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Monitoring Child Growth and Development through the Stimulation-Cognitive Application

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ABSTRACTS

Introduction : The early age period is a crucial phase in children's growth and development that requires optimal monitoring and stimulation, especially in cognitive, language, and social-emotional aspects. However, low knowledge and involvement of mothers in proper stimulation practices are still the main challenges in monitoring child growth and development. This community service activity aims to improve the quality of supervision of child growth and development through the use of *the Stimulasi-Cognitive* application as a means of monitoring cognitive development and increasing *maternal sensitivity* in mothers under five in Bandung. **Method** : The method used is a participatory and educational approach through counseling, training, mentoring, and pre-test and post-test evaluation. The activity involved 50 mothers who had children aged 0–5 years. Interventions include child growth and development education, training on the use of *Stimulation-Cognitive* applications, and assistance in using applications for 2–4 weeks. Data was collected through knowledge questionnaires, observation of application usage skills, brief interviews, and application usage data. **Result** : The results showed a significant increase in mothers' knowledge of child growth and development indicators, shown by an increase in comprehension scores of 84% in the post-test compared to the initial condition. In addition, as many as 90% of participants were able to use the application independently, and the application was used to monitor more than 50 children during the mentoring period. The cognitive stimulation recommendation feature has been proven to encourage active involvement of mothers in accompanying children at home and increase maternal responsiveness to children's developmental needs. **Conclusion :** Stimulation-Cognitive-based *education and mentoring* are effective in improving maternal knowledge, skills, and *sensitivity*, and have the potential to become a technology-based model for monitoring child growth and development that can be integrated into Puskesmas services.

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1. INTRODUCTION

In the early stages of life, particularly at the age of *0–5 years*, children's development progresses very rapidly and determines the quality of future human resources. This period is often referred to as the *golden age*, during which motor, cognitive, language, and social-emotional development must be monitored regularly. Research shows that developmental delays, both physical and cognitive, remain a significant problem in Indonesia and may have long-term consequences if not addressed early. For instance, a study in the Bandung area confirmed that a number of children experienced developmental delays, highlighting the importance of early detection and systematic, continuous monitoring of child growth and development. (Triwiji Lestari , Elisa, 2024)

Child growth and development problems that go undetected as early as possible often stem from suboptimal routine monitoring and parents' limited knowledge, particularly among mothers, in providing appropriate stimulation. *Maternal sensitivity*—a mother's ability to understand and respond to her child's needs and signals promptly and appropriately—has been empirically shown to have a significant influence on children's cognitive, social, and emotional development. Children raised by highly sensitive mothers tend to have more secure attachment, better language development, and more optimal cognitive abilities than children who receive less responsive stimulation from their parents. (Putri Nada Aprilia, 2025). In addition, survey results and national data published in various national and regional descriptive studies indicate that Indonesia's child development index has only reached a certain range, with areas such as numeracy and literacy showing lower results than other developmental elements such as physical development. This reflects that cognitive stimulation and parent–child interaction remain suboptimal, requiring a more innovative approach to monitoring and stimulating child growth and development. (Andi Akifa Sudirman1, 2024)

Another fundamental problem identified is the low practice of developmental stimulation by parents. Several studies have shown that without directed stimulation, children may experience delays that are not only temporary but can also become permanent impairments in speech, fine motor skills, and executive brain function. Regular and appropriate stimulation strongly determines whether a child can reach or even exceed the developmental milestones expected for their age. (Nanik Wahyuni1, 2016). Furthermore, although health services in Indonesia through Puskesmas (community health centers) already

provide growth and development monitoring such as weight and height measurements, as well as a child development monitoring card (*Kartu Kembang Anak*), this practice is often not integrated with real-time and continuous cognitive measurement tools. Therefore, the use of digital technology, particularly applications that can help monitor child development indicators and provide appropriate stimulation guidance for mothers, is an innovative step that is urgently needed in today's digital era.

