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Learning through Play in Early Childhood: A Systematic Review

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Abstract

Playing is the leading activity in kindergarten education, a unique form of activity that conforms to the age characteristics of preschool children, and an important way to promote the overall and healthy development of children's bodies and minds. This research's purpose was to carry out a literature systematic review on the learning through play in early childhood. This review was estimated on the steps pointed in the PRISMA criteria, as well as new research that merged different research designs. The publications for this study were adopted using two prestige databases: Scopus and Web of Science. This review's four major themes were derived from a thematic analysis, which includes (1) research area, (2) language, and (3) timeline. Thus, the result of this study made several significant additions to the corpus of knowledge for practical reasons. The following findings display the significance of learning through the play method in early childhood: 1) Learning outcomes, 2) Pedagogical, 3) Professional development and 4) Parents' beliefs. The learning outcomes of learning through the play method seem to be a key research topic, while parents' belief is the lacking research topic among scholars. Finally, this paper is concluded with suggestions for future research directions and a call for more diverse research paradigms.

Keywords: Learning Through Play, Early Childhood, Children, Review, SLR

Introduction

Society and daily life are the resource banks for children's learning. The motivation for children's learning comes from playing. The goal of kindergarten education and teaching is to cultivate children's love of learning. Therefore, the content of children's learning cannot be separated from playing, while the kindergarten curriculum should be closely linked with life and the process itself is a part of children's life. If children's material needs are met, they can learn happily during play, receive knowledge, and cultivate good personality qualities.

It can be difficult to determine play (Zosh et al., 2018). The most popular definition of play was provided by UNICEF (2018), stating that 'play should be actively engaging, joyful, meaningful, iterative and socially interactive'. In educational contexts, researchers such as Montessori, Froebel, Piaget, Vygotsky, Erikson, and Bruner have defined learning through play from different perspectives as Table 1.

Table 1
Perspectives of Play

	Perspectives
Friedrich Frobel (1782-1852)	Play is natural learning and children are free to achieve harmony through play.
Maria Montessori (1870-1952)	Play is a children's job.
Jean Piaget (1896-1980)	Children acquire knowledge while exploring the physical world through playing.
Lev Semanovich Vygotsky (1896-1934)	Children build knowledge through social interaction during playing.
Jerome S. Bruner (1976)	Children's involvement in playing activities provides meaningful learning experience.
Eric Erikson (1902-1994)	Children can "project a relevant personal theme on the microcosm of a play table". (Doris B., 2015)

Beyond preschool education, the importance of learning through play strategy are essential to push forward children's involvement, engagement, inclusion, and holistic skills growth (Parker et al., 2022). Another definition by Jay and Knaus (2018); Pyle and Danniels (2017) argued that when the approach to learning is intentionally centred around the children's' experience of play pertains to 'Play based learning'. The Preschool curriculum emphasizes learning through play that crosses all pillars of learning. This strategy was originally guided by NAEYC focusing on the principles of Developmentally Appropriate Practice (ABP) in early childhood schooling.

NAEYC adheres to the principle that learning through play is crucial in developing self-regulation and nurturing children's language, cognitive, and social skills (Gestwicki, 2014) while Marbina et al (2011) explained that experiences are devised and boosted to make effective use of accessible resources and compose child-led, teacher-guided, and teacher-led opportunities. Children make exploration, discovery, and construction of experiences directly and naturally through the process of play. This approach can meet the needs and encourage the development of children from the physical, social-emotional, cognitive, and language aspects to the maximum.

According to the LEGO foundation (2019), learning through play includes the incorporation of free or voluntary play, guided play, constructive play, collaborative play, learning through games, physical and digital games, among others. Similarly, Weisberg et al (2013) have pursued a continuous learning process through play, from free play to guided play through teacher-led play. The main principles of learning through play combine the different spheres of children's life-home, school, society, and the wider world. Adults have an important role in facilitating this continuity and relevance of learning by recognizing, initiating, guiding, and scaffolding playing experience, as a support for children's agency.

Continuity of playful learning in Figure 1 shows different levels of adult-child involvement in a playful experience-at one end, free play gives children the freedom to play, explore and discover; this is evolving towards a more guided or structured game with adult participation. On the other side of the continuum, it is important to ensure that adults are equipped with necessities and appropriate skills to support learning via play-even in the case of free games,

as an adult needs to recognize the benefits of free games and cultivate them by providing time and environment (Pyle et al., 2017).

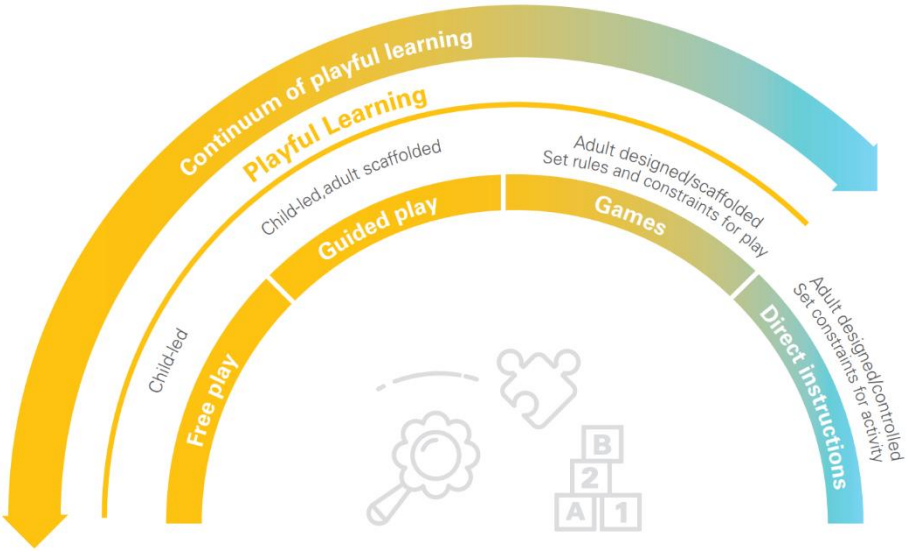

Figure 1. Continuum of Playful Learning (Adapted from Zosh et al., 2017)

In recent years, there has been an increasing amount of literature investigating professional development, policy, and benefits in play (Manal & Mona, 2020; O'Connor et al., 2019; Brandice, 2021). However, past studies indicated that learning through play has not yet been implemented in teaching practice widely as recommended in the Malaysia National Preschool Standard Curriculum (revised 2017). Formal teaching such as direct is still practiced by preschool teachers in Malaysia due to the greater emphasis on students' academic mastery (Norsuhaily et al., 2015). Twelve years ago, Thomas et al (2010) suggested that the gap between Preschool teachers' perceptions of learning through play and the actual situation be addressed.

However, until now, it is believed that there are still gaps between teaching theory and practice. This situation is evidenced by studies conducted by researchers to overcome the challenges faced by early childhood educators. In the call of student-centred teaching, past studies have shown that preschool teachers frequently use teacher-centred teaching to achieve specific academic goals. Such an approach makes teaching and learning less effective since students are rarely allowed to give opinions, express thoughts, and collaborate with friends, besides involving fewer hands-on activities as students only receive input directly from the teacher.

Furthermore, UNICEF listed several factors that caused learning through play not to be deeply integrated into many countries, which include the lack of understanding of the value of play, parental or caregiver misconceptions, curriculum and early learning standards that do not address play, lack of teacher professional development and large class sizes that limit children's freedom to play. There is no denying that the play approach contributes to children's development. This approach is also recognized by psychologists such as Froebel, Piaget, and Vygotsky as an effective method.
Therefore, it is important to implement systematic reviews related to the research of learning through play in early childhood so that directions of research could be developed in the

future. Systematic reviews reflect current research topics, provide updates on research developments, and guide the direction of future research. The result of this study will be able to attract the interest of early childhood educators and researchers. Accordingly, this review is guided by the following research questions

1/ What are the methodological trends in studies on learning through play in early childhood?
2/ What are the key research themes explored in the literature on learning through play in early
childhood?
3/ What are the content areas, educational contexts and playing elements are embedded in learning through play in early childhood?
4/ What are the educational outcomes in learning through play in early childhood?

