

The Implementation of Early Childhood Mathematics Education in Stimulating Collaborative Abilities: A Local Wisdom Approach

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Mathematics education is still a polemic in Early Childhood Education (ECE), as is learning to read, write and count. But the introduction of mathematics can be introduced to early childhood through daily activities and environmental approaches. The purpose of this study is to describe the need for mathematical recognition at an early age, and the supporting and inhibiting factors in early mathematics learning by utilising local wisdom. The study was conducted at twenty institutions along the Solo Highway, with data collection techniques through observation, interviews, and questionnaires to educators and early age parents. The results of the study explain how local wisdom could be used to stimulate mathematics learning.

Key words: *Early Mathematics Education, Stimulation, Collaborative, Cognitive Skill, Local Wisdom.*

Introduction

Collaboration is a skill that needs to be developed in learning. The ability to collaboration is very relevant to the needs of the 21st century, in addition to other abilities such as creativity, critical thinking, and problem-solving, innovation, and communication. Collaborative learning is a learning model that applies a new paradigm in learning theories. This approach can be described as a learning model by actively encouraging students to work together in small groups to achieve common goals. The collaborative approach aims to enable students to build their knowledge through dialogue, and sharing information between students and teachers so students can improve their mental abilities to a high level. This model is used in every subject especially those that might develop sharing of information among students.



Things that need to be considered in collaborative learning activities, include students working together to solve the same problem, rather than individually solving separate parts of the problem. Thus, during collaboration students' work together to build the same understanding and concept of solving each part of the problem or task.

From this point of view, the collaborative learning model is efficient because each student is required to think interactively. Experts believe that thinking is not just manipulating mental objects, but also interactions with others and with the environment. In classes that apply a collaborative model, the teacher shares authority with students in a variety of specific ways. The teacher encourages students to use their knowledge, respect their co-workers and focus on high-level understanding. The teacher's role in the collaborative learning model is as a mediator. The teacher connects new information to students' experiences with the learning process in other fields, helps students determine what to do if students experience difficulties and helps them learn about how to learn. Furthermore, the teacher as a mediator adjusts the level of student information and encourages students to maximise their ability to be responsible for the next teaching and learning process.

In general, the notion of collaborative learning (CBL) is often equated with cooperative learning (CPL). The definition of cooperative learning is described as a cooperative structure in the form of group work. Within this cooperative work structure, processes of interaction occur between group members, and is called collaboration. This collaboration as stated by Gerlach (1994) is: "Collaboration is a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respecting the abilities and contributions of their peers". According to this view, collaboration is a basis for interaction and a way of life for individuals in which individuals are responsible for their actions, which include the ability to learn, appreciate and provide support for their groups. Through these activities, we can identify collaborative behaviours, place the behaviours in the proper order, and enable learners to demonstrate them. Central to this collaboration skill is the ability to exchange thoughts and feelings between learners with each other at the same level (Borich, 1996). CPL is more controlled by students, while CBL is owned by students. In CPL many mechanisms of team analysis and introspection are centered on the learner, whereas in CBL the centre is more on the learner (Panitz, 1996). Kagan (1990) defines CPL as a structural approach based on the creation, analysis and application of systematic structures, or organising social interaction in the classroom. Structure generally involves a series of steps. An important keyword for this approach is the distinction between "structure" and "activity".

In CBL, learners transfer all authority to the team, while CPL does not. Collaborative work is a process of collaboration carried out between individuals and between groups, which are attentive and respectful of fellow members, to achieve common goals. In the context of



learning Robert et.al said, “Collaborative learning is cooperative-based learning. So to realise collaborative learning begins with familiarising students with cooperative learning”. Cooperative learning, designed by the teacher, will be the beginning of change in the classroom. If students are accustomed to working together, interdependent with one another to gain knowledge, then students will develop into collaborative students. Based on the results of Fadel's, Bialik and Trilling collaboration is able to include students from different backgrounds, skills, views of people and is needed because problems and challenges are increasingly complex (Fadel, 2015). Johnson, Johnson, and Stanne, in their meta-analysis study, explained that collaborative learning is more effective in increasing academic achievement than an individual or competitive model (Johnson, Johnson, & Stanne, 2000). Facts on ECE institutions, where learning is carried out through various models such as group models, corner models, centre models, and area models that are generally used in the learning process have some similarities. In class, the children are divided into several groups by giving assignments with three or four types of play that must be completed independently, even though the child's sitting position is arranged in groups. This means that the implementation of learning that stimulates collaborative ability is still less encouraged. Besides, there are several principles of learning in ECE, including that learning is done through play. In the guidebook, the concept of playing, according to Piaget, is an activity carried out repeatedly and leads to pleasure and satisfaction. In the play, a process called assimilation occurs in mental activity, according to Piaget, in addition to assimilation, the process of accommodation in play is carried out by reorganising new aspects of the external environment. This is a process of building intelligence that occurs through play.

