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Exploring doctoral students' perceptions of supervisory attributes shaping their intellectual growth, motivation, and scholarly development

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***Abstract*—**The attributes of supervisors within educational contexts play a critical role in shaping students' cognitive development towards lifelong learning. Thus, the specific supervisory attributes that enable this process to remain under-explored. This study examines how postgraduate students perceive that their supervisors' attributes influence their intellectual growth, motivation, and scholarly development. It employs a qualitative approach, utilising a thematic research design. Nine Ghanaian doctoral students were selected from a public University in Ghana. It used semi-structured interviews to collect data. They were analysed through thematic analysis. This study revealed various supervisory attributes, including intellectual stimulation, emotional/motivational support, autonomy versus directive supervision, availability/responsiveness, modelling scholarly rigour, feedback quality, and interpersonal dynamics. The findings revealed that supervisory attributes form an invisible scaffold that critically shapes cognitive engagement and intellectual growth. The key catalysts include intellectual stimulation, emotional support, and a balance between autonomy and guidance. Overall, prescriptive supervision stifles students' curiosity. These novel findings underscore the importance of intellectual humility and collaborative, dynamic supervision in fostering deep engagement. This study offers actionable insights for developing adaptive mentoring practices that align with students' evolving needs, thereby contributing to effective supervisory training within global higher education.

Keywords: Cognitive apprenticeship, Cognitive engagement, Doctoral students, Supervisory attributes

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I. INTRODUCTION

THE pursuit advanced knowledge through postgraduate education is a vital investment for individuals and societies alike, forming the foundation of innovation and helping to address complex global challenges. For nations such as Ghana, which have rapidly expanded higher education systems, cultivating a robust cohort of doctoral graduates is not just an academic concern, but an essential developmental imperative for driving national progress and competitiveness. However, the success of this endeavour hinges not only on institutional resources or curricular design, but also on the profound intellectual and psychological transformation of the doctoral candidate. This transformation is driven by cognitive engagement: the deliberate, strategic, and sustained mental investment that a student makes in mastering obscure skills, in-depth knowledge, and identity of a scholarly discipline (Mahmoudi-Dehaki & Nasr-Esfahani, 2025). This deep-seated intellectual commitment distinguishes ritualistic compliance from genuine scholarly development, ultimately determining the quality and timely completion of thesis, as well as the capacity for lifelong knowledge production (Le et al., 2021; Ore, 2021).

Fostering such profound engagement remains a significant global pedagogical challenge, particularly amid the unique pressures faced by developing higher education landscapes (Chugh et al., 2022). While multiple factors are at play, the relationship between supervisors and students is increasingly recognised as the catalytic core of doctoral education: a relational pedagogy in which intellectual guidance, psychological support, and professional socialisation converge powerfully (Adedokun & Oyetunde-Joshua, 2024; Han & Jin, 2025). Within this framework, effective supervision acts as an 'invisible scaffold', a concept deeply rooted in Lev Vygotsky's sociocultural theory. According to Vygotsky, learning and cognitive development occur through social interaction, whereby a more knowledgeable individual provides tailored support and scaffolding within the learner's Zone of Proximal Development. This enables the learner to accomplish tasks that would otherwise be beyond their independent capacity. In doctoral supervision, this translates into supervisor attributes such as providing intellectual stimulation, granting autonomy, offering motivational support, and modelling scholarly practice, thereby systematically building the student's independent research capability (Calor et al., 2022; Faber et al., 2024). This scaffolding reduces extraneous cognitive load, nurtures metacognitive skills, and strengthens the intellectual confidence necessary for deep engagement.

Despite their theoretical importance, the precise mechanisms through which these scaffolds influence cognitive engagement remain under-explored in specific socio-cultural contexts, such as Ghana. The Ghanaian academic environment is characterised by resource constraints, significant staff-to-student ratios, and cultural norms that emphasise power distance. These factors can inadvertently lead to supervisory approaches that are perceived as either overly directive or disengaged (Torgbe, 2025). Such conditions risk stifling the intellectual agency and motivation required for high-level research. Consequently, there is a critical lack of understanding of how doctoral students in this setting perceive and interpret their supervisors' attributes, and how these perceptions directly impact their intellectual growth, intrinsic

motivation, and overall scholarly development. It is urgent to address this gap, as these perceptions constitute the psychological reality through which the presence or absence of supervisory support is filtered, thereby directly fuelling or inhibiting cognitive investment (Acosta-Gonzaga & Ramírez-Arellano, 2022; Wang & Wang, 2024).

