

EFFECTIVENESS OF A COMPETENCY-BASED SHADOW TEACHER TRAINING PROGRAM ON INCLUSIVE EDUCATION OUTCOMES FOR CHILDREN WITH NEURODEVELOPMENTAL DISORDERS: A QUASI-EXPERIMENTAL STUDY IN INDONESIA

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ABSTRACT

The inclusion of children with neurodevelopmental disorders (NDD) in mainstream educational settings requires qualified shadow teachers (STs) who possess evidence-based competencies aligned with contemporary diagnostic frameworks. However, in Indonesia, structured competency-based ST training programs grounded in DSM-5-TR criteria and internationally recognized behavioral intervention principles remain scarce. This study evaluates the effectiveness of a three-session online competency-based shadow teacher training program developed by Yamet Child Development Center, examining its impact on participants' knowledge acquisition, practical competency, and self-efficacy in supporting children with NDD in inclusive education settings. Methods: A quasi-experimental pre-test/post-test design was employed with $N = 47$ participants (completion rate = 90.38%; female = 83.0%) recruited from inclusive education practitioners at two structured inclusive institutions in Lampung Province, Indonesia: Yamet School Cendana Lampung and TK Bumi Grande Lampung. Participants completed a structured 7.5-hour online training program (3 sessions x 150 minutes) covering NDD diagnostic profiles per DSM-5-TR (APA, 2022), assessment and IEP/PDI development, ABA-based shadowing techniques, and inclusive education documentation. Knowledge was assessed using three validated 20-item multiple-choice questionnaires (one per session; $\alpha = 0.82-0.87$). Competency self-efficacy was measured using a 15-item Likert-scale instrument adapted from the Special Education Self-Efficacy Scale (SESES; $\alpha = 0.91$), comprising three subscales aligned with SKKNI PAS Jenjang IV KKNi competency domains. Paired-samples t-tests revealed statistically significant post-test improvements across all three sessions: Session 1 ($M = 58.42$, $SD = 9.12$ vs. $M = 81.36$, $SD = 7.45$; $t(46) = 14.87$, $p < .001$, $d = 2.17$); Session 2 ($M = 61.25$, $SD = 8.75$ vs. $M = 83.94$, $SD = 6.88$; $t(46) = 15.62$, $p < .001$, $d = 2.28$); Session 3 ($M = 59.87$, $SD = 9.03$ vs. $M = 85.21$, $SD = 6.12$; $t(46) = 16.45$, $p < .001$, $d = 2.40$). All effect sizes were very large ($d > 2.0$). Self-efficacy improved significantly from pre-training ($M = 3.12$, $SD = 0.54$) to post-training ($M = 4.28$, $SD = 0.47$; $t(46) = 13.21$, $p < .001$, $d = 1.93$). Program satisfaction was high, with 89% endorsing strong practical relevance and 92% reporting improved classroom confidence. Discussion: The program's dual grounding in internationally validated evidence-based frameworks (ABA, UDL, PBIS, DSM-5-TR) and Indonesia-specific regulatory standards (SKKNI PAS; Kepdirjen 2/3694/IX/2025) produced robust, culturally responsive professional development outcomes consistent with Bandura's (1997) self-efficacy theory and Cognitive Load Theory (Sweller et al., 2019). A structured, evidence-based online shadow teacher training program significantly enhances knowledge acquisition and professional self-efficacy among Indonesian inclusive education practitioners. These findings support the integration of competency-based training within national shadow teacher certification frameworks and provide a replicable model for professional development in low- and middle-income inclusive education contexts.

KEYWORDS: shadow teacher; neurodevelopmental disorders; inclusive education; Applied Behavior Analysis; competency-based training; Indonesia; DSM-5-TR; self-efficacy; SKKNI PAS

INTRODUCTION

Background and Global Context

Neurodevelopmental disorders (NDD), including Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), Intellectual Disability (ID), Specific Learning Disorders (SLD), and Speech and Language Disorders, represent a heterogeneous group of conditions characterized by persistent deficits in cognitive, communicative, adaptive, or social domains that manifest during the developmental period (American Psychiatric Association [APA], 2022). The global prevalence of NDD has risen substantially over the past two decades; ASD alone affects approximately 1 in 36 children in the United States (Centers for Disease Control and Prevention [CDC], 2023), while ADHD affects an estimated 5–7% of the global school-age population (Polanczyk et al., 2015). In Indonesia, national epidemiological data remain limited, yet Kementerian

Kesehatan estimates suggest approximately 2.4 million individuals are living with ASD, with the majority remaining underserved by specialized educational services (Kemenkes RI, 2021).

The inclusive education movement, formalized globally through the Salamanca Statement (UNESCO, 1994) and embedded in Indonesian national law through Permendiknas No. 70/2009 and Undang-Undang No. 8/2016, mandates that children with disabilities and special educational needs have the right to quality education in mainstream settings. However, the successful implementation of inclusive education is contingent upon adequately trained educational personnel who can bridge the gap between clinical diagnosis and classroom practice (Schwab et al., 2022; Sharma & Sokal, 2015).

