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The Influence of Academic Supervision, Teacher Understanding of Special Needs Education, and Universal Design for Learning on the Implementation of Inclusive Education in Kindergarten

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Abstract
Inclusive early childhood education demands not only equitable access but also teacher competence and adaptive instructional leadership. This study investigates the relationship between academic supervision and teachers' understanding of children with special needs (SEN) and the Universal Design for Learning (UDL) framework within an inclusive kindergarten context. Employing a quantitative approach, the research involved 10 early childhood teachers at TK Khalifah, East Kutai, Indonesia. Data were collected through validated questionnaires, structured interviews, document analysis, and observation. The instruments measured two main variables: academic supervision and teacher understanding of SEN and UDL. Descriptive analysis showed that both variables predominantly fell into the moderate category. Inferential analysis using Pearson correlation revealed a strong positive relationship ($r = 0.81$) between academic supervision and teacher understanding, with a coefficient of determination (R^2) of 86.6%. These findings suggest that academic supervision makes a significant contribution to teachers' inclusive competence. However, the moderate performance trends may reflect limited access to structured professional learning and the absence of contextual variables such as prior training or institutional support. The study concludes that differentiated, reflective, and collaborative supervision is crucial for advancing inclusive practices. Practical implications include the need for enhanced supervisory models and targeted professional development for early childhood educators. This research offers empirical insights to inform inclusive education policy and instructional leadership in early learning environments.

INTRODUCTION

Inclusive education has emerged as a progressive approach aimed at ensuring equitable access and participation for all learners, including those with special educational needs (SEN) and exceptional abilities. In early childhood settings, this model supports both academic and socio-emotional development through inclusive learning environments that promote shared engagement among diverse learners (Bakken, Brown, & Downing, 2017; Haslip & Gullo, 2018). Despite growing policy support, the operationalization of inclusive education remains inconsistent, especially at the kindergarten level, due to persistent challenges related to teacher capacity, limited instructional adaptability, and insufficient structural support (Hornby, 2011; Lindsay, 2003; Norwich & Lewis, 2001; Moriña, 2019).

While some schools have adopted inclusive policies and established basic support mechanisms, implementation is often undermined by fragmented collaboration, inadequate resources, and a lack of teacher preparedness (Engelbrecht et al., 2016; Freeman-Green et al., 2025). Teachers are expected to address a broad spectrum of learning needs, yet many continue to struggle with differentiated instruction due to insufficient pedagogical training and practical experience (Onyishi & Sefotho, 2020; Attwood et al., 2019). These challenges are particularly acute in under-resourced or developing

contexts, where systemic barriers exacerbate the gap between inclusive ideals and classroom realities (Srivastava et al., 2015; Kefallinou et al., 2020). Without sustained professional development, inclusive education remains largely rhetorical rather than transformational (Forlin, 2010).

Moreover, inclusive classrooms offer dual benefits: they provide therapeutic environments for children with SEN and foster empathy and social awareness among typically developing peers (Mamas & Avramidis, 2013; Terpstra & Tamura, 2008; Santos et al., 2016; Kudrnáč et al., 2024). However, the success of such environments hinges on teacher competence, both emotional and pedagogical (Zweers et al., 2021; Calandri et al., 2025). Teachers with strong inclusive orientations are more likely to create equitable, supportive, and respectful classroom cultures (Avramidis & Norwich, 2002).

In practice, many early childhood educators still demonstrate limited understanding of academic supervision, lack sufficient knowledge of SEN learners, and remain unfamiliar with inclusive frameworks such as Universal Design for Learning (UDL) (Bondar & Shestopalova, 2020; Hasibuan, 2024; Bedir, 2022; Vitelli, 2015). UDL, despite its growing prominence as a foundational framework for inclusive instruction, is not widely implemented due to low teacher awareness and a lack of practical guidance (Florian, 2015; Johnson & Semmelroth, 2014). These deficits underscore a pressing need for targeted professional development and instructional leadership mechanisms that can effectively translate inclusive principles into practical classroom practices.

