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Readiness Of Early Childhood Education Teachers In Bekasi In Implementing Coding Learning : A Multidimensional Study Of Cognitive, Psychomotor, and Affective Aspects.

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ABSTRACT:

Background/purpose. The development of technology and the demands of 21st cenruty skill require the integration of coding learning from an early age. This study aims to analyze the readiness of Early Childhood Education (ECE) teacher in Bekasi in implementing coding learning for early childhood through a multidemintional study covering cognitive, psychomotor, and affective aspect.

Materials/methods. This study uses a quantitative descriptive method with an evaluative survey approach. Date were obtained through a coding teaching material development workshop attended by 33 respondents (28 teachers and 5 ECE principals) in Bekasi. The assessment instrument uses a structured rubric to measure cognitive, psychomotor, and affective competencies.

Results. The findings show that the level of teacher readiness in the cognitive aspect is in the moderate category (average 2.53 on a scale of 3.0) with the highest score in the remembering dimension (2.70) and the lowest in the creating dimension (2.42). The psychomotor aspect averages 2.58 out of 3.0 with an advantage in the skill of demonstrating unplugged activities (2.61). In the affective aspect, teachers showed good readiness (average 2.6) with the highest score in the accepting dimension (2.8).

Conclusion. ECE teachers in Bekasi showed quite good readiness in implementing coding learning, but still need strengthening, especially in the ability to create integrated learning plans and skills in organizing coding pedagogical values of coding in learning.

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1. Introduction

The digital era and rapid technological developments have changed the paradigm of early childhood education, including the integration of computational thinking skills through coding learning. Coding for early childhood (AUD) is one of the fundamental skills needed to prepare the next generation to face the challenges of the 21st century (Bers, 2018). In Indonesia, especially in Bekasi, which is one of the capital's satellite cities with quite rapid technological developments, the intergration of ECE is still relatively new and requires adequate teacher readiness.

Teacher as agents of change have a strategic role in the successful implementation of coding learning in ECE. However, the integration of technological elements such as coding in the ECE curriculum faces various challenges, especially related to teacher readiness in terms of knowledge, skill, and attituteds (Dong et al., 2020). The digital divide phenomenon experienced by educators is one of the significant obstacles in the implementation of technological-based learning at the ECE level (Blackwell et al., 2016).

Although there have been several studies on coding learning for early childhood (Strawhacker & Bers, 2019; Sullivan & Bers, 2016), a comprehensive study oh the readiness of ECE teachers in implementing coding learning, especially in the Indonesian context, is still very limited. Teacher readiness needs to be studied multidimensionally including cognitive, psychomotor, and affective aspects to provide a holistic picture of the professional capacity of teachers in integrating coding learning in ECE.

This study aims to : (1) Identify the level of readiness of ECE teachers in Bekasi in the cognitive aspect in implementing coding learning; (2) analyze teacher's psychomotor skills in demonstrating and developing coding learning media; and (3) evaluate teacher's affective dispositions towards the integration of coding learning in the ECE curriculum. The result of the study are expected to provide an empirical basis for the development of programs to improve the professionalism of ECE teachers, especially in the field of coding learning.

2. Methodology

2.1. Research Design

This study uses a quantitative descriptive approach with an evaluative method to analyze the level of readiness of ECE teachers in implementing coding learning. The implementation of the research was carried out through Community Service (PKM) activities in the form of a workshop on developing coding teaching materials for early childhood.

2.2. Participant

The research participants consisted of 33 ECE educators in Bekasi consisting of 28 teachers (84,8%) and 5 principals (15,2%). In terms of teaching experience, participants consisted of categories, the teaching experience of participants was 0-2 years: 9 peoples (27,3%), 3-5 years: 13 peoples (39,4%), 6-10 years: 6 peoples (18,2%), and above 10 years: 5 peoples (15,1%). Participant selection used a purposive sampling technique by condisering the representation of ECE institutions in various sub-district in Bekasi.

2.3. Data Collection Instrument

The main research instrument used a structured assessment rubric consisting of three aspects:

1. **Cognitive Aspect Rubric** – Measuring six dimensions according to Bloom's taxonomy including remembering, understand, apply, analyze, evaluate, and create. Each dimension is assessed on a scale of 1-3.
2. **Psychomotor Aspect Rubric** – Measuring three dimensions of skills, namely the skill of demonstrating unplugged activites (D-UP), the skill of operating coding applications (OP-CO), and skills in creating coding learning media (MM). The assessment uses a scale of 1-3
3. **Affective Aspect Rubric** – Measuring five affective dimensions based on Krathwohl's taxonomy including receiving, responding, valuing, organization, and characterization. The assessment uses a scale of 1-3.

