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Abacus as Educational Media: Collaboration between Parents and Children in the Development of Numeracy Skills

Ratu Eva Febriani[1*], Yusnida[2]
[1,2]Universitas Bengkulu
Bengkulu, Indonesia
ratuevafebriani@unib.ac.id*

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Abstract

This Community Service activity aims to improve the numeracy skills of children living in RT 6 Kebun Keling Village, Teluk Segara District, Bengkulu City, by using abacus training as an educational tool. The methodology applied is counseling in the form of lectures that are strengthened by discussions and questions and answers, complemented by practice and simulations of learning assistance by parents. The findings showed that incorporating abacus into the learning framework significantly improved children's numeracy skills, with 75% of participants successfully completing counting tasks using abacus. In addition, proactive parental involvement has been shown to increase their confidence in facilitating their child's learning process at home, as evidenced by 65% of parents who expressed their ability to support their child's learning efforts. This initiative not only strengthens children's numeracy skills but also fosters a constructive emotional bond between parents and children. In summary, synergies between parents, children, and educators facilitated through play-based methodologies such as abacus have shown effectiveness in improving numeracy skills while fostering a fun learning atmosphere. The sustainable development of this activity is recommended to improve the quality of early childhood education.

A. Introduction

Indonesia has set a target to achieve "Golden Indonesia" in 2045. The initiative is carried out to realize this through growing a superior and resilient generation. An important first step in developing this character is to prioritize improving the quality of education. In the contemporary era marked by globalization, mastery of literacy and numeracy skills is an important competency for individuals to face the complexity of challenges (Darmastuti et al., 2024; Mustapa, 2024; Anggraeni et al., 2024; Grasby et al., 2020). However, in the context of Indonesia, the prevalence of literacy and numeracy is very low, which raises concerns about the quality of education in this country.

In 2022, Indonesia's PISA score ranked 66th out of 81 countries, the 15th lowest in the world. The 2022 PISA measurement is focused on students' proficiency in mathematics, especially in mathematical reasoning. This indicates that the mathematical ability of Indonesian children is relatively less than that of children in other countries. For this reason, there needs to be efforts to develop children's numeracy skills that can start from an early age with a more attractive approach. The development of numeracy in early childhood in the golden age (0-6 years) is an important foundation of education, because this is the time when cognition develops rapidly.

Counting includes identifying numerical symbols, distinguishing patterns, and understanding logical relationships, which collectively form the basis for the acquisition of more complex mathematical competencies at a later stage. Empirical studies show that using a game-based methodology for teaching

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numeracy can significantly increase children's engagement and understanding, especially through the use of educational tools such as abacus, which have been proven to be effective in increasing mastery of numerical concepts A study on the abacus education using an after-school programs in elementary schools (Agamboka et al., 2023;Pahmi et al., 2023). Abacus has been recognized as an educational tool that is able to improve children's numeracy skills (Anam et al., 2020). Furthermore, Ray et al. (2023) stated that children who master the abacus can perform calculations faster and more accurately than those who do not master it. In addition, children who master the abacus technique have a better cognitive level (León et al., 2021).

Each child has its own characteristics that are different from the others. This proves that each child learns at his own pace and for each age group also has a variation in learning speed. The mastery of numeracy skills for children cannot only depend on teachers at school, parental participation is needed in the development of children's numeracy skills. The condition of children's numeracy skills in RT 6, Kebun Keling Village, Bengkulu City, is not much different from Indonesian children in general, it is still relatively low. Based on initial interviews with several children and parents randomly in this environment, information was obtained that children generally do not like mathematics subjects because they have a higher level of difficulty and the explanations given by teachers in schools with conventional methods have not activated students' numeracy skills. Therefore, there needs to be the development of new learning methods that can attract students' interest in mathematics lessons.

By integrating innovative learning methods such as the use of Abacus, educators can create a more engaging and effective learning experience for children. It is important to continue to explore different approaches that can facilitate the development of cognitive and academic skills, so that children are not only active in learning but also able to apply their knowledge in everyday life. As such, collaboration between educators, parents, and communities is essential to creating a learning environment that supports children's holistic growth.

Innovations in teaching methods such as Abacus can also help address existing educational gaps, ensuring that all students have equal access to tools and techniques that can enhance their abilities. Integrating such innovative teaching methods not only increases student engagement but also fosters a love for learning, encouraging them to explore and investigate further into various subjects. The mastery of abacus techniques by children encourages their ability to calculate faster and more accurately and improves their mathematical skills (Barner et al., 2018).

