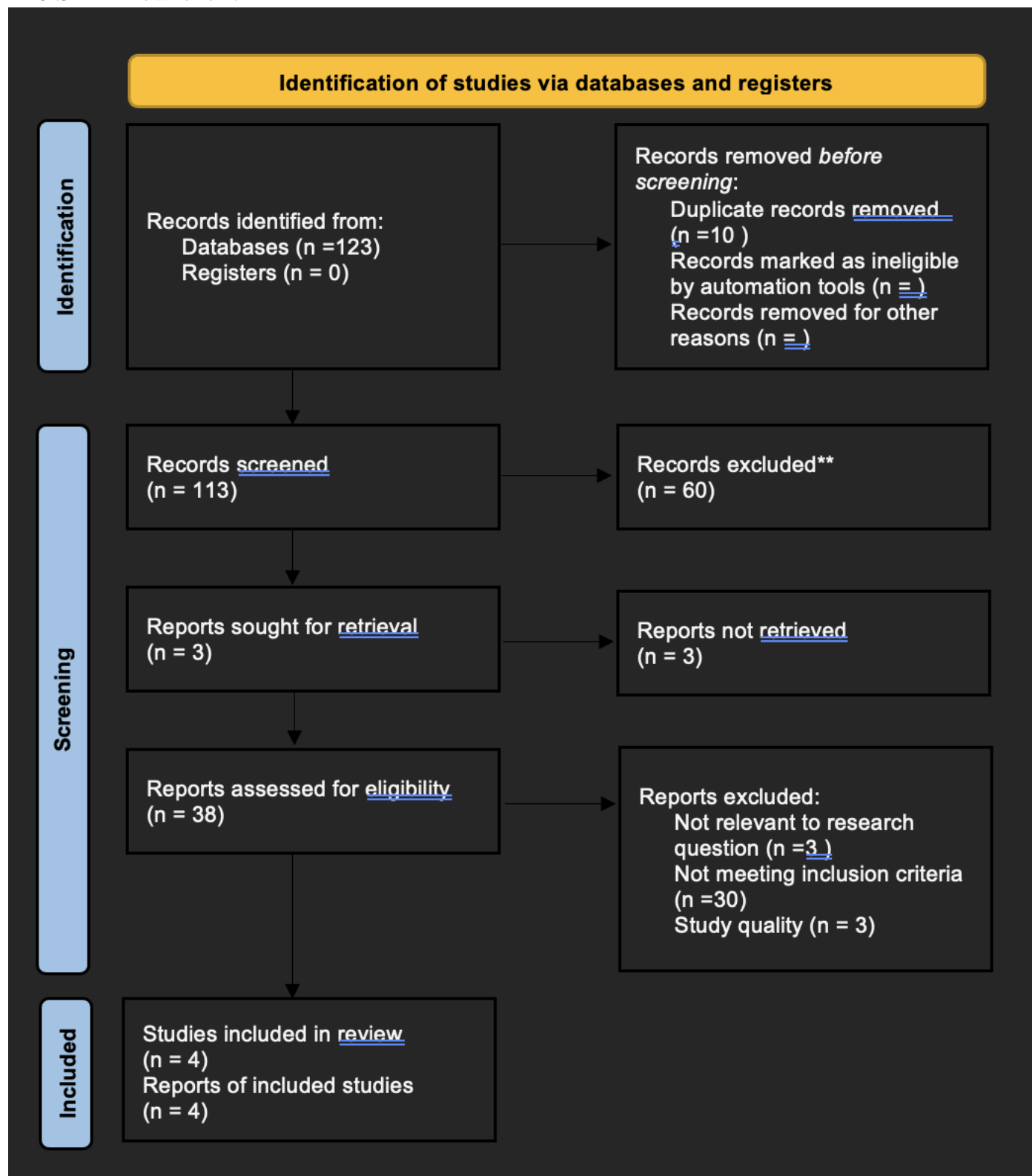


Figure1: PRISMA flow-chart

### The articles of our systematic literature review

Following is the characteristics of the four scientific articles used in this systematic literature review.