To investigate this complex dynamic, the present study adopts a tripartite theoretical synthesis that progresses from motivational foundations to pedagogical execution. At the macro level, Self-Determination Theory (SDT) provides a motivational framework, proposing that cognitive engagement flourishes in environments that fulfil innate psychological needs for autonomy, competence, and relatedness (Kumar & Kaur, 2019; Tafvelin & Stenling, 2021). Attributes of supervisors that foster volitional ownership, build efficacy, and establish trusting connections are thus vital catalysts for sustained scholarly drive (Dehkordi et al., 2025). While SDT explains why students engage, the Cognitive Apprenticeship model operationalises how this engagement is pedagogically scaffolded. This meso-level theory clarifies the methods of modelling, coaching, scaffolding, and fading through which the tacit cognitive processes of expert research can be made visible and gradually transferred to apprentice scholars (Dennen, 2013; Feinstein, 2021). Complementing this, Transformational Leadership Theory adds a crucial behavioural dimension at the micro level. It explains how supervisory behaviours characterised by inspirational motivation, intellectual stimulation, and individualised consideration can enhance student performance and foster a greater sense of scholarly ownership (Kim et al., 2023; Sheehan et al., 2020). In summary, this integrated framework posits that transformational leadership behaviours deliver the apprenticeship pedagogy in a supportive manner, thereby creating a powerful, multi-layered invisible scaffold that enables deep cognitive engagement.

This study, therefore, aims to explore how doctoral students at Ghanaian universities perceive their supervisors' attributes as shaping their intellectual growth, motivation, and scholarly development. Adopting a qualitative, thematic approach that privileges the student voice, this research seeks to generate nuanced, context-rich insights into the experience of scaffolding within this distinctive environment (Adedokun & Oyetunde-Joshua, 2024). This study makes three contributions. First, theoretically, it advances knowledge by integrating SDT, Cognitive Apprenticeship, and Transformational Leadership into a novel framework for understanding supervisory influence. Secondly, it provides essential empirical evidence from the Global South, challenging and potentially expanding Western-centric models of effective supervision. In practice, the findings will inform the development of targeted supervisory development programmes and institutional policies in Ghana and similar contexts, with the aim of enhancing research quality, completion rates, and the holistic development of the next generation of Ghanaian scholars.

II. OBJECTIVE OF THE STUDY

This study explores how postgraduate students perceive that supervisors' attributes shape their intellectual growth, motivation, and scholarly development

III. METHODS

Research approach

This study employed a qualitative research method to investigate supervisory attributes and their role in catalysing cognitive engagement among postgraduate students. This research approach was chosen to facilitate an in-depth exploration of complex, socially constructed phenomena (Burr et al., 2014; Lim, 2025).

Research design

This study employed a thematic analysis. This research design was deliberately selected to gain insight into the complex, subjective, and often tacit perceptions that doctoral students hold regarding their supervisory relationships. Unlike quantitative methods, which measure frequencies, thematic analysis enables an in-depth, inductive exploration of lived experiences, allowing rich, context-specific insights to emerge naturally from the data. Through this process, the researcher systematically identified, analysed, and reported patterns or themes that illuminate how specific supervisor attributes are perceived as either catalysing or constraining intellectual growth and scholarly engagement. This study systematically follows the thematic design outlined by Braun and Clarke (2006, 2019) to interpret the data, identify patterns within the qualitative dataset, and analyse them. This procedure ensures that the thematic structure is grounded in participants' narratives while providing a conceptual interpretation of how supervisory interactions function as an 'invisible scaffold' for doctoral development (Braun & Clarke, 2019; Clarke & Braun, 2017). This design is thus uniquely powerful in uncovering the nuanced mechanisms of the 'invisible scaffold' within Ghanaian higher education's distinctive socio-cultural context.

