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# The Effect of Implementing the DACAR Online Learning Model on Critical Thinking Skill as of Early Childhood



Gusmaniarti<sup>1,2</sup> | Mustaji<sup>1</sup> | Wahono Widodo<sup>1</sup> | Suryanti<sup>1</sup> | Hendratno<sup>1</sup> | Neni Mariana<sup>1</sup>

<sup>1</sup>Universitas Negeri Surabaya, Indonesia

<sup>2</sup>Universitas Muhammadiyah Surabaya, Indonesia

## Abstract

This research investigates how the online implementation of the DACAR learning model comprising Demonstration, Association, Collaboration, Action, and Reward impacts the development of critical thinking abilities in early childhood. The study is grounded in the belief that fostering critical thinking from an early age is crucial, even when instruction occurs virtually. A quantitative approach was employed, utilizing a quasi-experimental design known as the One Group Pretest-Posttest Design. The participants consisted of 30 group B students from Insan Cendekia Kindergarten in Sidoarjo during the 2024/2025 academic year, selected through total sampling. Data were gathered through assessments and observations aligned with early childhood critical thinking indicators. Analysis was conducted using the SPSS software, including tests for normality, homogeneity, and paired sample t-tests. Findings revealed a statistically significant improvement between pretest and posttest scores, with a p-value of 0.000 ( $p < 0.05$ ), indicating that the online DACAR model positively influences young children's critical thinking skills. These results suggest that DACAR is an effective method for enhancing cognitive development during early learning, even in an online format.

**Keywords:** *Online learning, DACAR model, critical thinking, early childhood*

## 1. Introduction

The rapid progress of science and technology has led to significant transformations in education systems globally, reaching all levels including early childhood education (Basri, 2023; Sajida Irsyadillah et al., 2022; Wang, Chen, Yu, Liu, & Jing, 2024). The widespread shift toward digital technology is reshaping how children acquire knowledge, communicate with others, and perceive the world around them (Bilyalova, Salimova, & Zelenina, 2020; Iivari, Sharma, & Ventä-Olkkonen, 2020). In the current digital age, learning is no longer restricted to traditional in-person classroom settings; instead, it has increasingly moved toward virtual formats that rely on technology like computers, tablets, and internet connectivity (Dakhi, Jama, & Irfan, 2020). This shift presents both difficulties and possibilities for the education sector, particularly in developing instructional methods that can deliver engaging and meaningful learning experiences through digital platforms.

This situation calls for innovative teaching strategies that not only keep pace with technological progress but also align with the developmental needs of young learners (Boiliu, Johanis, & Messakh, 2024). Early childhood education goes beyond academics, encompassing the development of character, social-emotional skills, motor abilities, language, and cognitive growth (Rohmah, Yusuf, Azizah, & M., 2023). Critical thinking is one of the key cognitive skills that should be nurtured from an early age (Imamah & Muqowim, 2020). In early childhood, often referred to as the golden age, the brain undergoes rapid development, laying the groundwork for more advanced thinking abilities later in life (Lestari, Mudhawaroh, & Ratnawati, 2020; Putra, 2022). As a result, educators play a crucial role in offering activities that encourage children to observe carefully, ask questions, think critically, and draw conclusions (Septiani, Widyaningsih, Khabib, & Igomh, 2016).

Critical thinking involves the capacity to analyze information in a logical, objective, and reasoned manner, enabling sound decisions grounded in evidence or experience (Novandi, Serani, Djudin, & Suratman, 2025; Robbani, 2025). Children



possessing these abilities often demonstrate greater independence, approach information with healthy skepticism, and show improved problem-solving skills (Sari, Sumarmi, Astina, Utomo, & Ridhwan, 2021; Zulyusri, Elfira, Lufri, & Santosa, 2023). Nonetheless, implementing online learning presents notable difficulties when it comes to nurturing critical thinking abilities, particularly among young children (Rahayu, Nurani, & Meilanie, 2023; Syafi'i, Chusnah, Inayati, & Sari, 2021). Restricted interaction, decreased physical and social engagement, and a shortage of diverse exploratory activities can lead to children becoming more passive and missing chances to enhance their higher-order thinking skills (Novianto et al., 2024; Wati, Nusantara, & Utama, 2024). Previous research has shown that the DACAR learning model, consisting of Demonstration, Association, Collaboration, Action, and Reward, has proven valid and reliable for developing critical and creative thinking skills in early childhood (Gusmaniarti, Mustaji, Widodo, Suryanti, & Wiryanto, 2025). This approach integrates multiple activity-based learning techniques through a sequence of stages: demonstration (observing real examples), association (linking new information to prior knowledge), collaboration (engaging with peers), action (practicing and applying skills), and reward (offering positive feedback). By positioning children as active participants rather than passive receivers, this model encourages greater motivation, emotional engagement, and the cultivation of reflective and analytical thinking.