<b>Author and year</b>	<b>Method</b>	<b>Journal</b>	<b>Country</b>
Parker, Thomsen, and Berry (2022)	Literature review	Frontiers in Education	Australia and Denmark
Martlew and Ellis (2011)	Exploratory study with interview and observation	Early Years An International Journal of Research and Development	Scotland
Bublkova-Moan, Hjetland and Wollscheid (2019)	Qualitative meta-synthesis	European Early Childhood Education Research Journal	Norway
Hunter (2014)	Mixed-method with an online questionnaire (multi-choice and open-ended)	NA	New-Zealand

*Table 4: Characteristics of the four included articles*

## Developmental themes

Cognitive, social and emotional developmental themes			
Theme	Example from articles	Dimension	No. of articles
Play as a scaffold for development	<p>Play-based learning allows for children to play together and thus learn from each other. This fits into Vygotskys view of learning, where the zone of proximal development can be reached in a play-based setting. Vygotsky himself noted that play was influential on child development, ranging from speech development to self-regulation (Parker, Thomsen, and Berry (2022))</p> <p>Play, therefore, can act as a scaffold for development, where children act as agents and dialogic partners with each other. PBL, is therefore child-centered and promotes the development of children by allowing them to follow their natural instincts and innate schema of exploration (Hunter and Walsh (2014b)).</p>	Cognitive, Social, Emotional	4

Theme	Example from articles	Dimension	No. of articles
Brain development	Play enhances prefrontal cortex development. It triggers the production of a vital protein crucial for fostering the formation of fresh neurons and synapses. Deprivation of play hampers brain maturation and hinders problem-solving abilities (Parker et al. (2022))	Cognitive	1
Deeper learning	Play-based learning (PBL) prioritizes children's developmental readiness and cultivates essential skills for academic success, encompassing physical, social, and emotional competencies and executive functioning skills crucial for future employability. Children in such environments exhibit greater happiness, engagement, and accelerated learning. In fact, studies have demonstrated the positive effects of play in regards to learning, where students learning under playful conditions more accurately can recall knowledge and gained a deeper understanding of concepts (Parker et al. (2022))	Cognitive, social	2

Theme	Example from articles	Dimension	No. of articles
Holistic	<p>When considering the holistic dimension of learning, research indicates that playful teaching methods may be more impactful in nurturing social, emotional, physical, cognitive, and creative skills compared to conventional or tightly structured pedagogical approaches typically employed in primary school settings. Numerous educators observe that play enhances children's holistic development, encompassing specific areas such as social, emotional, and cognitive growth (Bubikova-Moan, Næss Hjetland, and Wollscheid (2019))</p>	Cognitive, social, emotional	4

Theme	Example from articles	Dimension	No. of articles
Social skills and competence	<p>Play interventions are frequently utilized as a therapeutic approach for children encountering difficulties in developing socio-emotional skills, including forming positive peer relationships. Within play-based learning environments, there's often an emphasis on fostering meaningful social interactions among children, which are crucial for their social development. Recent studies offer compelling evidence that play not only enriches children's subject knowledge across various academic domains but also promotes the cultivation of social competencies and a disposition for learning (Joan Martlew and Ellis (2011)) In a comparative study conducted across Japan, the US, and Sweden, teachers universally associate play with the development of social skills, irrespective of cultural context (Bubikova-Moan et al. (2019))</p>	Social, Emotional	2

