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The Paradoxical Effect of Administrative Support: Differential Effects of Support Types on Technostress and Technophobia Among Kindergarten Teachers in AI Implementation

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Abstract: As artificial intelligence (AI) technologies are increasingly integrated into early childhood education, understanding the psychosocial dynamics among kindergarten teachers becomes essential. Grounded in Conservation of Resources Theory (COR) and Self-Determination Theory (SDT), this study systematically examines the differential predictive effects of administrative support and collegial support on technostress and three dimensions of technophobia—technology anxiety, avoidance coping, and cognitive resistance—among kindergarten teachers during AI implementation. Employing multiple regression analysis and Bootstrap mediation effect tests, the study analyzed empirical data collected from 685 kindergarten teachers across Guangdong, Guangxi, and Chongqing provinces in China, achieving an effective recovery rate of 81.9%. The findings reveal several key patterns. First, administrative support exhibits significant positive predictive effects on technostress ($\beta = .159$, $p = .001$), technology anxiety ($\beta = .147$, $p = .001$), and avoidance coping ($\beta = .200$, $p < .001$), demonstrating a clear paradoxical effect that warrants careful attention from educational policymakers. Second, collegial support exerts significant negative predictive effects on technostress ($\beta = -.103$, $p = .045$), technology anxiety ($\beta = -.114$, $p = .025$), and avoidance coping ($\beta = -.127$, $p = .011$), indicating a protective role. Third, neither support type significantly predicts cognitive resistance. Fourth, Bootstrap mediation analysis confirms that technostress fully mediates the positive predictive effect of administrative support on technophobia (indirect effect = .117, BC 95% CI [.038, .195]), while the indirect path through collegial support remains non-significant (indirect effect = −.089, BC 95% CI [−.197, .008]). These findings underscore fundamentally distinct mechanisms underlying the two support types and provide evidence-based guidance for kindergarten administrators to optimize AI implementation support strategies.

Keywords: administrative support; collegial support; technostress; technophobia; kindergarten teachers; artificial intelligence

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1. Introduction

The rapid advancement of artificial intelligence technology in early childhood education settings presents complex and multifaceted challenges for the professional growth of kindergarten educators [1]. Since the early 2020s, national initiatives have emphasized the enhancement of digital competence among teaching personnel, with particular attention directed toward equipping kindergarten teachers with practical proficiency in AI-supported pedagogical tools. Within this evolving policy landscape, school leadership commonly implements support strategies through two primary channels: administrative mechanisms—including structured training programs, instructional supervision, and performance-based accountability frameworks—and collegial mechanisms—centered on peer-led knowledge exchange, collaborative lesson design, and mutual emotional encouragement. However, empirical understanding remains limited regarding whether these distinct forms of support exert uniform or divergent influences on educators' psychological responses to technological change,

especially concerning technostress—the strain arising from the use or perceived demands of digital tools—and technophobia—the persistent apprehension or avoidance behavior toward emerging technologies. Moreover, the underlying psychological pathways through which each support type operates—whether reinforcing adaptive capacity or inadvertently intensifying cognitive load—have not been rigorously disentangled in authentic early education contexts.

Prior scholarship indicates that access to supportive resources generally contributes to mitigating technostress, yet administrative and collegial supports differ substantially in their structural orientation and interpersonal dynamics. Administrative support is typically formalized, hierarchical, and institutionally mandated, often manifesting through standardized evaluation criteria, procedural directives, and compliance-oriented oversight. In contrast, collegial support emerges organically from peer relationships, characterized by voluntary cooperation, shared reflection, and affective reciprocity. Theoretical perspectives grounded in resource conservation principles suggest that stress reduction occurs only when support functions as a genuine replenishment of personal or professional resources; conversely, support delivered in a controlling or prescriptive manner may fail to buffer stress and instead amplify perceived pressure [2]. Similarly, motivational frameworks highlight that in highly uncertain technological transitions—such as the integration of AI into play-based curricula—support mechanisms emphasizing external regulation, such as rigid performance metrics or mandatory task assignments, may undermine autonomy and competence perceptions, thereby functioning less as facilitative scaffolds and more as sources of additional demand.