Material and Methods

i/ Identification

In choosing several suitable papers for this report, the systematic review process consists of three main phases. The first step is keyword recognition and the quest for linked, similar terms based on the thesaurus, dictionaries, encyclopaedia, and previous studies. Accordingly, after all the relevant keywords were decided, search strings on Scopus and WoS (see Table 2) database have been created. In the first step of the systematic review process, the present research work successfully retrieved 2247 papers from both databases.

Table 2
The search string

Scopus	**TITLE-ABS-KEY ((learning AND through AND play OR play AND based AND learning) AND (early AND child OR preschool OR kindergarten)) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))**
WoS	((TI= (((learning AND through AND play OR play AND based AND learning) AND (early AND child OR preschool OR kindergarten)))) OR AB= (((learning AND through AND play OR play AND based AND learning) AND (early AND child OR preschool OR kindergarten)))) OR AK= (((learning AND through AND play OR play AND based AND learning) AND (early AND child OR preschool OR kindergarten)))

ii/ Screening

Duplicate papers should be excluded in the process of the first step of screening. The first phase omitted 13 articles, yet the second phase screen 394 articles based on several inclusion and exclusion criteria developed by researchers. Literature (research articles) was the first criterion because it is the primary source of practical information. It also includes the exclusion from the existing study of publication in the form of systematic review, review, meta-analysis, meta synthesis, book series, books, chapters, and conference proceedings. Moreover, the review centralized exclusively on papers written in English. It is necessary to note that the schedule was chosen for a three-year duration (2019-2021). Otherwise, only studies carried out in Social Science and final publication stage have been selected to conform to the analysis objective. In all, 1853 publications based on parameters were excluded. Table 3 lists the criteria for exclusion and inclusion:

Table 3
The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Spanish, French, German
Timeline	2019 - 2021	< 2018
Literature type	Journal (only research articles)	Journal (book chapter, conference proceeding)
Subject Area	SOCI	Besides CS, M, E
Publication Stage	Final	In Press

iii/ Eligibility

For the third step, known as eligibility, a total of 381 articles have been ready. All articles' titles and key content were thoroughly reviewed at this stage to assure that the inclusion requirements were fulfilled and fit into the present study with the current research aims. Therefore, 307 reports were omitted because they were not pure science articles based on empirical evidence. Finally, 74 articles are available for review. The flow diagram for the investigation is describe in Figure 2.

Figure 2. Flow Diagram of the proposed searching study (Moher et al., 2009)

Table 4
The research article finding based on the proposed searching criterion

No	Authors	Title	Source title	Scopus	WoS
1	Matsui (2021)	Reflection on the Professional Development of Early Childhood Education and Care Teachers in Japan Based on Children's Voices	International Journal of Early Childhood	/	/
2	Lindeman et al. (2021)	Digitalisation in early childhood education: a domestication theoretical perspective on teachers' experiences	Education and Information Technologies	/	/
3	Bers (2021)	Coding, robotics, and socio-emotional learning: Developing a palette of virtues	Pixel-Bit, Revista de Medios y Educacion	/	/
4	Tang et al. (2021)	Unveiling Malaysian parents' perspectives on existing quality of early childhood care and education	Perspektivy Nauki i Obrazovania	/	
5	O'Keeffe & McNally (2021)	'Uncharted territory': teachers' perspectives on play in early childhood classrooms in Ireland during the pandemic	European Early Childhood Education Research Journal	/	/
6	Carolan et al. (2021)	Families' Experiences of a Universal Play-based Early Childhood Program in Nova Scotia: Implications for Policy and Practice	Journal of Research in Childhood Education	/	/
7	Campbell (2020)	Teaching phonics without teaching phonics: Early childhood teachers' reported beliefs and practices	Journal of Early Childhood Literacy	/	/
8	Reikerås (2020)	Relations between play skills and mathematical skills in toddlers	ZDM-Mathematics Education	/	/
9	King et al. (2020)	Promoting children-nature relations through PBL in ecotourism sites	Journal of Teaching in Travel and Tourism	/	/
10	Bose & Bäckman (2020)	Specialised education makes a difference in preschool teachers' knowledge bases in the teaching of mathematics and science: A case of Botswana and Sweden	South African Journal of Childhood Education	/	/
11	Dzamesi & van Heerden (2020)	A professional development programme for implementing indigenous play-based pedagogy in kindergarten schools in Ghana	South African Journal of Education	/	/
12	Nakawa (2020)	Proposing and modifying guided play on shapes in mathematics teaching and learning for Zambian preschool children	South African Journal of Childhood Education	/	/
13	Atakpo (2020)	Early childhood developmental experiences as a tool for combating future security challenges in Nigeria	Journal of Educational and Social Research	/	
14	Kewalramani et al. (2020)	Children's engineering design thinking processes: The magic of the ROBOTS and the power of BLOCKS (electronics)	Eurasia Journal of Mathematics, Science and Technology Education	/	
15	Vanbecelaere (2020)	The effects of two digital educational games on cognitive and non-cognitive math and reading outcomes	Computers and Education	/	
16	Josephidou (2020)	A gendered contribution to play? Perceptions of Early Childhood Education and Care (ECEC) practitioners in England on how their gender influences their approaches to play	Early Years	/	
17	Ramani & Scalise (2020)	It's more than just fun and games: Play-based mathematics activities for Head Start families	Early Childhood Research Quarterly	/	

18	Sakr & Scollan (2019)	The screen and the sand-timer: The integration of the interactive whiteboard into an early years free-flow learning environment	Journal of Early Childhood Research	/	/
19	Outhwaite et al (2019)	Raising early achievement in math with interactive apps: A randomized control trial	Journal of Educational Psychology	/	/
20	Kewalramani & Havu (2019)	Preschool teachers' beliefs and pedagogical practices in the integration of technology: A case for engaging young children in scientific inquiry	Eurasia Journal of Mathematics, Science and Technology Education	/	
21	Moe (2019)	How to teach kindergarten teacher education students about play? The perspective of academic pedagogy teachers	Universal Journal of Educational Research	/	
22	Yin et al (2021)	What Facilitates Kindergarten Teachers' Intentions to Implement Play-Based Learning?	Early Childhood Education Journal		/
23	Keung & Fung (2020)	Exploring kindergarten teachers' pedagogical content knowledge in the development of play-based learning	Journal of Education for Teaching		/
24	Rodriguez (2021)	Could that be Play? Exploring Pre-service Teachers' Perceptions of Play in Kindergarten	Early Childhood Education Journal		/
25	Keung & Cheung (2019)	Towards Holistic Supporting of Play-Based Learning Implementation in Kindergartens: A Mixed Method Study	Early Childhood Education Journal		/
26	Hesterman & Targowska (2020)	the status-quo of play-based pedagogies in Western Australia: Reflections of early childhood education practitioners	Australasian Journal of Early Childhood		/
27	Wu (2019)	Researching children's learning and play in a Chinese context: children's perspectives on their play and learning	European Early Childhood Education Research Journal		/
28	Catalano & Campbell (2021)	The occurrence of pretend play in early childhood education in Romania-an investigative study	Early Child Development and Care		/
29	Leung et al. (2020)	Video art as digital play for young children	British Journal of Educational Technology		/
30	Wu (2021)	A co-constructed picture of learning in play by teachers and parents	Journal of Early Childhood Research		/
31	Duncan et al. (2020)	eLIPS: Development and Validation of an Observational Tool for Examining Early Language in Play Settings	Frontiers in Psychology		/
32	Walsh et al. (2019)	`It's teaching...but not as we know it': using participatory learning theories to resolve the dilemma of teaching in play-based practice	Early Child Development and Care		/
33	Cohrssen & Niklas (2019)	Using mathematics games in preschool settings to support the development of children's numeracy skills	Mathematics Education Research Journal		/
34	Pollitt et al (2020)	Assessing spatial reasoning during play: educator observations, assessment, and curriculum planning	Mathematics Education Research Journal		/
35	Vogt & Hollenstein (2021)	Exploring digital transformation through pretend play in kindergarten	British Journal of Educational Technology		/
36	Abdi & Cavus (2019)	Developing an Electronic Device to Teach English as a Foreign Language: Educational Toy for Pre-Kindergarten Children	International Journal of Emerging		/