Collaborative learning is a transaction-oriented learning in terms of methodology. This orientation views learning as a dialogue between students and students, students and teachers, students and the community and the environment. Students are seen as the problem solvers. This perspective views teaching as a "conversation" in which learners and students learn together through a negotiation process. The process of negotiation in the collaborative learning pattern has six characteristics, namely (1) the team shares the tasks to achieve the learning objectives, (2) team members give input to each other to better understand the problems faced, (3) team members ask each other to better understand in depth, (4) each team member authorises other members to talk and give input, (5) teamwork is accounted for by other people, and is accountable to itself, and (6) there is interdependence among team members. There are a number of factors that need to be considered in collaborative learning patterns, namely the role of learners and the role of teachers. The roles of learners that must be developed are: (1) directing, namely compiling a plan to be implemented and proposing alternative solutions to the problem at hand, (2) explaining, namely giving explanations or conclusions to other group members, (3) asking questions, namely asking questions to gather information you want to know, (4) criticise, i.e. submit a rebuttal and question the reasons for the proposals / opinions / statements submitted, (5) summarise, i.e. make conclusions from



the results of the discussion or explanation given, (6) take notes, namely making notes about everything that happens and what is obtained by the group, and (7) implementing a mediator, who is to reduce conflict and try to minimise tension that occurs between group members. In relation to these special characteristics, four were identified in conducting learning activities that involve collaborative processes.

Collaboration skills should be developed early on through various learning and assessment activities. (Nicolopoulou, 1993). Vygotsky explained that through play children can build knowledge (Fleer, Hedegaard, Fleer, & Hedegaard, 2013). Teaching and learning that can cause pleasure can be done by playing (Edward, 1994). Likewise, play can be utilised in learning mathematics for early childhood.

Mathematics education for early childhood in Indonesia is still a polemic. The practice of learning at an early age is still emphasised in various aspects of development, such as religious, moral values, art, language, physical motor, social emotions, and cognitive. In the implementation of early mathematics, learning becomes part of various aspects of these developments, especially cognitive development.

Another problem arises when there are differences in perceptions related to learning to read, write and arithmetic (calistung) between parent expectations and perceptions of educators and managers about the concept of childhood education. This gap occurs because when graduates from kindergarten were in elementary school they had been required to be calistung, because of different learning patterns when in kindergarten and elementary school. This is because calistung is a basic ability that must be possessed as it is in Law number 20 of 2003 concerning the national education system article 4 paragraph 5, which explains that one of the principles in the administration of education is to develop a culture of reading, writing, and arithmetic for the whole community. In line with the enactment of the 2013 curriculum, the ability of Calistung becomes an emphasis in elementary schools. Mathematic's learning is not only a process of transferring ideas from the teacher to the students, but also is a process where teachers encourage students to develop their ideas (Kristanti, Suharno, & Gunarhadi, 2017).

While one of the goals of ECE is to prepare for further education, mathematics learning becomes part of providing literacy in numeracy skills. Studies conducted by the OECD, show that the role of ECE is vital in providing mathematics education from an early age, based on the results of the program for International Student Assessment (PISA). Introducing children to the concept of mathematics from an early age is very important, so students don't experience a phobia of mathematics (Erdo & Pomerance, 2018). This is important because mathematics is a major contributor to student success and achievement, in education and professionalism.



Local wisdom is a view of life and science, as well as various life strategies in the form of activities, carried out by local communities in answering various problems in meeting their needs. In etymology, local wisdom (local wisdom) consists of two words, namely wisdom (wisdom) and local (local). Other names for local wisdom include local policy (local wisdom), local knowledge (local knowledge) and local intelligence (local genius).

The term local wisdom is the result of the translation that was first introduced by Quaritch Wales in 1948-1949, which means the ability of local culture to deal with the influence of foreign cultures, when the two cultures are related (Rosidi, 2011). Local wisdom is a creative answer to local geographical-political, historical and situational circumstances (Permana, 2010). Local wisdom can also be interpreted as a view of life and knowledge, as well as a variety of life strategies in the form of activities carried out by local communities in answering various problems to meet their needs.