Mathematics learning with an abacus game approach does not only rely on children's abilities and the role of the teacher but needs to involve parents. Parental involvement is essential for the success of children's education, especially in mathematics. Studies show that the attention paid by parents to children's learning development is directly correlated with their children's academic achievement and math mastery (Ghazali et al., 2021; Fiskerstrand et al., 2024). Parents who are actively involved by using games such as abacus build positive interactions while providing fun learning for children (Latipah & Afriansyah, 2018; Borzekowski et al., 2019). Studies involving Latin American families show that parental participation in children's learning activities aimed at improving children's mathematical performance has proven to be effective (Barner et al., 2018). Interaction between children and parents during play activities can increase confidence, cooperation skills, and motivation to learn. Research shows that educational game tools help create a fun learning experience while building a strong emotional bond between children and parents (Basyiroh, 2017).

With the increasing importance of interactive and fun educational approaches, the integration of abacus games and parental involvement can be used as an innovative program in children's education. This program not only improves children's learning outcomes but also increases parental participation in the educational process. Further development of abacus-based programs has the potential to be widely adapted in various formal and non-formal educational institutions (Ramlah et al., 2023). Through the right approach, education can be a means to empower children to face future challenges and equip them with relevant and adaptive skills. The importance of collaboration between all these stakeholders not only strengthens the foundations of education, but also creates a mutually supportive community where children can develop optimally.

Based on the previous explanation, the community service activity in RT 6 Kebun Keling Village, Bengkulu City aims to increase the awareness of parents and children about mastering numeracy skills and create collaboration between them through abacus games that are not only carried out by children but also involve parents.

B. Methods

Community service activities carried out by the Community Service Team from the Department of Development Economics of the University of Bengkulu in RT 6 Kebun Keling Village, Bengkulu City. The participants involved were 30 people consisting of 20 parents, 8 children, 1 RT, 1 traditional leader. The implementation of this activity lasted for six months starting from proposal preparation to activity reporting. The following are the three major stages of implementing community service activities:

1. Activity Preparation

The preparation stage in this activity starts from making direct observations to the destination location where community service activities will be carried out. Things to do when conducting field surveys are:

a) Conducting the management of activity permits
b) Conducting preliminary data collection regarding the general condition of the activity area, namely Kebun Keling Village, especially RT 6.
c) Coordination with the head of RT 6 regarding the implementation schedule, the capacity of the participants who attended, and the targeted groups of residents.
d) Establish communication with community leaders and related parties so that activities can be carried out without unwanted interruptions and obstacles.

Apart from conducting the initial survey, other things that are also prepared are supporting documents for licensing and also activity designs that are written in a structured and systematic manner in accordance with the guidelines from PPM University of Bengkulu.

2. Implementation of Activities

The training activity was centered at the Mess Bank Bengkulu which is located adjacent to the rear Marlborough Fort in the administrative area of Kebun Keling Village, Bengkulu City. This activity was carried out with three approaches, namely counseling, question and answer discussions, and abacus training.

In the counseling session, it was focused on providing knowledge about the role of parents in the development of children's learning abilities and basic material about abacus game techniques. In this session, the benefits of abacus in improving counting skills quickly and accurately were also conveyed. This activity uses a participatory approach so that a discussion space is given for participants to ask and answer questions related to the material presented. The discussion session was divided into two sessions, each of which was allocated for three questions from parents or children. To attract the interest of participant participation, each active participant is given a prize.

Meanwhile, in the abacus training session, learning is adjusted to visual and kinesthetic learning styles. The participants were given training modules, demonstrations of the use of abacus, and hands-on practice. Each participant was given an abacus and directed by being given an example first and guided by an instructor. For parents, the training is focused on assisting children in learning abacus at home.

3. Activity Evaluation

The final stage of the activity is in the form of an evaluation that measures the level of success in the implementation of the activity. The evaluation was carried out through three forms, namely a short quiz for the participants, a simulation of learning assistance for parents and a questionnaire to capture participants' satisfaction responses to the activity on a Likert scale.

C. Result and Discussion

The quality of human resources is one of the important pillars in realizing an advanced civilization. One of the basic skills that must be strengthened by the Indonesian generation is numeracy skills that have an impact on productivity. The difficulty of the Indonesian workforce to compete in the job market is due to low productivity (Putri et al., 2023), so there needs to be a change in learning approaches, especially mathematical skills. In addition, the increase in numeracy skills will encourage profitable investment skills, because currently the investment level of the Indonesian people is still relatively low (Febriani et al., 2024; Kristofano & Febriani, 2024). Meanwhile, improvements in the quality of education in Indonesia cannot be separated from the government's commitment, especially related to budget regulation and expenditure which will have an end impact on economic performance in general (Agustina et al., 2024).