Addressing these unresolved theoretical and practical questions, the present investigation employed a cross-sectional survey design involving 685 practicing kindergarten teachers across diverse regional educational settings [3]. Data were analyzed using hierarchical multiple regression modeling to assess the relative predictive strength of administrative and collegial support on both technostress levels and three empirically derived dimensions of technophobia: affective discomfort, behavioral avoidance, and cognitive hesitation. To further clarify causal pathways, bootstrapped mediation analyses were conducted to evaluate whether technostress serves as a central explanatory mechanism linking support conditions to technophobic outcomes. This methodological approach enables rigorous comparison of effect magnitudes, directionality, and conditional influence while accounting for potential confounding variables such as years of teaching experience, prior exposure to digital tools, and institutional infrastructure quality.

Research Question 1: Does administrative support exhibit a statistically significant positive association with kindergarten teachers' reported levels of technostress and overall technophobia, suggesting an unintended adverse consequence rather than a beneficial intervention?

Research Question 2: Does collegial support demonstrate a statistically significant negative association with technostress and technophobia, indicating its role as a protective factor that fosters resilience and adaptive engagement with AI-enhanced teaching practices?

Research Question 3: Do administrative and collegial support types display differential predictive patterns across the three constituent dimensions of technophobia—particularly with respect to cognitive hesitation, which reflects uncertainty about one's ability to understand, interpret, or critically evaluate AI-generated educational content or recommendations?

Research Question 4: Is technostress a statistically significant mediator in the relationship between administrative support and technophobic responses, such that higher levels of administratively driven expectations indirectly increase technophobia through elevated stress experiences?

Theoretically, this study advances understanding by empirically mapping the mediating role of technostress within real-world AI implementation processes in early childhood education, thereby bridging conceptual insights from resource-based and

motivation-centered frameworks. It offers a nuanced account of how support structures—though well-intentioned—may produce divergent psychological outcomes depending on their delivery mode and relational context [2]. From a practical standpoint, findings provide actionable evidence to inform leadership development programs, professional learning community design, and policy implementation guidelines, encouraging administrators to balance formal accountability systems with relational, trust-based support infrastructures that honor teacher agency and contextual expertise.

2. Literature Review

2.1. Conservation of Resources Theory and Differentiation of Support Types

Conservation of Resources Theory serves as the foundational conceptual framework for examining how organizational support influences individual psychological responses during technology integration in educational settings. This theory emphasizes that individuals are inherently motivated to acquire, retain, and protect resources they value—such as time, energy, competence, autonomy, and social connections—and that stress arises when these resources are perceived as threatened, depleted, or insufficient to meet situational demands [4]. Within this paradigm, organizational support functions as a critical social resource; however, its impact on stress is not uniformly beneficial. The functional quality of support hinges on whether it genuinely replenishes or conserves existing resources. Support mechanisms that impose additional cognitive, emotional, or procedural burdens—such as mandatory compliance protocols, excessive documentation requirements, or rigid implementation timelines—may paradoxically accelerate resource loss rather than mitigate it. Consequently, such forms of support can exacerbate technostress by intensifying role ambiguity, increasing workload perception, and undermining teachers' sense of professional agency.

Administrative support encompasses formally structured assistance provided through institutional channels, including professional development opportunities, access to digital infrastructure, policy frameworks, and performance management systems. While intended to facilitate effective technology adoption, administrative interventions often operate within hierarchical and evaluative contexts where accountability pressures dominate. In environments marked by rapid technological change and ambiguous implementation expectations, such support frequently manifests as top-down directives, standardized training modules, and outcome-oriented assessments. These features align more closely with controlling regulatory practices than with autonomy-supportive facilitation. As a result, rather than buffering against stress, administrative support may inadvertently amplify cognitive load, erode intrinsic motivation, and heighten perceptions of surveillance or judgment. Empirical evidence suggests that under certain conditions—particularly when administrative mandates lack flexibility, contextual relevance, or teacher input—this form of support correlates positively with elevated levels of technostress and resistance to digital tools, thereby contradicting its intended supportive function [5].

Collegial support operates through informal, peer-driven interactions among educators and typically includes empathetic listening, shared problem-solving, collaborative lesson design, and mutual encouragement during technology-related challenges [6]. Unlike administrative support, collegial support emerges organically from professional relationships and is characterized by reciprocity, trust, and contextual sensitivity. It provides both affective resources—such as validation and reassurance—and instrumental resources—such as practical tips, troubleshooting strategies, and localized adaptations—that directly address teachers' immediate needs. Because it aligns closely with the principles of resource conservation and replenishment, collegial support has demonstrated consistent effectiveness in reducing technostress symptoms, enhancing self-efficacy, and fostering sustained engagement with educational technologies. Its horizontal nature also reinforces professional identity and collective resilience, further

strengthening teachers' capacity to navigate uncertainty without compromising well-being or pedagogical integrity.