			Technologies in Learning	
37	Halimah et al (2020)	Storytelling through ``Wayang Golek'' puppet show: Practical ways in incorporating character education in early childhood	Cogent Education	/
38	Aksoy & Baran (2020)	The Effect of Story Telling-Based and Play-Based Social Skills Training on Social Skills of Kindergarten Children: An Experimental Study	Egitim Ve Bilim-Education and Science	/
39	Hyun et al. (2021)	I See Why They Play: Chinese immigrant parents and their beliefs about young children's play	Early Childhood Research Quarterly	/
40	Subaramaniam & Mon (2020)	Understanding the requirement of a 3D aided augmented reality mobile app dictionary for children	International Journal of Technology Enhanced Learning	/
41	Lange & Sareh (2021)	Using Number Games to Support Mathematical Learning in Preschool and Home Environments	Early Education and Development	/
42	Theodotou (2020)	An empirical study comparing different art forms to develop social and personal skills in early years education	Education 3-13	/
43	Gomes & Fleer (2019)	The Development of a Scientific Motive: How Preschool Science and Home Play Reciprocally Contribute to Science Learning	Research in Science Education	/
44	Li et al (2021)	Studying teacher professional development: how a Chinese kindergarten teacher brings play practices into the program	Early Years	/
45	Gibb et al (2021)	Promoting Executive Function Skills in Pre-schoolers Using a Play-Based Program	Frontiers in Psychology	/
46	Timmons et al (2021)	The Impacts of COVID-19 on Early Childhood Education: Capturing the Unique Challenges Associated with Remote Teaching and Learning in K-2	Early Childhood Education Journal	/
47	Alkhede & Holmqvist (2021)	Preschool Children's Learning Opportunities Using Natural Numbers in Number Row Activities	Early Childhood Education Journal	/
48	Zhu et al (2021)	Mathematical beliefs and self-reported practices of Chinese early childhood teachers in the context of teaching mathematics during block play	European Early Childhood Education Research Journal	/
49	Karabon (2019)	The use of mathematics in early childhood classroom transitions to foster co-construction of knowledge, negotiation, and cultural mediation	Learning Culture and Social Interaction	/
50	Howe et al (2021)	Scotland Embarks on a National Outdoor Play Initiative: Educator Perspectives	Early Education and Development	/
51	Egan & Beatty (2021)	To school through the screens: the use of screen devices to support young children's education and learning during the COVID-19 pandemic	Irish Educational Studies	/
52	Bollinger & Myers (2020)	Young Children's Writing in Play-Based Classrooms	Early Childhood Education Journal	/
53	Peppler et al (2019)	Squishing Circuits: Circuitry Learning with Electronics and Playdough in Early Childhood	Journal of Science Education and Technology	/
54	Ramani et al (2020)	Racing dragons and remembering aliens: Benefits of playing number and working memory games on kindergartners' numerical knowledge	Developmental Science	/
55	Nieuwmeijer et al (2019)	Dutch early years classroom teachers facilitating and guiding musical play: problems and opportunities	European Early Childhood Education Research Journal	/

56	Disney et al (2019)	Digital play in young children's numeracy learning	Australasian Journal of Early Childhood	/
57	Williams & Thevenow (2021)	Zones of mathematical play	Journal of The Learning Sciences	/
58	Matsumoto et al (2021)	Pedagogical Photo documentation for play in early childhood education and rare	Early Years	/
59	Thai et al (2021)	Accelerating Early Math Learning with Research-Based Personalized Learning Games: A Cluster Randomized Controlled Trial	Journal of Research on Educational Effectiveness	/
60	Parrott & Cohen (2021)	Advantages of mixed-age free play in elementary school: perceptions of students, teachers, and parents	International Journal of Play	/
61	Theodotou (2019)	Examining literacy development holistically using the Play and Learn through the Arts (PLA) programme: a case study	Early Child Development and Care	/
62	Nieuwmeijer et al (2021)	Musical play in the early years: the impact of a professional development programme on teacher efficacy of early years generalist teachers	Research Papers in Education	/
63	Isabelle & Velazquez (2021)	Using the engineering design process (EDP) to guide block play in the kindergarten classroom: exploring effects on learning outcomes	International Journal of Play	/
64	Colliver et al (2021)	Formal literacy practices through play: exposure to adult literacy practices increase child-led learning and interest	International Journal of Early Years Education	/
65	Lenhart et al (2019)	Does Play Help Children Learn Words? Analysis of a Book Play Approach Using an Adapted Alternating Treatments Design	Journal of Research in Childhood Education	/
66	Kewalramani et al (2021)	Using Artificial Intelligence (AI)-interfaced robotic toys in early childhood settings: a case for children's inquiry literacy	European Early Childhood Education Research Journal	/
67	Lindsay (2021)	Visual arts pedagogy in early childhood contexts: The baggage of self-efficacy beliefs, pedagogical knowledge and limited pre-service training	Australasian Journal of Early Childhood	/
68	Wishart & Rouse (2019)	Pedagogies of outdoor spaces: an early childhood educator professional learning journey	Early Child Development and Care	/
69	Adbo & Carulla (2020)	Learning About Science in Preschool: Play-Based Activities to Support Children's Understanding of Chemistry Concepts	International Journal of Early Childhood	/
70	Sibanda & Kajee (2019)	Home as a primary space: Exploring out-of-school literacy practices in early childhood education in a township in South Africa	South African Journal of Childhood Education	/
71	Simoncini et al (2020)	The Impact of Block Play on Children's Early Mathematics Skills in Rural Papua New Guinea	International Journal of Early Years Education	/
72	Walan & Enochsson (2019)	The potential of using a combination of storytelling and drama, when teaching young children science	European Early Childhood Education Research Journal	/
73	Apostolou et al (2020)	Pre-primary and first grade primary school teachers' perceptions on the integration of pre-primary and first grade primary school curricula in Greece	L1 Educational Studies in Language and Literature	/

74	Alemi & Haeri (2020)	Robot-assisted instruction of L2 pragmatics: Effects on young EFL learners' speech act performance	Language Learning & Technology	/

