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How to Strengthen Children's Numeracy from Home?

Aisyah Senja Mustika, Riyadi, Sandra Bayu Kurniawan

Universitas Sebelas Maret
aisyahsenja@student.uns.ac.id

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Abstract
Numeracy is one of the most essential abilities that needs to be developed in early childhood from home. This research aims to explore effective strategies for strengthening children's numeracy abilities in the home environment. Given the importance of numeracy as a basic skill for education and daily life, interventions carried out at home can play a significant role in the development of this skill. This research uses a literature review method by collecting, analyzing, and synthesizing various related research sources. The results of the research show that 1) interaction through numeracy conversations, 2) formal and non-formal numeracy activities, 3) parents' knowledge, abilities, and experiences, and 4) the role of parents' attitudes and expectations are proven to be effective in helping children develop numeracy skills better. Therefore, this research recommends that parents be more involved in their children's learning process at home and create an environment that supports numeracy learning. It is hoped that these findings can provide practical guidance for parents in improving their children's numeracy skills at home, as well as become a reference for educators in preparing numeracy skills development programs.
Keywords: *numeracy, parents, strengthen*

Abstrak
Numerasi merupakan salah satu kemampuan paling esensial yang perlu dikembangkan pada anak usia dini sejak dari rumah. Penelitian ini bertujuan untuk mengeksplorasi strategi yang efektif dalam memperkuat kemampuan numerasi anak-anak dari lingkungan rumah. Mengingat pentingnya numerasi sebagai keterampilan dasar untuk pendidikan dan kehidupan sehar-hari, intervensi yang dilakukan di rumah dapat berperan signifikan dalam perkembangan keterampilan ini. Penelitian ini menggunakan metode literature review dengan menghimpun, menganalisis, dan mensintesis berbagai sumber penelitian terkait. Hasil penelitian menunjukkan bahwa 1) interaksi melalui perbicangan numerasi, 2) aktivitas numerasi formal dan nonformal, 3) pengetahuan, kemampuan dan pengalaman orang tua, serta 4) peran sikap dan harapan orang tua terbukti efektif dalam membantu anak-anak mengembangkan kemampuan numerasi dengan lebih baik. Dengan demikian, penelitian ini merekomendasikan agar orang tua lebih terlibat dalam proses belajar anak di rumah dan menciptakan lingkungan yang mendukung pembelajaran numerasi. Temuan ini diharapkan dapat memberikan panduan praktis bagi orang tua dalam meningkatkan keterampilan numerasi anak-anak di rumah, serta menjadi acuan bagi pendidik dalam penyusunan program pengembangan keterampilan numerasi.
Kata kunci: *numerasi, orang tua, menguatkan*

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INTRODUCTION

Early numeracy skills are an important foundation in developing children's mathematical abilities, and research even shows that numeracy skills can predict academic success at the next level. Counting skills, recognizing number symbols, comparing numbers, and making estimates are accurate predictors of seeing a child's numeracy potential at school (Raghubar & Barnes, 2017). If we strengthen numeracy at an early stage in children's lives, this will have a significant impact on their mathematical skills later in life. This strengthening impact is increasingly visible for children with learning difficulties, early numeracy intervention helps them to master more complex skills at a later stage (Charitaki et al., 2021; Nelson & McMaster, 2019; Purpura & Napoli, 2015).

Strengthening children's numeracy at an early age does not only occur at school, parents play an important role in their development. Numeracy practice at home plays an important role in strengthening early childhood numeracy skills. Numeracy programs carried out by parents have been proven to be able to improve children's numeracy skills to a more complex level (Dulay et al., 2019). Both formal and informal numeracy activities, parental attitudes and expectations, and the numeracy environment at home contribute significantly to the development of children's numeracy skills. In addition, early literacy skills also have an influence on numeracy development, showing the importance of a holistic approach in supporting children's development (Kleemans et al., 2012; Segers et al., 2015; Skwarchuk et al., 2014).

Parents can provide support by providing fun experiences so that children have a positive perception of numeracy, parents can create various activities to develop children's abilities in applying mathematical concepts to everyday life (Skwarchuk, 2009). Apart from that, parents can also carry out simple arithmetic operations such as addition or subtraction with objects around the house (Pan et al., 2023; Skwarchuk et al., 2014). There are many things parents can do to strengthen their children's early numeracy, one of which is developing an environment rich in numeracy (Bernabini et al., 2020). Parents can invite children to become acquainted with various geometric shapes through house ornaments, installing tools to measure height and weight, arranging or grouping objects based on size, putting up posters of mathematicians, etc.