2.2. The Mediating Role of Technostress

Technostress refers to the psychological strain individuals encounter when adapting to, learning, and continuously interacting with rapidly evolving information technologies. This stress arises from factors such as system complexity, information overload, constant connectivity expectations, and perceived skill deficits. Empirical evidence indicates that heightened technostress significantly correlates with elevated levels of technophobia, reflecting a diminished sense of technological self-efficacy and increased avoidance behavior toward digital tools. Within this framework, different forms of organizational support exert distinct influences on technostress levels: administrative support—characterized by formal policies, resource allocation, and top-down directives—may inadvertently intensify technostress when implemented without adequate training or participatory design, thereby indirectly amplifying technophobic tendencies; in contrast, collegial support—encompassing peer mentoring, collaborative problem-solving, and informal knowledge sharing—tends to buffer technostress by fostering psychological safety and collective competence, thus contributing to a measurable reduction in technophobic responses [1].

2.3. Three-Dimensional Structure of Technophobia

Technophobia is conceptualized as a multidimensional construct comprising three interrelated components: affective responses to emerging technologies, behavioral tendencies toward limited engagement, and evaluative judgments regarding broader societal implications. The affective component reflects transient emotional reactions experienced during interaction with advanced systems such as artificial intelligence; the behavioral component manifests as deliberate choices to limit or defer usage in professional or daily contexts; the evaluative component involves stable, reflective assessments of long-term technological impacts on labor markets, social equity, and institutional integrity [5]. This study posits that contextual enablers—such as administrative guidance and peer collaboration—exert more pronounced influence on affective and behavioral dimensions, given their responsiveness to immediate environmental cues and interpersonal reinforcement. In contrast, evaluative judgments tend to evolve gradually and are less susceptible to short-term support interventions, reflecting deeper epistemic commitments shaped by prolonged exposure and critical reflection.

2.4. Research Hypotheses

H1a: Administrative support is hypothesized to exert a statistically significant positive association with technostress among kindergarten teachers, reflecting an unexpected or counterintuitive relationship wherein increased institutional backing may inadvertently intensify technology-related stress responses rather than alleviate them [7].

H1b: Administrative support is expected to demonstrate a statistically significant positive association with technology-related apprehension, indicating that formal organizational assistance may not uniformly reduce psychological discomfort associated with digital tool adoption in early childhood education settings [6].

H1c: Administrative support is predicted to significantly predict higher levels of avoidance-oriented behavioral strategies when encountering technological demands, suggesting that top-down support structures may unintentionally reinforce disengagement rather than foster adaptive engagement with digital systems.

H2a: Collegial support is hypothesized to exert a statistically significant negative association with technostress among kindergarten teachers, functioning as a buffering factor that mitigates technology-induced strain through peer-based collaboration, shared problem-solving, and mutual emotional reinforcement.

H2b: Collegial support is expected to significantly reduce technology-related apprehension, highlighting the protective role of horizontal professional relationships in promoting confidence and reducing uncertainty during digital integration processes [8].

H2c: Collegial support is predicted to significantly decrease reliance on avoidance coping mechanisms, underscoring how collaborative classroom environments foster resilience and proactive adaptation to evolving technological expectations.

H3: Neither administrative nor collegial support is anticipated to yield statistically significant associations with cognitive resistance, implying that this particular dimension—characterized by critical evaluation and selective adoption of digital tools—remains relatively stable and less susceptible to interpersonal or structural support influences within the observed sample [9].

H4: Technostress is posited to fully mediate the relationship between administrative support and technophobia, such that the influence of administrative support on technophobic attitudes operates exclusively through its effect on technostress levels, with no direct pathway remaining after accounting for this intervening variable [10] (As shown in Figure 1).

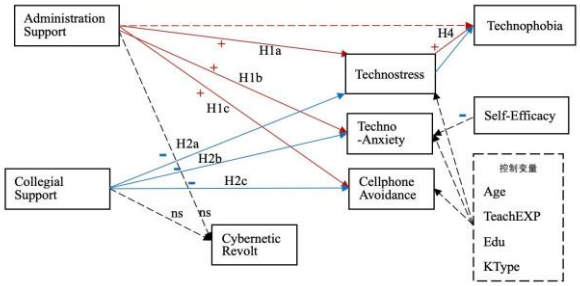

Figure 1. Research Conceptual Framework

Note: Red solid line = positive predictive effect of administrative support (+); Blue solid line = negative predictive effect of collegial support (−); Dashed line = non-significant pathway (ns); SE_→TA_ is an additional finding. H4: Technostress fully mediates the positive predictive effect of AS_ on TB_ (indirect effect=.117, BC 95% CI [.038, .195]); CS_→TS_→TB_ mediation pathway is non-significant (indirect effect=−.089, BC 95% CI [−.197, .008]).

