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Introducing Math Concepts At An Early Age: Collaborative Stimulation

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ABSTRACT

Purpose of the study: Early childhood education is considered very strategic in human development. This is because early childhood education provides a foothold in further education. Including in mathematics education which is needed from an early age. This article aims to describe the benefits of local wisdom around children's environment in introducing math concepts through collaboration during a pandemic.

Methodology: This research uses a child collaborative approach through descriptive analysis in two institutions with data collection methods of interviews, questionnaires, and observations.

Main Findings: The results showed that the role of communication is very important between children, parents, and teachers in collaborating to stimulate the formation of mathematics through local wisdom.

Novelty/Originality of this study: This research recommends that introducing math is done with real activities, encouraging children to stimulate the habit of collaboration in improving children's life skills.

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1. INTRODUCTION

Early childhood education (ECE) as a foundation in the journey of human development is very important. This is because it provides the initial stepping stone to the next stage. Growth monitoring, health checks, and provision of referrals can be provided at this stage in their services [1]. Therefore, if a problem occurs at the first stage, it can be addressed immediately so that it does not interfere with further development. Early childhood education needs to involve the role of many parties, such as formal, non-formal and informal institutions. Informal education or education in the family is needed to help children achieve their development. In addition, formal education is also needed to support children's education [2]. So, good cooperation between schools and parents is needed.

Research highlights two primary challenges confronting early childhood education in fostering mathematical development in young children: (a) insufficient effective teacher training in early mathematics [3] and (b) the influence of beliefs on the execution of mathematics instruction in early childhood classrooms [4], [5]. The Mathematical Development Beliefs Survey (MDBS) was created to serve as a tool for assessing beliefs that influence the implementation of mathematics in early childhood education. The MDBS assesses perceptions regarding the suitability and significance of supporting mathematics development in preschool settings. It also assesses educators' ideas regarding the origin of mathematical knowledge (whether it is generated by the

instructor, the kid, or both) and their confidence in associated training. Researchers have consistently indicated that these particular attitudes affect the manner and extent to which teachers execute instruction in their classrooms [6], [7].

The development that needs to be stimulated in early childhood education includes six aspects. These aspects are religious and moral values, physical-motor, cognitive, language, social-emotional, and art [8]. All these aspects are not given as a whole, not separated in the process. These six aspects form the structure of the curriculum in PAUD institutions. On the other hand, there are facts about the low scores of Indonesian students in reading, arithmetic and science. Indonesian students' reading results ranked 72 out of 77 countries, math ranked 72 out of 78 countries, and science ranked 70 out of 78 countries. Likewise, with TIMSS results from 1999, 2003, 2007, 2011, and 2015, Indonesia was below the average score of participating countries [9]. Internal assessments conducted on junior high school ninth grade students also show that Indonesian students' math skills are still low. In 2019, the Indonesian Student Competency Assessment showed that 55.83% of Indonesian students had low ability in reading and 66.11% were low in science, while in mathematics as many as 79.44% of students had low ability [10]. This data explains that Indonesian students on average have low abilities in mathematics. The low math skills from the OECD research results explain that the role of education is very important in human quality. In relation to the PISA scores, early childhood education has a positive impact on children's cognitive development as future human capital [11]. Thus, providing early math education and literacy to children is necessary. Meanwhile, another challenge in education is to provide the skills needed in the 21st century. One of them is the ability to collaborate [12]. This includes cognitive skills where one is required to have interpersonal skills and intrapersonal skills [13]. These skills need to be given early in developing children's cognitive aspects.

During the pandemic, children are deprived of learning stimulation. Therefore, learning innovations are needed to cover the loss of learning experiences during the pandemic. Some teachers' statements explain that the pandemic has had an impact on lagging behind in many knowledge concepts that should be understood. Children are not fully prepared for the further education they will go through so more efforts are needed to close the knowledge gap due to the pandemic. Not only related to cognitive aspects and knowledge, online learning makes children dependent on gadgets that have an impact on social-emotional problems, lazy to move and interact with the environment. Therefore, providing meaningful play experiences through collaborative play in local games is very important as an effort to catch up with learning in recognizing math concepts through play activities.