Understanding the importance of numeracy skills for Indonesia's young generation and how it affects needs to be carefully considered. Therefore, community service activities carried out in RT 6 Kebun Keling Village, Teluk Segara District, Bengkulu City are present as one of the efforts to foster an attractive mathematics learning climate and open up insights that mathematics is not a lesson that needs to be feared and avoided and instill an understanding to parents that their role in the children's learning process is very meaningful.

Parents' skills in teaching basic math concepts can provide a solid foundation for children, helping them build the confidence and critical skills necessary to succeed in school. Parental involvement in children's education creates a positive learning atmosphere, emotional connections are established, children will more easily absorb information and develop a deep curiosity about the world around them.

Figure 1. Participants in counseling activities and training in abacus counting techniques

The use of game techniques in conveying material is the best approach for children today. The abacus is one of the tools that can be used to boost children's numeracy skills. Based on this activity, information was obtained that when parents are directly involved with the learning carried out by their children, the results become better than letting children understand themselves or be helped by others.

The provision of material was carried out by the lecture method. The selection of this method is considered the most appropriate to be applied to this activity motivated by the following reasons: First, time and resource efficiency; With lectures, the information provided to the participants can be conveyed at once in a relatively short time and does not require complicated equipment or preparation. Second, the resource person mastered the material well; Through this method, the material is delivered in a structured and systematic manner by the resource persons in accordance with the objectives of the activity. Third, this method is suitable because the material presented is complex so it needs an in-depth explanation and participants can ask questions directly if there are things that are not clear. However, although this method is considered suitable, it has a weakness in terms of minimal participant participation so that it tends to cause a loss of focus from the participants, especially if it lasts for a long time. Therefore, in addition to the lecture method, it is also equipped with discussion and question and answer methods.

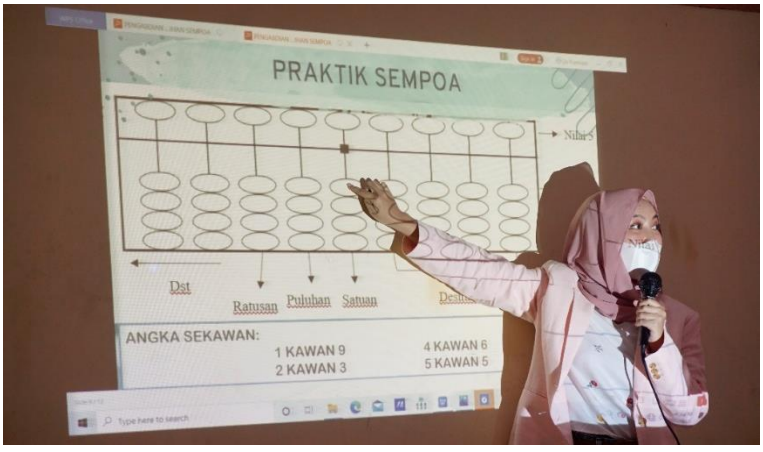

Figure 2. Presentation of abacus material by resource persons

The abacus training held at RT 6 Kebun Keling Village, Bengkulu City, has proven effective in improving numeracy skills among children while encouraging parental involvement in the learning process. This effort provides instruction on fundamental mathematical calculations through real methods, thus facilitating a more comprehensive understanding of numerical concepts for children. Previous studies have shown that manipulative techniques, such as the abacus, can markedly improve numerical proficiency during early developmental stages (De Chambrier et al., 2021).

Parents who participated in this activity experienced an increased understanding of the facilitation of their children's educational efforts in the home environment. They reported an increased sense of security in helping children with counting-centered tasks, which is consistent with evidence showing that proactive parental involvement positively affects children's educational outcome (Nakijoba et al., 2024; T. Hife & C. Pañares, 2023).

Overall, this activity shows that enhancing partnerships between parents and children through training initiatives like this can foster an engaging and enjoyable educational environment. In addition, it underscores the importance of implementing progressive pedagogical strategies to address fundamental educational barriers in specific areas, as depicted in community-oriented numeracy research (Aini et al., 2024).

As a component of the evaluative process, this program not only records progress in numeracy competence but also assesses the level of satisfaction of participants with the activities held. The evaluation consisted of three forms, namely quizzes, simulations and surveys. The quiz was carried out in the middle of the activity by giving several short questions, including those targeted for two different groups, namely children and parents. The open questions for children are:

1. What are the main functions of abacus in learning to count
2. Do the practice of adding 6 + 5 using an abacus
3. Perform the calculation with an abacus for the sum of 26 + 34
4. Does counting become easier when you have mastered the abacus technique?
5. Do you want to continue learning abacus at home with your parents?