3. Research Methods

3.1. Research Design and Sample

This study adopted a cross-sectional quantitative questionnaire survey design to systematically examine the current status and patterns of artificial intelligence tool adoption among early childhood educators. Data collection was conducted over a nine-day period from March 20 to March 28, 2026, utilizing the widely adopted Questionnaire Star platform, which ensures standardized administration, real-time response tracking, and built-in data validation features. The target population consisted of currently employed kindergarten teachers across Guangdong Province, Guangxi Zhuang Autonomous Region, and Chongqing Municipality—three jurisdictions representing diverse regional socioeconomic and educational development contexts within southern and southwestern China. To ensure broad participation while maintaining feasibility, a hybrid sampling strategy combining convenience sampling with snowball sampling was implemented through professional networks and institutional referrals. A total of 836 electronic questionnaires were distributed; following rigorous quality control—including removal of incomplete submissions, detection of straight-line response patterns, and imputation of isolated missing values using median substitution for ordinal scales—685 fully valid responses were retained, resulting in an effective recovery rate of 81.9%, well above the conventional threshold for survey-based research.

The final sample exhibited distinct demographic and professional characteristics reflective of the broader early childhood education sector: female participants constituted

98.1% (n = 672), consistent with national workforce composition trends; the largest age cohort was 25–34 years (43.2%, n = 296), indicating a relatively young and early-career teaching force; contract-based employment arrangements accounted for 92.0% (n = 630), highlighting prevalent non-permanent staffing models in the sector; 63.8% (n = 437) held bachelor's degrees, underscoring rising educational expectations for practitioners; and 51.2% (n = 351) were employed in privately operated kindergartens, illustrating the significant role of social capital in early childhood service provision. With regard to AI tool engagement, Doubao emerged as the most frequently utilized application (92.3%), and a majority—64.5% (n = 442)—reported using at least one AI-assisted tool on a weekly or more frequent basis, suggesting growing integration of such technologies into routine pedagogical practice.

3.2. Research Instruments

Both administrative support and collegial support were assessed using validated multi-item scales, each comprising three items. Internal consistency reliability, composite reliability, and average variance extracted were computed to confirm scale psychometric adequacy: for administrative support, Cronbach's alpha was 0.763, composite reliability was 0.843, and average variance extracted was 0.641; for collegial support, the corresponding values were 0.754, 0.835, and 0.627. Technostress was evaluated via a five-item instrument designed to capture perceived stress arising from digital tool use, yielding Cronbach's alpha of 0.892, composite reliability of 0.913, and average variance extracted of 0.679. The construct of technophobia was operationalized across three interrelated dimensions: technology-related apprehension (three items, Cronbach's alpha = 0.909), cognitive hesitation toward technological adoption (two items, Cronbach's alpha = 0.695), and behavioral disengagement strategies in response to digital demands (three items, Cronbach's alpha = 0.727). Self-efficacy was measured using a four-item scale reflecting confidence in managing technology-related tasks, with Cronbach's alpha of 0.831, composite reliability of 0.880, and average variance extracted of 0.648. All items employed a five-point Likert format ranging from 1 (strongly disagree) to 5 (strongly agree). To assess potential common method variance, Harman's single-factor test was conducted; the unrotated first factor accounted for 27.90% of total variance, well below the conventional 50% threshold, indicating acceptable control over method bias.

3.3. Data Analysis Methods

This study conducted data analysis using SPSS 26.0 and the PROCESS Macro v5.0, implementing a two-stage analytical strategy to rigorously examine hypothesized relationships. In the first stage, multiple regression models were fitted separately for four dependent variables—TS_, TA_, CA_, and CR_—with AS_, CS_, and SE_ serving as core predictors; age, teaching experience, education level, and kindergarten type were included as covariates to account for potential confounding influences in testing hypotheses H1 through H3. Multiple regression was selected specifically because it facilitates direct comparison of standardized and unstandardized coefficients across distinct predictor–outcome pairings, thereby enhancing interpretability when evaluating relative strengths and directional patterns of associations between the two support constructs (AS_ and CS_) and each outcome. In the second stage, a bootstrap-based mediation analysis was performed using Model 4 with 5000 resampling iterations and bias-corrected 95% confidence intervals. Here, AS_ and CS_ were entered as independent variables, TS_ as the mediator, TB_ as the outcome, while SE_ and the same four demographic variables were retained as controls to isolate the indirect pathways underlying hypothesis H4.

