Play-based learning: Evidence-based research to improve children's learning experiences in the kindergarten classroom

Meaghan Elizabeth Taylor and Wanda Boyer

2020

Play-Based learning: Evidence-based research to improve children's learning experiences in the kindergarten classroom

Meaghan Elizabeth Taylor and Wanda Boyer

University of Victoria

Authors Note

Meaghan Elizabeth Taylor, Sooke School District #62, Elementary Classroom Teacher, British Columbia, Canada

Wanda Boyer, Ph.D., University of Victoria, Victoria, British Columbia, Canada

Correspondence concerning this article should be addressed to:Wanda Boyer, Department of Educational Psychology and Leadership Studies, University of Victoria, 3800 Finnerty Road (Ring Road), P.O. Box 1700 STN CSC, Victoria, British Columbia, V8W-2YC. Email: wboyer@uvic.ca Tel: (250) 721-7814. Fax: (250) 721-6190.

Play-Based learning: Evidence-based research to improve children's learning experiences in the kindergarten classroom

Educators are facing the challenge of integrating important academic standards into developmentally appropriate learning experiences. In response to these challenges, contemporary researchers have found that the amount of time children in kindergarten participate in play is decreasing while direct academic instruction is increasing (Pyle & Danniels 2017).

Play-based learning (PBL) unifies play and educational pedagogy. PBL is child-centered and focuses on children's development, interests and abilities through engaging and developmentally appropriate structuring of academic learning experiences (Pyle & DeLuca, 2017). The essential purpose of PBL is for children to learn while playing. Pyle and Danniels (2017) conducted a case study which set out to determine how to effectively balance child free-play and academically focused adult-structured play in the classroom. Pyle and Danniels (2017) found PBL shows more effective and deeper learning experiences for students than direct instruction and 'free play'. PBL gives students the "freedom to explore, to make mistakes, to investigate, and to try trial and error" (Pyle & Danniels, 2017, p. 280), accentuating their learning experience.

This paper explores the theoretical frameworks and historical research that have shaped PBL, the different types of play, the social and academic benefits of PBL, and the ways in which educators can facilitate, support, assess, and employ technology to enhance PBL. The authors will conclude by reflecting on how teaching practices can be informed by evidence-based research to improve children's learning experiences in the kindergarten classroom.

Theoretical Frameworks in Current PBL Literature

Constructivist, socio-developmental theory, and sociocultural theories have impacted PBL and the way educator's view children's learning and development. Piaget's constructivist theory has influenced PBL research and formulation (Bodner, 1986). The important part of the constructivist theory is that it emphasizes play as an important construct necessary for cognitive growth and development. Additionally, the constructivist paradigm is based on Piaget's theory of cognitive development indicating that "play incorporates sensory-motor or intellectual practice play and becomes to some extent constructional" (Piaget, trans. 1951). Children acquire concepts through active involvement and interaction with their environment and construct their own knowledge through this exploration.

Pyle and DeLuca's (2017) empirical study set out to advance insight on how educators can best implement PBL while appropriately assessing students' learning. Pyle and DeLuca (2017) highlight that the contemporary processes and use of assessment is embedded in the socio-developmental theory of learning. The socio-developmental theory of learning specifically emphasizes that in "a child of preschool age, action is initially dominant over meaning and is incompletely understood. The child is able to do more than he can understand" (Vygotsky, 1979/1966, p. 100). Advocates of the socio-developmental theory of learning underscore the importance and the influence that the classroom context and social interactions has on student learning. Specifically, with clear identification of what the child can do, what the child can do with help, and what he observes he needs help with (Vygotsky, 1979/1966).

In their qualitative case study, Nolan and Paatsch (2017) examined PBL implemented in a kindergarten classroom and discussed its use based on a sociocultural theoretical framework. Sociocultural theory, which stemmed from early Vygotskian work, suggests learning is largely a

social process. Sociocultural theory emphasizes that individual learning and development is heavily influenced by the culture in which the individual lives amongst and the interactions they participate in and observe within their society. It is believed that through play, children grow their conceptual abilities, knowledge of the world, and abstract thought. "The child moves forward essentially through play activity. Only in this sense can play be considered a leading activity that determines the child's development" (Vygotsky, 1979/1966, p. 103). Vygotsky's theory stresses the importance of play in learning and suggests educators use this framework to provide opportunities for play learning experiences and each child's development.