Uge, Neolaka, & Yasin (2019) explained that local values are starting to be abandoned by the local community, so that students do not understand local cultural values. The word local, which means a place or at a place, or at a place where it grows, exists, lives, something that may be different from another place or is located at a place of value that may be local or universal (Fahmal, 2006: 30-31). According to Sedyawati (2006: 382), local wisdom is interpreted as wisdom in the traditional culture of ethnic groups. Wisdom in the broadest sense is not only in the form of cultural norms and values, but also all elements of ideas; including those that have implications for technology, health care, and aesthetics. With this understanding, what is included as a translation of local wisdom is a variety of patterns of action and material cultural outcomes. According to Nasiwan et al (2012: 159), local wisdom is wisdom or noble values contained in local cultural assets such as traditions, *petitihs* and life's motto. Local wisdom is the truth that has been directed or fixed in an area. Local wisdom contains high values of life and is worthy of being continuously explored, developed, and preserved as an antithesis or change in social culture and modernisation. Local wisdom of past cultural products, is constantly being used as a guide to life, even though it has local value, but the values contained therein are considered to be universal. Local wisdom is formed as a cultural superiority of the local community and geographical conditions in a broad sense.

Local wisdom is seen as very valuable and has its own benefits in people's lives. The system was developed because of the need to live, maintain, and carry on living in accordance with the situation, conditions, abilities, and values that are lived in the community concerned. In other words, local wisdom then becomes part of people's wise way of life to solve all of life's problems that they face. Thanks to local wisdom people can carry on with their lives, and even develop sustainably.

The function of local wisdom towards the entry of foreign cultures is to accommodate elements of outside culture, integrate outside cultural elements into native culture, and give direction to the development of culture and as a filter and controller of external culture (Verse, 1986).

According to Mitchell (2003), local wisdom has six dimensions, namely:

- a. Ability to adapt to its environment because the community has local knowledge in controlling nature. As well as public knowledge about climate change and a number of other natural phenomena.
- b. Local rules or values regarding the actions or behaviour that are adhered to and agreed upon by all community members, but these values will change according to the progress of the community. The values of actions or behaviour that exist in one group may not be agreed or accepted in other community groups, there is a uniqueness. Like the Dayak tribe with a tradition of tattooing and piercing in several parts of the body.
- c. Ability to survive (survival) to meet the needs of each family, which is called the substance economy. This is a way to maintain human life that depends on nature, starting from the ways of hunting, gathering, farming, to ways of home industry.

Each community will use local resources according to their needs and will not exploit large-scale or commercialised products. Communities are required to balance nature, so that it does not impact negatively on them. Each community basically has its own local government or tribal government. The tribe is a legal entity that instructs its citizens to act according to rules that have been agreed upon for a long time. Then if someone violates these rules, the chief as decision maker will impose certain sanctions. Humans are social creatures who need help from others in doing their work, because humans cannot live alone and humans work together to protect the surrounding environment.

Early mathematics education, by utilising local potential, is possible in ECE institutions (Ernawati, 2018; Kusna, 2019). This is consistent with the ECE level education unit curriculum that carries out education and learning by the characteristics of the institution and its environment by referring to Montessori's opinion that learning methods are integrated with daily activities (Montessori & Burstyn, 1982; Soundy, 2009; Tubaki & Matsuishi, 1972). By getting children closer to the surrounding environment and the potential around them, including their culture, they can support the surrounding environment and the media used for character education (Pamungkas, Syamsudin, Harun, & Sudaryanti, 2019).

Collaborative ability can be stimulated early on through the learning process by introducing the surrounding environment in introducing mathematical concepts. Therefore this paper will



describe the implementation of early children's mathematics education through local wisdom in stimulating collaborative abilities.

Research Method

This research uses a descriptive qualitative approach. To reveal phenomena that occurs in the field (Arikunto, 2013: 234) through gathering information about a phenomenon that exists when the research is carried out (Moleong, 2007: 6), for example behaviour, perception, motivation, action, holistically utilising a description in the form words or language in a particular natural context using scientific methods. Research is conducted by observing, interviewing the two institutions in Sukasjo, Kartasura. Data analysis is done using an interactive analysis approach, starting from collecting data through observation, interviews, and questionnaires. The data reduction was made by sorting and selecting, categorising, and making abstractions about the implementation of early mathematical education. The next step is to present data in the form of field notes, interview notes, and documentation organised to make it easier to analyse, to reach conclusions (miles, M.B & Huberman, 2009: 20).