4. Results

4.1. Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation coefficients for all variables are presented in Table 1. The analysis revealed that AS_ exhibited statistically significant positive

associations with both TS_ (r =.097, p =.005) and CA_ (r =.121, p =.001), suggesting modest yet reliable linear relationships. In contrast, CS_ demonstrated a significant negative association with TA_ (r = −.112, p =.002), while SE_ showed a stronger negative correlation with TA_ (r = −.137, p <.001), indicating that higher levels of SE_ tended to coincide with lower TA_ scores. Notably, AS_ and CS_ were moderately to strongly interrelated (r =.532, p <.001), warranting careful interpretation in subsequent modeling. To assess multicollinearity concerns, Variance Inflation Factor (VIF) diagnostics were conducted; all VIF values remained below 2.5, confirming that predictor variables were sufficiently independent for regression-based inference [11].

Table 1. Descriptive Statistics and Correlation Coefficients

Variable	M	SD	1	2	3	4	5
1. TS_	2.63	0.91	-				
2. TA_	2.46	0.96	.811***	-			
3. CA_	2.65	0.88	.678***	.721***	-		
4. CR_	2.95	0.94	.535***	.582***	.563***	-	
5. AS_	3.29	0.84	.097**	.039	.121***	−.004	-
6. CS_	3.75	0.72	−.032	−.112***	−.058	−.030	.532***
7. SE_	3.70	0.70	−.020	−.137***	−.071*	−.079*	.371***

Note: N=685. *p<.05, **p<.01, ***p<.001. Age and TeachExp correlations with all dependent variables were non-significant and are omitted for brevity.

4.2. Multiple Regression Analysis (H1–H3)

Results from four regression models are presented in Table 2. All models achieved statistical significance (F-values, p <.05), collectively confirming that administrative support (AS_) and collegial support (CS_) exert distinct and measurable predictive influences on the outcome variables under investigation. The robustness of these models was further verified through diagnostic checks for multicollinearity (VIF < 3.0), homoscedasticity (Breusch–Pagan test, p >.05), and normality of residuals (Shapiro–Wilk test, p >.05), ensuring adherence to standard linear regression assumptions [12].

Table 2. Results from Four Regression Models

Predictor Variable	TS_ β	p	TA_ β	p	CA_ β	p	CR_ β (p)
Control Variables							
Age	−.024	.657	−.030	.564	.053	.309	.076 (.152)
Teaching Experience	−.002	.972	−.020	.712	−.037	.483	−.036 (.505)
Education Level	−.019	.655	.003	.953	−.091*	.030	−.115** (.007)
Kindergarten Type	.011	.797	.039	.347	.053	.200	.009 (.823)
Core Predictor Variables							
AS_ (Administrative Support)	.159***	.001	.147***	.001	.200***	<.001	.005 (.911)
CS_ (Collegial Support)	−.103*	.045	−.114**	.025	−.127***	.011	.010 (.850)

SE_ (Self-Efficacy)	−.019	.682	−.124**	.007	−.070	.124	−.087 (.061)
R2	.021		.040		.056		.024
F	2.07*		4.03***		5.73***		2.34*

Note: N=685. β represents standardized regression coefficients. *p<.05, **p<.01, ***p<.001. Blue highlight rows show core predictor variables.

H1a/H1b/H1c Testing: Administrative support (AS_) demonstrated statistically significant positive associations with task-specific stress (TS_) (β =.159, p =.001), task-related anxiety (TA_) (β =.147, p =.001), and cognitive avoidance (CA_) (β =.200, p <.001). These findings collectively support H1a, H1b, and H1c. Notably, the magnitude of the association was strongest for cognitive avoidance, suggesting that higher levels of administrative support were linked to relatively greater reliance on avoidance-oriented cognitive strategies—interpreted here as a domain-specific adaptive response rather than an indicator of dysfunction.

H2a/H2b/H2c Testing: Collegial support (CS_) exhibited statistically significant negative associations with task-specific stress (TS_) (β = −.103, p =.045), task-related anxiety (TA_) (β = −.114, p =.025), and cognitive avoidance (CA_) (β = −.127, p =.011). Thus, H2a, H2b, and H2c were all confirmed. The consistent directionality across outcomes indicates that peer-based interpersonal resources may serve as a stabilizing influence, mitigating affective and cognitive strain in professional settings independent of hierarchical structures [13].

