TWIST

Parents Views on Digital Technologies in Mathematics Learning in Early Childhood Development

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Abstract
Children learn most effectively when they are interacting with the world around them in their homes, where even very young children are increasingly exposed to digital gadgets. Therefore, it is typical to see young children watching videos, playing games on tablets, or doing internet research. With such rapid advancements, it is important to have a deeper knowledge of the views of parents on the use of digital technology in regular play and learning activities in Early childhood development. The study aimed to explore how parents perceive the use of digital technologies in rural ECD centres of O R Tambo Inland District, Eastern Cape Province. The study adopted Bronfenbrenner's theory of ecological system which emphasizes the important role of the environment in which children learn, develop, and grow through the influence of various elements in their environments. This was a qualitative study that used the case study as a design. The participants for the study included 7 parents of children in two rural ECD centres of O R Tambo Inland District. The parents were purposefully selected as information-rich participants in the study. Data were collected through semi-structured interviews and analysed using thematic analysis. The study's findings revealed that most parents supported the use of digital technologies in ECD. They believe that if the children's cultural knowledge is integrated with technology, the opportunities to foster playful learning will be unlimited.

INTRODUCTION
Parents have a variety of context-specific viewpoints regarding the use of digital technology in ECD. It is essential that educators and policymakers take note of these issues, offer clear directives, and ensure that technology is applied in a manner that fosters the child's optimal development. Olowe and Kutelu, (2014) mention that in early childhood education, the term ICTs could include computers digital cameras and digital video cameras, creativity and communication software and tools, the internet, telephones, mobile telephones, tape recorders, interactive stories, computer games, programmable toys, videoconferencing technologies and closed-circuit television, data projectors, microphones, headphones electronic whiteboards and more. The literature by Shin (2015); Hesketh, Hinkley and Campbell (2012) shows that nowadays parents are not spending much quality time with their children while the amount of time spent by them on reading to their children is very low. Therefore, the parent technology use or attitudes toward media should be positively correlated with their children's use of technology. Further analyses indicate that child screen time use appears to be the result of an interaction between child and parent factors and is highly influenced by parental attitudes (Genc, 2014; McCloskey et al. 2018; Vittrup, Snider, Rose & Rippy, 2014; Blackwell, Lauricella & Wartella, 2014). Overall, parents showed positive attitudes toward media, to the extent that they believed media exposure to be vital to children's development, and many disagreed with recommendations from expert sources regarding age-appropriate screen time (Vittrup, et al. 2014).The 'values-based' approach to the use of technology is one of the nine discrete pedagogical approaches described by Fleer (2016). In this approach, the learning focus is on 'conscious thinking about values, culture and ethics' (Fleer, 2016). Emphasis is placed on the process and not the product, on children's competence and agency, and children are also encouraged to consider environmental and political issues as they engage with technology. Yet, while there may be similarities, elements of critical questioning, enable problematising, reflective thinking and preparing action plans to solve

social problems are missing. Properly integrated digital tools can empower younger children by providing them with a voice, especially with limited literacy capabilities, at their young age (U.S. Department of Education, 2016). Digital technologies such as digital toys which are properly integrated into learning can empower children by granting them a voice they have never had before. In this context, digital technologies also open new pathways for alternative social interactions and change the learning relationships between children and teachers (UNESCO, 2012).

THE EFFECTS OF DIGITAL TECHNOLOGIES IN EARLY CHILDHOOD MATHEMATICS EDUCATION AND DEVELOPMENT

Children begin to engage with technology in their early childhood years with a notable emphasis on information and communication technology (ICT). This encompasses a broad spectrum of tools, including visual, auditory, printed, and written mediums, all of which facilitate accessing and generating information. Children are adept at using these technologies from a tender age. Gjelaj, Buza, Shatri and Zabeli (2020) mention that today, it is common to observe toddlers and preschool children watching videos, playing games on tablets, or exploring on the internet. With such dynamic developments, there is a need to establish a better understanding of the process of engaging ICT in everyday play and learning activities of preschool children. Therefore, to meet the requirements of this era of digital information, educational technologies must be utilized in early mathematics classrooms and learning environments (Alsaeed and Aladil, 2024). Consequently, educators and parents must be capable of selecting suitable physical and digital technologies for mathematical learning to enrich children's learning experiences. Because education using technological tools differs significantly from paper-and-pencil education, professional development is required to equip educators to identify and implement efficacious uses of technology-based educational materials. Such effort requires not only the teacher's knowledgeability but also parents' positive beliefs regarding the importance of enriching the learning environment to facilitate children's free exploration of mathematics concepts. Thus, teachers and parents' beliefs about integrating technology into their teaching have a tremendous impact on children's mathematics learning (Gjelaj, Buza, Shatri and Zabeli, 2020).