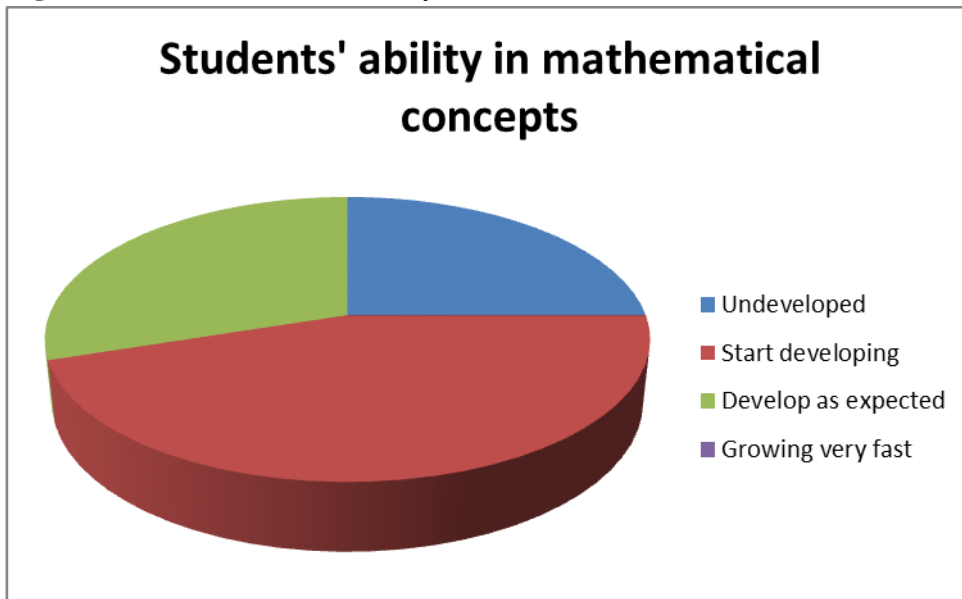
Results and Discussion

Children receive early mathematics education through play activities or assignments using the surrounding environment. Utilising used materials from the grounds around the institution, the teacher choses media for the learning process such as seeds and leaves of plants. Traditional games are also used to stimulate collaborative skills and introduce early mathematical concepts.

The Form of Learning by Utilising Local Wisdom by Educators

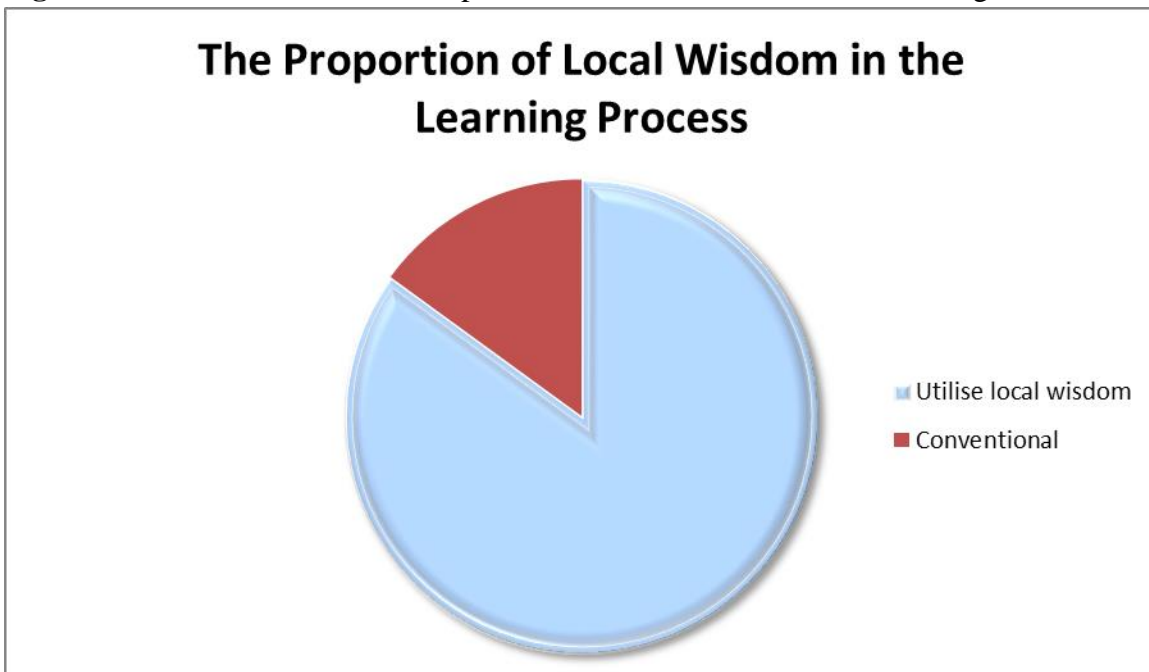
Based on 20 respondents consisting of educators in 18 Solo Raya Kindergarten institutions in Boyolali, Sukoharjo, Surakarta, and Karanganyar), the proportion of local wisdom blended into the teaching-learning activities can be seen in the figure below.