Table 5
Educational context, play elements and learning outcomes

No	Authors	Educational context	Play elements	Results
1	Matsui (2021)	Professional development	Not specified	Children's voices stimulated the teachers to change their perspective on children's play.
2	Lindeman et al (2021)	Professional development	Not specified	Successful domestication of digital tools in ECE include digital competence, including pedagogical aspects, in combination with personal drive and professional learning and development.
3	Bers (2021)	Pedagogical	Apps & robotic kits	CAL emphasizes creative play and self-expression by positioning the learning of programming as the mastering of a new symbolic language.
4	Tang et al (2021)	Parent's beliefs	Not specified	Parents have found ECCE programmes much effective where children not only enjoy but their learning improves,

				and parents have appreciated the quality of hygiene level and facilities in pre-school are up to the mark and standard but further can be improved.
5	O'Keeffe & McNally (2021)	Pedagogical	Not specified	Teachers believed play was an especially important pedagogical tool in supporting young children's social-emotional development, learning and transition back to school.
6	Carolan et al (2021)	Parent's beliefs	Not specified	Connection to school community and good communication with a child's educators as predictors for positive attitudes toward PBL.
7	Campbell (2020)	Professional development	Not specified	Teachers interpreted phonics instruction as a method occurring as an isolated skill–drill activity.
8	Reikeras (2020)	Learning outcomes	Rule-based Play, Pretend Play, Exploring, Construction Play	Rule-based Play was difficult for the toddlers, whereas Pretend Play, Exploring and Construction Play correlated with

				mathematical skills.
9	King et al (2020)	Learning outcomes	Storytelling	Visiting an ecotourism site does not automatically create a relationship between children and nature if children are not able to actively engage with the natural world.
10	Bose & Backman (2020)	Professional development	Not specified	A framework for specialised and professional early childhood education (ECE) training and acquiring SMK and PCK that contributed to the preschool teachers' knowledge bases and practices in their teaching of mathematics and science.
11	Dzamesi & van Heerden (2020)	Professional development	Not specified	The essential components of the programme: a guide for professional teacher development for delivering indigenous play-based pedagogy (IPBP) in ECE.
12	Nakawa (2020)	Learning outcomes	Guided play	Particularly effective for children in terms of explicitly learning the basic features of

				the shapes and important mathematical ideas such as congruency, similarity, and symmetry.
13	Atakpo (2020)	Pedagogical	Not specified	A functional early childhood education programme is capable of inculcating in the child developmental experiences which will help the child later in life.
14	Kewalramani et al (2020)	Learning outcomes	Robotic toys, little Bits electronic magnetic blocks	Integration of STEM-focused playful experiences supported children's scientific inquiry, design thinking and creativity as well as vocabulary targeted at interdisciplinary STEM concepts.
15	Vanbecelaere et al (2020)	Learning outcomes	Digital educational games	Children who played a game performed better on number line estimation and reading competence, better scores in the delayed reading post-test, but not in the delayed math post-test. For non-cognitive outcomes, game

				training did not affect math or reading anxiety.
16	Josephidou (2020)	Professional development	Not specified	The 'usage of gender scripts' (Burn and Pratt-Adams 2015, 6) by a small sample of ECEC practitioners, from a diverse range of settings (n=13) in the English context, to discuss their practices, experiences, and observations in relation to play pedagogy.
17	Ramani & Scalise (2020)	Learning outcomes	Numerical magnitude comparison game, shape, & colour matching game	Numerical magnitude comparison game did not improve children's numerical knowledge while shape and colour matching game did improve children's shape knowledge.
18	Sakr & Scollan (2019)	Learning outcomes	Interactive whiteboard	Show diversity in how the children drew the IWB into activity and point towards the potentials for collaborative creativity in interactions with the IWB.
19	Outhwaite et al (2019)	Learning outcomes	Interactive Math apps	The math apps

				supported targeted basic facts and concepts and generalized to higher-level math reasoning and problem-solving skills.
20	Kewalramani & Havu (2019)	Pedagogical	Not specified	Teachers occasionally used iPads and some apps within their intentionally constructed science investigations.
21	Moe (2019)	Pedagogical	Not specified	Pedagogy teachers' understandings of certain teaching practices like a) professional conversations about play, b) play activities, and c) any other practices that facilitate students' critical reflection on play.
22	Yin et al (2021)	Professional development	Not specified	Teachers with higher efficacious beliefs showed more active intentions to implement play-based learning.
23	Keung & Fung (2020)	Professional development	Not specified	Teachers believed that ongoing complexities and dilemmas regulating their practice which required

				them to modify pedagogical strategies.
24	Rodriguez (2021)	Pedagogical	Not specified	PSTs' widespread conceptualizations of play, including misconceptions.
25	Keung & Cheung (2019)	Parent's beliefs	Not specified	The roles and functions of parents and teachers were significant in supporting the implementation of play-based learning in kindergarten settings.
26	Hesterman & Targowska (2020)	Pedagogical	Not specified	Beliefs and values pertaining to quality play-based learning and tensions associated with the diminishing role of play in the early years of schooling and its impact on young children.
27	Wu (2019)	Learning outcomes	Demonstration	Children's retrospective reflected a contradictory view to traditional Chinese culture, which juxtaposes play with learning.
28	Catalano & Campbell (2021)	Learning outcomes	Pretend play	Pretend play contributes significantly to children's emotional, social, physical, and

				intellectual development and can achieve the skills promoted
29	Leung et al (2020)	Learning outcomes	Video art	The children engaged in concurrent exploratory activities, using a digital video recorder and toys to create innovative and imaginative play.
30	Wu (2021)	Parent's beliefs	Not specified	Different social representations of learning in play in the Hong Kong context.
31	Duncan et al (2020)	Learning outcomes	eLIPS tool	eLIPS has potential as a tool to assist early years educators in understanding individual patterns of language acquisition in a play-based environment and for framing team discussions about approaches to early language support.
32	Walsh et al (2019)	Pedagogical	Not specified	Models of learning can illuminate differences between early years practitioners, with many teachers tending to adopt either an overly passive or directed

				stance in the play experience.
33	Cohrssen & Frank (2019)	Learning outcomes	Maths Games	Children in the intervention group showed statistically greater gains in their mathematical competencies in a post intervention assessment.
34	Pollitt et al (2020)	Pedagogical	Not specified	The implementation of the activities by educators, educator beliefs about mathematics, spatial reasoning, and mathematics teaching practice.
35	Vogt & Hollenstein (2021)	Learning outcomes	Robotics, autonomous vehicles, & Internet of things	The potential of pretend play for children to explore digital transformation and to acquire the digital competences needed in the future.
36	Abdi & Cavus (2019)	Learning outcomes	Raspberry Pi & makes use of the RFID technology	The developed toy can be suitable for use as an educational toy for pre-kindergarten children to teach English as a second language.
37	Halimah et al (2020)	Learning outcomes	Storytelling	Children were effective in instilling moral values to generate positive

				responses from children.
38	Aksoy & Baran (2020)	Learning outcomes	Storytelling, Play-based	Both Story telling dan play based social skills training were found significantly in each dimension.
39	Hyun et al (2021)	Parent's beliefs	Not specified	Chinese immigrant parents hold positive beliefs about play, while also displaying some concerns about preschool curriculum in the United States
40	Subaramaniam & Mon (2020)	Learning outcomes	AR mobile app dictionary	The proposed requirement will allow children to use mobile device in more effective and fun ways.
41	Lange et al (2021)	Learning outcomes	Memory matching games	The number of math games played was positively associated with verbal counting.
42	Theodotou (2020)	Pedagogical	Not specified	An arts-based methodology is indeed beneficial for children's social and personal development.
43	Gomes & Fleer (2019)	Parent's beliefs	Not specified	Show how a scientific motive develops through playful everyday learning

				moments at home and at preschool when scientific play narratives and resources are aligned.
44	Li et al (2021)	Professional development	Play world model	Educational experiment creates a new kind of social situation for teachers, amplifies reflective practice and in so doing.
45	Gibb et al (2021)	Learning outcomes	BBF programme	BBF program reported it was easily and successfully integrated into their existing preschool curricula.
46	Timmons et al (2021)	Parent's beliefs	Not specified	Revealed five themes: equity consideratio ns, synchronous versus asynchronou s teaching and learning, social and emotional effects on students, academic impacts, and effects on parents or families.
47	Alkhede & Holmqvist (2021)	Pedagogical	Not specified	Teachers who provide the opportunity for children to experience more complex and contradictor y activities based on