Theme	Example from articles	Dimension	No. of articles
Language development	Play stimulates and motivates children in their development of skills, language acquisition and concentration. Free play (a variant of play based learning) has been found to help children develop their oral language and social skills through interaction with others (Bubikova-Moan et al. (2019))	Cognitive, Social	1
Emotional development	In a playful environment, interactions with peers and adults contributes to children's development, which allows them to understand the thoughts and feelings of others. It also becomes easier for children to express and manage their emotions during play. In addition, it is recognized that a crucial aspect of play involves the limitations imposed by children themselves through the establishment of rules that dictate proper engagement in the activity (Joan Martlew and Ellis (2011))	Emotional	1

*Table 5: Cognitive, social and emotional developmental themes*



## Themes in challenges of implementation

Measuring Progression	School Management and Curriculum	Lack of resources	Role of teachers
<ul style="list-style-type: none"> <li>• Evidence of children's learning</li> <li>• Assessment and accountability</li> <li>• Absence of standardized tools</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to implement from policy to action</li> <li>• No consensus on the definition of PBL</li> <li>• Pressured by policy mandates Lack of backing by school management</li> </ul>	<ul style="list-style-type: none"> <li>• To low adult-to-child ratio</li> <li>• Time constraints</li> <li>• Lack of training</li> <li>• Lack of funding</li> </ul>	<ul style="list-style-type: none"> <li>• Complex role in PBL setting</li> <li>• Need knowledge, experience, and skill</li> <li>• Fear of standing out in promotion of PBL</li> <li>• Negative attitude from parents and staff</li> </ul>

*Table 6: Themes in challenges of implementation*

**Measuring progression.** In exploring the domain of play-based learning in primary school, a key challenge regarding the measurement of student progression is prominent. As highlighted by some teachers in the second article (Joan Martlew and Ellis (2011)):"One of the concerns highlighted by the teachers was gathering evidence of children's learning: moving away from the workbook and worksheet resulted in challenges in terms of

assessment." Citing another article in the literature review, they found the same problem mentioned by teachers: despite being committed to integrating this pedagogy into the curriculum, they felt there are difficulties in measuring progression in the pupils from PBL contexts (Joan Martlew and Ellis (2011)). The same teachers said they found issues supporting the children's learning and had difficulties deepening their appreciation of the educational value inherent in various forms of play-based contexts (Joan Martlew and Ellis (2011)).

A similar point is mentioned in the fourth article: "assessment and curriculum implementation were each mentioned once as barriers to the successful implementation of PBL" Hunter and Walsh (2014b). This point were also mentioned in the first article (Parker et al. (2022)), where they claim that assessment and accountability are barriers to implementing learning through play. The authors' root concern here is the absence of standardized tools and methodologies to evaluate play-based pedagogy's educational benefit and progression in primary school (Parker et al. (2022)). The current research and policy on this topic focus largely on pre-school rather than primary school settings (Parker et al. (2022)).

**Policy, school management and curriculum.** The findings from the reviewed literature articulate the difficulties in the intersection between educational policy, curricular demands, school management, and implementing play-based learning pedagogy. From the first article, a short phrase captures the essence of the challenge: "Difficult to implement from policy to action" (Parker et al. (2022)). This statement is based on a few key reasons from the article. Firstly, they claim that there is no clarity on what learning through play means. Secondly, there is insufficient communication between all stakeholders (research, policy, system, and school) to contribute to the collective decision on what outcome education should have and how to facilitate and measure it. There is friction between the endorsement of PBL at the policy level and the pragmatic aspect of the actual

implementation within the educational system.

Teachers in the third article (Bubikova-Moan et al. (2019)) feel pressured by policy mandates and the expectations of delivering the curriculum adequately. Expanding on these points, the same article identified further challenges with policy mandates challenging PBL implementation within early childhood education. An "increasing policy pressure on school preparedness and raising academic standards" leads to "professional resistance and uncertainty with important spin-offs such as time management concerns" (Bubikova-Moan et al. (2019)).

Lastly, the fourth article mentions the challenge of school management buy-in (support from the school management), stating that "school management buy-in was identified four times by participants" as a barrier to the successful implementation of PBL (Hunter and Walsh (2014b)). Curriculum implementation were mentioned once as a barrier here as well.