Parents who have a positive attitude and think that numeracy skills are important tend to be involved more in numeracy activities which then have an impact on their children's skills (Mutaf-Yıldız et al., 2020). Unfortunately, many parents think that numeracy-related activities are the school's responsibility. Parents are reluctant to invite their children to become acquainted with numeracy (Hidayah et al., 2023). This is exacerbated by the increasingly low level of interaction between parents and children, both due to work factors and the disproportionate use of communication technology. In fact, numeracy activities carried out by both mothers and fathers are positively correlated with children's numeracy skills (del Río et al., 2017a; Huang et al., 2017; Mues et al., 2022).

There are many factors that influence the role of parents in strengthening early childhood numeracy. Socioeconomic and math anxiety influence the type of numeracy activities and frequency of parental involvement (del Río et al., 2017b; Khanolainen et al., 2020), uniquely, mothers with low socioeconomic status are more often involved in numeracy activities with children (del Río et al ., 2017b). The education of both mother and father is positively correlated with children's numeracy skills (Abuya et al., 2015; Kongkona Sonowal, 2023), mother and father's numeracy skills are also positively correlated with children's numeracy skills (de Coulon et al., 2011).

By reviewing the importance of parental involvement in strengthening early childhood numeracy and the influencing factors, this research seeks to explore how parents can effectively strengthen children's basic numeracy from home.

METHOD

Literature review according to (Creswell, 2018) is a summary that comes from various journals, books, articles and other documents that explore previous or current issues regarding information on the topic being researched, literature review also classifies various subtopics according to research. According to him, a literature review has several objectives, including sharing with readers several other research results that are closely related to the research being conducted. This allows for a wider research reach, and continuous dialogue, and fills gaps and expands previous research (Cooper, 2020, Marshall & Rossman, 2016 (Creswell, 2018)). According to Creswell, the 2018 literature review provides a framework for setting benchmarks for research results and comparing them with other findings. Researchers need to add some related literature, summarizing it from broad topics to more focused topics. This journal uses SLR analysis, a systematic literature review provides a comprehensive review of literature related to the research question, synthesizing previous work to strengthen the knowledge base of a topic while adhering to transparency and bias reduction(Williams et al., 2021).

RESULT AND DISSCUSSION

To obtain data regarding how parents at home strengthen numeracy skills in early childhood, the author collected 26 literature consisting of 25 journals and one book. Twenty-five journals are international journals that come from education journals, child development journals, elementary school children's journals, psychology journals, and related journals published from 2014 to 2023. The journals talk about the numeracy environment at home or HNE which includes numeracy discussions and numeracy activities, both formal and informal. It also discusses the influence of parents' attitudes, knowledge, and socioeconomics which apparently have an influence on children's numeracy abilities. The following is a complete presentation of data extracted from various literature regarding strengthening children's numeracy from an early age at home:

Tabel 1.1 Literature Review of Home Numeracy Environment

Researcher and Year	Literature	Research result
(Skwarchuk et al., 2014)	*Journal of Experimental Child Psychology*	Numeracy activities, both formal and informal, at home have a positive impact on children's numeracy skills. Informal activities encourage non-symbolic arithmetic while formal activities increase children's knowledge of the number system.
(Braham et al., 2018)	*Developmental Psychology*	Parents who engage in interactions involving various numerical content and contexts are proven to be able to sharpen children's spot attention to numerical information in the future.
(Girard et al., 2021)	*PLOS ONE*	Challenging and enjoyable numeracy experiences at home are positively correlated with children's arithmetic abilities when they are in elementary school.
(Xu, 2023)	*The Educational Review*	Strengthening numeracy at home, such as creating a well-developed numeracy environment, activities rich in numeracy, quality numeracy