The Role of the Shadow Teacher in Inclusive Settings

The shadow teacher (ST) — also referred to as a paraprofessional, educational aide, or special education paraeducator — serves as a critical intermediary between specialist clinical services and mainstream classroom instruction. Operating at the intersection of behavioral intervention, academic adaptation, and social facilitation, the ST's role requires a sophisticated repertoire of competencies including understanding of diagnostic profiles, implementation of individualized education programs (IEP), application of evidence-based behavioral intervention strategies (particularly Applied Behavior Analysis; ABA), and management of maladaptive behaviors across multiple school settings (Giangreco et al., 2010; Riggs & Mueller, 2001).

In Indonesia, the professional role of the shadow teacher has been formally codified through the Standar Kompetensi Kerja Nasional Indonesia for Pendampingan Anak Berkebutuhan Khusus (SKKNI PAS, Jenjang IV KKNi), comprising 10 core competency units (Q.86PAS.001–010), and further structured through the Keputusan Direktur Jenderal No. 2/3694/LP.00.00/IX/2025 establishing the Standar Kompetensi Kerja Khusus (SKKK) Bidang Pendampingan ABK. Despite this regulatory framework, implementation gaps persist: training programs remain largely informal, competency assessment is inconsistent, and practitioners frequently lack exposure to internationally validated intervention frameworks aligned with current diagnostic standards (DSM-5-TR, APA, 2022).

Research Gap

A systematic review of the literature reveals a critical gap in empirical evidence concerning structured, competency-based ST training programs in low- and middle-income countries (LMICs), particularly in Southeast Asia. While professional development interventions for paraprofessionals have been studied in high-income countries (Finke et al., 2021; Brock et al., 2020), these programs are rarely adapted to local regulatory frameworks, cultural contexts, or the specific diagnostic profiles most prevalent in the target population. Furthermore, existing Indonesian ST training programs have not been systematically evaluated for their impact on knowledge acquisition, competency self-efficacy, or participant outcomes using validated psychometric instruments.

The absence of evidence-based, culturally contextualized ST training models in Indonesia represents both a research gap and a practical problem of significant magnitude, given that the quality of ST practice directly influences academic, behavioral, and social outcomes for children with NDD in inclusive education settings (Walker et al., 2022; Rispoli et al., 2021).

Research Objectives and Hypotheses

This study aimed to: (1) evaluate the effectiveness of a three-session competency-based online ST training program on participants' knowledge acquisition across three competency domains; (2) assess changes in participants' self-efficacy in supporting children with NDD in inclusive settings; and (3) examine participant satisfaction and perceived practical relevance of training content.

The following hypotheses were advanced:

- H1: Participants will demonstrate statistically significant knowledge gains from pre-test to post-test across all three training sessions.
- H2: Participants will report significantly higher self-efficacy scores in ST competencies following program completion.
- H3: Participants will report high levels of satisfaction with and perceived relevance of the training program to their professional practice.

LITERATURE REVIEW

Applied Behavior Analysis in Inclusive Education

Applied Behavior Analysis (ABA) constitutes the most extensively evidence-based intervention framework for children with ASD and related NDD (Cooper et al., 2020). Derived from Skinner's (1938) principles of operant conditioning and developed into applied methodology by Baer, Wolf, and Risley (1968), ABA employs systematic manipulation of antecedent and consequent environmental variables to establish, maintain, or reduce target behaviors. Contemporary ABA practice is characterized by individualization, data-driven decision making, and a hierarchical prompting system that supports skill acquisition while fading toward independence (Cooper et al., 2020). Meta-analytic evidence consistently demonstrates ABA's efficacy in improving communication, social skills, adaptive behavior, and academic performance in children with ASD (Virués-Ortega, 2010; Weitlauf et al., 2021).

For shadow teachers operating in inclusive classrooms, ABA-informed competencies include implementation of discrete trial training (DTT), naturalistic developmental behavioral interventions (NDBI), reinforcement systems (token economies, differential reinforcement procedures), and behavioral data collection. The translation of these clinical strategies into inclusive classroom contexts requires deliberate professional development that bridges the gap between specialist knowledge and everyday classroom practice (Hume et al., 2021).

Frameworks for Inclusive Education Practice

Three internationally recognized frameworks inform contemporary inclusive education practice: Universal Design for Learning (UDL; CAST, 2018), Differentiated Instruction (DI; Tomlinson, 2014), and Response to Intervention (RTI; Fuchs & Fuchs, 2021). UDL provides a proactive architectural framework for classroom design that accommodates diverse learner profiles through multiple means of representation, action/expression, and engagement. RTI operationalizes a tiered intervention model in which universal screening, data-based decision making, and increasingly intensive interventions are coordinated across three tiers of support. These frameworks, complemented by Positive Behavioral Interventions and Supports (PBIS; Sugai & Horner, 2020), constitute the theoretical infrastructure of high-quality inclusive education practice.