				their prior knowledge enhance the children's learning opportunities.
48	Zhu et al (2021)	Pedagogical	Not specified	Math teaching efficacy mediated the positive relationship between constructivist beliefs and child-centred practices, but not between traditional beliefs and teacher-directed practices.
49	Karabon (2019)	Pedagogical	Not specified	Children were afforded the opportunity to socially construct new knowledge, negotiate understandings, and mediated cultural resources from outside of schooling.
50	Howe et al (2021)	Pedagogical	Not specified	Educators working in outdoor play programs were more confident in supporting outdoor play.
51	Egan & Beatty (2021)	Parent's beliefs	Not specified	More likely to spend time watching educational TV programmes or playing educational screen-based games if their parent believed screen

				content had educational value.
52	Bollinger & Myers (2020)	Pedagogical	Not specified	Learning stations encourage writing offered authentic and creative opportunities for composition but must be scaffolded with intentional teaching for children to continue to develop their writing skills.
53	Peppler et al (2019)	Learning outcomes	Squishy Circuits toolkits	Squishy Circuits toolkit enabled children to explore concepts important to circuitry learning, including current flow, polarity, and connections.
54	Ramani et al (2020)	Learning outcomes	Tablet-based training games	Number game improved kindergarten children's numerical knowledge at the latent level, and these improvements remained stable as assessed 1 month later.
55	Nieuwmeijer et al (2019)	Professional development	Not specified	Musical play may be a valuable addition to early years music education, one that enables young children to learn about

				music more consistent with their age and interests.
56	Disney et al (2019)	Learning outcomes	Apps via iPad technologies	Young children's numeracy learning outcomes were improved.
57	Williams & Thevenow (2021)	Learning outcomes	Video game	Players pass through five zones of mathematical play that build upon each other and closely interrelate, and that these zones each involve different types of failure, feedback, and learning experiences.
58	Matsumoto et al. (2021)	Parent's beliefs	Not specified	The documentation enhanced the parents' and guardians' communication with their children and with other parents, practitioners, and children in the classroom, encouraging them to talk about their children's play and learning.
59	Thai et al (2021)	Pedagogical	Not specified	My Math Academy produced positive impacts on students' interest and self-confidence in learning math.

60	Parrott & Cohen (2021)	Learning outcomes	Let Grow Play Club	This play was perceived as valuable for helping build friendships and developing social skills, as older children become role models to younger ones.
61	Theodotou (2019)	Learning outcomes	PLA programme	PLA contributed to children's literacy development.
62	Nieuwmeijer & van Oers (2021)	Professional development	Not specified	PD enhanced teachers' TE for musical play and for 50% of the respondents for music education in general.
63	Isabelle & Velazquez (2021)	Pedagogical	Block play	EDP scaffolds building skills, critical thinking, and problem-solving; encourages the use of engineering specific vocabulary and dialogue; develops an understanding of foundational engineering skills; promotes the transfer of these acquired skills to support other areas of learning; and supports collaboration and cooperation.
64	Colliver et al (2021)	Learning outcomes	Literacy & numeracy play	Pre-schoolers' exposure to

				parents' and educators' everyday code-related literacy practices can enhance pre-schoolers' literacy interest and learning.
65	Lenhart et al (2019)	Learning outcomes	STDP	Implementing the technique with play made a difference in children's word awareness (recognition), but not for children's understandings of word meanings.
66	Kewalramani et al (2021)	Learning outcomes	AI robotic toys	Children's play with the AI robot fostered inquiry literacies - namely creative inquiry, emotional inquiry, and collaborative inquiry.
67	Lindsay (2021)	Professional development	Not specified	Educator's low visual arts self-efficacy beliefs develop during childhood and are not improved by pre-service training, resulting in limited visual arts skills and knowledge.
68	Wishart & Rouse (2019)	Pedagogical	Not specified	Engaging in the PL led to changed perceptions for the educators who felt more

				confident in their understandings of the value and benefits of nature-rich outdoor environments to support young children's active play.
69	Adbo & Carulla (2020)	Learning outcomes	Visual computer animations	A process of 'sustained shared thinking' could describe the teaching or learning processes evident in the children's and teacher's conversations.
70	Sibanda & Kajee (2019)	Parent's beliefs	Not specified	Children interact with multiple discourses during their everyday practices and play.
71	Simoncini et al (2020)	Learning outcomes	Block play	Access to block play had potential to improve mathematics skills in early childhood settings in Papua New Guinea.
72	Walan & Enochsson (2019)	Learning outcomes	Storytelling, drama	Children had learnt the names of immune system cells, how they work when someone has a cold and viruses cause colds.
73	Apostolou et al (2020)	Pedagogical	Not specified	Pre-primary and primary school teachers partially agree with

				the integration of curricula, delineating it within a specific context and proposing common goals and teaching approaches that will be governed by continuity and consistency.
74	Alemi & Haeri (2020)	Learning outcomes	RALL	RALL instruction was more effective than non-RALL instruction.

Result and Finding

In early childhood, learning outcomes is one of the most significant research in learning through play method. Since early childhood educators are concerned about the growth and success of this region, the issues have become increasingly significant. Based on the searching technique, 74 articles were extracted and analysed.

All articles were categorized based on four main themes, namely Learning outcomes (33 articles), Pedagogical (19 articles), Professional development (12 articles) and Parent's belief (10 articles) (Table 4).

Learning Outcomes (33 articles)

Mathematics (11 articles)

Previous studies have primarily concentrated on learning Mathematic through play. Disney et al. (2019) studied the integration of digital technology within early childhood settings. Their analysis revealed that young children's numeracy learning outcomes were improved after they used the applications via iPad technologies. Outhwaite et al (2019) added that the math apps supported targeted basic facts and concepts and generalized them to higher-level math reasoning and problem-solving skills.

In a different study, Nakawa (2020) presented that learning through play was uniquely effective for children in explicitly learning the basic features of shapes and important mathematical ideas such as congruency, similarity, and symmetry. Research findings by Ramani and Scalise (2020) also pointed out that shape and colour matching games have improved children's shape knowledge. However, they found that the numerical magnitude comparison game did not improve children's numerical knowledge. In numeral identification, Lange et al (2021) resulted in positive impacts and the number of math games played was positively associated with verbal counting. Similarly, Vanbecelaere et al (2020) added that children who played a game fullied better on number line estimation and reading competence for cognitive outcomes.

Furthermore, Ramani et al (2020) proposed that playing the number game enhance kindergarten children's numerical knowledge at the potential level, and these improvements kept stable as assessed 1 month later. In addition to the work of Ramani et al (2020) and Reikerås (2020) study presented that rule-based play was tough for toddlers, whereas pretend play as well as probing and construction play was matched with mathematical skills. The researchers determined styles of play that are more appropriate when adopting Mathematics in toddler groups.

According to Simoncini et al (2020), block play has the latent to strengthen Mathematics skills in early childhood. Block play could grant a flexible and affordable ways to sustain early mathematical learning through primary school. Interestingly, a study by Williams and Thevenow (2021) on five zones of mathematical play indicated that the players were able to build upon each other and closely interrelate and that these zones involved different types of failure, feedback, and learning experiences. The study is consistent with that by Cohrssen and Frank (2019), which summarized that Math Games may increasing the learning effects. Another parental report by Ramani and Scalise (2020) raised several concerns about the frequency of game playing at home related to children's learning. Their analysis revealed that there was wide variability in how parents assisted the children during the card gameplay.