However, the use of the DACAR Model within online learning environments, particularly for young children, remains largely unexplored through empirical research. Challenges such as adapting each DACAR stage to a virtual setting and the reduced opportunities for face-to-face interaction highlight the importance of further evaluating how effective this method is when implemented online. Moreover, research examining the influence of the DACAR model on the development of 21st-century skills in online learning environments remains scarce. Similarly, the integration of technology in implementing innovative learning models is still limited. This is largely due to challenges in adapting such models to remote learning settings, often caused by insufficient access to digital tools, as well as limited technological proficiency among both educators and students. Despite these obstacles, few studies have explored how the DACAR model might effectively address these specific issues. What sets the online use of the DACAR model apart is its structured sequence of learning phases, which aligns well with modular instruction. It also offers flexibility in adapting to various digital tools and platforms, supports learner autonomy and collaborative engagement in virtual settings, incorporates authentic and project-based assessments, and fosters meaningful learning interactions even in the absence of face-to-face contact. Several studies have indicated that digital learning platforms played a significant role in supporting early childhood education during the COVID-19 pandemic (Jinyoung Kim, 2020). For instance, online modalities provided alternative ways to maintain learning continuity when in-person classes were disrupted (Triyo Supriyatno, 2020). Additionally, the integration of e-learning has shown potential in fostering students' critical thinking, which is an essential skill in 21st-century education. The shift toward technology-enhanced learning is increasingly viewed as a necessary step to equip students with higher-order thinking abilities that are vital in modern educational contexts (Dewi Kusuma Wardani, 2018).

This study seeks to examine the impact of applying the DACAR learning model in an online setting on the critical thinking abilities of young children. Given the growing demand for innovative teaching methods that align with the digital age while maximizing children's developmental growth, this research holds significant value. The findings are anticipated to offer theoretical insights for advancing early childhood education and serve as a practical guide for educators, parents, and policymakers in creating effective, engaging, and meaningful learning experiences in today's digital environment.

## 2. Materials and Methods

This research employed a quantitative method using a quasi-experimental One Group Pretest-Posttest design. Participants first completed a pretest, followed by an intervention involving online learning through the DACAR model, and finally took a posttest to evaluate the impact of the intervention (Djollong, 2014). The study population consisted of all Group B students at Insan Cendekia Kindergarten Sidoarjo for the 2024/2025 academic year, totaling 30 children. Due to the small and accessible population size, saturated sampling (total sampling) was employed, including every member of the group as participants in the research. This study involved two variables: the independent variable (X), which is the online DACAR learning model (Demonstration, Association, Collaboration, Action, Reward), and the dependent variable (Y), representing early childhood critical thinking skills. Data were collected using two primary methods: tests and observations. The tests consisted of activity-based tasks or questions aimed at evaluating critical thinking abilities before and after the intervention, while observations were conducted using assessment sheets aligned with early childhood critical thinking indicators, such as skills in observing, comparing, reasoning, and drawing conclusions. The research tools consisted of critical thinking skill test sheets and observation forms. In this study, the critical thinking instrument was evaluated by three experts comprising



71 educators, academic lecturers, and evaluation specialists and the results indicated that the instrument is valid for assessing  
 72 practical thinking skills. In the online implementation of the DACAR learning model comprising Demonstration, Association,  
 73 Collaboration, Action, and Reward the operationalization and measurement of critical thinking skills are aligned with each  
 74 stage of the learning process and tailored to relevant digital activities and assessment tools. During the Demonstration phase,  
 75 learners are asked to watch instructional videos and respond to comprehension questions via platforms like Google Forms;  
 76 their responses are evaluated based on interpretation and clarification skills, using a 1–4 accuracy based scoring scale. In the  
 77 Association stage, students engage in activities such as interactive quizzes and submit brief reflections through platforms like  
 78 Google Classroom to assess their ability to analyze and infer, with scores determined using an analytical rubric. The  
 79 Collaboration phase emphasizes argument evaluation and discussion, where students interact in LMS forums or virtual  
 80 breakout rooms to examine case studies; participation and reasoning quality are then rated using a rubric focused on  
 81 engagement and critical depth. The Action stage involves applying learned ideas by creating digital outputs such as posters,  
 82 infographics, or short videos which are assessed through a rubric that considers creativity, relevance, and analytical insight,  
 83 again using a 1–4 scale. Lastly, in the Reward phase, students reflect on their learning through journals or short video logs,  
 84 evaluated using a rubric that captures the depth, sincerity, and alignment of their reflections with the material. Across all  
 85 stages, a consistent scoring rubric is applied to assess critical thinking, where a score of 1 indicates no demonstration of the  
 86 targeted skills, score 2 reflects minimal and imprecise demonstration, score 3 denotes adequate and relevant use of critical  
 87 thinking, and score 4 represents clear, logical, and consistently strong critical engagement with the learning content. Data  
 88 from the pretest and posttest were analyzed using descriptive and inferential statistics with SPSS software. This included  
 89 calculating measures like mean, minimum, maximum, and standard deviation, along with conducting tests for normality  
 90 (Kolmogorov-Smirnov), homogeneity (Levene’s Test), and paired sample t-tests to identify significant differences between  
 91 pretest and posttest results. The analysis was conducted using a significance level of  $\alpha = 0.05$ .