Shadow teachers operating within these frameworks must understand how to individualize within universal structures — implementing child-specific accommodations and modifications while supporting full classroom participation. This demands training programs that explicitly address framework implementation rather than merely theoretical description.

Professional Development for Paraprofessionals

Research on paraprofessional professional development consistently identifies knowledge gaps in behavioral intervention principles, IEP implementation, and disability-specific characteristics as barriers to effective inclusive education support (Giangreco et al., 2010; Brock & Carter, 2021). Effective professional development for paraprofessionals is characterized by: content grounded in evidence-based practice; structured competency-based curricula; active learning and practice opportunities; ongoing supervision and feedback; and alignment with formal credentialing systems (Brock et al., 2020; Finke et al., 2021).

In Indonesia, the formal credentialing structure for shadow teachers (SKKNI PAS, Jenjang IV KKNI) provides a unique regulatory scaffold within which competency-based training can be systematically positioned. However, the empirical evaluation of training programs within this framework has not been previously reported in the peer-reviewed literature, representing the primary contribution of the present study.

METHODS

Study Design

A quasi-experimental one-group pre-test/post-test design was employed. This design was selected as appropriate given the professional development context, in which randomization to a waitlist control condition was not ethically feasible without denying training to registered participants. The design follows established precedent in paraprofessional professional development research (Brock & Carter, 2021; Finke et al., 2021) and provides sufficient internal validity for initial program evaluation purposes.

Participants

Participants were recruited through purposive sampling from inclusive education practitioners affiliated with two institutional partners implementing structured inclusive education models in Lampung Province, Indonesia: (1) Yamet School Cendana Lampung, an inclusive primary school implementing multidisciplinary collaboration involving psychologists, therapists, and shadow teachers; and (2) TK Bumi Grande Lampung, an inclusive early childhood education setting emphasizing early screening, individualized education planning (IEP), and classroom-based intervention support. Recruitment was facilitated through the organizing platform PAUDNESIA and Biro Psikologi CHARACTER (CV. Cipta Ragam Talenta, Sidoarjo, East Java).

Inclusion criteria required participants to: (1) be currently working as a shadow teacher, inclusive classroom teacher, or early childhood educator providing direct support to children with neurodevelopmental disorders; (2) have direct classroom experience with children requiring individualized educational support; and (3) complete both pre-test and post-test assessments for all three sessions. Exclusion criteria included failure to complete pre- or post-test instruments for any session.

A total of N = 52 participants enrolled in the training program; N = 47 met inclusion criteria and completed all sessions and assessments (completion rate = 90.38%). The dropout rate of 9.62% (n = 5) was attributed to technical connectivity issues during synchronous sessions rather than voluntary withdrawal, as confirmed by post-program communication. All 47 participants were included in the final analysis. Demographic characteristics are presented in Table 1.

Table 1. Participant Demographic Characteristics (N = 47)

Characteristic	n	%
Gender		
Female	39	83.0

Male	8	17.0
Age (years)		
18–25	18	38.3
26–35	21	44.7
36–45	6	12.8
>45	2	4.2
Educational Background		
Senior High School (SMA/SMK)	5	10.6
Diploma (D3)	12	25.5
Bachelor's Degree (S1)	27	57.4
Master's Degree (S2)	3	6.5
Work Experience as ST/Inclusive Educator		
< 1 year	14	29.8
1–3 years	21	44.7
> 3 years	12	25.5
Institution		
Yamet School Cendana Lampung	29	61.7
TK Bumi Grande Lampung	18	38.3

Note. ST = shadow teacher. The majority of participants (83.0%) were female, consistent with national trends in the Indonesian shadow teacher workforce. The distribution across experience levels reflects a professionally heterogeneous sample ranging from novices to practitioners with >3 years of experience.

Training Program Description

The training program — Online Training Shadow Teacher, jointly organized by Yamet Child Development Center and PAUDNESIA — was delivered across three sessions of 150 minutes each (total: 450 minutes / 7.5 contact hours) via synchronous Zoom video conferencing over three consecutive evenings (18.30–21.00 WIB). Content was developed and delivered by the lead author (licensed clinical psychologist, occupational therapist, and certified behavioral practitioner with >20 years of clinical experience in child development and ABA). The program was structured in accordance with the SKKNI PAS Jenjang IV KKNI competency framework and the DSM-5-TR diagnostic classification system (APA, 2022). Table 2 provides a detailed content description per session.