Science (7 articles)
Previous studies have reported that the Squishy Circuits toolkit enabled children to explore dan circuitry concepts, including current flow, polarity, and connections (Peppler et al., 2019). In another study by Walan and Enochsson (2019), children had learned the names of immune system cells and how they work when someone has a cold through play. Moreover, they had also learned that colds are caused by viruses. However, there were also a small number of children who did not show any learning development related to this specific content.

Similarly, Kewalramani et al (2020) examined the integration of STEM-focused. In the study, researchers found that playful experiences supported children's scientific inquiry, design thinking, and creativity as well as vocabulary targeted at interdisciplinary STEM concepts. Most recently, Adbo and Carulla (2020) discovered that the deconstruction of everyday items familiar to the children and visual computer animations lend experiences that enabled children to switch from a macro-level of understanding to imagine the molecular or atomic level to distinguish between macro- and micro-understandings of `small'.

Research findings by Leung et al (2020) also pointed out that the children were engaged in converging exploratory activities using a digital video recorder and toys to create an innovative and imaginative play. Interestingly, Vogt and Hollenstein (2021) found similar results revealing the hidden of pretend play for children to search out digital alternation and obtain the digital competencies demanded in the future. However, another study by King et al (2020) suggested that children could engage with the natural world actively if they had an ecotourism site visit.

Language (12 articles)
A research study by Wu (2019) presented those children gave meaning to the play activities. In the study, researchers reported that children’s experiential activities reflected a contradictory view of traditional Chinese culture, which juxtaposes play with learning.

Another study by Abdi and Cavus (2019) examined the development of educational toys for pre-kindergarten children to teach English as a second language. The developed toy was user-friendly, and the pre-kindergarten children were enthusiastic about playing with it resulting in enjoyable learning.

The study by Lenhart et al (2019) examined the implementation of technology with play. Results demonstrated that play made a difference in children's word awareness (recognition), but not in children's understandings of word meanings. Aksoy and Baran (2020) have found differences that children who participated in play-based social skills training were detected to be at a significantly higher level in dimensions of 'communication', 'adaptation', 'self-control', 'prosocial behaviours', 'assertiveness', and total social skills compared to children who have not had any intervention. More recently, Gibb et al (2021) observed improvement in all three domains of brain development, language, and motor skills. In addition, adopters of the BBF program reported that it was easily and successfully integrated into their existing preschool curricula.

An early study by Theodotou (2019) showed the positive contribution of PLA to children's literacy development. With the same objective, Colliver et al (2021) conducted numerical experiments on pre-schoolers' exposure to parents and educators. The study has found that everyday code-related literacy practices can enhance pre-schoolers' literacy interest and learning. According to an investigation by Alemi and Haeri (2020), RALL instruction was more effective than non-RALL instruction in improving the young learners' performance. Duncan et al. (2020) found similar results showing that eLIPS has the potential as a tool to assist early year educators in understanding individual patterns of language acquisition in a play-based environment and for framing team discussions about approaches to early language support.

In addition to the work of Alemi and Haeri (2020); Duncan et al (2020), the proposed requirement by Subaramaniam & Mon (2020) will allow children to use mobile devices in more effective and fun ways. Furthermore, Kewalramani et al (2021) later revealed how children creatively collaborated with their peers to create a sustainable city for their robot and `his' family to live happily. Children's play with the AI robot fostered inquiry literacies - namely creative inquiry, emotional inquiry, and collaborative inquiry.

Furthermore, Halimah et al (2020) concluded that practical learning steps including the introduction of themes and character stories, figures of Wayang Golek, storytelling, conversations about character education depicted in the content of the story, the actualization of character education through either indoor or outdoor play, as well as reflection on the character development of children were effective in instilling moral values to generate positive responses from children.

Social (3 articles)
Sakr and Scollan (2019) revealed the diversity in how the children drew the IWB into activity and pointed toward the potential for collaborative creativity in interaction with the IWB. Parrott and Cohen (2021) added that the play was perceived as valuable for helping build friendships and developing social skills, as older children become role models to younger ones. Furthermore, Catalano and Campbell (2021) concluded that pretend play dedicates

significantly to children's emotional, social, physical, and intellectual growth and can accomplish the skills urged.

Pedagogical (19 articles)

Teachers' beliefs (10 article)

In recent years, there has been a raising amount of literature regarding teachers' beliefs and pedagogical practices in play-based learning. In 2019, Moe study's presented pedagogy on teachers' understandings of certain teaching practices like: a) professional conversations about play, b) play activities, and c) any other practices that facilitate students' critical reflection on playing. This is consistent with Wishart and Rouse (2015), which showed that engaging in the PL led to changed feelings for the educators who felt more confident in their understanding of the value and advantages of nature-rich outdoor setting to sustain young children's active play. Walsh et al (2019) also highlighted how participatory models of learning can reflect opposites between early years practitioners, with many teachers tending to assume either an extremely passive or directed stance in the play experience.

With the same objectives, Hesterman and Targowska (2020) proposed the beliefs and values be part of quality play-based learning and tensions be related with the reducing role of play in the early years of schooling and its impact on young children. Pollitt et al (2020) also found mutual effect between the three sticking points of the research project, which consist of: the practices of the activities, educator views about mathematics, dimensional reasoning, and mathematics teaching practice. In addition, Zhu et al (2021) indicated that Math teaching efficacy mediated the positive connection between constructivist beliefs and child-centred implements, but not between traditional beliefs and teacher-directed practices. Interestingly, a study by Apostolou et al (2020) demonstrated that pre-primary and primary school teachers partially agreed with the integration of curricula, while Pre-primary school teachers who disagreed strongly expressed their concern about the potential schoolification of pre-primary school. However, it was later shown by Rodriguez (2021) that there is a need for Preservice teachers (PST) to launch a thorough understanding of the integration of play in kindergarten classrooms.

In a different study, Kewalramani and Havu (2019) examined the integration of technology. Teachers were not averse to, but rather accepting of embedding technology as a pedagogical affordance and keen on planning for multimodal science-based experiences. Despite prior evidence, Howe et al (2021) later showed that educators working in outdoor play programs were more confident in raising outdoor play, reported more advantages, risks, and challenges for both children and educators besides highlighted more barriers to practicing the new policy.

Pedagogical approach (9 articles)

Karabon (2019) found that regarding the assist of the teacher in a social learning context, children were allowed to socially build new knowledge, discuss understandings, and mediated cultural resources afterschool. A research study by Atakpo (2020) also found that functional early childhood education programs such as the play-based approach are capable of inculcating in the child's developmental experiences, which will help the child later in life since the early childhood stage is the stage where characters are built, and personalities are formed. This is supported by Alkhede and Holmqvist's (2021) study, which revealed that

teachers who formulate the opportunity for children to experience more complex and contradictory activities based on their prior knowledge would increase the children's learning opportunities. O'Keeffe and McNally (2021) added that teachers embraced play was a major pedagogical tool in supporting young children's social-emotional growth, learning, and transition back to school. According to the teachers, play strategies are recommended to parents during distant teaching and home-schooling and almost all teachers (99%) proposed to apply play as a pedagogical strategy upon school reopening.

Another study by Theodotou (2020) indicated that an art-based methodology is certainly favourable for children's social and personal growth, for example confidence, independence, and relationships. Furthermore, Isabelle et al (2021) mentioned that the use of the EDP scaffolds building skills, critical thinking, and problem-solving; promotes the use of engineering definite vocabulary and dialogue; exploits an understanding of bottom-line engineering skills; stimulated the transfer of these acquired skills to back other areas of learning and sustains collaboration and consociation.