Figure 1. Students' Initial Ability Chart



Most educators have utilised local wisdom in mathematics education. Among the 20 teachers, observed and interviewed, 18 institutions have used local understanding with different intensities both in the variety of games and the type of media.

Figure 2. The Utilisation of the Proportion of Local Wisdom in the Learning Process



Types of learning that are utilised in learning the introduction of early mathematical concepts:

Table 1: Learning Types by Collaborative Activities

1	Playing “ <i>Congklak</i> ”	Counting
2	Singing in the local language	Counting, mentioning numbers
3	Utilising numeric used goods	Counting
4	Introducing the regional cuisine by numeracy	Counting, the concept of numbers
5	Utilising the surrounding environment (leaves, twigs, plants, roots, etc.)	Counting and recognising the concept of numbers
6	Traditional communication tools (<i>Kentongan</i>)	Counting

Learning is also carried out by using materials that are around the ECE institution, or from the environment by the children. The children bring used materials such as skins of red onion or garlic, chicken eggshells, coconut pulp, seeds, and they are also asked to make projects from loose materials that are not used anymore. The obstacles experienced by teachers can be identified in the following discussion. In stimulating early childhood mathematical abilities, there are a variety of traditional games that need to be introduced to children from an early age because local wisdom can instil children's character education (Wagiran, 2012). Character education is important because of the changing times of the 21st century with very tight competition (Yusuf, 2017). One of the challenges in facing intense competition is to stimulate learning through collaborative learning in ECE institutions (Coufal & Woods, 2018; Tudge, Winterhoff, & Carolina, 1993). Collaborative ability is needed in the 21st century (Koenig, 2011) therefore teachers need to design learning that can stimulate the power of collaboration (Kleinsmann, Deken, & Dong, 2011), including in the ECE by utilising local wisdom (Kusna, 2019). This follows the research conducted by Pamungkas about the importance of local wisdom in kindergarten, as part of ECE (Pamungkas et al., 2019; Kusna, 2019).

Vygotsky's view is that children learn through interaction with the environment (Colliver & Veraksa, 2019), and through collaborative games with peers (Fawcett & Garton, 2005). However, in the results of the study, there are not many teachers who use collaborative games through local wisdom games through role-playing, such as playing house, market, police-police, and others. Although this is seen in children's games when playing free, children learn to collaborate with their peers. This needs to be studied in several traditional games, which can stimulate the ability of collaboration while at the same time, instil a love of regional culture.

Children are still faced with obstacles and are challenged by understanding mathematical concepts in learning. The teacher needs to make various learning innovations by utilising



loose parts or unused items by not ignoring the needs and characteristics of children, according to the child's cognitive development (Nicolopoulou, 1993). This includes how to integrate the need for necessary skills, provide literacy of mathematical concepts, and collaborative capabilities in early childhood curricula (Durham, Harrison, & Barry, 2019).

Conclusion

Based on the explanation above, it can be concluded that the use of local wisdom is essential for early childhood education in stimulating mathematical abilities and stimulating the ability to collaborate. Many local-based media and games use a regional approach through regional languages, regional competitions, and the surrounding environment in early mathematics education. In early childhood education, stimulation in introducing mathematical concepts has been practiced as learning. However, local wisdom-based stimulation that can stimulate children's ability to collaborate needs to be done more through local wisdom-based group games called “sambatan” or games “gobak sodor”, “cublak-cublak suweng” and the like.

The quality of early childhood education with local wisdom in Indonesia is based on government standards through eight education standards. (1) the level of achievement in child development standards. (2) content standards (3) process standards (4) educator and education personnel standards (5) infrastructure facilities standards (6) management standards (7) assessment standards (8) financing standards. To retain the quality of early childhood education institutions need to have internal and external quality assurance. Internal quality assurance is carried out by the education office which cover early childhood education institutions. Whereas external quality assurance is held by a national accreditation body.

In developing countries such as Indonesia, quality improvement is a necessity that must be achieved by ECE institutions. This will enable the impact of early education, given the importance of early education for human development to be observed.

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