Digital applications based on *stimulasi-cognitive* can provide features that allow mothers to continuously monitor their child's cognitive development and offer daily stimulation guidance according to the child's developmental stage. This approach not only assists health workers at Puskesmas in the monitoring process but also directly enhances *mother sensitivity* through more enriching mother–child interactions in everyday contexts. Mothers' direct involvement in using this application makes the monitoring process no longer merely a clinical activity, but part of real practice at home. The Stimulus Mobile Application has high usability, with an average score of 78.6 (SD = 8.5) based on the System Usability Scale (SUS).

Empirical data also show that the role of parents, particularly mothers, in providing regular stimulation is closely related to children's developmental achievement. When mothers are actively involved and know which developmental aspects should be stimulated at each age stage, children tend to show more optimal developmental outcomes. This indicates that developing an application that functions not only as a monitoring tool but also as an educational medium for mothers is a key element in efforts to improve the quality of early parenting. (Russiska1, 2023)

On the other hand, in today's digital era, children are growing up in an environment increasingly filled with screens and technology. Stimulation practices and parent–child interaction become a particular challenge when parents do not fully understand how to use technology wisely to support their child's development. By providing an application personalized for each child, including cognitive stimulation patterns tailored to age and ability, this digital approach is expected to convert the potential risks of technology into a supportive tool that facilitates positive growth and development through maternal involvement. The community service activity designed here will not only facilitate the monitoring of child growth and development through the application, but will also involve direct training for mothers and health workers at the UPTD Caringin Health Center, Bandung

City. This training aims to improve mothers' competence in providing stimulation and interpreting developmental monitoring results, while supporting *mother sensitivity* in a sustainable manner. This intervention is expected to create behavioral changes that encourage mothers to become more responsive to their children's developmental needs.

Against this background, this community service activity is relevant and important in the context of developing human resource quality from an early age, in line with public health development goals. Through synergy between digital technology, maternal empowerment, and health service practices at Puskesmas, an effective and sustainable model for monitoring child growth and development is expected to emerge, with a broad impact on the quality of child development in the intervention area.

2. METHODS

This community service activity was carried out using a participatory and educational approach, employing counseling, training, mentoring, and evaluation methods. The implementation stages included:

a. Preparation

1) An initial survey of the needs of the target community (parents, posyandu cadres).
2) Coordination with community partners (posyandu, PKK, or the local village office).
3) Preparation of training materials and a user module for the Stimulasi-Cognitive application.
4) Installation of the application on the devices to be used by participants

b. Implementation

1) Socialization and Education: Introduction to the concept of child growth and development, the importance of early detection, and the role of technology in monitoring child development

Figure 1. Opening of the community service activity by the Head of UPTD Caringin Health Center

Figure 3. Trying out the Stimulasi-Cognitive application

2) Application Use Training: Participants received hands-on training in using the Stimulasi-Cognitive application, including:
   a) Entering child development data
   b) Interpreting growth and development chart results
   c) Performing cognitive stimulation based on the application's recommendations

Mentoring: For 2–4 weeks, participants were assisted in using the application regularly, including monitoring their child's development at home.

c. Evaluation

1) Evaluation was conducted before and after the activity through questionnaires and brief interviews.
2) Success was assessed by comparing participants' level of understanding, application use skills, and the appropriateness of the stimulation performed.

2. Data

a. Primary Data

1) Data were collected through pre-tests and post-tests to assess participants' knowledge.
2) Direct observation during training and mentoring.
3) Interviews with participants (parents/cadres)
4) Application usage data (number of logins, number of children monitored, development data entered).

b. Secondary Data

1) Child development data from posyandu in the form of KMS data
2) Child health reports
3) References from the literature and standard instruments from the KPSP and KMS

3. RESULTS AND DISCUSSION

RESULTS

Based on the results of the activity, the following findings were obtained:

a. Increased knowledge of the stimulasi-cognitive application and child development

1) Pre-test results showed that 10% of participants did not understand at all, 50% had limited understanding, 16% had fair understanding, 20% understood, and only 4% fully understood early childhood development indicators.
2) After the training, post-test results increased to 84%, indicating a significant improvement in understanding.