Table 2. Training Program Content and Structure

Session	Core Content	Theoretical Framework	Duration
1 (9 April 2026)	Inclusive education foundations; SKKNI/Kepdirjen regulatory framework; shadow teacher professional roles and competencies; child developmental milestones (3–12 years); NDD profiles per DSM-5-TR: ASD, ADHD, Speech & Language Disorder, Intellectual Disability, Down Syndrome	DSM-5-TR; Neurodiversity paradigm; Ecological Systems Theory (Bronfenbrenner)	150 minutes
2 (10 April 2026)	Specific Learning Disorders (Dyslexia, Dyscalculia, Dysgraphia, Dyspraxia/DCD, Slow Learner); assessment principles (ASQ-3, GARS-3, NST); IEP/PDI development; DMSO curriculum adaptation model; progress monitoring and evaluation	DSM-5-TR; Cartwright IEP model; RTI; DMSO Framework	150 minutes
3 (11 April 2026)	ABA prompting hierarchy (7 levels); shaping, chaining, task analysis; reinforcement systems (token economy,	Applied Behavior Analysis; UDL (CAST, 2018); PBIS	150 minutes

	DRA, DRI, DRO); UDL; PBIS; management of tantrum, echolalia, stimming, and oppositional behavior; daily documentation; observation report format	(Sugai & Horner, 2020)	
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Research Setting

This study was conducted across two inclusive education institutions in Lampung Province, Indonesia, both implementing structured multidisciplinary inclusive education models:

- **Yamet School Cendana Lampung:** Yamet School Cendana Lampung is an inclusive primary school operating under a multidisciplinary team model that integrates psychologists, occupational therapists, speech-language pathologists, and shadow teachers in a coordinated intervention system. The school employs a structured workflow encompassing screening, diagnostic referral, IEP development, classroom-based implementation by shadow teachers, and periodic multidisciplinary evaluation — consistent with internationally recognized inclusive education best practice (Schwab et al., 2022).

- **TK Bumi Grande Lampung:** TK Bumi Grande Lampung is an inclusive early childhood education (PAUD) setting that emphasizes early developmental screening, individualized education planning, and classroom-based intervention support for children with developmental delays and neurodevelopmental disorders. The institution applies a systematic inclusion workflow including age-appropriate developmental monitoring, structured observation, and collaboration between early childhood educators and clinical specialists.

Both institutional settings provided the naturalistic professional context within which participants applied training content, enhancing the ecological validity of knowledge transfer and self-efficacy assessment outcomes (Walker et al., 2022). Participant recruitment from these two complementary settings — encompassing both primary and early childhood inclusive education — strengthened the representativeness of the sample across key professional roles encountered in Indonesian inclusive education.

Instruments

Knowledge Assessment Questionnaire (KAQ)

Knowledge acquisition was assessed using three session-specific multiple-choice instruments (20 items each; 4-response options), covering the core content domains of each session. Items were distributed across three difficulty levels: Easy (30%; 6 items), Moderate (30%; 6 items), and Difficult (40%; 8 items). Items were developed based on DSM-5-TR diagnostic criteria, SKKNI PAS competency standards, and established ABA and inclusive education frameworks. Content validity was established through independent review by three subject matter experts (licensed clinical psychologists and special educators with >10 years of clinical and academic experience). Scores ranged from 0–100 (5 points per correct response). Internal consistency reliability for each instrument was acceptable to good: Session 1 KAQ ($\alpha = 0.82$), Session 2 KAQ ($\alpha = 0.85$), and Session 3 KAQ ($\alpha = 0.87$).

Shadow Teacher Self-Efficacy Scale (ST-SES)

Professional self-efficacy was measured using a 15-item Likert-scale instrument (1 = not at all confident to 5 = extremely confident), adapted from the Special Education Self-Efficacy Scale (SESES; Savolainen et al., 2020) to reflect the specific competency domains of the Indonesian shadow teacher professional role as defined in SKKNI PAS Jenjang IV KKN. Three subscales were included: (1) Disability Identification and Understanding (5 items; e.g., 'I am confident in identifying behavioral indicators of ASD and ADHD based on DSM-5-TR criteria'); (2) IEP Implementation and Curriculum Adaptation (5 items; e.g., 'I am confident in developing and implementing an IEP/PDI for a child under my care'); and (3) Behavioral Support and Communication (5 items; e.g., 'I am confident in applying ABA-based prompting and reinforcement strategies in the inclusive classroom'). The instrument was adapted with expert panel input and pilot-tested prior to study commencement. The full-scale reliability was excellent: overall $\alpha = 0.91$.

Program Satisfaction Survey (PSS)

A 10-item post-training survey assessed participant satisfaction and perceived practical relevance using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), supplemented by two open-ended qualitative questions soliciting narrative feedback on program strengths and areas for improvement. Qualitative responses were analyzed using inductive thematic analysis (Braun & Clarke, 2006).

Procedure

Participants completed the KAQ-1 pre-test approximately 15 minutes before Session 1 commenced. The KAQ-1 post-test was administered immediately following Session 1 conclusion. This procedure was replicated for Sessions 2 and 3. The ST-SES was administered immediately prior to Session 1 (pre-training baseline) and immediately following Session 3 post-test (post-training). The PSS was administered following post-test completion in Session 3. All instruments were administered electronically via Google Forms distributed through the Zoom chat feature. Data collection was conducted during April 2026 in Lampung, Indonesia.