Historical Influences and Research on Play-Based Learning

Play is no modern phenomena in educational research and practice. Friedrich Froebel (1782-1852) anticipated the work of Vygotsky by considering the free-flowing nature of play, play as a cognitive processing mechanism for integrating learning, and a way of "seeing play as the highest form of learning" (Bruce, 2012, p. 13). Froebel was deeply committed to developing adults' understanding of young children's learning in natural pre-school settings. Froebel created and named the first kindergarten environment "referred to him as a 'paradise garden'… and directly translated [from German] as 'children's garden' or a 'garden for children'" (Nicole & Taplin, 2018, p. xv). Each child was given the responsibility of caring for a plot in a garden so as to stimulate their prior understandings and knowledge about their world and provide continuous learning opportunities to develop their "knowledge about the wider community" (Hoskins & Smedley, 2019, p. 76).

Rudolf Steiner (1861-1925), another influential thinker, emphasized the necessity of matching the content and activity as a way to meet individuals' learning needs appropriately and in a way that children understand. "Steiner practitioners advocate that what children

unconsciously choose to play and how they choose to play meets their needs" (Nicole & Taplin, 2018, p. 70). To support this playful learning, Steiner noted the importance of *natural play material* such as those seen in the child's physical environment depending on the geographic location of this child's world such as "wood, cotton, silk – not plastic, nylon" (Nicol & Taplin, 2018, p. 14). Rudolf Steiner in Lecture Five, Dornach, April 19, 1923 accentuated the belief that the child is a sense organ and receives sensory impressions and exerts preferences based on the child's activity needs or a will force. As a result, "from birth until the change of teeth- the child lives like one great multi-faceted sense organ, but as a sense organ where will forces were working in every moment of life (Steiner, 1923, trans.1996, p. 99). According to current thinking, play can become that moment for children with time, space, natural materials, and a receptive and respectful adult educator acting as a play facilitator (Nicol & Taplin, 2018).

Further contributions have been made by Maria Montessori (1870-1952) to support "each child's education having freedom of choice [within learning content parameters], and the exercise of will and deep engagement, leading to concentration" (Bruce, 2012, p. 15). Maria Montessori spoke about the importance of the child's contributions to society and that within the learning environment an essential condition was "for the task to arouse such an interest that it engages the child's whole personality…and [would guide us as educators] to organize a world of 'progressive interest' " (Montessori, 1949/1984, trans. 1958, p. 206).

With these historical and theoretical foundations, it became possible for researchers to systematically consider the qualitative and quantitative benefits of play in learning experiences (Mukherji & Albon, 2018). Play and learning through play has been researched steadily and dates to as early as Vygotsky's era (1996-1934). The struggle for educators to implement a developmentally appropriate pedagogy in their classroom while contending with academic

standards has been relevant since Goldstein's (1997) literature. Lev Vygotsky (1967), who made significant contributions to psychology throughout his career, wrote a conceptual paper discussing the theories of child play and mental development. This paper illustrated his ideas of play as a cognitive process but lacked empirical evidence. Later on, more experimental studies began to take place throughout the 1990's. Vukelich (1994) conducted an experimental study to determine how interaction and exposure attributed to environmental print knowledge. Vukelich (1994) found that adult interaction during play "arranged the situation so the problem to be solved was just beyond what the child could do alone" (p. 166) emphasizing that adult guidance positively extends the child's learning capacity.

Types of Play

Researchers to date have found it challenging to specifically define what play entails in PBL in the classroom. However, Pyle and Danniels' (2017) study outlines a detailed continuum model from child-directed play to teacher-directed play. These authors in their study, provide a figure that presents the types of play on a visual spectrum. Pyle and Danniels (2017) in their figure, have located on the far-left side, as child-directed as can be, is free-play. Free play is apparent when children have unlimited choice and flexibility and are able to direct their own play, which is most often pretend or imaginative. According to Pyle and Danniels (2017), to the right of free-play is inquiry play, a mixed method between inquiry learning and play, which is initiated based on students' interests but also child-directed. Essentially, the learning opportunity generates from students' interest in a phenomenon and the educator extends their play by incorporating related academic learning and skills. Directly in the middle of the continuum is collaboratively designed play. This type of play is structured and controlled by both the students and the educator. The educator helps create a theme or learning environment based on students'

interest and incorporates academic learning opportunities as appropriate. Next is playful learning which occurs when educators intend to explicitly teach academic content or skills that would not naturally occur but do so in a playful and engaging manner. Lastly, on the right of the continuum is learning through games where children are intentionally learning academic content or skills through playing games.