Figure 3. Assistance in the practice of mastering abacus counting techniques

Of the 8 children who participated in the activity and answered this quiz, all were able to answer question no.1, 6 people managed to answer questions no.2 and no. 3 correctly. Meanwhile, for the 4th and 5th questions they answered yes, with the abacus counting becomes easier and they want to continue learning the abacus at home with their parents.

Furthermore, the quiz questions for parents are as follows:

1. Does participating in this activity provide benefits?
2. By using abashes, how to help children understand tens and units?
3. Do you feel able to accompany your child to learn abacus at home?
4. Is the material provided easy to understand?

This quiz question was well responded to by parents. Of the 20 parents, for question no.1, all answered that this activity was very useful. The answers to the second question are quite varied, including:

"In order for children to understand the concept of tens and units in abacus, it is necessary to teach that in abacus there are columns that represent value places (units, tens, hundreds, etc.)."

"Give a number solving exercise such as 53, then teach the child to break it down into 50 (tens) and 3 (units). On the abacus, 5 circles are shown in the tens column and 3 circles in the unit column. After that, it's the child's turn to try it himself."

"Explaining the concept of tens and units with real objects such as marbles."

For the 3rd and 4th questions, around 65 percent of parents answered that they were able to accompany their children to learn the abacus at home and the material provided was clear and understandable.

As a form of appreciation for the active involvement of participants during the direct activity, prizes were given to participants who successfully answered the questions.

Figure 4. Submission of door prizes for participants in the discussion and question and answer session

Furthermore, at the end of the activity, a simulation of abacus learning assistance was carried out by parents. Parents are given the role of mentors and children are students. On this occasion, parents give questions to children and help them when they encounter difficulties. After this simulation is completed, it is continued by filling out a questionnaire with the results listed in table 1.

The findings from the survey showed that most participants expressed satisfaction and advocated the continuation of activities regularly to improve their children's educational experience and broaden their understanding of contemporary pedagogical approaches.

Table 1. Percentage of Participant Assessment of the Implementation of Activities

	Statement	Disagree	Agree	Strongly agree
1.	This activity is very useful for improving numeracy skills		85	15
2.	The resource person was able to convey the material clearly and easily understood		90	10
3.	The allocation of time given is sufficient to practice the material	5	80	15
4.	The ability to accompany children to learn becomes increased after participating in this activity	1	75	24
5.	It is necessary to carry out follow-up activities to deepen the mastery of the abacus		56	44

Source: Author calculation from questionnaire data

The results of this activity contain several implications, namely: (1) There is an increase in numerical competence due to the fun abacus game and supports cognitive development; (2) This activity encourages parents to be more active in the process of educating children so that through abacus games parents get new insights about effective learning methods and can apply them at home; (3) There is a spread of learning innovations based on educational tools that are adapted to various other mathematical concepts and support more experiential education. In addition, based on the results of the activity, several limitations were found, namely the existence of time limitations and accessibility, not all parents have enough understanding of the

concept of education and abacus games, differences in social and economic backgrounds so that the variety of carrying capacity of parents and children is not optimal, and this service activity has not been completed with a long-term evaluation system to see the impact of child development.

Furthermore, there are several things that can be recommended for the follow-up of this activity, including strengthening training programs with advanced assistance, diversifying learning media through the development of abacus games in a digital format that can be accessed by parents and children on mobile devices, introducing other alternative media as learning sources such as math puzzles, forming a community of parents and children, and develop long-term evaluation methods.

D. Conclusion

The abacus training conducted in RT 6 Kebun Keling Village, Teluk Segara District, Bengkulu City, serves as convincing empirical evidence that a game-based pedagogical framework, which promotes active collaboration between children and their parents, can significantly improve numeracy competence. The use of abacus as an educational instrument not only facilitates children's understanding of basic mathematical principles but also increases their self-efficacy in engaging with subjects that were previously considered challenging. In contrast, parental involvement in these learning efforts reinforces their recognition of the importance of the role of mentoring in the household, and has been shown empirically to increase the effectiveness of children's holistic learning experiences. In addition, this activity illustrates that a comprehensive pedagogical approach—including child empowerment, proactive parent involvement, and community support—can foster a more inclusive and sustainable education ecosystem. These collaborative efforts not only lead to improved academic performance but also foster constructive social interactions, strengthen emotional bonds between parents and children, and instill public trust in the importance of educational innovation.

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