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics Version 26. Normality of knowledge score distributions was assessed using the Shapiro-Wilk test. Given the normal distribution of scores confirmed in all three sessions (Session 1: $W = 0.97$, $p = .32$; Session 2: $W = 0.98$, $p = .41$; Session 3: $W = 0.96$, $p = .28$), paired-samples t-tests were used to compare pre- and post-test knowledge scores within each session. Effect sizes were calculated using Cohen's d , with $d \geq 0.2$ classified as small, $d \geq 0.5$ as medium, and $d \geq 0.8$ as large (Cohen, 1988). Pre-post ST-SES total and subscale scores were compared using paired-samples t-tests. Statistical significance was set at $\alpha = .05$ (two-tailed). Qualitative data from open-ended PSS items were analyzed using inductive thematic analysis following the six-phase framework of Braun and Clarke (2006): familiarization, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Thematic analysis was conducted independently by two coders, with satisfactory interrater agreement established through consensus discussion following initial independent coding.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent before study commencement. Data were anonymized and stored securely. Ethical approval was obtained from the Ethics Committee of the Faculty of Psychology, Universitas 17 Agustus 1945 Surabaya (Reference No.: 157/KEP-PSI/UNTAG/XII/2025; Date: 12 December 2025). Participation was entirely voluntary, with no penalty for withdrawal.

RESULTS

Knowledge Acquisition: Session-by-Session Analysis

Paired-samples t-tests revealed statistically significant and practically meaningful improvements in knowledge scores from pre-test to post-test across all three training sessions. Table 3 presents descriptive statistics, inferential test results, and effect size estimates.

Table 3. Pre-test and Post-test Knowledge Scores by Session (N = 47)

Session	Pre-test (SD)	M	Post-test (SD)	M	Mean Gain	t (df = 46)	p	Cohen's d
Session 1 — NDD Foundations & DSM-5-TR Profiles	58.42 (9.12)		81.36 (7.45)		+22.94	14.87	< .001	2.17
Session 2 — SLD, Assessment & IEP/PDI	61.25 (8.75)		83.94 (6.88)		+22.69	15.62	< .001	2.28
Session 3 — ABA Techniques & Documentation	59.87 (9.03)		85.21 (6.12)		+25.34	16.45	< .001	2.40

Note. M = mean; SD = standard deviation. Effect size thresholds: $d \geq 0.2$ small, $d \geq 0.5$ medium, $d \geq 0.8$ large (Cohen, 1988). All effect sizes are classified as very large, indicating highly practically significant training effects.

Pre-test scores across all three sessions indicated moderate baseline knowledge (range: 58.42–61.25), consistent with participants' prior informal exposure to inclusive education practice in the absence of structured competency-based training. Post-test scores ranged from 81.36 to 85.21, representing performance well above the established competency threshold of 70 (14 of 20 items correct). Knowledge gains were consistent across sessions (mean gain range: +22.69 to +25.34 points), suggesting that the progressive instructional design maintained its effectiveness across all three content domains.

Effect sizes were very large across all three sessions ($d = 2.17, 2.28$, and 2.40 for Sessions 1, 2, and 3, respectively), substantially exceeding the large effect threshold ($d \geq 0.8$) and indicating highly practically significant training effects. The progressive increase in effect size from Session 1 to Session 3 suggests that participants benefited from the cumulative scaffolding of content, with foundational knowledge established in Session 1 supporting deeper integration of clinical assessment, IEP development, and behavioral intervention content in Sessions 2 and 3. These findings are consistent with cognitive load theory (Sweller et al., 2019) and the principle of distributed practice in professional development design.

Comparison with benchmarks from similar paraprofessional training studies further contextualizes these results. Brock et al. (2020) reported mean Cohen's $d = 1.12$ for a structured ST training program in the United States ($N = 38$), while Finke et al. (2021) reported $d = 1.45$ – 1.89 across sessions in a multi-component paraprofessional professional development intervention. The effect sizes observed in the present study ($d = 2.17$ – 2.40) exceed these benchmarks, potentially reflecting the high relevance of the culturally and professionally contextual training

content to Indonesian practitioners who had limited prior exposure to structured ABA and DSM-5-TR-based frameworks.

Shadow Teacher Self-Efficacy

Paired-samples t-tests revealed significant improvement in self-efficacy scores across all three ST-SES subscales and the total scale from pre-training to post-training. Results are presented in Table 4.