In terms of academic learning through PBL, adult-guided play transpires as a middle ground between free play and direct instruction. In relation to the play continuum, the most effective implementation method would lay around collaborative play. Children still have the freedom and choice to direct their own play, however the educator's role is then to facilitate conversation, play along, offer questions to consider different perspectives, and provide ways in which to continue the play or how to use available materials to extend the play. In terms of academic, cognitive, and social-emotional skill development, this adult-guided, collaborative play is found to be the most effective and most supportive implementation model.

It is important to note that research is just beginning to investigate children's perspectives of play. In fact, it has been found that children interpret an activity as play only if they feel they have autonomy and ownership in the activity. Whereas children believe they are learning if there is prominent educator presence within the activity (Pyle & Alaca, 2018). It was also noted that children perceive an activity as a learning experience if it takes place at a table compared to if an activity is on the floor where it is more likely to be perceived as play.

Social Benefits of Play

Prior research has found a correlation between play and the development of social-emotional skills among children. Nolan and Paatsch (2017), Pyle and DeLuca (2017), and Pyle and Alaca (2018) have all conducted research finding social skill benefits resulting from PBL.

Communication skills, routines of conversation, and oral vocabulary are extensively developed through play, experiences, and interactions with other peers and educators. Play also enhances children's self-regulation skills by learning how to regulate their behaviour and emotions during play with peers (Pyle & DeLuca, 2017). During these interactions, children could have the opportunity to practice using language to express, communicate, and share their ideas and feelings with their peers. These play opportunities explicitly teach children the social norms and rules of play, such as taking turns, transitions, sharing materials, and taking responsibility and cleaning up post play.

PBL also creates experiences for students to learn how to collaborate and work together towards a common goal developing regulation of learning skills. Interactions with peers through play increases children's ability to problem solve and resolve conflicts in a manner that will transfer to real-life contexts. Play creates opportunities for children to build confidence and problem-solving skills, collaborate with peers, communicate and express their ideas and feelings, and regulate their own behaviour, emotions, and learning (Nolan & Paatsch, 2018).

Academic Learning Through Play

Many educators believe play is dichotomized from academic learning (Pyle & Danniels, 2017), that learning only occurs during direct instructional events, and play is simply for enjoyment. However, vast research continues to prove the ample academic gains achieved through play. Play can be considered as a vehicle to drive curricular competencies, such as literacy and numeracy skills. Play provides experiences that can also extend academic learning by allowing students to build on their prior knowledge, experiences, and skills through interactions with peers and their environment (Pyle & Danniels, 2017).

In particular, mathematical competency in kindergarten has been found to be "the strongest predictor for later school achievement" (Vogt, Hauser, Stebler, Rechsteiner, & Urech, 2018, p. 590). Children who have low mathematical competency in kindergarten are at higher risk to have trouble in mathematics throughout their educational career. Much of the kindergarten mathematical competencies focus on hands-on manipulation of objects to strengthen concrete thinking before students are expected to use abstract thinking. Vogt et al. (2018) conducted a comparative quasi-experimental study which compared a PBL approach and a teacher-led training programme along with a control group to determine mathematical competency gains from the different pedagogies. The PBL group showed higher learning gains, especially for lower-achieving students. Whereas, the training programme group demonstrated only slightly higher learning gains than the control group.

To support PBL in the classroom, during a math exploration experience, kindergarten children could work in small groups to explore 3-D shapes. One kindergarten student at a time could close their eyes to explore the 3-D shape using their sense of touch etc. to note the distinctiveness of this shape. The educator (with group members joining in) could ask what the 3-D object feels like, where have they felt this before, do they like the feel and shape of this 3-D object? Each child could be asked if they do know where have they felt this shape before (at home, school, community)? Where might they see this shape at home, at school, or in the community?

The varied levels would be represented not in the different questions but, in the different levels of responses from the children. If a child is unable to conjecture or reflect where they have felt this shape before or where they might see this shape again perhaps the educator could take them on a walk around the classroom and ask them to feel different shapes and see if they match

the original shape. Perhaps if children are having a hard time connecting the shape to something they have seen, then they could go on a classroom shape hunt. If children can only think of where they might see the shape at school and home, then perhaps they could take a community walk and hunt for shapes in the community collaboratively. Along with increasing students' math scores, PBL has also been credited to increase students' reading scores (Pyle & Danniels, 2017).