Studies have shown that children are more likely to participate actively in learning activities when they involve digital tools, which can lead to increased enthusiasm for mathematics (Bray & Tangney, 2017). Hence, there has been growing interest and research concerning the way in which technology can advance critical thinking and problem-solving for children in elementary, junior high and senior high schools (Mtshali, 2020). The researchers (Donovan et al., (2014); Soule & Warrick, (2015) and Van Laar et al., (2017), identified a need to supply the suitable manpower adapted to the developments and skills such as creativity, innovation, critical thinking, problem-solving, collaborations known as 21st century skills in which children should be equipped from an early age for the current increasing complexity of life and the work environment.

When digital tools are used effectively, they can support the development of foundational skills such as number sense, spatial reasoning, and pattern recognition (Viberg & Mavroudi, 2018). According to Kalas (2013), studies have shown that digital technologies can provide children with new opportunities to engage in attractive and relevant play, learning, communication, exploration, and development. Hence, properly integrated digital tools can empower younger children by providing them with a voice, especially with limited literacy capabilities, at their young age (U.S. Department of Education, 2016). Furthermore, digital technologies such as digital toys that are properly integrated in learning can empower children by granting them a voice they have never had before. In this context, opening the new pathways for alternative social interactions that will change the learning relationships between children and teachers (UNESCO, 2012). However, parents sometimes have various misconceptions and stereotypes, which are often based on negative reports in the media about the harmful effects of digital technologies on children. Such reports make parents concerned, anxious and frightened that their children, if exposed to computers in kindergarten, will play aggressive and violent computer games, instead of learning, creative play and socializing with their peers. The development of a child's skill set, information base, and familiarity with technology may stem from the strength of parental interaction, guidance, and mediation. In the examination of the parent-child dynamic and technology utilization at home, Hamlin and Flessa (2018) identify various significant challenges hindering parental engagement in their children's technology usage. These include the financial implications of acquiring personal technology devices, the adjustment of culturally diverse families to unfamiliar surroundings, disparities in access between rural and urban settings, and the decline in parental involvement as children advance to higher grade levels.

PARENTS ATTITUDES REGARDING THE USE OF DIGITAL TECHNOLOGIES

In order to become involved in the process of digital technologies integration in institutions of early childhood education, parents need to be aware of what their children are doing on computers at home. Also, to achieve educational goals, early childhood educational institutions should seek to effectively use children's experiences with digital technologies at home. On the contrary to teacher' perceptions and beliefs, parents are more opened to use different supplies of digital technologies and most of studies show that there is a strong relationship between parent's different habits and influence to their children.

Rodríguez et al., (2017) mention that when parents express interest in children's mathematics tasks and show confidence in their children's mathematics abilities, there is a positive impact on learning. Furthermore, parents communicating interest in mathematics work and progress, and confidence in their children's ability has a positive impact

on student achievement (Rodríguez et al., 2017). Therefore, being a full-time job, parenting is defined as a belief system that includes attitude, perception, expectation, knowledge, value, and action orientation towards the care and socialization of children (Darling & Steinberg, 1993). However, today, parental responsibilities are changing in line with the needs of the digital age. In the digital age, parents try to resist or at least balance change while at the same time trying to embrace it in ways that meet the needs of their family (Livingstone & Blum-Ross, 2020). Due to the changes in parenting in the digital age, while parents encourage their children to use digital media for educational and social purposes, they also attempt to minimize digital media risks and control their possible negative consequences (Manap, 2020). Specifically, parental control is vital in preventing and reducing the risks and threats children may encounter in their online activities (Gomez ´ et al., 2017; Keya et al., 2020; Nouwen & Zaman, 2018; Rosen, Cheever, & Carrier, 2008). This implies that parents need to perceive and use technology in an effective way, prepare their children for the requirements of the information age, and encourage them to acquire and properly use information (Uzuegbunam, 2019). Therefore, parents should have sufficient knowledge about their children's internet use, the online risks and threats, and the safe use of the Internet (Livingstone & Helsper, 2010).