Addressing this gap, the present study investigates the interplay between three pivotal variables, academic supervision, teacher understanding of children with special needs, and the application of UDL, and their combined impact on the implementation of inclusive education in kindergarten settings. Inclusive early childhood education requires not only policy alignment but also professional competence and adaptive pedagogical support (Akrim & Harfiani, 2019; Andresen, 2013). Previous studies have underscored that teachers' conceptual clarity about inclusion and their capacity to apply inclusive strategies are crucial for classroom success (Fyssa, Vlachou, & Avramidis, 2014; Olsen et al., 2019). Likewise, UDL provides a flexible instructional model to address learner variability (Nelis, Pedaste, & Šuman, 2023), while academic supervision is vital in shaping teacher reflection, competence, and instructional quality.

This study responds to a clear research gap: although existing literature has examined inclusive practices, few have explored how the convergence of supervision, teacher competence in SEN, and UDL adoption influences inclusive implementation in early childhood contexts. The novelty of this research lies in its integrative approach, which simultaneously analyzes the structural (supervision), personal (teacher understanding), and instructional (UDL) dimensions that collectively shape inclusive education. Specifically, this study seeks to: (1) analyze the influence of academic supervision on inclusive practice implementation in kindergarten classrooms; (2) evaluate the relationship between teachers' understanding of special needs education and the quality of inclusive instruction; and (3) assess the extent to which comprehension of UDL principles enhances inclusive teaching at the early childhood level.

The expected contributions are threefold: first, for educators, the study offers insights into how supervision and UDL can inform inclusive pedagogical development; second, for school leaders, it provides guidance on designing supervisory models aligned with inclusion; third, for the academic community, it advances the discourse by integrating supervision, learner diversity, and instructional design into a coherent framework for early childhood inclusion. Ultimately, this study aims to generate empirically grounded, context-sensitive recommendations to enhance inclusive education practices and promote sustainable, equity-driven development in early learning environments.

METHODS

Research Design and Setting

This study employed a quantitative research design to examine the relationship between academic supervision, teachers' understanding of children with special needs (SEN), and the implementation of inclusive education using the Universal Design for Learning (UDL) framework. The

research was conducted at TK Khalifah, an early childhood education institution located on Tiung Raya Street, Munthe Subdistrict, North Sangatta District, East Kutai Regency, Indonesia. The study was conducted over a four-month period, from February to May 2025.

Table 1. Research Activity

Activity	Feb	Mar	Apr	May
Research Preparation	✓			
Preliminary Observation	✓			
Refinement of Chapters I–III	✓			
Data Collection		✓	✓	
Data Processing			✓	
Data Analysis				✓
Report Writing				✓

Population and Sample

The population consisted of all teachers at TK Khalifah North Sangatta. The population is the general group from which a sample is drawn, characterized by specific attributes relevant to the research objectives. The sample included 10 kindergarten teachers and 20 six-year-old students enrolled at TK Khalifah. Proportional sampling was employed to ensure balanced representation of the groups within the population. This technique involved selecting participants proportionally from each subgroup based on their size in the total population.

Data Collection Techniques and Instruments

This research employed multiple data collection methods to enhance validity and triangulation, including questionnaires (primary), structured interviews, observation, and document analysis (supporting).

Questionnaire (Primary Instrument)

A structured questionnaire was administered to teacher respondents to gather data on their perceptions of academic supervision by the principal, as well as their understanding and implementation of inclusive practices involving SEN and UDL. The questionnaire was designed with closed-ended Likert-scale items aligned with predefined indicators.

Document Analysis

Document analysis was conducted using a checklist to examine formal records, including supervision plans, observation forms, and follow-up documentation. The goal was to assess the presence and quality of planning, implementation, and follow-up processes in academic supervision.

Table 2. Document Analysis Instrument Grid

No	Document Component	Available	Not Available
1	Supervision Planning Documents		
1.a	Stated objectives of supervision	☐	☐
1.b	Clearly defined supervision targets (e.g., improving inclusive teaching)	☐	☐
1.c	Specified techniques/methods (e.g., observation, mentoring)	☐	☐
1.d	Supervision schedule (with dates & frequency)	☐	☐
2	Supervision Implementation Records		
2.a	Activity log or implementation notes	☐	☐
2.b	Completed classroom observation forms	☐	☐
3	Follow-Up Documentation		
3.a	Documentation of supervision outcomes/results	☐	☐
3.b	Action/improvement plans based on supervision	☐	☐

Structured Interviews

Structured interviews were conducted with teachers to explore their experiences and perceptions related to academic supervision, inclusive teaching, and the application of UDL. The interview protocol was developed based on specific indicators related to the key research variables.