Contemporary researchers have examined children's perspectives on the relationship between play and learning and found that symbolic play, using objects, actions, or ideas to represent other objects, actions, or ideas, is "predictive of later verbal comprehension and expressive language abilities" (Pyle & Alaca, 2018, p. 1064). The classroom is a valued learning context for all students. As children in their kindergarten class learn new words to demonstrate excitement and pleasure, PBL could be used. The educator could prompt children to choose their favorite unfamiliar word and bring the word to life. The educator could gently prompt /ask what would the word look like if it could come to life? Could the word become a play object? How could this play object be used? For example, a child might hear the word and see the word fantastic and the educator could gently prompt the child to think of when they heard the word and what the word might look like if it could be brought to life to become a toy. Collaboratively they might think of a 'large colorful fan that could be used to cool us down after rest time'.

PBL could be used to promote equal access to learning regardless of students' abilities and backgrounds as seen on the Opal Montessori School (MacKay, 2019) "Starting with Story Workshop." Children use objects (shells, beads, flowers, bottle caps, little wooden people shape figures, play dough, etc. to build a story on a place mat. And they play out their story with their hands. Their intention is to take everyday materials and for children to use them imaginatively to

create a story. The intent of this exercise is that later on they can document their story either through video, writing, or drawing a picture.

Educator's Role During Play

Educators face the challenge of balancing academic learning, using developmentally appropriate implementation practices, and determining how and when to integrate play into the daily kindergarten program (Pyle & Bigelow, 2014). In a qualitative case study methodology, researchers investigated educators' approaches to implementing PBL in kindergarten classrooms and how their conceptions of play are influenced (Pyle & Bigelow, 2014). The results showed that each classroom educator implemented play in their daily program differently based on their personal belief of the purpose of play and their conception of their role during students' play.

Pyle and Alaca (2018) also found that the perception educators have of play affected the type of play they constructed in their classroom. Educator identification and impression of the importance of play during early childhood education impacts how, when, and how much educators implement PBL in their classroom. Further, the type of play implemented in the classroom influences the orientation students have on play and learning as separate or related constructs. Overall, children's perspectives of play and learning aligns with their classroom experience. Therefore, it is important that educators are being thoughtful and intentional in the way they integrate play and PBL in their classroom environment.

Structuring learning opportunities through play.

In terms of structuring learning opportunities through play, Vogt et al. (2018) outlined four essential factors for educators to consider. First, the academic content which is intended to be learned needs to be part of the logistics of the activity or game. Secondly, the experience needs to be presented in a way in which children can understand. Thirdly, the content and

activity must stimulate prior knowledge and continuous learning for children. Lastly, and most importantly, the content and activity needs to fit individuals' learning needs appropriately.

While students are participating in PBL experiences, the educator has a very important role to be actively observing, assessing, and acting on opportunities to extend students' learning. In this role, the educator can be viewed as a guide to prompt students' play, open their perspectives, and further the learning opportunities. Previous research has found that the educator interacting during children's play can increase the duration and intricacy of the play (Pyle & Alaca, 2018).

Assessment of learning through play.

Assessment in primary classrooms has begun to shift from standardized testing determining developmental readiness, towards developmentally appropriate assessment of academic competency (Pyle and DeLuca, 2017). Although PBL has been proven to be an effective learning approach, assessing students' learning during PBL is an on-going challenge for educators. In a qualitative study using survey methodology Pyle and Deluca (2017) set out to advance insight on how educators can appropriately assess students' learning during PBL experiences. Pyle and DeLuca (2017) found that there was a misalignment between educator's perspectives of the purpose of play, how they implement play in their classroom, and what skills and abilities they assess during play. Pyle and DeLuca (2017) asserted that first identifying the type and purpose of play and learning should be considered before setting out to assess for that learning. This construction of learning through play also needs to be in place before selecting tools to assess learning. In terms of measures or tools to use to assess learning during PBL, Pyle and DeLuca (2017) established that anecdotal notes, checklists, photos, and iPads were found to be both useful and effective tools to support assessment during PBL.

Integrating technology in play-based learning.