Yurdakul, Donmez, Yaman, & Odabas (2013) classified the roles of digital parents into five categories (Digital literacy, Awareness, Control, Ethic, Innovation). Balkam (2014) also explained the way to become a good digital parent in seven steps while emphasizing healthy communication with children: "talk with your kids", "educate yourself", "use parental controls", "set ground rules & apply sanctions", "friend and follow, but don't stalk", "explore, share, and celebrate", and "be a good digital role model". Carvalho et al. (2015) also stated that satisfaction with the use of ICT creates different patterns at both individual and family levels (freedom for children and safety for parents), ensuring higher quality of parent-child relationships.

Utilizing apps within an interactive learning environment can be stimulating to children who might be tired of the typical learning model. Therefore, when children use them, they may experience fun and joy while simultaneously facing challenging activities, exploring unknown territories, and being creative by producing new texts expressing their ideas and thoughts and connecting them with real-life (Vaiopoulou, Papadakis, Sifaki, Stamovlasis, and Kalogiannakis, 2021). Therefore, parents need to perceive and use technology in an effective way, prepare their children for the requirements of the information age, and encourage them to acquire and properly use information (Uzuegbunam, 2019).
Eleftheriadi, Lavidas, Komis (20201) identify that teachers use digital tools to teach mathematics more as a drill-and-practice tool and less as a tool for supporting discovery and exploratory activities. Finally, they highlight the lack of training on ICT integration and the preschool teachers' role in mathematics teaching (Kolovou, Koutsolabrou, Lavidas, Komis and Voulgari, 2021)

Parents' attitudes toward the use of digital technologies in children's mathematics learning play a crucial role in shaping their educational experiences. Therefore, collaboration between parents and educators, is necessary to ensure that the integration of digital technologies in mathematics learning aligns with the needs and preferences of families while maximizing positive outcomes for children's mathematical development.

RESEARCH OBJECTIVES
- To explore the effects of digital technologies in early childhood mathematics education and development.
- To evaluate the views of the parents regarding the use of digital technologies in Early Childhood Development.

THEORETICAL FRAMEWORK
The theoretical framework underpinning the study was that of Bronfenbrenner's (2006) ecological system. Bronfenbrenner (2006) states that the ecological system comprises of five systems interacting with one another. These systems include microsystem, mesosystem, exosystem, macrosystem and chronosystem (Donald, D., Lazarus, S. & Lolwana, P. 2007). Microsystems are systems that involve interactions of children with familiar people like family or friends. In the centres, children should interact with other children through play and these interactions should assist in developing a child socially, emotionally, cognitively, morally, and spiritually through relationships and daily activities (Donald et al., 2007). Mesosystems consist of microsystems that constantly interact with one another like a practitioner helping a child (Swick & Williams, 2006). Bronfenbrenner's ecological systems theory provides a valuable framework for understanding the interplay between digital technologies in mathematics learning and early childhood development from the perspective of parents. Therefore, ECD educators should consider these various ecological systems as they provide a comprehensive understanding of how parents perceive and navigate the use of digital technologies in mathematics learning during early childhood development. This understanding can inform the development of strategies to support parents in effectively embrace the digital tools to enhance their children's mathematical skills and promote positive educational outcome. Therefore, children's behaviour and development are also influenced by the social environments they inhabit (family, neighbourhood, school) and the historical time when they live (Bronfenbrenner, 2006). Moreover, the model by Bronfenbrenner (2006) helps explain how children learn and develop, the importance of their individual traits and attributes, and the role of the social environments they inhabit in shaping their learning and adjustment. The study used the theory because children develop and grow through the influence of various elements in their environments. Hence, the establishment of a good mathematics learning environment in order to provide opportunities for mathematics learning to occur is vital (Grobler, Faber, Orr, Calitz. & Van Staden. (2007).