		conversations, guidance as a scaffold in understanding a numeracy context, and building partnerships between home and school are proven to improve children's numeracy skills.
(DePascale et al., 2021)	*Cognitive Development*	Parents and children's mathematical abilities are related to the quality of their conversations about mathematical concepts and numbers while they play.
(Annemie et al., 2021)	*Diversity Dimensions in Mathematics and Language Learning*	How parents have conversations with their children about numeracy can provide a fairly significant picture of their mathematical abilities at preschool age.
(Casey et al., 2018)	*Child Development*	Mothers who invite children to talk about quantities in a collection of objects have been proven to increase children's mathematical achievement in kindergarten and first grade of elementary school.
(Gunderson & Levine, 2011)	*Developmental Science*	Parents' discussions with children about numbers, such as counting the number of certain objects, have a positive correlation with children's knowledge of basic numbers in the future.
(Soni & Kumari, 2017)	*International Journal of Science and Mathematics Education*	Mathematics anxiety and parents' mathematics attitudes influence children's mathematics anxiety, even extending to their mathematics presentations.
(Slusser et al., 2019)	*Developmental Science*	Parents' ability in mathematics has a positive impact on children's language related to numbers.
(Braham & Libertus, 2017)	*Developmental Science*	Parents who are experts or skilled in mathematics have a positive correlation with their children's mathematical abilities, they pass on the insights they gain so that they are able to sharpen their children's numerical skills.
(Silver et al., 2022)	*Journal of Educational Psychology*	Parents who carry out numeracy conversations by providing input regarding mathematics lessons are positively correlated with their children's higher mathematics achievement compared to other children with the same obstacles.
(Purpura et al., 2020)	*Frontiers in Psychology*	Numeracy activities at home, both direct (formal) and indirect (non-formal), can significantly improve children's numeracy and mathematical

		language skills. Formal activities are activities that are explicitly intended to teach children numeracy, while non-formal activities are teaching numeracy that is carried out implicitly.
(Vasilyeva et al., 2018)	*Journal of Cognition and Development*	Parents' belief in the importance of numeration leads them to engage in numeracy activities with their children at preschool age, especially those related to the introduction of number symbols and cardinal numbers.
(Maloney et al., 2015)	*Psychological Science*	Parental anxiety about mathematics (perceiving mathematics as difficult) causes children to study less and experience more mathematics anxiety. This relationship becomes stronger as parents intervene more in their children's mathematics homework.
(Im & Kang, 2023)	*Korean Journal of Child Studies*	Numeracy practice at home has more impact on improving children's numeracy skills and problem-solving abilities than private mathematics tutoring outside.
(M. Susperreguy et al., 2020)	*Early Childhood Research Quarterly*	Parents who have a positive attitude and high academic expectations for their children's numeracy must be involved in strengthening their children's math skills.
(Mou et al., 2023)	*Child Development*	The numerical vocabulary developed by children is related to the children's initial numerical vocabulary abilities obtained from their parents.
(Šilinskas et al., 2020)	*Early Childhood Research Quarterly*	The frequency of numeracy activities carried out by parents adjusts the child's numeracy performance abilities, but it cannot be guaranteed that the most frequent frequency means the most impact.
(Douglas et al., 2021)	*Advances in child development and behavior*	Parents' confidence in their children's numeracy skills is positively correlated with their support for strengthening their children's numeracy skills.
(Son & Hur, 2020)	*Journal of Research in Childhood Education*	Talking about numeracy by caregivers while cooking while children are on holiday at home has been proven to be able to improve children's math skills. Talking about measurements is also an interesting scaffold for related tasks.
(Pina et al., 2014)	*Frontiers in Psychology*	Parental education level has a positive correlation with children's mathematical abilities.

(Ghazali et al., 2021)	*International Journal of Learning, Teaching and Educational Research*	Parents in Malaysia have high knowledge and understanding as well as attitudes that support early childhood numeracy, but they need direction in order to provide support effectively.
(Oh et al., 2022)	*Developmental Psychology*	Parents with high math anxiety tend to prefer control, but they find it difficult to accept that their child's math performance is poor, which creates conditions that are not constructive.
(Elliott et al., 2021)	*Education Sciences*	Parents' belief in their responsibility for their pre-school children's numeracy literacy skills is positively correlated with their children's numeracy abilities.
(M. I. Susperreguy et al., 2020)	*Child Development*	Parents who facilitate numeracy activities such as simple addition at preschool age produce better numeracy performance later in life.