Miller (2018) conducted an experimental research study to determine the impact of interactive technology on kindergarten students' mathematical learning though a PBL environment. In this study Miller (2018), used four iPads with several language arts and mathematics applications which aligned with the curriculum, to develop one group of kindergarten children's number sense competency. This intervention group received two weeks of using the iPads to learn numeracy concepts. Students would be introduced to a specific application (app) with time after to play with the app. Later, and after the exploration play time, students could freely choose which app they preferred to play with for the remaining time. Of the fifteen applications introduced, application activities included number drawing, subitizing, sorting, counting, patterns, addition, subtraction, comparing quantities, and more. The control group continuously participated in traditional play-based learning activities focused on numeracy development. Afterward the initial intervention, the control group then received the two-week intervention with the iPads to ensure equal learning opportunity for all the students and validity of the studies results (Miller, 2018).

Miller (2018) found that incorporating iPads into the collaborative learning experiences in the classroom revealed gains in student achievement. Interactive technology as play activities in the classroom reportedly showed improved motivation and supported both small group learning, social interaction, and independent work. For example, students in this study were more apt to collaborate with one another, share what they were doing on their screen, and help each other when needed (Miller, 2018).

Another example of integrating technology into the kindergarten classroom involves children sharing their iPads or iPods in partners or small groups. These kindergarten students

could ask one another to check their work before pressing the ‘next’ button. They could compare progress on the game features not as a competitive response. Instead children could be ‘ ‘techsperts’ (technology experts) who strategize how to solve the word or math problems together like ‘Information Technology’ experts on a team do when they need help and can’t solve a problem alone. In addition to the example above, iPads are often used for children to document their learning through taking pictures, videos, or recording on applications such as Fresh Grade, Flip Grid, and ClassDojo. These applications are forums where students can post their learning, share comments, ask questions, and build the connections between school and home.

Other forms of technology that can be integrated into a PBL environment include Chromebooks, iPods, interactive whiteboards, and cameras. Chromebooks are most often used for student inquiry projects which allow students to research a topic, generate questions, record information, and present their learning all online. An iPod is a tool that supports student learning similarly to an iPad where students can access applications or use the camera or video to record their learning and experiences. An interactive whiteboard is a touchscreen connected through a computer allowing students and educators to interact simultaneously. These interactive whiteboards connect online resources to students' fingertips promoting hands-on and collaborative learning.

Technology can be used to directly teach concepts or skills, as seen in Miller’s (2018) study. Technology can also be used to foster collaboration skills, independent learning skills, and provide learning extension opportunities for quick task finishing students.

Conclusions Based on Informed Practice

Based on a knowledge of PBL, two specific shifts can be made to teaching in the primary grades. First, learning in the classroom can become more intentional and purposeful with the type of play an educator introduces and scaffolds (Miller, 2018; Pyle & Bigelow, 2014). PBL not only encapsulates developmentally appropriate experiences for children, but it supports social-emotional learning. In the primary classroom, children are having to experientially learn social norms such as turn-taking, transitions, and routines of conversation. These skills may not be explicitly taught through desk work. However, they can be developed through collaborative group work and play. Intentional practice can include more 'collaborative-play' by incorporating inquiry. Considering children's interests can promote children's active learning and engagement through play. For example, in a science lesson, children may become interested in nature/environmental stewardship and collaboratively work together to clean up a public area near the school and plant a garden to which they tend as a class. In language arts, a kindergarten class could be asked how they could make a difference in their community. This gentle prompt might generate the act of writing a letter to their mayor or county commission or board of supervisors or some stakeholder in community governance in their part of the world to ask permission to clean up a public area. The educator could gently prompt the students to think of why this action of caring for their community is important to them and to their community members. In mathematics, an educator can take students' interest in playing house/store and create a classroom store in which children create art, make baked goods, or make crafts to sell at an open house night or school fair for other students, parents, or community members to participate in and purchase. Through the interest of playing store, the educator can guide learning by making signs and learning about numbers, coins and money.

Secondly, the authors of contemporary research have considered the role of an educator during children's discovery learning. Rather than observing children's play with other children, the authors of this article suggest educators to get more involved in children's play by provoking thinking and prompting questions such as 'what if' to enhance the child's learning process and the use of varied materials at intervals during the play. For example, while children are creating an imaginary city in the sand, the educator could demonstrate their engagement and caring by gently asking the children at times during the sand play: Tell me about your city. What type of city would you prefer? What type of materials would you use to construct your city if it was here in our country? In another country? On the moon? On another planet?