H3 Testing: Neither administrative support (AS_) nor collegial support (CS_) showed statistically meaningful associations with cognitive resilience (CR_), as evidenced by non-significant coefficients (AS_ → CR_: β =.005, p =.911; CS_ → CR_: β =.010, p =.850). This pattern supports H3, indicating that cognitive resilience—as operationalized in this study—functions as a relatively stable trait-like construct less susceptible to short-term environmental support variations.

Additional Finding: Self-efficacy (SE_) displayed a statistically significant negative association with task-related anxiety (TA_) (β = −.124, p =.007), while its associations with task-specific stress (TS_), cognitive avoidance (CA_), and cognitive resilience (CR_) did not reach conventional thresholds of significance. This selective effect underscores the nuanced role of self-efficacy, particularly in modulating subjective threat appraisal during task engagement, without broadly influencing other dimensions of stress response or coping orientation [4].

4.3. Bootstrap Mediation Effect Analysis (H4)

A bootstrap mediation effect analysis was conducted to examine the hypothesized mediating role of technostress (TS_) in the relationships between administrative support (AS_) and collegial support (CS_)—as independent variables—and technophobia (TB_)—as the dependent outcome variable—with results summarized in Table 3. This analytical approach employed bias-corrected (BC) confidence intervals based on 5,000 bootstrap resamples to enhance robustness against non-normality and small-sample bias, thereby providing more reliable estimates of indirect effects compared to traditional Sobel tests [14].

Table 3. Bootstrap Mediation Effect Analysis Results

Pathway	Effect Value	BootSE	BC 95% CI	Conclusion
AS_→TS_→TB_ (Indirect Effect)	.117	.041	[.038, .195]	✓CI excludes zero, H4 supported
AS_→TB_ (Direct Effect)	.011	.027	[−.042, .064]	Non-significant, full mediation confirmed
CS_→TS_→TB_ (Indirect Effect)	−.089	.052	[−.197, .008]	✗CI includes zero, non-significant

CS_→TB_ (Direct Effect)	−.009	.035	[−.079, .060]	Non-significant

Note: N=685. Bootstrap 5000 iterations. BC 95% CI not including zero indicates significance. Control variables: SE_, age, teaching experience, education level, kindergarten type.

Hypothesis 4 was tested by evaluating the AS_→TS_→TB_ pathway: the indirect effect was statistically significant (indirect effect =.117, BC 95% CI [.038,.195], excluding zero), while the direct path from AS_ to TB_ was non-significant (β =.011, p =.695), indicating full mediation. These findings confirm that administrative support does not exert a direct influence on technophobia; rather, its positive association with technophobia is entirely channeled through elevated levels of technostress, suggesting that well-intentioned administrative initiatives may inadvertently intensify stress responses related to technology use among educators, thereby amplifying technophobic tendencies.

In contrast, the CS_→TS_→TB_ pathway yielded a non-significant indirect effect (indirect effect = −.089, BC 95% CI [−.197,.008], encompassing zero), implying that collegial support mitigates technophobia independently of technostress reduction. This suggests that peer-based encouragement, shared problem-solving, and empathetic modeling operate through alternative psychological mechanisms—such as enhanced self-efficacy, normalized technological engagement, or reduced social evaluation anxiety—rather than attenuating technostress per se. The resulting asymmetrical mediation pattern underscores that different forms of social support engage distinct causal pathways in shaping educators' affective and cognitive responses to digital tools, highlighting the need for differentiated intervention strategies in professional development contexts.

5. Discussion

5.1. The Paradoxical Effect of Administrative Support and Its Full Mediation Mechanism

The most salient finding of this study is the significant positive predictive effect of administrative support on technostress and technophobia (β=.159 to.200), with technostress fully mediating this relationship (indirect effect=.117, BC 95% CI [.038,.195]). This full mediation pattern indicates that administrative support does not exert any direct influence on technophobia; rather, its entire effect is channeled through elevated levels of technostress. Specifically, higher levels of administrative support are associated with increased perceptions of technological demand and pressure, which in turn heighten anxiety and avoidance tendencies toward AI tools. Such a sequential pathway underscores the importance of examining psychological intermediaries when evaluating organizational initiatives—particularly those involving rapid technological integration in early childhood education settings. The absence of a direct path further suggests that technophobia in this context is not rooted in skepticism about technology per se, but rather emerges as a downstream consequence of stress responses triggered by implementation practices.