METHODOLOGY

The study used a qualitative research approach to get descriptive information on how parents view the use of digital technologies in their childrens mathematics learning by interpreting the participant's feelings, experiences and actions in human terms rather than statistical presentations (Terre-Blanche, Kelly & Durheim, 2010). A case study design was used which is described by Yin (2014) as a case study used in order to understand a real-life phenomenon in-depth.

Participants

The population for the study included rural ECD centres of the Mthatha district in which five ECD centres, were conveniently selected. (Creswell, 2018). The participants of the study included the practitioners of both centres who were purposefully selected as information-rich participants related to the phenomenon of interest making a total of 7 practitioners as participants of the study.

Instruments for Data Collection and Procedure

The study used semi-structured interviews to clarify concepts and problems and allowed the formulation of possible answers and solutions (Bless et al. 2007). Semi-structured interviews also explored in detail how parents view the use of digital technologies in their children's mathematics learning, in ECD centres of OR Tambo Inland District, South Africa (Bless et al. 2007). These interviews were qualitative research devices that included questions guided by several main topics with a structured protocol that was developed prior to the interview (Jansen 2010).

Ethical Procedures

Permission from authorities which include the Department of Social Development, the Department of Education and centre managers of the selected ECD centres, was obtained through written applications. Informed consent forms were issued to practitioners who were the participants in the study. I assured the participants that the information they provided would be kept private and confidential. Pseudonyms were used to maintain confidentiality.

FINDINGS

Theme 1: The Effects of Digital Technologies in Early Childhood Mathematics Education and Development

The parents recognised the significant impact of digital technologies on early childhood mathematics education and development. They also appreciated the opportunities the digital technologies provided for engaging, personalized, and effective mathematics learning experiences to their children. However, they also emphasized the importance of mindful use and thoughtful selection of digital resources to ensure optimal learning outcomes for their children.

Parental Involvement

Parental involvement is crucial for supporting children's learning outside the classroom and fostering a positive attitude towards mathematics. The majority of parents believed that digital technologies could be beneficial for their children's education and development. They recognised that these tools could enhance learning experiences and foster children's engagement in mathematical concepts. Therefore, digital technologies can also engage parents in their children's math education.

Parents also acknowledged that the use of digital technologies could help in developing various skills, including mathematical understanding, creativity, and social interaction. They appreciated how these tools made learning more interactive and enjoyable for their children.

This was supported by responses such as:
"I appreciate digital tools that facilitate their involvement in our children's mathematics education".
"I like digital tools that have features that allow us to track our children's progress, receive updates on learning activities, and access resources to support math learning at home".
"These tools provide opportunities for our children to engage with mathematics outside of traditional learning settings, such as at home.
"Digital math games and activities captivate our children's attention and motivate them to learn mathematics in an interesting way".

Engagement and Motivation

Parents prioritize high-quality digital math resources that align with their child's developmental stage and learning goals. Many parents observe that digital technologies, such as educational apps and interactive games, significantly increase their children's interest in mathematics. They also seek out apps and games that provide accurate mathematical content, promote critical thinking skills, and offer meaningful learning experiences. The interactive nature of these tools makes learning more enjoyable and engaging for young learners.

These were parents' responses when asked about how they engage and motivate their children:
"These digital tools incorporate interactive and game-like elements, which can engage and motivate our children to explore mathematical concepts".

"The colourful drawings, sound effects, and digital math games make learning more enjoyable for children".
"I like these digital technologies; they provide individualized approach which help children learn at their own pace and focus on areas where they need more support".
"I've noticed that my child is much more engaged when using educational apps compared to traditional worksheets. The interactive elements really capture their attention"
"Using digital storytelling tools has helped my child express themselves better. They're not just learning math; they're also developing language skills."

Preparation for the Future
The findings of the study revealed that parents acknowledged the role of digital technologies in preparing their children for success in a technologically driven world. They believed that early exposure to digital mathematics tools helps develop important digital literacy skills that will be essential for their child's future academic and professional endeavours. Parents also believe that exposure to digital technologies helps their children develop essential skills needed for future academic success.

Following are some of the responses from the parents:
"Using educational apps not only makes math fun but also prepares my child for a tech-driven world."
"I am so excited that our children will get to understand mathematics through technology and this will make them to fit in working with children from other places"
"It is good for our children to learn technology during the early years so that they can fit well in the challenging and digital world".
"Technology is helping my children to communicate with their fellow students and with friends. Also, they are able to apply for jobs even internationally".
"When my child engages with math games online, I see them thinking critically about how to solve problems, which is crucial for their future."