**Lack of resources.** Resource availability poses a major challenge when attempting to include play-based learning in primary education. The systematic literature review highlighted some structural constraints that educators and the school system face when integrating PBL into teaching practice.

In the second article, the authors identified an issue regarding the adult-to-child ratios. The disparity between preschool, which typically has a ratio of one adult to every ten children, and primary school classrooms, which can be as low as one adult to twenty-five children, is significant (Joan Martlew and Ellis (2011)). This ratio, even with occasional classroom assistant support, leads teachers to report that "learning in the primary school environment can be less responsive to individual children's interests and needs" due to the limitation in adult availability. The issue of class sizes is also mentioned in article three: "teachers struggle to engage in play due to large class sizes and, relatedly, understaffing

(Bubikova-Moan et al. (2019))", and article four where the primary barrier to successful PBL implementation is identified as "adequate resourcing of teacher ratio" (Hunter and Walsh (2014b)).

The third article considers time to be a significant obstacle to implementing PBL. Play is conceptualized as a free, unstructured, child-directed activity, and teachers have problems finding time to incorporate it into an already full curriculum. The educators here frequently complain that the school day does not provide adequate time for play-based activities (Bubikova-Moan et al. (2019)).

Another constraint mentioned in the same article is the scarcity of staff qualified to deliver PBL strategies. The traditional educational way of doing things, along with limited opportunities for training and developing professionals, hinder the adoption of PBL in a lot of elementary school contexts (Bubikova-Moan et al. (2019)). The authors also note that funding and a limit of PBL-specific resources, including digital ones, hinder structural implementation across contexts.

**Role of teachers.** This challenge concerns the role teachers play both within the PBL environment and in dealing with the repercussions PBL has on the culture around them.

From article three, teachers from several studies acknowledged that their role in PBL requires timely and skillful intervention to enhance children's learning and development (Bubikova-Moan et al. (2019)). For example, one teacher describes "a process of constant reflection about her role in the play." She highlights the importance of observing children's developmental needs to scaffold their learning processes. Other studies report on the struggles the teachers face in defining their role in a PBL environment, talking about "keeping a balance between leadership, involvement, and co-participation that would be non-intrusive and respecting children's agency as autonomous players and learners." They

express the importance of the teacher's need for knowledge, experience, and skills to know when and how to intervene in children's play.

The literature review also reveals that educators must navigate sociocultural attitudes toward PBL as they diverge from the education norm. For instance, some teachers in article three state that there is a reluctance to debate the value of PBL because of the fear of standing out and being perceived as unproductive for choosing play-based methods over traditional, direct instruction with tangible outcomes (Bubikova-Moan et al. (2019)).

This sociocultural attitude is also mentioned in article two, where parents' and staff's negative views on PBL made it difficult to implement. For example, a study said that parents were perceived as an "intervening force" driven by their "overwhelming academic concern" (Joan Martlew and Ellis (2011)).

## Discussion

Interpretation of key findings:

### **Developmental impacts of play-based learning through the lens of psychological theories**

The result from our systematic review reveals that play-based learning (PBL) has multiple benefits on cognitive, social, and emotional development in elementary school children. The data from our studies aligns with Vygotsky's sociocultural theory, which argues that social interactions among children play a significant role in cognitive development (Imsen (2020), p.203) PBL encourages learning through social engagement, and the children who participate in PBL settings shows improved problem-solving skills and enhanced social interactions. They also found that playful experiences lead deeper learning when they are engaging, joyful, social interactive and meaningful (Parker et al. (2022)). This aligns with Vygotsky, who viewed play as an important part of learning and that joy is perhaps the most important characteristic of play. In this, joy acts as motivation to learn, which then drives the learning forward and allows it to happen in the best way possible (Imsen (2020), p.203).