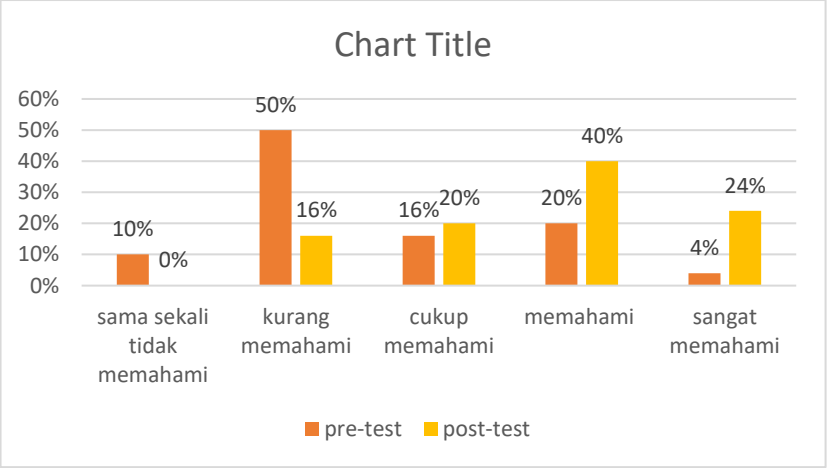

Diagram 1. Comparison of percentages before and after the material on the Stimulasi-Cognitive application was delivered

Before the material on developmental stimulation and the use of the Stimulasi-cognitive application was delivered, 10% of respondents “did not understand at all” and 50% “had limited understanding,” indicating a very low initial level of understanding. This suggests that most respondents were initially unfamiliar with stimulation and with applications that could be used to expand mothers’ knowledge of child stimulation.

After the material was delivered, a significant change occurred: no respondents remained in the “did not understand at all” category, and the proportion of “limited understanding” dropped to 16%, a substantial decrease. There were also significant shifts in the “fair understanding” category, which rose to 20%, and the “understood” category, which rose to 40%, indicating an increased capacity to understand child developmental stimulation and the stimulasi-cognitive application, which facilitates and expands mothers’ access to knowledge about child

developmental stimulation. Most notably, the "fully understood" category increased from 4% to 24%.

This improvement indicates that the training was highly effective, not only in increasing understanding of growth and developmental stimulation, but also of the Stimulasi-cognitive application that can assist mothers

b. Improved Skills

1) As many as 90% of participants were able to use the Stimulasi-Cognitive application independently by the end of the training.
2) The application was used to monitor more than 50 children during the mentoring period.

c. Application Effectiveness

1) The application proved to make it easier for parents and cadres to record and monitor child development.
2) The cognitive stimulation recommendation feature proved to encourage parents to be more active in accompanying their children at home.

d. Challenges

1) Some participants experienced technical difficulties, including internet connectivity issues and limited phone memory.
2) The application needs to be updated so that it can be used offline or with simpler features.

The results of the pre-test and post-test analysis showed that education and mentoring based on the *Stimulasi-Cognitive* application had a significant impact on improving mothers' knowledge in monitoring child growth and development. At the initial stage, the level of understanding among participants was relatively low, as indicated by 60% of respondents falling into the "did not understand at all" and "limited understanding" categories. This condition reflects limited access to information as well as low digital literacy

and child development literacy among mothers before the intervention. This finding is in line with research by Hamadani et al. (2020) which states that parents' low knowledge of child developmental stimulation remains a major problem in many communities, particularly among mothers with limited access to formal educational resources.