Thai et al (2021) also provided My Math Academy, which emerged positive impacts on students' savour and self-confidence in learning math. Similarly, Bers (2021) found that CAL sets opportunities for socio-emotional growth in the context of a collaborative PBL setting, a coding playground, in which there is a purposeful exploration of ethical and moral values and intentional promotion of vigorous behaviours and character strengths. In addition, Bollinger, and Myers (2020) suggested that there should be learning stations that stimulate writing and offer real and creative opportunities for construction but must be oriented with intentional teaching for children to persist and exploit their writing skills.

Professional Development (12 articles)

Recently, previous studies gave a comprehensive review of teachers' knowledge. Nieuwmeijer et al (2019) recognized that musical play is a valuable addition to the early years of music education, one that enables young children to learn about music more consistently with their age and interests. This is supported by Nieuwmeijer and van Oers (2021) who revealed that taking part in the PD promoted teachers' TE for the musical play and 50% of the respondents for music education in general. Interestingly, Josephidou (2020) listed three possibilities of the 'usage of gender scripts' which are no distinct in practitioner gendered practices, more men were needed in ECEC because they had something to present, and the difficulties for men to be as effective as women in the ECEC workplace.

Another study by Campbell (2020) indicated that teachers interpreted phonics instruction as a method occurring as an isolated skill–drill activity. Teachers subsequently held strong views against heavily scripted commercial phonics programs. Matsui (2021) also found that children's voices stimulated the teachers to change their perspectives on children's play. In contrast, the study by Lindsay (2021) indicated that educators' low visual art self-efficacy beliefs developed during childhood and were not improved by pre-service training, resulting in limited visual arts skills and knowledge. Lindeman et al (2021) concluded that major factors in the successful domestication of digital tools in ECE include digital competence and pedagogical aspects, in combination with the personal drive as well as professional learning and growth.

In addition to work of Nieuwmeijer et al (2019); Nieuwmeijer and van Oers (2021); Campbell (2020); Lindsay (2021); Lindeman et al (2021), numerous researchers have acknowledged the need of teacher's training. Firstly, Bose and Backman (2020) raised several concerns about the significance of a framework for specialized and professional early childhood education (ECE) training and gaining SMK and PCK that conduced to the preschool teachers' knowledge bases and practices in their teaching of mathematics and science. Similarly, Dzamesi and van Heerden (2020) highlighted the need for professional teacher development in delivering indigenous play-based pedagogy (IPBP) in ECE. Their study revealed that the program had a positive impact on classroom practices.
Keung and Fung (2020) are consistent with (Bose and Backman, 2020; Dzamesi and van Heerden, 2020). In their study, teachers considered that ongoing complexities and perplex regulate their practice, which requires them to amend pedagogical strategies. Situated forms of knowledge were found as dispensable components forming their professional practice.

Most recently, Li et al (2021) presented an educational test that initiates a novel nature of social status for teachers, expands reflective practice, and in so doing, acts as an essential source of professional growth for supported practice change. However, it was later shown by Yin et al (2021) that principal instructional leadership was positively associated with teachers' intentions to implement play-based learning directly and indirectly through trust in colleagues and teacher self-efficacy.

Parents' belief (10 articles)
The parents' perspective of play-based learning has been widely investigated. Gomes and Fleer (2019) gave a comprehensive review on how a scientific motive is exploited through playful everyday learning moments at home and at preschool when scientific play narratives and resources are aligned. Timmons et al (2021) also revealed equity considerations, synchronous versus asynchronous teaching and learning, social and emotional effects on students, academic impacts, and effects on parents or families. According to an investigation by Hyun et al (2021), Chinese immigrant parents keep positive views toward play, while also demonstrating some concerns pertaining to the preschool curriculum in the United States, which is likely derived from their own learning experiences when they were in China. However, interestingly, this is contrary to a study conducted by Wu (2021) reporting different social stand for some point of view of learning in play in the Hong Kong context.

Another study by Tang et al (2021) examined parents' perceived satisfaction with the quality of ECCE programs. The parents reported that the ECCE programs are much more effective where children did not only enjoy but also have their learning increased. In addition, parents appreciated the quality of hygiene level and facilities in pre-school that was up to the mark and standard and can be further improved. These results contradicted the experiments of Sibanda and Kajee (2019) who considered children's out-of-school practices with the potential to sustain literacy development in school. Sibanda and Kajee concluded that children interact with multiple discourses during their everyday practices and play. Despite prior evidence, Egan and Beatty (2021) identified that children are perhaps like to spend time watching educational TV programs or playing educational screen-based games if their parents believe that screen content had educational value.

Carolan et al (2021) added that parents felt that their child was supported by the program and would transition more easily to the first year of school owing to the participation. The researchers highlighted the significance of connection to the school community and good communication with a child's educators as predictors for positive stances toward PBL. The finding is consistent with that of past studies by Keung and Cheung (2019), which proposed that the roles and functions of parents and teachers were significant in supporting the implementation of play-based learning in kindergarten settings. More recently, a study by Matsumoto et al (2021) indicated that the documentary improved the parents' and guardians' social connection with their children and other parents, practitioners, while children in the classroom, fostering them to talk on their children's play and learning.

Play Elements (36 articles)

In recent years, several studies have published a paper in which they described play elements. For example, Sakr and Scollan (2019); Leung et al (2020); Peppler et al (2019); Li et al (2021); Abdi and Cavus (2019) discovered digital technology such as interactive whiteboards, video art, video tools, and models. Similarly, Vanbecelaere et al (2020); Adbo and Carulla (2020); Williams and Thevenow (2021); Ramani et al (2020); Subaramaniam & Mon (2020); Disney et al (2019); Outhwaite et al (2019) also presented digital educational apps and games as well as visual computer animations. In addition, Kewalramani et al (2021); Kewalramani et al (2020); Vogt and Hollenstein (2021); Alemi and Haeri (2020); Bers (2021) examined AI robotic toys, namely little Bits electronic magnetic blocks and Robot-Assisted Language Learning (RALL).

In contrast, Ramani and Scalise (2020); Cohrssen and Frank (2019); Lange et al (2021); Colliver et al (2021); Lenhart et al (2019); Wu (2019) primarily concentrated on demonstration. Research findings by Nakawa (2020); King et al (2020); Halimah et al (2020), Aksoy and Baran (2020); Walan and Enochsson (2019) also pointed toward drama and storytelling. The study by Nakawa (2020) investigated guided play. In addition, Catalano and Campbell (2021), and Reikeras (2020) also provided pretend play. The research by Reikeras (2020) also presented Rule-based play and exploring and construction play in different studies. Furthermore, Simoncini et al (2020); Isabelle et al (2021) highlighted the need for block play. In a different study, Gibb et al (2021), Parrott and Cohen (2021) and Theodotou (2019) examined the Play club, Building Brains, and Futures (BBF) programme, and Play and Learn through the Arts' (PLA) programme. Furthermore, Duncan et al (2020) developed an early language acquisition support named eLIPS tools.

Discussion

Based on the results, this study outlined the research topics between 2019-2021. It was observed that many publications are focusing on learning outcomes. In contrast, parents' belief was the lowest research topic. Overall, these studies exposed further gaps in our efforts to address issues in learning through play method.

The discussion of the results begins with consequence in learning though play. Firstly, language and literacy were the major studies component follow by second component, early Mathematic. Only 7 studies examined early Science. In language and literacy component, previous research examined word awareness (recognition skills) through technology play

(Lenhart et al., 2019). This finding is consistent with Sharifah & Aliza (2013) that suggest identifying as one of the skills in cognitive development.

The present findings also suggest that it is necessary to ensure that children able to achieve positive emotions (Catalano & Campbell, 2021), building a positive self-concept (Aksoy & Baran, 2020), building interaction skills (Aksoy & Baran, 2020; Sakr & Scollan, 2019), and social skills (Aksoy & Baran, 2020; Parrott & Cohen, 2021; Catalano & Campbell, 2021). Through storytelling and drama, children able to express their emotions and build positive self-concept (Halimah et al., 2020). However, recognize skills and manage own emotions skills have not been discover by research.