In addition, there is a need for cooperation between preschool institutions and parents so that children can be stimulated to think problem solving in activities to recognize math concepts. Teachers can stimulate collaborative play in the classroom. Teachers form groups of 3-5 children to collaborate in math activities, such as playing sellers and buyers, playing cooking, making projects such as houses, swimming pools, and other activities that involve math concepts. At home, parents can involve children in daily activities, such as inviting children to cook, clean the house, and other activities that can develop children's life skills, especially mathematical thinking skills.

The stimulation given to children in learning must be able to accommodate the needs of children in accordance with character development and future needs. Vygotsky in his theory of social constructivism [14]. In addition, Vygotsky also explained learning in early childhood through play [15]. Vygotsky's view of the zone of proximal development in fulfilling certain developmental tasks can be done by providing appropriate assistance so as to provide sufficient "encouragement" for children to achieve these tasks. To help children move through the zone of proximal development, educators need to focus on three important components that aid the learning process: (1) The presence of someone with knowledge and skills outside of the student (another more knowledgeable person), in this case peers or adults in the vicinity. (2) Social interaction with friends or more skilled adults that allow students to observe and practice their skills. (3) Scaffolding, or supportive activities provided by educators, or more competent peers, to support students in learning to reach the ZPD. Through collaboration with peers or with parents, children can explore learning objects to fulfill developmental tasks.

In play, children can develop various basic skills needed for life skills, including learning to count and recognize math concepts. Various studies have been conducted to improve early math skills in PAUD institutions. Be it the ability to read, write and count [16], through peer tutors [17], the use of learning media used in learning the introduction of counting [18] and the impact on children [19]. Therefore, there are still polemics related to learning the introduction of mathematical concepts.

However, mathematical ability is a basic ability that must be possessed by individuals, even in all aspects and facets of life we need mathematical concepts. Mastering Mathematics provides many opportunities for individual success [20]. This is because math is not only a subject matter in the academic field. Rather, it provides opportunities for the development of strong quantitative reasoning as an important foundation for achievement in school, in the professions, and in many aspects of life. Currently, there are still many who view math as a scourge or something to be feared. Therefore, it is necessary to be prepared from time to time in providing mathematical concepts that are in accordance with the needs and characteristics of child development [21]. This research is expected to fill the gap in introducing math concepts in early childhood through good

collaboration between parents and educators. The role of parents is very important to support children's math learning [22]. Likewise, the learning approach is close to the child's world, by utilizing local wisdom [23] and collaboration [24] with various parties in this study.

2. RESEARCH METHOD

This research uses a descriptive qualitative approach based on phenomenology to get the meaning of a value, the perception of learning early childhood math concepts and their implementation in learning at preschool institutions. It is utilized to investigate and delineate phenomena inside their natural environments. It emphasizes comprehending the "what," "how," and "why" of human experiences, behaviors, or processes, utilizing comprehensive, thorough explanations without attempting to quantify results.

This research was conducted in April- September 2020. It intentionally chooses individuals possessing particular traits, experiences, or expertise pertinent to the study's objective, particularly in early childhood education instruction at Numbering school. This method guarantees that the sample is abundant in the data required to tackle the research question. The informants in this study were teachers, principals, and parents (Table 1).

Table 1. Sample Compositions

Informant	Topic of Interview	Number of Interviews
Teacher	Child a Ability	N=2 (female); 1 class teacher and 1 companion teacher
Principal	Forms coordination with teachers and parents, curriculum content and mathematics	N=1 (female)
Parents	Forms of collaboration, a activities carried out by parents, approaches and media used and children's abilities.	N=5 (female)

Data was collected by conducting interviews, observations and documentation. Observations were made using the check list technique and by writing anecdotes. Data derived from the check list was then converted into quantitative data for descriptive statistical analysis. Observation data was conducted to see the activities of teachers and parents in stimulating the introduction of local wisdom-based math concepts and collaboration, both in the interaction of children with children, parents with children, teachers with children, teachers with children, teachers with parents, and parents with children, parents and children with the environment. Checklist observations are used to see the frequency level of activities that have the same theme in common, while anecdotal observations are carried out to see patterns, phenomena that occur and get meaning. Meanwhile, documentation was collected to complement information from interviews and observations. Documentation can be in the form of photos or videos of children's activities, learning planning, implementation and evaluation documents, curriculum and other activity programs, as well as portfolios or children's work.