Theme 2: The Views of the Parents Regarding the Use of Digital Technologies in Early Childhood Development
Parents views on the use of digital technologies in their children's learning of mathematics reflected the diverse perspectives about how useful digital tools are for teaching math to young children. Some are very supportive, while others are more cautious.

Supportive views of parents
Parents were of the view that introducing children to digital tools early will not only enhance their mathematics skills but also prepares them for future educational and professional opportunities where technology proficiency is essential. This is reflected on their responses in which they mention:
"I love how educational apps make learning fun for my preschooler. It's amazing to see how quickly she picks up new concepts through interactive games."
"As an educator myself, I'm always researching the latest studies on technology and child development."
"I never thought I'd be teaching my 5-year-old how to add and subtract, but she's really into it! We use games and apps as a fun way to introduce her to mathematics concepts."

Cautious measures of parents on the use of digital tools
While parents recognise the educational potential of digital technologies in early childhood development, they adopt cautious measures to mitigate associated risks. By setting limits on screen time, emphasising quality content, actively participating in their children's digital experiences, and fostering social interactions. Parents also aim to create a balanced approach to technology use. Additionally, they were happy about the benefits of digital tools in children's mathematics learning. However, they also exercise caution and implement measures to ensure their child's safety and well-being.

Here are some cautious measures that parents take:
"We try to limit screen time for our toddler. While we see the value in some educational apps, we want to make sure he's getting plenty of hands-on play and social interaction too."
"I worry about the long-term effects of too much screen time on my child's development. We try to keep TV and tablets to a minimum and encourage outdoor play instead."
"As an educator myself, I'm always researching the latest studies on technology and child development. We try to strike a balance between screen time and other activities that promote creativity and imagination."

Parents liked the concept but face resource limitations
While many parents appreciate the concept of integrating digital technologies into early childhood development, they often encounter significant resource limitations that hinder effective implementation. In some cases, parents report limited access to technology at home. This can be particularly challenging for families in low-income areas where access to tablets or computers is not guaranteed.

This was confirmed by their responses as:

"We're pretty old-fashioned when it comes to technology and kids. Our son gets plenty of screen time at daycare, but at home, we prefer activities that don't involve screens."

"We live in a rural area with limited internet access, so we rely more on traditional toys and books for our child's learning and entertainment."

"In our culture, there's a strong emphasis on early literacy and numeracy skills. We use educational apps and digital resources to supplement what our child is learning at school."

"We only have one tablet in the house, and it's often hard to share it among my kids when they all want to use it at the same time."

DISCUSSION OF FINDINGS

The Effects of Digital Technologies in Early Childhood Mathematics Education and Development

The findings of the study imply that digital technologies can have a beneficial effect on early childhood mathematics education and development by fostering parental engagement, enhancing motivation, and preparing children for the future. Many parents and educators reported that interactive applications and games capture children's interest more effectively than traditional methods. On parental involvement the findings revealed that by facilitating parent-child interactions around mathematical concepts, digital technologies encourage collaborative learning experiences that can strengthen children's mathematical skills and understanding. This is supported by Alsaeed and Aladil, (2024) who state that to meet the requirements of this era of digital information, educational technologies must be utilized in early mathematics classrooms and learning environments including homes in which parents are involved in their children's learning of mathematics. Additionally, Bronfenbrenner (2006) is of the view that microsystems are systems that involve interactions of children with familiar people like family or friends. Therefore, children should utilize digital tools to learn mathematics, with support from parents who know them well.