2.4. Research Procedure

The research was carried out through three main stages:

1. **Preparation Stage** – Including the preparation of assessment rubric instruments, instrument validation by experts, and coordination with the Bekasi Education Office for the implementation of the workshop.
2. **Implementation Stage** – The workshop on developing coding teaching materials for early childhood was held for 3 days with the material: (a) basic concepts of computational thinking and coding, (b) unplugged and plugged coding learning approaches, (c) integration of coding learning in the ECE curriculum, and (d) practice of developing integrated codimg learning plans.
3. **Evaluation Stage** – The assessment was conducted at the end of the workshop to measure the three aspects of teacher readiness. Participants were divided into 6 groups and evaluated ny the research team using a prepared rubric.

2.5. Data Analysis

The assessment data were analyzed using descriptive statistics to calculate the average value for each dimension and aspect. Categorization of readiness levels is divided into three levels : low (1,00-1,66), medium (1,67-2,33), and

high (2,34-3,00). Correlation analysis was also conducted to see the relationship between teaching experience and the level of readiness in the three aspects.

3. Result/Findings

3.1 Cognitive Aspect Readiness

The result of the overall cognitive aspect assessment showed that ECE teachers in Bekasi had a level of readiness in the high category with an average of 2.53 on a scale of 3.0. As shown in table 1, the remember dimension obtained the highest score (2.70), while the create dimension obtained the lowest score (2.42).

Table 1 Cognitive Aspect Assesment Results

Table 1. Cognitive Aspect Assesment Result

Dimension	Description	Average
Remembering (RM)	The ability to remember basic coding concepts of early childhood	2,70
Understanding (UN)	The ability to explain the relationship between computational thinking and coding	2,45
Applying (AP)	The ability to apply computational thinking concepts	2,55
Analyzing (AN)	The ability to analyze unplugged and plugged coding activities	2,52
Evaluating (EV)	The ability to evaluate the suitability of coding activities	2,52
Creating (CR)	The ability to design integrated coding learning	2,42
Overall Averege		**2,53**

A more detailed analysis shows that out of 33 respondents, only 1 person (3%) achieved the maximum score 3,0 on all cognitive dimensions. The majority of respondents (51,5%) obtained an average score between 2,5-2,8, while 45,5% of respondents obtained an average score between 2,0-2,4.

3.2. Psychomotor Aspect Readiness

In the psychomotor aspect, the assessment results showed that the level of ECE teacher readiness was in the high category with an average of 2,58 on scale 3,0. The skill dimension demonstrates unplugged activites (D-UP) obtained the highest score (2,61), followed by skills in creating coding learning media (MM) with a score of 2,58, and the lowest in skills in operating coding application (OP-CO) with score 2,55.

Table 2 Psychomotor Aspect Assessment Results

Table 2. Psychomotor Aspect Assesment Result

Dimension	Description	Average
D-UP	Skills in demonstrating unplugged coding activities	2,61
OP-CO	Skills in operating coding applications	2,55
MM	Skills in creating coding learning media	2,58
Overall Average		**2,58**

Distribution analysis shows that 7 respondents (21,2%) achieved a maximum score of 3.0 in all psychomotor dimensions, while 16 respondents (48.5%) obtained an average score of 2.3-2.7, and 10 respondents (30.3%) obtained an average score of 2.0-2.2.

3.3 Affective Aspect Readiness

The affective aspect assessment results show that the ECE teacher readiness level is in the high category with an average of 2.6 on scale of 3.0. The receiving dimension obtained the highest score (2.8), while the organizing dimension obtained the lowest score (2.5).

Table 3 Affective Aspect Assessment Result

Table 3. Affective Aspect Asseement Result

Dimension	Description	Average
Receiving (RC)	Enthausiasm and attention in early childhood coding training	2,8
Responding (RS)	Active participation in discussions and training activities	2,7
Valuation (V)	Belief in the benefits of coding for early childhood	2,6
Organizing (OR)	Integration of coding concepts with pedagogical values of early childhood education	2,5
Characterizing (CH)	Commitment to implementing coding learning in the classroom	2,6
Overall Average		**2,6**

Of the 33 respondents, 16 peoples (48,5%) obtained an average score of the affective aspect between 2,6-2,8, and 17 peoples (51,5%) obtained an average score between 2,2-2,4. No respondents achieved a maximum score of 3,0 on all affective dimensions.

3.4 Correlation Of Teaching Experience With Readiness Level

Correlation analysis showed a positive but insignificant correlation ($r = 0,28$, $p > 0,05$) between teaching experience and readiness level in the cognitive aspect. Meanwhile, a weak negative correlation ($r = -0,32$, $p < 0,05$) was found between teaching experience and the level of readiness in the psychomotor aspect, indicating that teachers with longer teaching experience tend to have lower psychomotor scores in the context of coding learning. In the affective aspect, no significant correlation was found with teaching experience ($r = 0,14$, $p > 0,05$).