Table 3. Interview Instrument Grid

No	Variable	Indicators
1	Academic Supervision	Planning, Implementation, Follow-up
2	Understanding of SEN and UDL	Lesson Design, Instruction, Assessment, Interpersonal Skills

Research Variables and Operational Definitions

Variable Y: Understanding of SEN and UDL in Inclusive Education

This variable refers to a teacher's ability to design and deliver inclusive learning by considering learner diversity, especially for children with special needs, and integrating UDL principles. It includes planning, teaching, assessment, and interpersonal collaboration. Measured using a questionnaire comprising indicators of lesson planning, implementation, inclusive assessment, and interpersonal adaptability.

Table 4. Instrument Grid – SEN and UDL Understanding

Dimension	Indicator	Item No.	Total
Planning	Lesson plan design, material development	1–2	2
Instruction	Opening, core activities, closing	3–5	3
Assessment	Evaluation method, instrument development, and feedback	6–8	3
Interpersonal	Communication and collaboration	9–10	2
Total			10

Variable X: Academic Supervision

Academic supervision is a structured process carried out by school leaders to enhance the professional performance of teachers through observation, evaluation, and pedagogical support and measured through teacher responses to a 30-item questionnaire based on planning, implementation, and follow-up of academic supervision activities.

Table 5. Instrument Grid – Academic Supervision

Phase	Dimension	Indicator	Item No.	Total
Planning	Observation planning, review of lesson plans, setting targets, and techniques	1–10	10	
Implementation	Observation, recording, and feedback	11–17	7	
Follow-Up	Reinforcement, data discussion, recommendations	18–30	13	
Total				30

Validity and Reliability of Instruments

Instrument validity was assessed using Pearson's Product-Moment Correlation. Prior to validity testing, normality was confirmed. An item was considered valid if the calculated r-value exceeded the critical r-table value at a 3% significance level. SPSS version 23 was used to facilitate calculations.

1. Variable X (Academic Supervision): 3 out of 30 items (items 15, 20, and 29) were found invalid and excluded from the analysis.
2. Variable Y (SEN and UDL Understanding): All 30 items were found valid.

Cronbach's Alpha was used to assess internal consistency. An instrument was deemed reliable if the Cronbach's Alpha coefficient exceeded 0.600. All instruments used in the study met this reliability threshold.

Data Analysis Techniques

Descriptive Analysis

Descriptive statistics (mean, median, mode, standard deviation) were used to describe teacher responses. Frequency distribution tables and bar charts were generated to visualize trends. Scoring trends were categorized as follows:

Table 6. Scoring Tendency

Score Category	Interpretation
X < (Mi – SDi)	Low
(Mi – SDi) < X < (Mi + SDi)	Moderate
X > (Mi + SDi)	High

Where Mi = mean, SDi = standard deviation, and X = respondent score.

Inferential Analysis

Pearson correlation analysis was used to examine the relationships between the independent variables (academic supervision, teacher understanding of SEN and UDL) and the dependent variable (inclusive education implementation). The analysis was conducted using SPSS 23.

RESULTS AND DISCUSSION

Results

Description of Data

This section presents the descriptive findings of the study based on the quantitative analysis of two main variables: academic supervision (X) and teacher understanding of children with special needs and Universal Design for Learning (Y).

Description of Variable X: Academic Supervision

The academic supervision variable was measured using a 30-item questionnaire. After testing for validity and reliability, 27 items were selected for retention. From 10 respondents, scores ranged from a minimum of 19 to a maximum of 38, with a mean score of 30.6.

Table 7. Frequency Distribution of Academic Supervision Scores

Interval	Class Boundaries	Midpoint	Frequency	Percentage
19–23	18.5–22.5	21	2	7%
24–28	23.5–27.5	26	6	20%
29–33	28.5–32.5	31	15	50%
34–38	33.5–37.5	36	7	23%
Total			30	100%

The histogram (Figure 1) illustrates that the highest frequency occurred in the 28.5–32.5 range, while the lowest frequency was observed in the 18.5–22.5 range.