The data that has been collected is then categorized and sorted to build a concept and meaning [25]. In conducting data analysis, it is carried out through the stages of reducing data, and sorting out all the data collected. The next stage is presenting data derived from qualitative data to build a narrative concept. The next stage is drawing conclusions. To ensure data validity, method triangulation was conducted. Data taken from interviews were then scanned through observation and documentation data. Qualitative data is juxtaposed with quantitative data whether there is a match or contradiction to the data described

3. RESULTS AND DICUSSION

Results contain a static set of data in the form of statistical analysis and qualitative analysis without interpretation. Results refer to the data that has been planned to be explored in the previous method session as material to answer the research objectives. Data can be displayed in the form of tables, figures, or descriptions including quotes from respondents or informants that have been arranged in accordance with the research objectives. The discussion should include a scientific debate using the theoretical basis that explains the findings of the previous analysis. Write down the scientific findings obtained from the research that has been carried out but must be accompanied by sufficient evidence. The scientific findings here are not the data collected from the research but rather an academic dialog between data and theory.

Early childhood programs are increasingly mandated to incorporate mathematical instruction methodologies in classrooms. This policy's emphasis on early mathematics instruction stems from the recognition that proficiency in mathematics is essential for engagement in the contemporary world, and that

children's initial mathematical skills establish the groundwork for subsequent learning [26]. Insufficient early experiences that foster mathematical growth may result in diminished mathematical skill acquisition and reduced overall school achievement [27]. Numerous research institutions have advocated for modifications in the education of early childhood teachers regarding mathematics. Publications from the National Council of Teachers of Mathematics (NCTM), the National Association for the Education of Young Children (NAEYC), and the National Research Council [28] advocate for curricula that foster the mathematical development of young children.

3.1. Introduction to Math Concepts through the surrounding environment

Introducing the concept of Mathematics needed to be introduced from an early age. This was to provide readiness to children, so that in time they did not experience fearly. Giving the correct mathematical concepts needs to be introduced, because mathematics is not just memorizing but providing stimulation for logical thinking, symbolic and rational thinking [29]. So that children's cognitive development is optimal. Based on the given Introducing math in PAUD institutions is done with play activities, assignments and learning with children's worksheets. Based on the results of interviews with teachers and parents, children learn to introduce math concepts in accordance with the PAUD curriculum based on ministerial regulation no. 146 of 2003 concerning the PAUD curriculum. The introduction of math concepts is part of children's cognitive growth. So the learning used follows the 2013 ECD curriculum. Based on interviews with parents, children learn math by counting, learning to add and subtract, and learning shape, time and space.

According to interviews with teachers, the average child's ability has developed as expected. This means that they are in line with cognitive development standards. Based on interviews with parents, children can count to 20-30 with parental guidance. Based on observation, the child's understanding of math concepts still needs stimulation. Children can mention numbers 1-20, can write but still do not understand the concept of numbers, addition and addition and major themes that need to be introduced as a basis so that children have readiness, no anxiety and confidence [30] in the next stage of education.

Topics in introducing mathematical concepts; geometry [31], knowledge of numbers related to arithmetic [32] and knowledge of algebra [33] which can be stimulated by parents through daily activities at home [34] when using mathematical concepts and the role of teachers [35] in applying learning mathematical concepts through media around the child's environment, using used materials that can still be used. Media that can be utilized are seeds, tubers, leaves and other local wisdom.