Participants

Nine PhD candidates from two public and one private university in Ghana were recruited using a purposive sampling strategy. To capture a range of supervisory experiences and levels of cognitive engagement, the selection criteria included academic discipline, years of study, and gender. Contact was made with university administrators to obtain programme and contact information for doctoral students. Prospective participants were invited to discuss the study aims via email and telephone. Of the 15 students who initially expressed interest, 6 subsequently declined due to time constraints related to their dissertations, leaving a final sample of 9 participants. The participants represented the Humanities, Social Sciences, and Natural Sciences at various stages of their doctoral studies, from coursework to near completion. Their diverse backgrounds ensured that the data reflected multiple perspectives on supervision, which is essential for developing an understanding that can be applied more widely. A detailed overview of the participant demographics is presented in Table 1.

Researchers' role

As academics familiar with the Ghanaian higher education landscape and postgraduate supervision, our position was pivotal. Our insider knowledge of the cultural and institutional contexts fostered rapport and trust during the recruitment process and data collection, facilitating open discussions (Berger, 2015). This mutual understanding made the interviews feel like collegial dialogues, putting participants at ease as they discussed mentor-mentee relationships. To mitigate potential insider bias, we engaged in continuous reflexive journaling and examined our assumptions about effective supervision, ensuring that the participants' voices remained the primary source of data (Reid et al., 2018). All interviews were conducted by a researcher who was not involved in supervising the participants, and participants were explicitly assured that the discussions would not be evaluated by their supervisors. This helped minimise social desirability bias and enabled authentic sharing of experiences.

Table 1: Participant demographics

Pseudonym	Age	Gender	Broad discipline	Current year of study
PGS1	32	Female	Social Sciences	3
PGS2	29	Male	Natural Sciences	2
PGS3	35	Female	Humanities	4
PGS4	31	Male	Public Health	3
PGS5	40	Female	Education	5
PGS6	27	Male	Education	2
PGS7	33	Male	Agricultural Sciences	4
PGS8	36	Male	Humanities	3
PGS9	30	Male	Business Studies	2

Note: PGS: Postgraduate Student

Data collection methods

Semi-structured interviews were employed as the primary data collection method, providing a balance between structure and flexibility, and allowing for the exploration of predetermined topics and the discovery of unexpected insights (Galletta, 2013). Data collection took place in April and May 2025. Semi-structured interviews were

conducted virtually or in person at locations chosen by the participants, with privacy being prioritised. Each 45–60-minute interview explored supervisory attributes, critical incidents in supervisory relationships, and participants' cognitive and emotional engagement. Written informed consent was obtained for audio recordings and transcriptions. To ensure precision and avoid challenges and strategies related to translation issues (Turhan & Bernard, 2022), interviews were conducted in English, the language of instruction at the postgraduate level in Ghana.

Data analysis

This study used thematic analysis to analyse qualitative data. Braun and Clarke (2006, 2019) note that this technique helps to interpret the data and identify and analyse patterns within the qualitative dataset. The analytical process followed a six-phase framework comprising familiarisation with the data, generating codes, searching for themes, reviewing, defining, and producing the report. This systematic procedure ensures that the thematic structure is grounded in participants' narratives while conceptualising supervisory interactions as an 'invisible scaffold' for doctoral development (Braun & Clarke, 2019; Clarke & Braun, 2017). Analysis was conducted using Braun and Clarke's (2006, 2019) six-phase reflexive thematic approach. The research team immersed itself in the data by reading the transcripts and reviewing the audio. Two researchers independently coded each transcript and collaborated to create a unified coding framework. These codes were then consolidated into candidate themes and reviewed against the dataset to ensure coherence. Themes were defined to capture core narratives, and the analysis was presented alongside anonymised transcript excerpts. This iterative process involved moving between datasets, codes, and thematic mapping to ensure analytical depth.

Ethical considerations

This study received formal ethical approval from the Institutional Review Boards of all participating universities. The research was conducted in strict accordance with this approval, with informed consent forming its ethical foundation. All participants were provided with comprehensive information sheets and gave explicit consent to participate in the study. They were assured of the voluntary nature of their involvement, their right to withdraw at any time without consequence, and that stringent confidentiality measures would be implemented to protect their data. This included the use of pseudonyms, anonymisation of transcripts, and the secure, encrypted storage of all data, thereby safeguarding participants' identities throughout the research process and in all subsequent publications.