To interpret the scores:

1. Mean = 30.6, Standard Deviation = 5
2. Moderate category: 25.6 to 35.6
3. High category: >35.6
4. Low category: <25.6

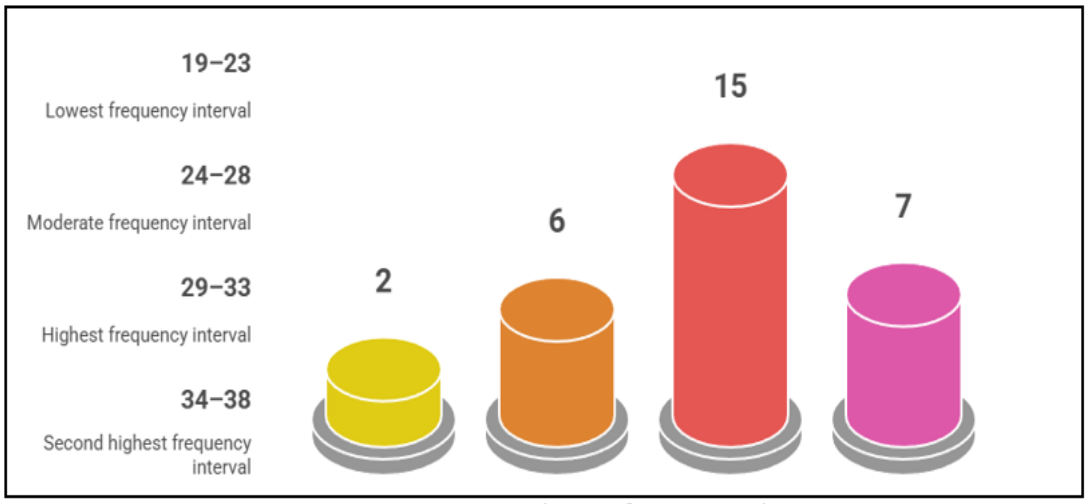

Figure 1. Frequency Distribution of Data Intervals

Table 8. Category Classification of Academic Supervision

Category	Range	Frequency	Percentage
High	36–38	7	23.3%
Moderate	27–34	19	63.3%
Low	21–26	4	13.3%

The data suggest that academic supervision in the studied setting generally falls within the moderate category (63.3%).

Description of Variable Y: Teacher Understanding of Children with Special Needs and UDL

This variable was measured using a 30-item validated and reliable questionnaire. Respondent scores ranged from 21 to 38, with a mean of 29.8 and a standard deviation of 7.3.

Table 9. Frequency Distribution of Teacher Understanding (ABK and UDL)

Interval	Class Boundaries	Midpoint	Frequency	Percentage
21–25	20.5–23.5	23	2	7%
26–30	25.5–29.5	28	13	43%
31–35	30.5–34.5	33	11	37%
36–40	35.5–39.5	38	4	13%
Total			30	100%

Based on the histogram (Figure 2), the highest frequency was in the 26–30 range.

Score interpretation:

1. Mean = 29.8, Standard Deviation = 7.3
2. Moderate category: 22.5 to 37.1
3. High category: >37.1
4. Low category: <22.5