After training and mentoring, post-test results showed an increase in understanding of up to 84%, with a significant shift toward the "understood" and "fully understood" categories. The disappearance of the "did not understand at all" category and the increase in the "fully understood" category from 4% to 24% confirm that digital education-based interventions are effective in enhancing mothers' cognitive capacity regarding child growth and developmental stimulation. This finding is consistent with the study by Liu et al. (2022) which reported that mHealth interventions accompanied by structured education can significantly improve parents' knowledge compared with conventional approaches. Digital applications enable interactive, repeatable, and easily accessible presentation of information, thereby strengthening mothers' learning processes.

In addition to increased knowledge, the activity also showed improvement in application use skills, with 90% of participants able to use the *Stimulasi-Cognitive* application independently by the end of the training. This ability reflects good technology acceptance among mothers, particularly due to the direct assistance provided during the training process. Research by Dol et al. (2021) confirms that the successful implementation of maternal and child health applications is strongly influenced by initial training support and ongoing mentoring. The use of the application to monitor more than 50 children during the mentoring period shows that the skills acquired were not merely theoretical but were genuinely applied in parenting practice and child development monitoring.

The effectiveness of the *Stimulasi-Cognitive* application is also reflected in the ease with which parents and cadres recorded and monitored child development, as well as in the cognitive stimulation recommendation feature, which encouraged parents' active involvement at home. This feature plays an important role in bridging the gap between knowledge and parenting practice. A study by McCarthy et al. (2023) showed that applications with feedback and personalized recommendation features can increase parents' involvement in children's daily stimulation activities. Thus, the application functions not only as a monitoring tool but also as a learning medium that encourages changes in parenting behavior.

Furthermore, this increase in knowledge and skills has the potential to enhance *mother sensitivity*, namely the mother's ability to respond to her child's needs appropriately and consistently. Maternal responsiveness is an important determinant of children's cognitive and social-emotional development. A longitudinal study by Prime et al. (2020) showed that parenting education-based interventions, including those using digital platforms, contribute positively to improving maternal sensitivity and the quality of mother–child interaction. As mothers' understanding of developmental indicators and age-appropriate stimulation increases, they become more attuned to their children's developmental needs.

Overall, the pre–post test results and other supporting findings indicate that the education and mentoring model based on the *Stimulasi-Cognitive* application is effective in improving mothers' knowledge, skills, and involvement in monitoring child growth and development. This model is in line with the recommendation of the World Health Organization (2023) which encourages the integration of digital interventions into primary health care to strengthen growth and development monitoring and early detection of developmental delays. With the support of Puskesmas and health cadres, this model has the potential to be replicated in other areas as a sustainable strategy for improving the quality of parenting and preventing child developmental problems from an early age.

4. CONCLUSION

This community service activity was attended by 50 mothers with infants aged 0–6 months in the working area of the UPTD Caringin Health Center, Bandung City. The results showed an increase in mothers' knowledge, skills, and involvement in monitoring child growth and development after education and mentoring on the use of the Stimulasi-Cognitive application.

The improvement in mothers' knowledge of early childhood growth and development was measured through pre-tests and post-tests. At the pre-test stage, most participants fell into the category of limited understanding of child development indicators. After the intervention, there was a significant increase in participants' level of understanding, as shown by the increased proportion of mothers in the understood and fully understood categories.

In addition to knowledge, mothers' skills in using the Stimulasi-Cognitive application also improved. Based on observation results and application usage data, most participants

were able to operate the application independently by the end of the training. The application was actively used to monitor the development of more than 50 infants during the mentoring period, including entering development data and performing cognitive stimulation according to the application's recommendations.

In terms of parenting behavior, the evaluation results showed increased maternal involvement in providing cognitive stimulation and responding to children's needs. Mothers became more attuned to their infants' developmental signals and more consistent in engaging in interactions that support children's cognitive and emotional development. This indicates an improvement in *mother sensitivity* as an impact of the intervention provided.

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