IV. RESULTS

Intellectual stimulation

The first theme encapsulates how supervisors provoked deep cognitive processing, critical analysis, and epistemological expansion. Participants consistently described interactions that moved beyond mere technical feedback into the realm of intellectual provocation. This aligns with the concept of cognitive scaffolding, where an expert guides a novice through challenging conceptual terrain by creating zones of proximal development. One participant illustrated this, noting his supervisor's practice of introducing radical perspectives that fundamentally challenged his assumptions:

"*My supervisor does not just accept my ideas at face value; he probes. Last week, he asked, 'What if your theoretical framework is a Eurocentric lens on a Global South context?' That question kept me awake for days!*" (PGS3).

This form of questioning disrupts cognitive complacency and fosters what Mezirow (1991) terms transformative learning, where deeply held assumptions are critically examined.

The data further indicated that this stimulation was not merely critical but also constructive. One participant reflected on the demanding yet valued nature of this engagement:

"*Some discussions leave me mentally exhausted in the best way. She will say, 'Your argument is coherent, but is it courageous?' That pushes me to interrogate my own biases*" (PGS3).

This practice of encouraging intellectual courage is a hallmark of supervision that promotes high-level cognitive engagement, moving students from safe, conventional thinking towards more original and impactful scholarship (Manathunga, 2005). Another participant highlighted the strategic use of devil's advocacy as a catalytic tool:

"*My supervisor plays devil's advocate deliberately. Once, I presented a methodology, and he responded, That is the conventional approach. Now, tell me why it is inadequate for your context.' It forced me to defend and refine my choices*" (PGS3)

This finding aligns with research on cognitive dissonance as a driver of deep learning, where supervisors intentionally create intellectual tension that students are scaffolded to resolve.

"*My supervisor does not just accept my ideas at face value; he probes. Last week, he asked, 'What if your theoretical framework is a Eurocentric lens on a Global South context?' That question kept me awake for days! It is not just about critique; he introduces radical perspectives I would never have considered, like suggesting I integrate decolonial epistemology. That's how I know I am growing*" (PGS1).

"*I will be honest: some discussions leave me mentally exhausted in the best way. She will say, 'Your argument is coherent, but is it courageous? That pushes me to interrogate my own biases. Though intimidating at first, this rigor is what I now value most*" (PGS2).

"*Critical thinking? Absolutely. My supervisor deliberately plays devil's advocate. Once, I presented a methodology, and he responded, that is the conventional approach. Now, tell me why it's inadequate for your context. It forced me to defend and refine my choices, a turning point in my work*" (PGS3).

Emotional and motivational support

The second theme emphasises the vital role of affective support in sustaining cognitive engagement amidst the inherent challenges of doctoral research. The data revealed that supervisors who successfully fostered resilience did so by normalising struggle and framing setbacks as integral to the scholarly process. This emotional scaffolding creates a psychologically safe environment that permits intellectual risk-taking (Edmondson, 1999). One participant provided a powerful example of this reframing.

"*After my conference paper was rejected, my supervisor said, 'Let us autopsy this, not mourn it. She reframed failure as part of scholarship. Her feedback isn't sugarcoated, but it's constructive, like a roadmap, not a reprimand*" (PGS4).

This approach aligns with Mangels et al.'s (2006) concept of a growth mindset, in which challenges are viewed as opportunities for development rather than indicators of ability.

Furthermore, participants emphasised the importance of supervisors normalising the iterative, often messy, process of knowledge creation. One participant described a shift in his perception of supervision meetings: "*I used to dread sharing half-baked ideas until he normalised 'thinking aloud. Now, our meetings feel like experimental, iterative labs*" (PGS5).

Creating a low-stakes environment for idea generation is crucial for fostering creativity and reducing anxiety, which can impede cognitive functioning (Fredrickson, 2001). The language of feedback was also identified as a key mechanism for motivational support. One participant highlighted the empowering effect of constructive phrasing:

"*Balance is key. My supervisor's feedback is precise but never punitive. She will say. This analysis is thin, but here's how to fortify it.' That 'but' is everything it acknowledges effort while elevating standards*" (PGS6).