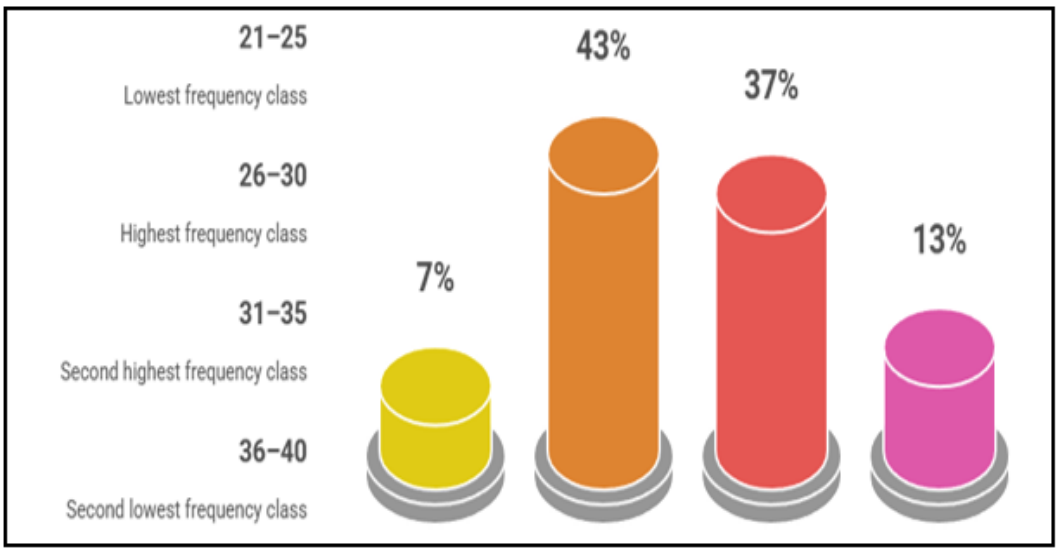

Figure 2. Distribution of Data Across Class Boundaries

Table 10. Category Classification of Teacher Understanding

Category	Range	Frequency	Percentage
High	36–38	4	13.3%
Moderate	27–34	26	86.6%
Low	21–25	2	6.6%

Most respondents (86.6%) demonstrated a moderate level of understanding of inclusive education practices.

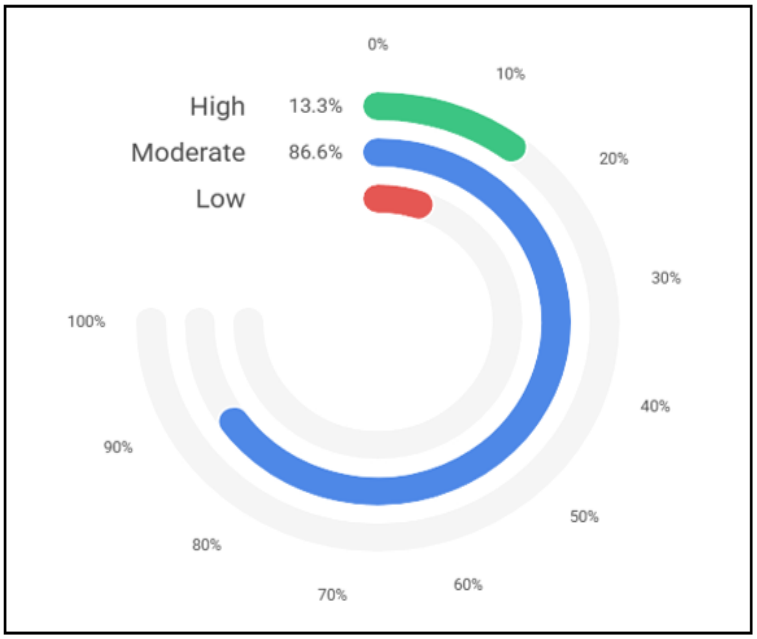

Figure 3. Distribution of Teacher Understanding Categories

Instrument Validity and Reliability

The validity test using the product-moment correlation confirmed that items with r-values above 0.3 were valid. A total of 27 items (for X) and 30 items (for Y) met this criterion. Reliability testing using Cronbach's Alpha showed values exceeding the threshold of 0.62, indicating strong internal

consistency. Additionally, a Pearson correlation analysis revealed a significant positive relationship (r = 0.62) between teachers' understanding of ABK and UDL, suggesting conceptual alignment between the two aspects.

Hypothesis Testing and Interpretation

The study aimed to examine the effect of academic supervision on teacher understanding of ABK and UDL. The result of the Pearson correlation test yielded a correlation coefficient of r = 0.81, with a p-value of 0.3 at α = 0.05. This indicates a strong, significant positive relationship. Moreover, the coefficient of determination (R^2) was 86.6%, indicating that academic supervision has a significant contribution to teacher understanding in inclusive education. Thus, effective supervision practices are crucial in enhancing teachers' inclusive competence.