4. Discussion

The result of the study show that ECE teachers in Bekasi generally have a realitvely high level of readiness in implementing coding learning for early childhood, but with several important notes on each dimension measured.

4.1 Cognitive Aspect : Strength in Basic Knowledge, Weakness In Innovation

The findings on the cognitive aspect indicate that ECE teachers have a fairly good understanding of the basic concepts of coding and computational thinking for early childhood. This can be seen from the relatively high scores for the dimensions of remembering (2,70) and applying (2,55). However, the lower score on the dimension of creating (2.42) indicates a gap in teacher's ability to design coding learning that is intergrated with the ECE curriculum creatively and innovatively.

Several finding are consistent with the statement that ECE teachers generally have sufficient conceptual knowledge of learning technology, but have difficulty in creatively integrating it into the curriculum (Dong et al., 2020). And also identified that the ability to design integrated technology-based learning is a major challenge for ECE teachers (Yin et al., 2019).

The gap in creative ability can be explained by the relatively new character of coding learning in the context of early childhood education in Indonesia, so that teachers do not yet have sufficient references and experience in developing intergtared learning designes. In addition, the existing ECE curriculum structure does not explicitly accommodate the integration of coding learning, so teachers need creativity and in-depth understanding to carry out the integration.

4.2 Psychomotor Aspects : Advantages Of The Unplugged Approach, Challenges In Digital Applications

In the psychomotor aspect, the results show that ECE teachers are more proficient in demonstrating unplugged coding activities (2.61) compared to operating coding applications (2.55). This finding indicates that the unplugged approach that does not require devices is easier for ECE teachers to adopt. This is consistent with research that found

that ECE teachers are more comfortable and confident in implementing coding activities without digital devices in the early stages (Sullivan & Bers, 2018).

The negative correlation between teaching experience and psychomotor readiness indicates a common digital divide phenomenon, where teachers with more experience (generally order) tend to experience obstacles in adapting to new technologies (Blackwell et al., 2016). This is an important concern considering that 8 of the 33 respondents (24.2%) are principals who generally have longer teaching experience but play an important role in supporting the implementation of learning policies.

4.3 Affective Aspect : High Enthausiasm, Challenges In Value Integration

The result of the affective aspect show a high level of enthausiasm and acceptance (2.8) towards coding learning, but a lower score on the organizing dimension (2.5) indicates challenges in integrating coding concepts with ECE pedagogical values. This gap indicate that although teachers have a positive attitude towards coding learning, they still need a deeper understanding of how coding values can align with ECE learning philosophies and approaches.

This finding emphasizes the importance of a holistic approach in introducing coding to early childhood, as stated through the concept of "Positive Technological Development" which emphasizes the integration of positive values in technology-based learning (Bers, 2018). The commitment of teachers to implement coding learning (2.6) which is quite high is an important capital for sustainable development.

4.4 Implications For Teacher Professional Development

Based on the research findings, ECE teacher professional development programs in implementing coding learning need to focus on :

1. Strengthening the ability ti design coding learning that is intergrated with thematic approaches in ECE through learning design workshop and ongoing mentoring.
2. Improving technical skills in operating coding applications that are suitbable for early childhood,by paying attention to the digital divide, especially for teachers who have longer teaching experience.
3. Facilitate reflection and in-depth discussion on the integration of ECE pedagogical values with computational thinking principles to help teachers organize these values in learning.
4. Establish a community of practice for ECE coding learning to exchange ideas and experiences in implementation.

5. Conclusion

This study concludes that ECE teachers in Bekasi show a fairly good level of readiness in implementing coding learning for early childhood, with an average value of 2.53 in the cognitive aspect, 2.58 in the psychomotor aspect, and 2.6 in the affective aspects form a maximum scale of 3.0. However, several dimensions still need strengthening, especially the ability to create integrated learning plans, skills in operating digital coding applications, and the ability to organize ECE pedagogical values with coding learning principles.

The findings also show a negative correlation between teaching experience and psychomotor readiness that needs attention in the development of teacher training programs. An important implication of this study is the need for a differentiated approach in ECE teacher professional development programs by considering teaching experience, technology background, and leadership roles in instituitions.

The limitations of this study include the relatively small number of samples and limited to one areas, as well as measurements taken immediately after training without follow-up evaluation of implementation in the classroom. Future research is recommended to examine the effectiveness of coding learning implementation in ECE classes and its impact on the development of early childhood computational thinking skills.

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