Collaboration has been done well between parents and teachers. However, collaboration skills need to be stimulated more by children through learning. Collaborative learning provides many benefits for children's development, not only from the cognitive, social, emotional and language aspects of children. This includes moral values because of the interaction built within the peer group. The introduction of mathematical concepts is still at the level of mentioning and remembering where high-level thinking stimulation has not been stimulated further. This can be further studied regarding the stimulation of children in accordance with development and future needs in introducing mathematical concepts to stimulate children to think higher.

3.2. Parent's Involvement on Children Task Completion

School policies play an important role in children's learning development. In both institutions, there are differences in the implementation of stimulation involving parents and children. Institution A uses home visiting practices. In institution B, home visits are not used and learning is done online through online classes. Children's interaction in developing collaboration skills has not been optimized. In completing children's tasks, parents' intervention can be explained in the following diagram.

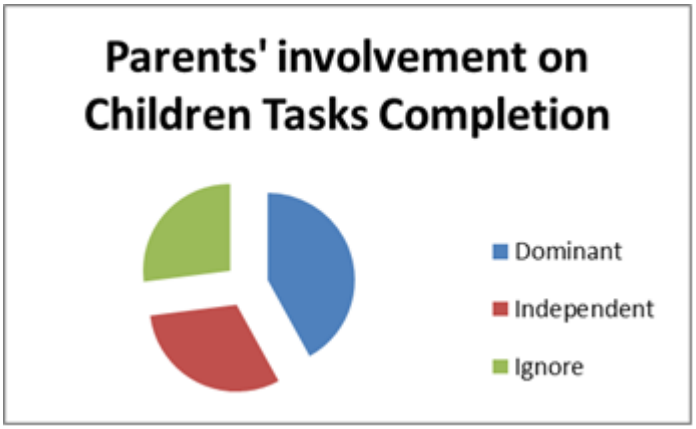

Figure 1. Parent's Involvement on Children Task Completion

Research facts show that the role of collaboration is needed in education. Nugraha and Rahman agree that parent-teacher collaboration can develop children's study success [36]. Therefore, schools are also expected to be smart in managing parenting activities, because it contributes greatly to the progress and quality of the institution [37]. If collaboration between schools and parents is well established, this ability also needs to be stimulated in children in interacting with their peers through collaborative learning stimulation [38]. Including with parents or teachers, by creating a collaborative environment in early childhood learning [39], so that children have the ability to solve problems through collaboration [40]. Collaboration as a social constructivist approach that can answer the needs of the 21st century, as a balance of academic ability or cognitive intelligence and socio-emotional ability or affective intelligence.

4. CONCLUSION

Collaboration is important in achieving goals. This is what needs to be done in building positive interactions between peers, teachers and parents, parents and children, and children and the environment. Based on the interview results, it shows that the school has a work program on parental involvement in supporting the achievement of the school's vision and mission through the parenting program. However, during the pandemic, there are different obstacles for each parent. Working parents will face great challenges in dealing with online learning. Education level and socioeconomic status also contribute greatly to children's development. Based on the observation, teachers and principals always work together and establish good communication and collaboration with parents. There are institutions that make regular home visits, but there are also those that do so through digital media. Communication is done through social media and face-to-face in the home visit. Parents who have free time can always accompany their children in learning, even though the concept of education that is in accordance with the needs and character of children could not be optimally implemented in providing stimulation to their children. Collaboration is also carried out with home visits by the teacher to the students' homes to stimulate and observe children's development. Schools did stimulation through instructional videos or online learning applications with parental assistance. Therefore, the parents' role is very important to provide stimulation to children. Based on the results of children's assessments, it appeared that differences in children's abilities between parents who work with low social, economic and employment status with parents who can always accompany and stimulate children. The quantity and quality of stimulation has a major contribution to the achievement of children's abilities. Early childhood educators experience diminished confidence in mathematics, which hampers their capacity to properly facilitate young children's mathematical learning. This observation prompts inquiries regarding the substance and efficacy of teacher training programs, workplace assistance, and professional development opportunities focused on enhancing early numeracy. Future study should investigate the influence of state ELS on teacher preparation programs in higher education and continuous in-service training, as well as how teacher educators, preservice teachers, and in-service teachers perceive and apply the standards in the classroom.

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