Research Limitations

1. The study focused solely on two variables (X and Y) within a single institution (TK Khalifah Sangatta Utara), limiting generalizability.
2. The sample size was relatively small (n = 10), which may reduce statistical power.
3. Additional variables such as training history, years of experience with ABK, or institutional support were not included but may have influenced the findings.

Despite these limitations, the results offer valuable insights into the importance of school leadership and structured supervision in supporting inclusive teaching practices in early childhood education.

Discussion

The present study explored the relationship between academic supervision and teachers' understanding of children with special needs and Universal Design for Learning (UDL) in an inclusive early childhood education setting. The findings indicate that academic supervision is predominantly perceived at a moderate level by the majority of respondents. At the same time, teachers' understanding of ABK and UDL also largely falls within the moderate category. This aligns with previous literature suggesting that academic supervision, when effectively implemented, can serve as a vehicle for professional growth, reflection, and pedagogical improvement (Mackinnon, 2004; Nordentoft et al., 2013). Moreover, the development of teacher competence in inclusive settings often requires both managerial support and pedagogical scaffolding, highlighting the interdependence between supervision and teacher performance (Bisschoff & Grobler, 1998). The correlation analysis in this study revealed a strong positive relationship (r = 0.81) between the two variables, with a coefficient of determination suggesting that academic supervision contributes substantially (86.6%) to teachers' inclusive competence. This finding further reinforces the notion that structured academic oversight plays a significant role in equipping teachers with the skills necessary to respond to learner diversity (Mitiku et al., 2014), particularly when combined with inclusive frameworks such as Universal Design for Learning, which has been shown to enhance accessibility and engagement across learner profiles (Capp, 2017).

These results suggest that adequate academic supervision may play a critical role in enhancing teachers' understanding of inclusive practices. The strength of the observed correlation supports the hypothesis that structured supervisory support can positively influence teachers' pedagogical readiness and responsiveness to diverse learner needs. This is consistent with findings that emphasize the importance of systematic guidance and reflection in supporting teachers to implement equitable and inclusive approaches in early childhood settings (Souto-Manning et al., 2019; DeVore & Russell, 2007). The relatively high percentage of teachers within the moderate category could indicate an existing foundation of knowledge that is potentially shaped and reinforced by supervision processes. Such a foundation may reflect broader patterns observed in similar contexts, where early childhood educators demonstrate a willingness to adopt inclusive teaching strategies when supported by

collaborative structures, shared professional experiences, and leadership that values diversity (Majoko, 2018; Agbenyega & Klibthong, 2021; Chatzigeorgiadou & Barouta, 2022).

While a strong relationship was anticipated, the magnitude of the coefficient of determination (86.6%) was unexpectedly high, especially given the modest scope of the supervision program and the relatively small sample size. This finding suggests that, in contexts where institutional resources and formal training are limited, academic supervision may serve as a particularly salient mechanism for fostering teacher professional development. Similar observations have been reported in early childhood education contexts where supervision practices have shown disproportionate impact relative to the size and resources of the institution (Ameli et al., 2024; Oke, 2016). Supervision, particularly when conducted with a clinical or pedagogical approach, has been recognised as a strategic tool that not only enhances instructional quality but also supports continuous teacher growth (Bencherab & Al Maskari, 2020; Coimbra et al., 2020). However, further investigation is necessary to determine whether the current findings are replicable across more diverse educational settings or are influenced by contextual factors unique to the institution studied, such as leadership dynamics, teacher collaboration culture, or prior exposure to inclusive education models.

It was anticipated that a larger portion of respondents might demonstrate either a high or low level of understanding, depending on their previous exposure to inclusive education. Contrary to this expectation, most respondents clustered within the moderate category. This pattern is consistent with findings from previous studies which reveal that while many teachers possess general awareness of inclusive education, such understanding often lacks depth and practical application due to limited opportunities for advanced training or reflective practice (Jia et al., 2024; Lancaster & Bain, 2020). Baseline knowledge without firm pedagogical grounding may stem from sporadic or surface-level exposure rather than sustained professional development (Hamman et al., 2013; Symeonidou & Phtiaka, 2009). Moreover, in-service teachers in inclusive settings often report tensions between their inclusive beliefs and their actual classroom practices, which further underscores the need for targeted support (Mitchell & Hegde, 2007). The findings thus highlight a potential need for more differentiated and strategically designed supervision to elevate teachers' understanding from moderate to high levels by addressing individual learning needs and contextual constraints.