Table 4. Shadow Teacher Self-Efficacy Scale (ST-SES) Pre- and Post-Training Scores (N = 47)

ST-SES Subscale (max score per item = 5)	Pre M (SD)	Post M (SD)	t (df = 46)	p / d
1. Disability Identification & Understanding (max = 25)	3.08 (0.62)	4.31 (0.44)	11.47 (46)	< .001 / 1.67
2. IEP Implementation & Curriculum Adaptation (max = 25)	3.05 (0.58)	4.22 (0.49)	12.14 (46)	< .001 / 1.77
3. Behavioral Support & Communication (max = 25)	3.22 (0.49)	4.31 (0.46)	12.89 (46)	< .001 / 1.88
Total ST-SES (max = 75; item mean reported)	3.12 (0.54)	4.28 (0.47)	13.21 (46)	< .001 / 1.93

Note. M = item mean (1–5 scale); SD = standard deviation; d = Cohen's d effect size. All three subscales and the total scale demonstrated statistically significant large-to-very-large effects.

The total ST-SES score increased from a pre-training mean of 3.12 (SD = 0.54) to a post-training mean of 4.28 (SD = 0.47), representing a mean gain of 1.16 scale points (37.2% relative increase). The t-test yielded $t(46) = 13.21$, $p < .001$, with a very large effect size ($d = 1.93$), indicating substantial and practically significant enhancement of professional self-efficacy following program completion.

All three subscales demonstrated significant pre-post gains with large effect sizes: Disability Identification and Understanding ($d = 1.67$), IEP Implementation and Curriculum Adaptation ($d = 1.77$), and Behavioral Support and Communication ($d = 1.88$). The largest gain was observed in the Behavioral Support and Communication subscale, consistent with Session 3's intensive focus on ABA-based techniques (prompting hierarchies, reinforcement systems, echolalia and tantrum management) that directly address competencies practitioners identified as most challenging in pre-training reflections. The pre-training scores across subscales (range: 3.05–3.22) indicated moderate baseline self-efficacy, suggesting participants were aware of their competency boundaries prior to training — a finding that aligns with the Dunning-Kruger literature and supports the accuracy of self-efficacy as a construct in this population (Kruger & Dunning, 1999).

Program Satisfaction and Perceived Relevance

Program Satisfaction Survey (PSS) responses demonstrated high overall satisfaction and perceived practical relevance across all training dimensions. Participant feedback indicated:

- Highly relevant to daily practice: 89% endorsed 'agree' or 'strongly agree'
- Improved classroom confidence following training: 92% endorsed 'agree' or 'strongly agree'
- Direct applicability to inclusive classroom settings: 87% endorsed 'agree' or 'strongly agree'
- Trainer expertise and delivery quality rated 'excellent' or 'very good': 94%
- Would recommend this program to colleagues: 96%

Inductive thematic analysis of open-ended qualitative responses yielded three primary themes. Theme 1: Practical Grounding in Real Clinical Contexts. Participants from both institutions frequently highlighted the direct applicability of training content to the specific children they support. Participants from Yamet School Cendana specifically reported enhanced ability to manage behavioral challenges, construct simplified IEPs, and respond more confidently to tantrum and distraction episodes in inclusive classrooms. Theme 2: Bridging Clinical Knowledge and Classroom Practice. Several participants articulated the training's value in translating clinical frameworks (DSM-5-TR diagnostic criteria; ABA principles) into practical shadow teacher actions — a translation gap previously unaddressed by informal in-service support they had received. Theme 3: Regulatory Legitimation of Professional Identity. Participants noted that awareness of the SKKNI PAS competency framework and Kepdirjen regulatory basis provided a professional legitimacy to their role that enhanced motivation and practice commitment. Representative quotes are provided below:

"Sebelumnya saya hanya tahu istilah autisme secara umum. Setelah pelatihan, saya benar-benar paham apa yang perlu saya lakukan di kelas dan bagaimana menangani setiap situasi." [Before, I only knew autism in general terms. After the training, I truly understand what I need to do in the classroom and how to handle each situation.] — Participant 12, Yamet School Cendana

"Materi IEP sangat membantu. Dulu saya tidak tahu cara menyusun target yang terukur untuk anak saya. Sekarang saya bisa." [The IEP content was very helpful. Previously I didn't know how to develop measurable targets for my student. Now I can.] — Participant 28, TK Bumi Grande

DISCUSSION

Knowledge Gains: Magnitude, Pattern, and Theoretical Interpretation

The present study's primary finding — statistically significant and very large knowledge gains across all three training sessions ($d = 2.17$ – 2.40) — provides robust initial evidence for the effectiveness of the competency-based shadow teacher training program and supports H1. The magnitude of these effects substantially exceeds benchmarks reported in comparable paraprofessional professional development studies conducted in high-income country contexts (Brock et al., 2020: $d = 1.12$; Finke et al., 2021: $d = 1.45$ – 1.89). Several factors may account for this amplified effect.

First, Indonesian shadow teacher practitioners have historically received minimal structured, competency-based professional development (Giangreco et al., 2010), resulting in lower baseline knowledge scores that created a larger ceiling for measurable gain. The observed pre-test means (58.42–61.25) confirm moderate to below-moderate baseline knowledge, consistent with a workforce that has developed practice knowledge primarily through informal on-the-job learning rather than structured evidence-based training. This pattern of high pre-post gain from a low baseline is characteristic of foundational training interventions and may not generalize to populations with higher prior training exposure.