From the various literature that has been written, we can analyze various ways that can be taken to increase the numeracy of early childhood from home. Parents are involved in various numeracy activities with children, both formal such as applying simple addition operations to contextual problems around the child, or informal numeracy activities such as number games. Parents are expected to have a positive attitude towards numeracy because this has an impact on parents' seriousness in taking part in strengthening numeracy. Home Numeracy Environment (HNE) or the numeracy environment at home is a stimulus that plays a significant role in children's numeracy skills. The following are the results of a synthesis of several literatures summarized by the author:

1. Interaction through Numeracy Discussions at home

One effective way for parents at home to improve their early childhood numeracy skills is by having numeracy conversations. This is supported by research conducted by (Gunderson & Levine, 2011) (Annemie et al., 2021) (Xu, 2023) which explains that conversations about numbers such as counting the number of objects can increase children's knowledge about basic numbers in the future. This discussion also has an impact on children's numerical vocabulary (Mou et al., 2023).

How can parents start a numeracy conversation? Numeracy conversations can be done by anyone, for example, a mother who invites them to count a collection of objects can also improve a child's numeracy skills, especially during preschool and first grade (Casey et al., 2018), the mother or father by providing input or suggestions when the child experiencing difficulties in mathematics lessons (Silver et al., 2022), or even by caregivers when cooking while children are on holiday at home because it has been proven to improve children's mathematics skills (Son & Hur, 2020).

2. Formal and Informal Numeracy Activities

Another effective way to develop children's numeracy skills is by carrying out both formal and normal numeracy activities (Purpura et al., 2020) (Xu, 2023). Formal activities are defined as activities that explicitly teach children numeration, for example, parents inviting children to carry out basic addition or subtraction operations. While non-formal activities are carried out implicitly or children do not realize that they are learning about numeracy, for example playing with numbers or singing about numbers (Purpura & Napoli, 2015). Formal activities develop children's knowledge of the number system,

while non-formal activities develop non-symbolic arithmetic (Skwarchuk et al., 2014). This numeracy activity will have an even greater impact if it is packaged in a challenging and fun way (Girard et al., 2021). The impact is even more significant than asking children to take private mathematics lessons (Im & Kang, 2023).

Should parents carry out numeracy activities continuously? Numeracy activities will be effective if they are carried out by paying attention to opportunities for numeracy activities to occur and by paying attention to children's performance in numeracy. Parents do not need to force too frequent frequencies, because more frequent frequencies cannot predict improvements in children's numeracy abilities (Šilinskas et al., 2020).

3. Knowledge, Ability, and Experience of Parents

To develop numeracy skills in early childhood, one important thing to do is for parents to equip themselves with numeracy knowledge and skills. According to various research results that have been collected by the author, parents' abilities are positively correlated with children's abilities (Braham & Libertus, 2017) (Braham et al., 2018). Parents who have mathematical abilities will automatically be able to carry out higher-quality numeracy conversations (DePascale et al., 2021). Children's insight and language regarding numeracy are also increasingly developing because parents pass on this insight to Anakusser et al., 2019; Braham et al., 2018).

Does parental education also have an influence? According to research conducted by Pina et al., 2014, parental education has a positive correlation with children's abilities. However, this education is not always formal, parents can always develop their mathematical abilities to support their children's numeracy skills.

4. The role of parental attitudes and expectations

To improve children's numeracy abilities, parents need to first have good attitudes, beliefs, and expectations regarding their children's numeracy abilities. Because parental confidence will have a positive impact on children's numeracy abilities (Vasilyeva et al., 2018; M. Susperreguy et al., 2020; Douglas et al., 2021; M. I. Susperreguy et al., 2020; Elliott et al., 2021)). Parents who are optimistic about numeracy tend to be more involved in numeracy activities (Maloney et al., 2015; Ghazali et al., 2021)). Meanwhile, parents who have mathematics anxiety tend to hurt their children's numeracy abilities (Soni & Kumari, 2017). This is because parents who have mathematics anxiety tend to be controlling, they cannot accept that their child has poor performance in mathematics, so that the child does not receive appropriate direction and support and this makes the condition worse (Oh et al., 2022).

CONCLUSION

Conclusion this research confirms that parents have a very important role in strengthening their children's numeracy skills from home. Through various daily activities involving numbers and mathematical concepts, parents can create an environment that supports effective numeracy learning. Activities such as cooking, shopping, and interactive games can be powerful tools for introducing and reinforcing basic math concepts. Parental support and active involvement in the learning process is a key factor in children's numeracy development. Overall, this research recommends that parents be proactively involved in their children's learning activities and design approaches that are fun and relevant to everyday life. By utilizing the potential of the home environment as a learning tool, parents can provide a strong foundation for children to master numeracy, which is not only beneficial for formal education but also for their daily lives.

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