This balanced feedback sustains motivation by validating the student's work while clearly outlining pathways for improvement, a practice supported by research on effective formative assessment (Hattie & Timperley, 2007).

"*After my conference paper was rejected, my supervisor said, 'Let us autopsy this, not mourn it. She reframed failure as part of scholarship. Her feedback is not sugarcoated, but it is constructive, like a roadmap, not a reprimand. That safety net lets me take intellectual risks*" (PGS4**).**

"*I used to dread sharing half-baked ideas until he normalised thinking aloud.' Now, our meetings feel like experimental, iterative labs. When I flopped a simulation, his response was, What is the next iteration? No shame, just*

forward motion" (PGS5).

"Balance is key. My supervisor's feedback is precise but never punitive. She will say. This analysis is thin, but here's how to fortify it. That 'but' acknowledges effort while elevating standards. It's motivation, not anxiety" (PGS6).

Autonomy versus directive supervision

The third theme delineates the delicate balance supervisors must strike between providing clear direction and fostering independent scholarship. The invisible scaffold here is adaptive, adjusting to the student's evolving needs. Participants described an initial phase where more directive supervision was necessary. One participant recounted this evolution:

"Early on, my supervisor was prescriptive; I needed it. Now, she steps back: You are the driver, I am the GPS. That trust is empowering" (PGS8).

This trajectory reflects the gradual release of responsibility model (Pearson & Gallagher, 1983), where support is intentionally withdrawn as the student's competence and confidence grow.

A critical finding was that autonomy is not synonymous with absence. Effective supervisors provided a clear structure within which autonomy could flourish. One participant highlighted this:

"*I am grateful for the leash, long but tangible. He will say, explore this dataset your way, but let us meet in two weeks to interrogate your choices"* (PGS7).

That structure keeps me from drowning in freedom." This structured autonomy prevents overwhelming ambiguity that can lead to procrastination or disengagement. Conversely, the negative impact of excessive control was also evident. One participant contrasted his positive experience with micromanagement:

"The worst? A supervisor who micromanages literature reviews. Mine says, 'Own your narrative. I will intervene only if you are canonically wrong.' That respect for my agency makes engagement effortless" (PGS9).

These finding highlights that supervisory control over procedural aspects can inadvertently hinder the cognitive ownership necessary for deep engagement and original contribution (McAlpine & Norton, 2006).

"*I am grateful for the leash, long but tangible. He will say, 'Explore this dataset your way, but let us meet in two weeks to interrogate your choices.' That structure keeps me from drowning in freedom.*" (PGS7).

"*Early on, my supervisor was prescriptive; I needed it. Now, she steps back: 'You're the driver; I'm the GPS.' That trust is empowering. But if I drift, she recalibrates with questions, not directives*" (PGS8).

"The worst? A supervisor who micromanages light reviews. Mine says, 'Own your narrative. I'll intervene only if you're canonically wrong.' That respect for my agency makes engagement effortless" (PGS9)

Modeling scholarly rigor and passion

The fourth theme captures the powerful role of supervisors as exemplars of scholarly practice and intellectual passion. Participants internalised their supervisors' attitudes towards research, indicating that modeling serves as a potent form of indirect scaffolding. One participant described being inspired by her supervisor's palpable enthusiasm:

"His enthusiasm is contagious. Once, he canceled a meeting to finish a chapter, saying, 'The ideas were burning, I had to capture them.' That dedication shamed my procrastination. Now, I chase that 'burn' too" (PGS1).

This form of observational learning, central to Bandura's (1977) social learning theory, demonstrates how supervisors' authentic engagement can powerfully shape students' motivation and scholarly identity.

Beyond passion, supervisors modeled the exacting standards of high-quality research. One participant described this not as intimidation but as an aspirational challenge:

"High standards? Yes. Intimidating? Never. She will say this draft is not you yet. Dig deeper.' It is aspirational like she sees my potential before I do" (PGS5).

This practice of holding students to high standards while expressing unwavering belief in their capability is a key attribute of mentors who foster excellence (Higgins & Thomas, 2001). The modeling extended to a demonstrable commitment to rigor, providing students with a tangible benchmark for their own work and helping them concretise abstract notions of scholarly quality.