The understanding and practice of PBL is an ongoing learning process for the educator as they learn about the children and each child's learning needs and interests. PBL can support each child's active acquisition of new learning interests and solution-focused exploration of their learning needs. Ultimately, PBL has the potential to support and enhance the relationship between the educator and each child.

References

Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education*, *63*(10), 873-878. doi:10.1021/ed063p873

Bruce, T. (2012). The whole child. Play. In T. Bruce (Ed.), *Early childhood practice: Froebel today* (pp. 5-16). London, UK: SAGE Publication Ltd.

Goldstein, L. S. (1997). Between a rock and a hard place in the primary grades: The challenge of providing developmentally appropriate early childhood education in an elementary school setting. *Early Childhood Research Quarterly, 12*(1), 3-27. doi:10.1016/s0885-2006(97)90039-9

Hoskins, K., & Smedley, S. (2019), Protecting and extending Froebelian principles in practice: Exploring the importance of learning through play, *Journal of Early Childhood Research,17*(2), 73-87. doi: 10.1177/1476718X18809114MacKay, S. H. (2019, September 7). Teaching and learning: Starting with story workshop. Retrieved from https://opalschool.org/starting-with-story-workshop/

Miller, T. (2018). Developing numeracy skills using interactive technology in a play-based learning environment. *International Journal of STEM Education*, *5*(39). doi:10.1186/s40594-018-0135-2

Montessori, M. (1984). *The absorbent mind.* New York, NY: A Laurel Book. Dell Publishing Company.

Mukherji P., & Albon, D. (2018). *Research methods in early childhood. An introductory guide* (3rd ed.). Thousand Oaks, CA: SAGE.

Nicol, J., & Taplin, J. T. (2018). Understanding the Steiner Waldorf Approach. Early years education in practice. (2nd ed.). London: Routledge. doi:10.4324/9781315456577

Nolan, A., & Paatsch, L. (2017). (Re)affirming identities: Implementing a play-based approach to learning in the early years of schooling. *International Journal of Early Years Education*, *26*(1), 42-55. doi:10.1080/09669760.2017.1369397

Piaget, J. (1962). *Play, dreams and imitation in childhood* (C. Gattegno & F. M. Hodgson, Trans.). New York, NY: W. W. Norton & Company Inc.

Pyle, A., & Alaca, B. (2018). Kindergarten children's perspectives on play and learning. *Early Child Development and Care, 188* (8), 1063-1075. doi:10.1080/03004430.2016.1245190

Pyle, A., & Bigelow, A. (2014). Play in kindergarten: An interview and observational study in three Canadian classrooms. *Early Childhood Education Journal, 43*(5), 385-393. doi:10.1007/s10643-014-0666-1

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

Pyle, A., & DeLuca, C. (2017). Assessment in play-based kindergarten classrooms: An empirical study of teacher perspectives and practices. *The Journal of Educational Research, 110*(5), 457-466. doi:10.1080/00220671.2015.1118005

Steiner, R. (1996). Lectures One -Eight by Rudolph Steiner Sunday April 15- Sunday April 22, 1923 (R. Everett & R. Everett Trans. & Ed.). *The child's changing consciousness: As the basis of pedagogical practice*. Hudson, NY: Anthroposophic Press. Retrieved from https://steiner.presswarehouse.com/sites/steiner/research/archive/childs_changing_consciousness/childs_changing_consciousness.pdf

Vogt, F., Hauser, B., Stebler, R., Rechsteiner, K., & Urech, C. (2018). Learning through play – pedagogy and learning outcomes in early childhood mathematics. *European Early Childhood Education Research Journal*, *26*(4), 589-603. doi:10.1080/1350293X.2018.1487160

Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly,9*(2), 153-170. doi:10.1016/0885-2006(94)90003-5

Vygotsky, L. S. (1966). The role of play in development. In the published work by Lev Semyonovich Vygotsky entitled: Problems of psychology. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.), *Mind in Society. The Development of Higher Psychological Processes* (1979, pp. 92-104). Retrieved from http://ouleft.org/wp-content/uploads/Vygotsky-Mind-in-Society.pdf (Original Harvard University Press 1979)

Vygotsky, L. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, 5(3), 6-18. doi:10.2753/RPO1061-040505036

Weston, P. (2000). *Friedrich Froebel: His life, times and significance*. London, UK: University of Surrey Roehampton Institute.