92 **3. Results**

93 This section presents the analysis results aimed at evaluating the impact of the online DACAR learning model on  
 94 young children's critical thinking skills. The analysis focuses on comparing pretest and posttest data collected after students  
 95 participated in the DACAR-based online learning intervention.

96 Descriptive statistics were used to summarize the data, including calculations of the mean, standard deviation,  
 97 maximum, and minimum values for both pretest and posttest scores. A normality test was conducted to assess whether the  
 98 data followed a normal distribution, which is a key assumption for parametric tests. The homogeneity test examined whether  
 99 the variances between pretest and posttest results were consistent. Finally, the paired sample t-test was applied to  
 100 determine if there was a statistically significant difference between the pretest and posttest scores, allowing conclusions  
 101 about the effect of the online DACAR learning model on critical thinking skills in early childhood

102 **Table 1.** Descriptive Statistics

	N	30	30
<b>Mean (Rata-rata)</b>		61.53	74.20
<b>Std. Deviation</b>		7.85	6.45
<b>Minimum</b>		50	60
<b>Maximum</b>		75	88

103 The average critical thinking score improved from 61.53 to 74.20 following the implementation of the DACAR model.  
 104 This suggests that the online DACAR learning approach effectively enhances critical thinking abilities in young children. The  
 105 score increase indicates that children became more proficient at observing, analyzing, and making conclusions after  
 106 participating in learning activities structured around the stages of Demonstration, Association, Collaboration, Action, and  
 107 Reward.

108 **Table 2.** Normality Test (Kolmogorov-Smirnov Test)

Group	Sig. (Kolmogorov-Smirnov)
Pretest	0.200
Posttest	0.144



109 Because the significance value exceeds 0.05, it suggests that the data in both groups follow a normal distribution.  
 110 This implies there is no notable deviation from what would be expected in a normal distribution.

111 **Table 3.** Homogeneity Test (Levene's Test)

Levene Statistic	df1	df2	Sig.
1.527	1	58	0.221

112 Since the significance value is 0.221, which is greater than 0.05, it indicates that the variance between the pretest  
 113 and posttest data is homogeneous. This uniformity in data variation satisfies a key assumption required for parametric tests  
 114 like the paired t-test. Having homogeneous data ensures that the statistical analysis results are more accurate and  
 115 dependable when evaluating the impact of the DACAR learning model on children’s critical thinking abilities.

116 **Table 4** Paired Sample t-Test

	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Posttest - Pretest	12.67	4.83	14.15	29	0.000

117 Since the Sig. (2-tailed) value is less than 0.05, a significant difference exists between the pretest and posttest  
 118 scores. This indicates that implementing the DACAR model in an online setting has a meaningful impact on students’ critical  
 119 thinking abilities. In other words, children’s critical thinking skills improved considerably following their participation in  
 120 learning activities using the online DACAR approach. These findings highlight the model’s effectiveness in fostering critical  
 121 thinking during early childhood development.

122 **4. Discussion**

123 Analysis using the Paired Sample t-Test revealed a significant improvement in students’ critical thinking skills after  
 124 the implementation of the DACAR learning model online. The average posttest score rose markedly to 74.20 from the pretest  
 125 average of 61.53, with a significance value of 0.000 ( $p < 0.05$ ). These results demonstrate that the DACAR model effectively  
 126 enhances critical thinking abilities in early childhood, even when delivered through an online learning format.

127 The DACAR model, composed of five key stages Demonstration, Association, Collaboration, Action, and Reward is  
 128 created to foster an engaging and meaningful learning experience. Even in an online learning environment, this method  
 129 effectively promotes active participation by utilizing interactive tools such as demonstration videos, virtual group discussions,  
 130 collaborative tasks, and motivating incentives.

131 The findings indicate that the guided inquiry learning approach effectively enhances students’ critical thinking  
 132 abilities (Sonia, Alberida, Arsih, & Selaras, 2023). The project-based learning approach positively and significantly impacts  
 133 children’s creative thinking skills (Cahyaningsih & Harun, 2023). The Team-Based Learning model has a greater effect on  
 134 enhancing students’ critical thinking skills compared to the Problem-Based Learning model (Dwi Nursulistyo, 2021). Using the  
 135 discovery learning approach to enhance critical thinking skills (Yuliati & Susianna, 2023).