Through play in early Mathematic, Nordin and Romarzila (2022) lists several sections in pre-number concepts. The finding match with the sections in pre-number concepts which are identify skills (Nakawa, 2020), matching skills (Ramani & Scalise, 2020), comparing skills (Nakawa, 2020), organize skills (Vanbecelaere et al., 2020), reasoning skills (Outwaite et al., 2019), and skills of understanding the concept of numbers (Lange et al., 2021; Ramani et al., 2020). By the way, classify skills not found in the present studies. Furthermore, both studies on gamification (Cohrssen & Frank, 2019; Ramani & Scalise, 2020) and non-gamification (Simoncini et al., 2020; Williams & Thevenow, 2021) enhance children's early Mathematic skills.

Science experiences is a process related to problem solving and systematic decision making. A science process skill involves observation, classification, measurement, inferencing, prediction, and communication (Nordin & Romarzila, 2022). The statement is significant with present studies which involve science process skills (Peppler et al., 2019; Kewalramani et al., 2020; Adbo & Carulla, 2020; Walan & Enochsson, 2019; Ramani & Scalise, 2020). Additionally, Children learn new concepts from their environment through the five senses (Piaget, 1952 in Nordin & Romarzila, 2022). This statement is significant with King et al. (2020) which mentioned a site visit could enhance children's knowledge on nature.

In early years education, learning through play is widely recognised as a pedagogical approach to fulfilled children needs. However, this topic has been debated in the research literature. Generally, there are 3 types of approach commonly use, teacher centred, learner centred, and material centred. Children and adolescent's cognitive can be nurtured until they reach the Zone of Proximal Development (ZPD). Consistent with beliefs of Vygotsky (1978) (in Sharifah & Aliza, 2013), we found that previous studies highlighted the role of facilitator in the learning process rather than the provider of knowledge (Karabon, 2019; Alkhede & Holmqvist, 2021). According to Vygotsky, children need adults to guide and support them. They can perform tasks and think more than they could without help once they achieve ZPD.

Besides, the finding provides evidence that art-based methodology (Theodotou, 2020) and engineering design process (EDP) (Isabelle et al., 2021) been examined. Furthermore, present findings suggest the need of learning resources such as play based programme (Atakpo, 2020; O'Keeffe & McNally, 2021; Thai et al., 2021) and learning stations (Bollinger & Myers, 2020; Bers, 2021).
Professional development solved many issues of learning through play in early childhood. Teachers' knowledge is not always related to their level of education, nor guarantee that

teachers have content knowledge related to effective teaching (Piasta et al., 2006). The most common challenges include early childhood teachers that hold limited content knowledge (Nieuwmeijer et al., 2019; Nieuwmeijer & van Oers, 2021; Lindeman et al., 2021; Hesterman & Targowska, 2020; Zhu et al., 2021). This contradicts Fleer's (2010) study which demonstrating that some teachers may have the requisite content knowledge, but they did not always make concepts conscious to children while engaged in play-learning programs they planned.

In line with this, teachers' beliefs should be concerned. Academic stress is now seen in lower grades in response to NCLB and remains under Every Successful Student Act (ESSA, 2015). One of the teachers believes that the integration of play and direct teaching as learning resources has become a 'difficult problem to overcome' with the enablers and barriers that shape the ECE experience for children (Edward, 2017; Brussoni et al., 2012; Coe, 2017; Palaiologou, 2016). This is because many early childhood educators do not know how to utilize the abilities found in natural elements to stimulate children's curiosity and connection with nature when there is a lacking in content knowledge, teaching skills, confidence, and adaptability (Blanchet & Elliot, 2011; Ryan & Northey-Berg, 2014; Aldhafeeria et al., 2016).

To maximize learning through play effectiveness, parents play an important part. Before the COVID-19 pandemic, there are a large involvement of families in their children's learning. However, the additional need for families to take on the role of teachers in delivering direction has been proven as a challenge (Timmons et al., 2020). The Ministry of Education aims to increase learning through play efficacy and quality. This entails a growing public understanding of learning through play for child development and enhancing learning effectiveness and quality. This is consistent with numerous present studies which parents have positive perspectives on ECCE programs (Tang et al., 2021; Carolan et al., 2021; Hyun et al., 2021; Keung & Cheung, 2019; Egan & Beatty, 2021; Timmons et al., 2021; Matsumoto et al., 2021; Timmons et al., 2021)

We have identified 36 articles with play element in relation to this work. Based on the analysis, there is a clear trend of increasing on educational support tools. For example, digital tools and toys (Sakr & Scollan, 2019; Leung et al., 2020; Peppler et al., 2019; Li et al., 2021; Abdi & Cavus, 2019, Duncan et al., 2020; Kewalramani et al., 2021; Kewalramani et al., 2020; Vogt & Hollenstein, 2021; Alemi & Haeri, 2020; Bers, 2021) even educational apps and games (Vanbecelaere et al., 2020; Adbo & Carulla, 2020; Williams & Thevenow, 2021; Ramani et al., 2020; Subaramaniam & Mon, 2020; Disney et al., 2019; Outhwaite et al., 2019).
What is interesting in this data is that learning through play educational programme in many dimensions have been developed (Gibb et al., 2021; Parrott & Cohen, 2021; Theodotou, 2019). We found that very few study examined on dimension of learning through play. Nakawa (2020) examined on guided play. This finding reflects there is very few studies towards dimension of learning through play. As described, they are four dimension which are free flow play, structured play, guided play, and playful teaching (in Sharifah & Aliza, 2013). Other than that, Sharifah, and Aliza lists four types of cognitive plays included Functional Play, Constructive Play, Dramatic Play, and Games with rules. Past studies indicate the significant on dramatic play (Nakawa, 2020; King et al., 2020; Halimah et al., 2020; Aksoy & Baran, 2020, Walan & Enochsson, 2019), constructive play and games with rules (Reikeras, 2020).

Play also can be divided based on content. In Zhu (2014), there are seven category which are Physical, Language and Literacy, Cognitive, Mathematic, Music, Art, and role play. For example, present studies examined Mathematics Simoncini et al (2020), Language and Literacy Nakawa (2020); Isabelle et al (2021); King et al (2020); Halimah et al (2020); Aksoy & Baran (2020); Walan & Enochsson (2019) which is consistent with (Zhu, 2014). We can see that several categories such as Physical, Cognitive, Music, Art, and role have not been explored widely.

Nevertheless, the professional development of teachers' and parents' beliefs is essential for increasing children's learning outcomes through the play method. This research indicates that community engagement raises awareness about learning through play and had a satisfactory outcome.

Conclusion

In summary, this study has outlined the research topics between 2019 to 2021. Studies on parents' belief in learning through play are still lacking. Secondly, very limited studies have examined the learning outcome of play at preschool age. Third, the implementation of teaching and learning through play should be given high attention. The main contribution of this work is to normalize the challenges in learning through play based on the different backgrounds of learners although it is difficult to determine the exact threshold value compared to several methods.

The main results of this study are summarized in Table 3 and Table 4. In the meantime, the proposed research topic is the most interesting among scholars. The results of this study indicated that learning through play is very important to be considered in the early childhood stage. There is still room for research and many issues to explore, such as guidelines for learning through play activities, teaching plans, and even the structure of a teaching handbook.

Limitation

First, this systematic review is limited to databases of Scopus and WoS. Therefore, analysis and interpretation may be affected by such limitations. Second, in view of the multiply of topics covered in the collected data, only key themes and results were reported based on the research topic, while some studies with the method, procedure, and technique could not be included in the discussion.

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