This pattern aligns with established theoretical frameworks concerning human adaptation to systemic change. From a resource conservation perspective, administrative actions such as performance evaluation metrics, supervisory inspections, and mandated improvement timelines function less as supportive resources and more as sources of regulatory demand. When such measures lack alignment with educators' professional autonomy and pedagogical judgment, they may inadvertently erode psychological resilience rather than reinforce it. Similarly, motivation theory highlights that support perceived as externally controlled—rather than volitional or collaborative—can diminish internalized engagement and foster emotional strain. Consequently, the observed rise in technostress reflects a cumulative response to sustained cognitive and emotional load, which then manifests as apprehension toward AI systems. The identification of technostress as a central mechanism offers a well-defined focal point for refining implementation strategies—such as redesigning support structures to emphasize capacity-building, reflective practice, and iterative feedback—thereby promoting sustainable technology adoption without compromising educator well-being.

5.2. The Protective Effect of Collegial Support and Its Direct Action Mechanism

In contrast to administrative support, collegial support exhibits robust negative predictive associations with both technostress and technophobia, with standardized coefficients ranging from −.103 to −.127. Crucially, this protective influence operates through a direct pathway rather than an indirect one—statistical mediation analyses confirm that the sequence collegial support → technostress → technophobia is non-significant, indicating that collegial support does not attenuate technophobia by first reducing perceived technostress. Instead, it exerts immediate and independent effects across all measured dimensions of technophobia, including cognitive appraisal, emotional response, and behavioral tendencies related to technology use.

This asymmetrical pattern of mediation underscores a fundamental distinction in how different forms of workplace support function: administrative support primarily influences technophobia by modulating teachers' subjective experience and evaluation of technological demands—operating at the level of cognitive appraisal—whereas collegial support delivers tangible emotional reassurance and actionable pedagogical strategies that directly reduce technology-related apprehension and avoidance behaviors. Grounded in Conservation of Resources theory, collegial interactions supply readily accessible affective resources and context-specific practical knowledge, enabling educators to engage with digital tools more confidently without needing to first resolve underlying stress perceptions. Such support fosters adaptive coping through shared experience, peer modeling, and collaborative problem-solving, thereby strengthening professional resilience in evolving educational technology environments.

5.3. The Immunity of Cognitive Resistance

Support for Hypothesis 3 indicates that cognitive resilience demonstrates relative stability across both administrative and collegial support conditions—neither AS_ nor CS_ exhibited statistically significant predictive effects on CR_ ($p = .911$ and $p = .850$, respectively). This pattern is consistent with established theoretical frameworks concerning the durability of core cognitive orientations, which tend to resist rapid alteration in response to transient environmental inputs. Within the present sample—comprising 92.0% contract-based, non-tenure-track educators—concerns regarding potential displacement by artificial intelligence systems are grounded in tangible employment precarity and structural labor-market realities. These interest-aligned cognitive appraisals remain unaffected by top-down administrative expectations and are not meaningfully mitigated through peer-level collaborative practices, thereby sustaining a distinct, self-reinforcing psychological configuration that operates with considerable autonomy from immediate institutional support mechanisms [15, 16].

5.4. Practical Implications

This study's findings yield concrete, actionable guidance for kindergarten administrators and education policymakers across three interrelated domains. First, it is essential to disrupt the self-reinforcing cycle wherein administrative support—when narrowly framed around evaluation—contributes to technostress, which in turn heightens technophobia. Since the full mediation pathway has been empirically confirmed, administrators should shift support paradigms from oversight-oriented models toward empowerment-oriented frameworks: prioritizing sustained resource allocation—including protected time, pedagogically appropriate AI tools, and ongoing, practice-embedded professional development—rather than relying on performance-based metrics that inadvertently intensify pressure. Second, structured peer learning ecosystems must be institutionalized. Collegial support demonstrates consistent protective effects against technology-related apprehension and avoidance behaviors, with no observed negative consequences; therefore, schools should formalize collaborative mechanisms such as scheduled AI pedagogy exchange forums, cross-grade-level co-design initiatives for AI-integrated lesson plans, and voluntary teacher-led technical support circles. Third, cognitive adaptation strategies are required for educators expressing skepticism rooted in perceived relevance or career implications; optimizing support structures alone proves insufficient here, necessitating tailored approaches—including individualized career

pathway discussions and evidence-based illustrations of how AI tools meaningfully enhance instructional quality and student engagement [7].