136 The demonstration phase offers clear examples that assist children in grasping concepts both visually and within  
 137 context (Cecep, Thosin Waskita, & Sabilah, 2022; Khanasta, Sinon, & Widyaningsih, 2016). Association enables children to  
 138 connect new knowledge with their prior experiences, enhancing both comprehension and retention (Badjeber, 2017;  
 139 Megiana Pertiwi et al., 2018). Additionally, collaboration helps children develop skills in communication, consider others’  
 140 viewpoints, and work together with peers to solve problems (Sudarti & Diana, 2023; Ulhusna, Putri, & Zakirman, 2020). The  
 141 action phase motivates students to apply critical thinking in decision-making and task completion, while rewards offer  
 142 positive feedback that boosts their motivation to learn (Anjani, 2018; Utomo, 2013).

143 These findings align with Piaget’s theory of cognitive development, which identifies early childhood as the  
 144 preoperational stage a period when children start to develop basic symbolic and logical thinking skills (Agung, Prodi, Guru, &  
 145 Ibtidaiyah, 2019). By using a systematic and consistent method like the DACAR model, children can progressively build their  
 146 critical thinking skills.

147 Moreover, these findings support earlier studies indicating that active, experience-based learning approaches  
 148 significantly enhance critical thinking abilities (Ritonga & Napitupulu, 2024), even in an online learning environment (Yunita,  
 149 Suryanti, & Supardi, 2021). The effectiveness of the DACAR model in an online setting demonstrates that advanced thinking



150 skills can be effectively nurtured through appropriate methods, despite the reduced face-to-face interaction between  
151 teachers and students.

152 Therefore, it can be concluded that applying the DACAR learning model online aligns well with the demands of  
153 digital-era education and effectively enhances critical thinking skills in early childhood, which serve as a crucial basis for their  
154 academic and social growth in the future. This study presents several limitations that should be acknowledged. One key  
155 constraint lies in the high dependence on parental engagement and the availability of technological resources at home during  
156 the implementation of the DACAR model in online early childhood education. As a result, outcomes may differ based on the  
157 family's socio-economic background. Additionally, assessing critical thinking in young children remains a challenge due to the  
158 limited availability of measurement tools that align well with their developmental and cognitive stages. The study's scope  
159 was also restricted to a specific group of participants within a particular geographical area, making it necessary to approach  
160 the generalization of these findings with caution.

161 The encouraging results demonstrating the potential of the online DACAR model in fostering critical thinking among  
162 early learners suggest several pathways for further investigation. Future studies should consider involving participants from  
163 more diverse social and cultural contexts to examine the model's broader applicability. Moreover, there is a pressing need to  
164 design and validate assessment tools that accurately capture early childhood critical thinking skills within digital learning  
165 environments. Longitudinal research is recommended to explore the sustained effects of the DACAR approach on children's  
166 cognitive and metacognitive growth over time. It would also be beneficial to investigate how targeted support and training  
167 for teachers and parents can enhance their roles in facilitating DACAR-based online learning, ultimately improving the  
168 model's effectiveness in early childhood education.

## 170 5. Conclusions

171 The online DACAR learning model has been shown to significantly and positively impact the development of critical  
172 thinking skills in early childhood. Based on these findings, it is recommended that further studies be conducted involving  
173 samples from elementary school students.

## 175 Ethical Considerations

176 This research, which engaged early childhood participants, was carried out with careful attention to ethical  
177 standards to safeguard the rights, well-being, and safety of all individuals involved. Due to the participants' developmental  
178 stage, informed consent was secured from their parents or legal guardians, who were thoroughly briefed on the purpose,  
179 methods, potential benefits, and any foreseeable risks associated with the study using language that was clear and  
180 accessible. Participation was fully voluntary, with assurances given that withdrawal could occur at any point without  
181 consequence. Personal data were handled with strict confidentiality, and all identifying details were removed to maintain  
182 anonymity in documentation and dissemination. The study's activities were purposefully structured to be age-appropriate,  
183 non-intrusive, and conducted in environments familiar to the children to ensure their comfort and emotional security. All  
184 researchers were equipped with appropriate training to interact with young children in a sensitive and respectful manner.  
185 Ethical clearance was obtained from a relevant institutional review board, ensuring the study met recognized standards for  
186 research involving minors. Importantly, the DACAR online learning model introduced during the study was designed to be  
187 safe, beneficial, and educational, complementing the existing curriculum and promoting the development of critical thinking  
188 in early learners.

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