Second, the progressive increase in effect size from Session 1 ($d = 2.17$) to Session 3 ($d = 2.40$) suggests that the deliberate scaffolding of content — establishing diagnostic and conceptual foundations in Session 1 before introducing assessment, IEP, and behavioral intervention content in Sessions 2 and 3 — supported cumulative knowledge integration. This pattern is consistent with Cognitive Load Theory (Sweller et al., 2019), which predicts that well-sequenced instruction that manages intrinsic and extraneous load produces superior learning outcomes, particularly for novice learners encountering complex professional knowledge for the first time.

Third, the alignment of training content with the Indonesian SKKNI PAS regulatory framework may have enhanced motivation and engagement, consistent with Self-Determination Theory (Ryan & Deci, 2000), which identifies regulatory integration — the sense that professional development is aligned with valued professional identity and goals — as a critical driver of learning motivation. Participants' qualitative reports of professional legitimization through the SKKNI/Kepdirjen regulatory framework corroborate this interpretation.

Self-Efficacy Enhancement and Its Implications

The very large effect observed for ST-SES total scores ($d = 1.93$) supports H2 and extends the existing literature on self-efficacy enhancement through structured professional development in inclusive education contexts (Schwab et al., 2022; Sharma & Sokal, 2015). Consistent with Bandura's (1997) triarchic model of self-efficacy sources, the training program operationalized multiple efficacy-building mechanisms: mastery experience (successful knowledge acquisition confirmed by post-test performance), vicarious learning (clinical case illustrations and scenario-based discussion during synchronous sessions), and verbal persuasion (expert trainer modeling and affirming practitioner competence within a regulatory legitimacy framework).

The differential pattern of subscale gains — with the Behavioral Support and Communication subscale producing the largest effect ($d = 1.88$), followed by IEP Implementation ($d = 1.77$) and Disability Identification ($d = 1.67$) — provides theoretically meaningful information for future program design. The highest gain in behavioral support competencies may reflect the convergence of several factors: Session 3's intensive, practical focus on ABA techniques directly applicable to daily classroom challenges (tantrum management, echolalia, stimming); participants' previous identification of behavioral management as their greatest area of uncertainty; and the concrete, procedurally specific nature of ABA content, which may be particularly amenable to self-efficacy enhancement through structured training (Cooper et al., 2020).

Importantly, higher self-efficacy in inclusive education practitioners has been empirically linked to more positive student outcomes, greater persistence in implementing challenging interventions, and reduced burnout — a concern of particular salience in the Indonesian shadow teacher workforce, where high practitioner turnover has been identified as a systemic challenge (Brock & Carter, 2021). The present findings suggest that competency-based training programs aligned with the SKKNI PAS framework may offer a viable pathway toward improving practitioner retention and long-term quality of inclusive education in Indonesia.

Cultural Contextualization as a Distinctive Contribution

A key novelty of the present training program — and a defining feature of its theoretical contribution to the literature — is the deliberate integration of internationally validated evidence-based practice frameworks (ABA, UDL, PBIS, DSM-5-TR; CAST, 2018; Sugai & Horner, 2020) with the specific cultural, regulatory, and institutional contexts of Indonesian inclusive education. Prior research has consistently demonstrated that professional development programs that disregard local regulatory, cultural, and resource constraints achieve lower implementation fidelity and sustainability in practice (Sharma & Sokal, 2015; Finke et al., 2021). The present program's explicit grounding in Indonesian law (Permendiknas No. 70/2009; PP No. 57/2021; UU No. 8/2016), national competency standards (SKKNI PAS, Jenjang IV KKNI), and culturally familiar clinical case contexts derived from Yamet Child Development Center's 20+ years of practice in the Indonesian context represents a model of locally responsive global professional development.

The research settings — Yamet School Cendana Lampung and TK Bumi Grande Lampung — exemplify institutional models for inclusive education practice in a middle-income country context. Both institutions employ systematic multidisciplinary workflows (screening → assessment → IEP → implementation → evaluation) that

parallel internationally recommended inclusive education systems (Schwab et al., 2022), yet operate within Indonesian resource constraints and regulatory requirements that differ substantially from high-income country contexts. The present study's documentation of training effectiveness within these authentic institutional settings therefore contributes context-specific evidence to the global literature on inclusive education professional development, which has been dominated by studies from the United States, United Kingdom, and Australia (Brock et al., 2020; Giangreco et al., 2010).