"His enthusiasm is contagious. Once, he canceled a meeting to finish a chapter, saying, The ideas were burning; I had to capture them. That dedication shamed my procrastination. Now, I chase that 'burn' too" (PGS1).

"*High standards? Yes. Intimidating? Never. She will say, 'This draft is not you yet. Dig deeper.' It is aspirational like she sees my potential before I do.*" (PGS3).

Interpersonal dynamics and trust

The final and foundational theme concerns the relational bedrock upon which all other scaffolding is built. The data suggest that without trust and psychological safety, the cognitive and emotional challenges of doctoral work become prohibitively daunting. Participants highlighted behaviours that actively built trust, such as supervisors demonstrating respect for the student's intellectual voice. described a pivotal moment:

"I challenged his critique once, and he paused, then said, Convince me" (PGS5).

That respect for dissent was pivotal. I am not a vessel for his ideas; we were co-constructors. This flattening of the traditional hierarchy transforms the relationship into a collaborative partnership, which is increasingly recognised as vital for advanced doctoral development (Pearson & Kayrooz, 2004).

Furthermore, supervisors who demonstrated vulnerability humanised the scholarly journey and normalised its challenges.

"Psychological safety is not assumed, it is built. He shares his own peer-review rejections to normalise struggle. That vulnerability dismantles hierarchy" (PGS9).

This act of sharing failure creates a shared identity as scholars and mitigates the imposter syndrome frequently experienced by doctoral researchers (Gardner & Holley, 2011). The establishment of this trusting interpersonal dynamic was not a passive outcome but an active achievement of the supervisor, creating the secure base from which students could engage in the high-risk cognitive and emotional work required for transformative learning.

"*I challenged his critique once, and he paused, then said, 'Convince me.' That respect for dissent was pivotal. I am not a vessel for his ideas; we're co-constructors*" (PGS5).

"*Psychological safety is not assumed, it is built. He shares his own peer-review rejections to normalise struggle. That vulnerability dismantles hierarchy*" (PGS9).

V. DISCUSSION

This study investigates a critical yet underexplored dynamic in Ghanaian higher education: how postgraduate students perceive their supervisors' attributes as catalysts for their cognitive engagement. The findings provide robust empirical evidence that effective supervision functions as a sophisticated 'invisible scaffold,' a multi-dimensional construct built from specific, interrelated supervisory behaviours. This scaffold directly enables deep intellectual investment, scholarly identity formation, and autonomous research development that define meaningful cognitive engagement. The identified themes: Intellectual Stimulation, Emotional and Motivational Support, Autonomy versus Directive Supervision, Modeling Scholarly Rigor and Passion, and Interpersonal Dynamics and Trust are not isolated factors but are deeply interconnected, each playing a distinct yet synergistic role in supporting the postgraduate journey.

The study's integrated theoretical framework powerfully elucidates the findings, which move beyond a singular explanation to offer a multi-layered understanding of the supervisory process. Through the macro-lens of SDT, the data reveal how effective supervisors create a motivational ecosystem that nurtures students' innate psychological needs. The provision of structured autonomy directly supports the need for volition and ownership, as evidenced by participants who thrived under facilitative guidance rather than controlling. Consistent, constructive feedback that acknowledges effort while elevating standards, as reported by PGS6, is a clear mechanism for building

perceived competence. Most establishing trust and psychological safety through vulnerable leadership and respect for dissent, as described by PGS5 and PGS9, fulfills the critical need for relatedness. This aligns with the propositions of Dehkordi et al. (2025) and Tafvelin and Stenling (2021), confirming that supervisor attributes that support autonomy, competence, and relatedness are indeed the bedrock of sustained motivational drive and deep cognitive engagement.