Moreover, the findings also resonate with Piaget's stages of cognitive development, especially in how play stimulates operational thinking in the preoperational and concrete operational stages (Siegler et al. (2003), p.120). From our data, children were observed to experiment and learn through action with other children, learning from cooperation and the consequences of these actions. This gives the children cognitive advances that traditional learning settings might not do as effectively. Moreover, the ability children had to explore and discover things independently illustrates the importance of individual experiences regarding play-based learning. It can therefore be argued, that the discovery process can more easily unfold in a play-based setting than in a traditional learning environment. When children engage with the environment in a play-based fashion, they

have the freedom to explore and investigate and as a result know no boundaries outside of their imagination unless constrained by an adult (Hunter and Walsh (2014b)).

Erikson's fourth stage of psychosocial development supports our findings of play-based learning in the classroom. This stage is about Industry vs. Inferiority, where the focus is on children developing their cognitive and social skills related to their cultural context. This stage is also important for children's ego development, emphasizing cooperation and working industriously (Siegler et al. (2003), p.321). From our result, we found that social competence and establishing positive peer relationships and cooperation were the outputs of a play-based learning environment (Bubikova-Moan et al. (2019)). Children in PBL environment develop a better sense of initiative, where they get enhanced emotional regulation and resilience, which are important elements in developing a healthy sense of identity and overcoming feelings of inferiority.

### **Embracing the Potential of play-based learning**

One of the most promising aspects of play-based learning, is the ability to promote motivation and enjoyment in students. This is highly important, as learning, especially in later years is dependent on students learning on their own initiative. The biology of the human brain seems to support this point. The neurotransmitter known as dopamine (DA) plays a crucial role in motivational control, influencing the process of learning what aspects of the world are favourable or unfavourable, and guiding actions aimed at attaining positive outcomes while avoiding negative ones. Certain dopamine neurons are responsible for encoding motivational value, thereby supporting brain networks for seeking, evaluation, and value learning (Bromberg-Martin, Matsumoto, and Hikosaka (2010)).

If play-based learning can promote development in various aspects, from the cognitive, social and emotional, as we have studied here, while also making learning a fun and engaging endeavour, then the potential for play-based learning cannot be overstated.

Furthermore, an American psychologist by the name of Howard Gardener, identified eight different kinds of intelligence and argued that they were all equally important. The kinds he identified were: Logical/mathematical, musical, spatial, bodily kinaesthetic, religious, interpersonal and intrapersonal (Macintyre (2016)).

If one is to agree with this view, then there is an argument to be made against the traditional educational system, which relies heavily on reading and writing as the basis for academic skills and development. For example, it is difficult to stimulate ones spatial or bodily kinaesthetic intelligence through such monotonous tasks, same can be said for interpersonal and intrapersonal intelligence. Play-based learning seems to integrate this different dimension in a more natural and substantial way compared to the traditional learning methods, and as a result, may be more beneficial when it comes to addressing the holistic aspect of human development. Inspiration can be taken from Montessori education, Reggio Emilia or other such alternative approaches as earlier discussed.

### **Implementation challenges**

Despite the supportive empirical evidence for the developmental benefits of PBL, the data highlights some substantial barriers in the implementation of it. There were four recurrent themes across the studies. One challenge was the inadequate skill, knowledge, and training for teachers, where they often don't feel confident in knowing when and how to intervene in a play-based setting and how to prepare for it. This discrepancy calls for broader research on play-based pedagogy in elementary school and a systemic change to bridge the theoretical knowledge with practical application. There also need to be a clearer definition on what play-based learning implies and the different applications of it in guided play, free play and semi-guided play.

Resource limitation were also a significant barrier to the adaptation of this pedagogy in the school realm. Structural constraints, such as adult-to-child ratios and class sized,



significantly impact the potential and effectiveness of PBL in the classroom Joan Martlew and Ellis (2011) Bubikova-Moan et al. (2019). Teacher say they have difficulties in responding to each individual children's interest and needs with ratios half of what it is in the preschool PBL setting. There is also a scarcity of staff qualified enough to implement PBL strategies into the elementary school system, there needs resources into training. Funding in general was reported as a hinder of the structural implementation of PBL across educational settings Hunter and Walsh (2014b)Bubikova-Moan et al. (2019).