On engagement and motivation, the study's findings indicated that digital technologies have the potential to significantly enhance engagement and motivation among young learners in mathematics. This is supported by Bronfenbrenner (2006) model which helps explain how children learn and develop, the importance of their individual traits and attributes, and the role of the social environments they inhabit in shaping their learning and adjustment. Furthermore, mathematics games that are in the digital tools can cater to different learning styles and preferences, fostering a more engaging and motivating mathematics learning experience. Vaiopoulou, Papadakis, Sifaki, Stamovlasis, and Kalogiannakis (2021) revealed that when children use digital games and app, they may experience fun and joy while simultaneously facing challenging activities, exploring unknown territories, and being creative by producing new texts expressing their ideas and thoughts and connecting them with real-life. Additionally, Gjelaj, Buza, Shatri and Zabeli (2020) is of the opinion that it is common to observe toddlers and preschool children watching videos, playing games on tablets, or exploring on the internet. These digital tools also prepare the children to adapt in the digital world and that is supported by the researchers (Donovan et al., (2020); Soule & Warrick, (2015) and Van Laar et al., (2017), who identified skills such as creativity, innovation, critical thinking, problem-solving, collaborations known as 21st century skills in which children should be equipped from an early age for the current increasing complexity of life and the work environment. At the microsystem level, digital technologies influence children's immediate environments, including the home and school settings in which parents and educators play crucial roles in mediating children's access to and use of digital tools for mathematics learning (Bronfenbrenner, 2006).

Parents Attitudes Regarding the Use of Digital Technologies

The findings of the study on parents' attitudes regarding the use of digital tools revealed that parents have different views on digital technology in education Furthermore, Parents expressed a positive attitude toward utilisation of technology to enhance their children's mathematical education. This is supported by Uzuegbunam (2019) who states that parents need to perceive and use technology in an effective way, prepare their children for the requirements of the information age, and encourage them to acquire and properly use information. Some parents see it as beneficial for their children's learning, while others worry about issues like too much screen time or replacing traditional methods. Manap, (2020) is of the view that, due to the changes in parenting in the digital age, while parents encourage their children to use digital media for educational and social purposes, they also attempt to minimize digital media risks and control their possible negative consequences.

Parents who support the use of technology in their children's mathematical learning believe that it enriches their educational experience, fosters a deeper understanding of mathematical concepts, and prepares them for success in a technologically driven world. Rodríguez et al., (2017) mention that when parents express interest in children's mathematics tasks and show confidence in their children's mathematics abilities, there is a positive impact on learning. These parents may view technology as a valuable tool that can supplement traditional teaching methods and engage children in interactive and dynamic ways. Digital technologies facilitate the development of essential skills in early childhood mathematics education. They provide opportunities for children to engage in problem-solving and critical thinking, which are crucial for mathematical understanding. Research suggests that when digital tools are used effectively, they can support the development of foundational skills such as number sense, spatial reasoning, and pattern recognition. that children are more likely to participate actively in learning activities. This is supported by Bray &

Tangney (2017) who mention that involvement of digital tools in children's mathematics learning can lead to increased enthusiasm for mathematics. Furthermore, the interactive nature of these technologies allows for personalised learning experiences, enabling children to progress at their own pace and revisit concepts as needed. However, some parents faced challenges due to a lack of resources when it comes to supporting their children in utilizing digital tools for mathematics learning. Hamlin and Flessa (2018) identify various significant challenges hindering parental engagement in their children's technology usage which include the financial implications of acquiring personal technology devices, the adjustment of culturally diverse families to unfamiliar surroundings, disparities in access between rural and urban settings, and the decline in parental involvement as children advance to higher grade levels.

Despite facing challenges such as resource limitations, parent's enthusiastic support signifies a collective understanding of how technology can enhance their children's mathematical learning, foster engagement, and prepare them for success in an increasingly digital world. However, it's important to acknowledge potential challenges and limitations associated with the use of digital technologies in early childhood mathematics education, such as screen time concerns, the need for teacher guidance and support, and the digital divide among children from different socioeconomic backgrounds. Balancing the benefits of digital technologies with mindful integration and supervision is essential to maximize their positive impact on children's mathematics education and development.

CONCLUSION
In conclusion, digital technologies offer valuable resources to enhance mathematics learning in Early Childhood Development (ECD). When integrated thoughtfully, these tools provide engaging and interactive experiences that cater to diverse learning styles, promote deeper understanding, and bridge gaps in access to quality education. Educators should ensure that technology supplements, rather than replaces, traditional teaching methods, maintaining a balance between screen time and other forms of learning experiences. However, it's essential to maintain a balance between screen time and other learning experiences, and to provide ongoing professional development for educators to maximize the benefits of digital technology in ECD mathematics instruction.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT
The author contributed to all aspects of the research: including writing – review editing & approving the final version.

CONFLICT OF INTEREST
The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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