The meso-level perspective of Cognitive Apprenticeship theory provides the pedagogical blueprint for operationalising this scaffolding. The findings demonstrate this process vividly. Supervisors modeled expert thinking by making their own scholarly passion and rigor visible, a form of observational learning that inspired students like PGS1 to internalise these standards. Coaching was evident in the precise, roadmap-like feedback described by PGS4 and the iterative, laboratory-like meetings valued by PGS5. Most significantly, the practice of scaffolding and fading was central to the theme of autonomy. Supervisors initially began with more directive support, as required by PGS8, and gradually transitioned to GPS-like guidance, thereby transferring responsibility and fostering independent cognitive capacity. This process of making tacit expertise explicit and then gradually withdrawing support is the core mechanism of Cognitive Apprenticeship (Dennen, 2013; Feinstein, 2021), and our data show it is instrumental in developing students' metacognitive skills.

At the micro-level, Transformational Leadership theory illuminates the inspirational quality of these pedagogical methods. The supervisors described by participants were not merely skilled technicians but transformational leaders. They provided intellectual stimulation by acting as devil's advocates and posing courageous questions, thereby elevating students' cognitive goals beyond mere coherence to originality, as PGS2 and PGS3 experienced. They offered individualised attention, tailoring their support to each student's evolving needs and striking a perfect balance between challenge and support. They employed inspirational motivation by reframing failure as an opportunity for an 'autopsy' rather than a 'mourning' (PGS4) and by expressing unwavering belief in a student's potential (PGS3). Finally, they are led by idealised influence, not through authority but by modeling dedication and scholarly integrity, earning respect and motivating students to emulate their commitment. This aligns with research by Kim et al. (2023) and Sheehan et al. (2020), which positions transformational supervision as a key driver of performance and positive self-concept.

The findings of this study resonate with the existing literature on supervisory practices. The critical role of intellectual stimulation and challenging dialogue in promoting deep learning is well-documented in studies from Western contexts (Manathunga, 2005; Sutherland, 2017). Similarly, the importance of emotional support and a growth mindset in building researcher resilience is a consistent theme in global scholarship (Mangels et al., 2006; Gardner & Holley, 2011). The identified need for a balanced approach to autonomy, transitioning from directive support to independent scholarship, corroborates the models proposed by Pearson and Gallagher (1983) and the warnings against micromanagement issued by McAlpine and Norton (2006).

However, this study contributes a critical contextual nuance that challenges the direct application of Western models. Within high-power-distance cultural norms characteristic of Ghana and many other nations in the Global South, the supervisor's role is often perceived as more authoritarian. In this context, the deliberate acts of vulnerability, the active flattening of hierarchy described by PGS5 (where we were co-constructors), and the conscious ceding of control take on heightened significance. These are not merely effective supervisory strategies; they are radical acts that actively counter unproductive cultural and structural norms. This finding provides a crucial amendment to the global literature, suggesting that the specific enactment of transformational leadership and cognitive apprenticeship must be consciously adapted to navigate and transform local power dynamics. This aligns with Torgbe's (2025) concerns about the Ghanaian context and suggests that the 'invisible scaffold' must be designed with a keen awareness of these constraints to be effective.

Furthermore, the study underscores that in under-resourced systems with high staff-to-student ratios, the intensive, relational model of supervision described by participants becomes even more precious and potentially elusive. The findings, therefore, not only identify effective practices but also highlight a stark inequity in the capacity of different institutions to provide them. This adds a layer of socio-political critique to the pedagogical findings, emphasising that fostering cognitive engagement is not solely a matter of individual supervisor skill but is also a function of institutional investment and resource allocation.

Implications for the findings

The implications of these findings are substantial for both theory and practice, as well as for policy. Theoretically, this study validates the power of integrating SDT, Cognitive Apprenticeship, and Transformational Leadership into a cohesive framework. This tripartite model offers a more comprehensive explanation of supervisory impact than any single theory can provide, detailing the why (Self-Determination Theory, SDT), the how (Cognitive Apprenticeship), and the spirit (Transformational Leadership) of effective supervision. For practice, the findings offer a clear, evidence-based blueprint for supervisor development programs. Graduate schools must move beyond generic advice and equip supervisors with specific strategies: training in Socratic questioning and devil's-advocacy techniques for intellectual stimulation; workshops on growth-mindset language and reframing failure for motivational support; and guidance on the deliberate, staged process of granting autonomy. Perhaps most importantly, supervisors must be encouraged to adopt vulnerable leadership and consciously foster psychologically safe, collaborative relationships.