One of the most significant challenges highlighted by our review involves the measurement of student progression in the context of PBL in primary school. As mentioned in the second article Joan Martlew and Ellis (2011), teachers expressed concerns about the difficulty of assessing learning without the traditional way of doing it. In today's traditional primary education, measurement relies on quantifiable and observable assessments, such as tests, worksheets, and homework, where there often is a correct way of doing things, which provides concrete evidence of a student's learning journey. However, the play-based learning approach emphasizes cultivating creativity, fostering social skills, and exploring, which makes it difficult to use such straightforward measurements. This barrier does not only hinder the integration of PBL into the curriculum but also affect the knowledge of educational value inherent in various forms of play-based learning and the children's appreciation seeing their tangible growth in it. As mentioned by one of the article, this calls for standardized measurement tools and methodologies to evaluate the educational benefits and progression of students engaged in PBL.

The role of teacher within PBL environments presents its own set of challenges, affecting how they can facilitate children's learning and development effectively. Teachers need to maintain a balance between being a leader, being involved in the play, co-participation and noticing each individual. This requires timely and skillful intervention Bubikova-Moan et al. (2019). Keeping this balance is important to enhance the learning while respecting that

all children are different and need their own space to grow Hunter and Walsh (2014b). However, defining their role in a PBL environment often leads to problems, especially in maintaining non-intrusive interactions.

### **Future work**

While the body of research on play-based learning has primarily focused on children in kindergarten and early childhood settings, there is growing recognition of its potential applicability and benefits for older children as well in primary school and beyond. However, significant gaps remain in our understanding of how play-based approaches can be effectively implemented and optimized to meet the developmental needs of older learners. As such, future research endeavors should seek to address these gaps and explore the untapped potential of play-based learning across various age groups and educational contexts. We recommend that future studies focus on the benefits in development in older children and explore new ways in which play-based learning can be implemented.

## Conclusion

This thesis has investigated the impact of play-based learning on the developmental domains of elementary school children and examined the substantial barriers to its implementation. Our systematic review confirms that PBL not only supports significant gains in cognitive function, social competence, and emotional resilience but also aligns with key developmental theories, providing a robust educational approach that addresses the holistic development of children. However, the effective implementation of PBL faces notable challenges, including the lack of standardized assessment tools, inadequate teacher training, and misalignments with current educational policies. Addressing these challenges requires a concerted effort to refine educational strategies and develop supportive policies that foster an environment conducive to play-based methodologies. Future research should focus on overcoming these barriers, exploring innovative assessment tools, and further investigating the long-term impacts of PBL across various educational settings. By continuing to adapt and evolve educational practices to include play-based learning, we can ensure that the educational system not only meets the academic needs of students but also nurtures their innate capabilities for growth, discovery, and joyful learning.