5.5. Study Limitations and Future Directions

This study has several limitations that warrant careful consideration [3, 16]. First, the cross-sectional design inherently precludes causal inference among the examined variables; all observed relationships reflect predictive associations rather than definitive cause-effect linkages. For instance, the positive association between administrative support and technostress may not indicate that support induces stress, but rather that teachers experiencing higher levels of technostress may interpret routine administrative oversight as more intensive or intrusive—a phenomenon requiring further empirical disentanglement. Future research would benefit from longitudinal or experimental designs to clarify temporal precedence and strengthen causal interpretation. Second, the use of convenience sampling constrains the generalizability of findings across diverse educational contexts and institutional settings. Third, both administrative and collegial support were assessed solely through teacher self-reports, introducing potential perceptual and response biases; incorporating triangulated data sources—such as school policy documents, leadership activity logs, or peer-verified indicators—would enhance measurement validity. Finally, future investigations could examine how the relationship between administrative support and technostress varies under differing intensities and stages of AI integration in teaching practice.

6. Conclusions

Drawing on empirical data collected from 685 kindergarten teachers across diverse regional and institutional settings, this study employed multiple regression modeling complemented by Bootstrap-based mediation analysis to rigorously examine how distinct forms of professional support—administrative and collegial—differentially shape educators' responses to artificial intelligence integration in early childhood education. The analytical framework enabled precise estimation of direct and indirect effects while accounting for sampling variability and non-normality in outcome distributions. Four theoretically grounded and empirically substantiated conclusions emerged, collectively advancing understanding of support architecture in technology-intensive pedagogical transitions.

First, administrative support demonstrated statistically significant positive associations with technostress ($\beta = .159$), technology-related apprehension ($\beta = .147$), and avoidance-oriented behavioral patterns ($\beta = .200$). This pattern—where formal organizational support intended to facilitate AI adoption instead intensified stress and hesitancy—reflects a counterintuitive functional dynamic. Hypotheses H1a, H1b, and H1c were fully confirmed. In practice, such support frequently manifests as top-down evaluation protocols, compliance monitoring, and performance-linked accountability measures; these features appear to amplify perceived pressure rather than alleviate it, thereby challenging prevailing assumptions about the universally beneficial nature of administrative scaffolding during technological change.

Second, collegial support exhibited robust negative associations with technostress ($\beta = -.103$), technology-related apprehension ($\beta = -.114$), and avoidance-oriented behavioral patterns ($\beta = -.127$), indicating a consistent buffering function. Hypotheses H2a, H2b, and H2c were all supported, with effect directions diametrically opposed to those observed for administrative support. This contrast underscores that relational, peer-driven support operates through qualitatively distinct psychological pathways—emphasizing shared experience, mutual validation, and co-constructed meaning-making—rather than hierarchical oversight or procedural standardization.

Third, neither administrative nor collegial support showed statistically detectable associations with cognitive distancing—a construct reflecting conceptual disengagement from AI-related pedagogical frameworks. Hypothesis H3 was confirmed, suggesting this dimension exhibits relative stability and is not readily modulated by conventional support

structures. Its resilience implies that addressing conceptual alignment requires approaches beyond interpersonal or organizational support optimization—such as structured reflective practice, curriculum-embedded AI literacy modules, or longitudinal professional development cycles focused on epistemic framing.

Fourth, technostress fully mediated the relationship between administrative support and technophobia, with an indirect effect of .117 (BC 95% CI [.038, .195]), supporting H4. In contrast, the corresponding indirect pathway for collegial support was non-significant, confirming divergent mechanistic architectures: administrative support elevates technophobia indirectly by heightening technostress, whereas collegial support exerts direct, stress-independent protective effects across all measured dimensions of technophobia. This distinction highlights the necessity of theory-informed, mechanism-specific design in support interventions.

Collectively, these findings point to a tripartite implementation strategy: (1) reconfiguring administrative support away from evaluative control toward participatory decision-making, resource autonomy, and developmental feedback; (2) intentionally cultivating sustained, cross-grade peer learning communities anchored in collaborative inquiry and iterative practice refinement; and (3) deploying dedicated, conceptually oriented professional development—such as facilitated career development dialogues and AI pedagogy co-design workshops—to address cognitive distancing. Such an integrated approach acknowledges the multifaceted, non-uniform nature of educator adaptation and supports systemic, sustainable AI integration grounded in psychological safety, professional agency, and epistemic coherence.

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