Policy Implications

The findings of the present study have direct implications for inclusive education policy in Indonesia. First, the demonstrated effectiveness of a structured, 7.5-hour competency-based training program suggests that the SKKNI PAS Jenjang IV KKNi credentialing framework can be meaningfully operationalized through time-efficient, online professional development modalities accessible to practitioners across Indonesia's geographically dispersed inclusive education landscape. Second, the magnitude of knowledge and self-efficacy gains observed in the absence of prior structured training underscores the urgent need to integrate competency-based professional development as a mandatory component of shadow teacher certification pathways, rather than relying on informal on-the-job learning. Third, the program's successful implementation in a Lampung Province context — outside the traditional Jakarta-Surabaya axis that dominates Indonesian child development services — supports its potential for national scalability, particularly in outer island provinces where specialized inclusive education services remain scarce.

Limitations and Future Directions

Several limitations of the present study should be acknowledged. First, the quasi-experimental single-group design precludes causal attribution; the observed gains may be influenced by maturation effects, regression to the mean, or testing effects in the absence of a control comparison. Future studies should employ randomized waitlist control designs in which participants are randomly assigned to immediate or delayed training arms. Second, the study assessed proximal outcomes — knowledge and self-efficacy — without evaluating distal outcomes including changes in ST practice behavior and child outcomes. Implementation science frameworks (Fixsen et al., 2019) emphasize that changes in practitioner knowledge and self-efficacy are necessary but insufficient indicators of effective professional development; future research should incorporate behavioral observation of ST practice and child-level outcome data at follow-up intervals of three, six, and twelve months. Third, participant recruitment from two institutions affiliated with the lead author's professional network may introduce selection bias favoring practitioners already predisposed to evidence-based practice. Fourth, qualitative interrater reliability was not reported quantitatively in the present study; future iterations should report Cohen's kappa for thematic coding. Fifth, the 90-day sustainability of knowledge gains was not assessed; future research should examine knowledge retention and self-efficacy maintenance over time.

CONCLUSION

This study provides the first empirical evaluation of a structured, competency-based shadow teacher training program grounded in the Indonesian SKKNI PAS Jenjang IV KKNi regulatory framework and internationally validated evidence-based practice (DSM-5-TR diagnostic criteria; Applied Behavior Analysis; Universal Design for Learning; Positive Behavioral Interventions and Supports). The program produced statistically significant and very large gains in shadow teacher knowledge (Cohen's $d = 2.17\text{--}2.40$ across three sessions) and professional self-efficacy ($d = 1.93$ for total ST-SES), accompanied by high levels of participant satisfaction and perceived practical relevance.

These findings position the Yamet Child Development Center competency-based training model as a replicable, scalable approach to shadow teacher professional development in Indonesia. The program's effectiveness in a Lampung Province context — encompassing both primary and early childhood inclusive education settings with participant profiles representative of the national shadow teacher workforce — supports its generalizability beyond the Jakarta-centered clinical service axis and its potential for national implementation.

The study makes three distinct contributions to the existing literature. Theoretically, it extends Bandura's (1997) self-efficacy framework to the under-researched professional context of shadow teachers in Indonesian inclusive education. Methodologically, it introduces and validates the Shadow Teacher Self-Efficacy Scale (ST-SES), an adapted instrument aligned with SKKNI PAS competency domains. Practically, it demonstrates the viability of intensive, time-efficient, synchronous online professional development as a modality for reaching geographically dispersed Indonesian inclusive education practitioners.

Future research should address the limitations of the present study by employing randomized controlled designs, incorporating behavioral observation of ST practice as a distal outcome, and tracking the durability of training effects at three-, six-, and twelve-month follow-up intervals. Collaborative policy initiatives involving Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi; the Indonesian Psychological Association (HIMPPI); and clinical child development institutions should work to formalize competency-based training within the national shadow teacher certification pathway, ensuring that every child with a neurodevelopmental disorder in an Indonesian inclusive classroom is supported by a qualified, well-trained, and professionally confident shadow teacher.

DECLARATIONS

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interest

The lead author serves as Founder and Director of Yamet Child Development Center, the institution that developed and delivered the training program evaluated in this study. To minimize potential bias, several safeguards were implemented: (1) standardized instruments with established validity and reliability were used for all quantitative measurements; (2) data analysis was conducted using predefined statistical procedures; (3) all data were anonymized prior to analysis; and (4) interpretation of findings was strictly based on objective statistical results. No financial incentives were associated with participant outcomes.

Ethical Approval

Ethical approval for this study was obtained from the Ethics Committee of the Faculty of Psychology, Universitas 17 Agustus 1945 Surabaya (Reference No.: **157/KEP-PSI/UNTAG/XII/2025**; Date: **12 December 2025**). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent

Written informed consent was obtained from all participants prior to the commencement of the study. Participants were informed about the study objectives, procedures, confidentiality of data, and their right to withdraw at any time without any consequences.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. Data are not publicly available due to ethical restrictions related to participant confidentiality.

Author Contributions

T.G.: Conceptualization, methodology, program development, data collection, formal analysis, writing — original draft preparation.

B.S.W.: Statistical validation, data curation, writing, review and editing. (Basilia Subiyanti Wilujeng)

All authors have read and approved the final manuscript.

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