One possible explanation for the moderate outcomes in both variables is the limited access to structured professional learning opportunities beyond routine supervision. Research has consistently shown that high-quality professional development—particularly when it is ongoing, reflective, and practice-oriented—is essential for enabling teachers to engage meaningfully with inclusive pedagogy (Florian & Rouse, 2010; Donath et al., 2023). The absence of additional variables—such as teachers' years of experience with ABK, prior training, or institutional support—may also contribute to the observed distribution, as these contextual factors are known to influence the depth and application of inclusive practices (Bešić et al., 2017; Waitoller & Artiles, 2013). Furthermore, the supervision process itself may not yet fully integrate reflective, collaborative, and practice-based approaches that are essential for deepening inclusive understanding. Collaborative professional development is particularly effective in building teacher confidence and competence in inclusive classrooms when it promotes shared inquiry and collegial dialogue (Holmqvist & Lelinge, 2021; Rosita et al., 2022). These findings suggest that revisiting the structure and content of both supervision and teacher learning opportunities is crucial to advancing inclusive educational goals.

Several limitations may have influenced the outcomes of this study. First, the small sample size ($n = 10$) reduces the generalizability of the results and may overestimate the strength of relationships. Second, the study was confined to a single institutional setting, which may limit contextual variation. Finally, the exclusion of potentially relevant moderating variables constrains the interpretation of causality. These limitations suggest that future studies should consider broader sample sizes and include a more comprehensive range of influencing factors to provide a more nuanced understanding of the relationship between supervision and teacher competence in inclusive settings.

Despite these limitations, the findings underscore the pivotal role of academic supervision in shaping teacher competencies in inclusive education. The strong positive relationship suggests that efforts to enhance the quality, structure, and content of supervision programs could yield significant improvements in teacher understanding and inclusive classroom practices. School leaders and policymakers may therefore consider strengthening supervisory frameworks as part of broader strategies to promote inclusive education, particularly in early childhood contexts. Future research should aim to investigate the mechanisms by which academic supervision affects teacher understanding, potentially by employing qualitative methods to capture teachers' perspectives and experiences. Expanding the research to include multiple institutions with varying supervision models may also provide comparative insights. Additionally, investigating the mediating effects of other professional development activities could further illuminate how best to support teachers in inclusive educational environments.

CONCLUSION

This study investigated the relationship between academic supervision and teachers' understanding of children with special needs (ABK) and Universal Design for Learning (UDL) within the context of inclusive early childhood education. The research aimed to determine the influence of structured supervision on teacher competence in inclusive practice. Employing a quantitative method with validated instruments, the study involved 10 kindergarten teachers at TK Khalifah Sangatta Utara. The findings revealed that both academic supervision and teacher understanding of inclusive education were generally at a moderate level. Notably, a strong and significant correlation ($r = 0.81$) was found between the two variables, with academic supervision accounting for 86.6% of teachers' inclusive competence. These results underscore the importance of supervision not merely as an evaluative tool, but as a strategic mechanism for professional development, particularly in settings with limited institutional resources. This study contributes to the growing body of literature on inclusive education by emphasising the integrative role of school leadership, structured reflection, and adaptive pedagogical support in advancing teacher competence. The novelty of this research lies in its focus on the convergence of structural (supervision), instructional (UDL), and personal (teacher understanding) factors in shaping inclusive practices in early childhood settings. Practically, the findings underscore the urgent need to enhance the quality of academic supervision by incorporating reflective, collaborative, and differentiated approaches that cater to teachers' diverse experiences and prior knowledge. Furthermore, the study suggests that school leaders and policymakers should prioritise targeted professional development programs aligned with inclusive goals. Future research should explore these relationships in broader institutional settings with larger samples and additional variables, such as teaching experience, prior training, and systemic support. Longitudinal and qualitative approaches could also enrich understanding of how supervision influences teachers' inclusive practices over time. In conclusion, academic supervision—when thoughtfully implemented—can be a transformative lever for promoting equity and inclusion in early childhood education.

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