From a policy perspective, this research sounds like a clarion call for institutional investment in supervisory relationships. The 'invisible scaffold' is labor-intensive and requires time. This demands policy reforms that recognise and reward high-quality mentoring, reduce excessive supervisory loads, and provide structured support for supervisors themselves. Universities must acknowledge that their most valuable pedagogical infrastructure in postgraduate education is not limited to laboratories or libraries alone, but rather in the quality of the dyadic relationships they foster between supervisors and students. Together, this study has humanised the complex process of postgraduate supervision by giving voice to the students' lived experiences. It has rendered the 'invisible scaffold' visible, detailing its components and demonstrating its profound power to catalyse the deep cognitive engagement that is the ultimate hallmark of successful postgraduate education. The lessons learned, particularly regarding the need to adapt transformational practices to specific cultural contexts, extend far beyond Ghana, offering valuable insights for any higher education system committed to nurturing the next generation of scholars and knowledge producers.

Strengths and limitations of the study

This study makes an important contribution to the field of educational psychology by innovatively exploring the 'invisible scaffolding' supervisory dynamic in Ghanaian higher education. A thematic analysis of postgraduate student narratives reveals how supervisor attributes can stimulate cognitive engagement. By integrating SDT, Cognitive Apprenticeship, and Transformational Leadership into a comprehensive framework, this study contributes to the literature by explaining the motivational, pedagogical, and inspirational aspects of effective supervision (Dehkordi et al., 2025; Kim et al., 2023). This study addresses a gap in Global South literature by demonstrating that transformational supervisory practices must counteract local high-power-distance norms (Torgbe, 2025). These findings could inform supervisor training programmes and institutional policies to improve the quality of mentoring. However, there are some limitations. The qualitative design limits the generalisability of the results. The small sample size of nine participants represents only a

select group of disciplines within Ghana's higher education system (Hennink & Kaiser, 2022). Students facing extreme supervisory challenges or who are disengaged remain unrepresented. Self-reported interview data may introduce recall and social desirability biases. Despite implementing measures such as reflexive journaling to mitigate insider bias, the researchers' familiarity with Ghana may have influenced their interpretation of the data (Berger, 2015). Besides, focusing solely on the student perspective provides an incomplete understanding, as it lacks observational data and the perspectives of supervisors. Future research should address these limitations by conducting mixed-methods studies that incorporate supervisor perspectives and direct observations of supervisors' behaviours. Additionally, longitudinal studies tracking supervisor-student relationships throughout the doctoral journey would reveal how scaffolding needs evolve over time. In the future, quantitative research using theme-derived scales could survey more institutions across West Africa. To understand engagement barriers, research must include students who have experienced supervisory failures. Intervention studies should evaluate professional development programmes that teach identified scaffolding strategies to improve doctoral supervision.

VI. CONCLUSION

This study sheds light on the structure of the 'invisible scaffold', a multidimensional construct that enables effective postgraduate supervisors to encourage cognitive engagement. The findings demonstrate that this scaffold is built on five key supervisory attributes: intellectual stimulation, emotional support, balanced autonomy, scholarly rigour, and modelling of trusting interpersonal dynamics. The study validates an integrated framework that explains this process at macro, meso, and micro levels. SDT reveals how supervisors nurture the psychological need for autonomy, competence, and relatedness. Cognitive apprenticeship theory provides the pedagogical mechanics of modelling, coaching, and support fading. Transformational Leadership theory captures the inspirational delivery of these methods, thereby transforming students' scholarly self-concept. The practical implications of this study are significant. It provides a blueprint for supervisor development, advocating training in Socratic questioning, growth mindset language, and the gradual granting of autonomy. It calls on supervisors to embrace vulnerable leadership to ensure their employees' psychological safety. These findings necessitate institutional investment. Universities must implement policies that reduce supervisory workloads and reward quality mentoring, particularly in under-resourced systems and high-power-distance cultures, like Ghana. This research humanises postgraduate supervision, demonstrating that the quality of the supervisory relationship is crucial in nurturing independent scholars and knowledge producers.

VII. CONFLICT OF INTEREST

There are no conflicts of interest in this article.

VIII. DATA AVAILABILITY STATEMENT

Data are available upon request.

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