## References

- Ali, E., Constantino, K. M., Hussain, A., & Akhtar, Z. (2018). The effects of play-based learning on early childhood education and development. *Journal of Evolution of Medical and Dental Sciences*, 7(43), 6808–6811.
- Anderson, R. D. (2004). Germany and the humboldtian model. *European Universities from the Enlightenment to 1914*, 51–65.
- Bromberg-Martin, E. S., Matsumoto, M., & Hikosaka, O. (2010). Dopamine in motivational control: rewarding, aversive, and alerting. *Neuron*, 68(5), 815–834.
- Bubikova-Moan, J., Næss Hjetland, H., & Wollscheid, S. (2019). Ece teachers' views on play-based learning: A systematic review. *European Early Childhood Education Research Journal*, 27(6), 776–800.
- D'Angour, A. (2013). Plato and play: Taking education seriously in ancient greece. *American Journal of Play*, 5(3), 293–307.
- Dewey, J. (1910). *How we think*. D.C. Heath Co Publishers.
- Garneli, B., Giannakos, M. N., Chorianopoulos, K., & Jaccheri, L. (2013). Learning by playing and learning by making. In *Serious games development and applications: 4th international conference, sgda 2013, trondheim, norway, september 25-27, 2013. proceedings 4* (pp. 76–85).
- Held, S. D., & Špinka, M. (2011). Animal play and animal welfare. *Animal behaviour*, 81(5), 891–899.
- Hong, S. B., Shaffer, L., & Han, J. (2017). Reggio emilia inspired learning groups: Relationships, communication, cognition, and play. *Early Childhood Education Journal*, 45, 629–639.
- Hunter, T., & Walsh, G. (2014a). From policy to practice?: The reality of play in primary school classes in northern ireland. *International Journal of Early Years Education*, 22(1), 19–36.

- Hunter, T., & Walsh, G. (2014b). From policy to practice?: the reality of play in primary school classes in northern ireland. *International Journal of Early Years Education*, 22(1), 19-36. doi: 10.1080/09669760.2013.830561
- Imsen, G. (2020). *Elevenes verden : innføring i pedagogisk psykologi* (6. utgave. ed.). Oslo: Universitetsforlaget.
- Joan Martlew, C. S., & Ellis, J. (2011). Play in the primary school classroom? the experience of teachers supporting children's learning through a new pedagogy. *Early Years*, 31(1), 71-83. doi: 10.1080/09575146.2010.529425
- Johansson, J.-E. (2018). Faw fröbel 1782–1852. *International handbook of early childhood education*, 1323–1345.
- Lillard, A., & Else-Quest, N. (2006). Evaluating montessori education. *science*, 313(5795), 1893–1894.
- Macintyre, C. (2016). *Enhancing learning through play: A developmental perspective for early years settings*. Routledge.
- Moeller, J., Brackett, M. A., Ivcevic, Z., & White, A. E. (2020). High school students' feelings: Discoveries from a large national survey and an experience sampling study. *Learning and Instruction*, 66, 101301.
- Parke, R. D. (2020, 01). *Social development*. Oxford University Press. Retrieved from <https://oxfordre.com/psychology/view/10.1093/acrefore/9780190236557.001.0001/acrefore-9780190236557-e-520> doi: 10.1093/acrefore/9780190236557.013.520
- Parker, R., Thomsen, B. S., & Berry, A. (2022). Learning through play at school—a framework for policy and practice. In *Frontiers in education* (Vol. 7, p. 751801).
- Pyle, A., & Danniels, E. (2017). A continuum of play-based learning: The role of the teacher in play-based pedagogy and the fear of hijacking play. *Early Education and Development*, 28(3), 274-289. doi: 10.1080/10409289.2016.1220771
- Seavoy, R. (2013). *An economic history of the united states: From 1607 to the present*.

Routledge.

Siddaway, A. (2015). *How to do a systematic literature review and meta-analysis*.

Siegler, R. S., DeLoache, J. S., & Eisenberg, N. (2003). *How children develop*. Macmillan.

Taylor, M. E., & Boyer, W. (2020). Play-based learning: Evidence-based research to improve children's learning experiences in the kindergarten classroom. *Early Childhood Education Journal*, 48, 127–133.

Teigen, K. H. (2015). *En psykologihistorie*. Fagbokforlag.

Van Horn Melton, J. (2003). *Absolutism and the eighteenth-century origins of compulsory schooling in prussia and austria*. Cambridge University Press.

Vogt, F., Hauser, B., Stebler, R., Rechsteiner, K., & Urech, C. (2020). Learning through play—pedagogy and learning outcomes in early childhood mathematics. In *Innovative approaches in early childhood mathematics* (pp. 127–141). Routledge.