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Examining the relationship between educators' knowledge levels and training preferences for enhancing support of neurodivergent learners

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***Abstract*—** Possibilities offered by educational neuroscience in the context of educator training and continuous professional development have been widely discussed. However, the application of this knowledge is largely absent. While South African policies promote the educator professional development initiatives to achieve inclusive education goals, significant gaps exist in examining the relationship between educator knowledge levels and training preferences when supporting neurodivergent learners. This study examined the relationship between educators' knowledge, professional challenges, and training preferences to enhance support for neurodivergent learners. Respondents were recruited from eight schools through the Centre for Neurodiversity database at the University of Johannesburg. It adopted a quantitative research paradigm and employed a descriptive design. A closed-end questionnaire with predefined answer choices was distributed using Google Forms to thirty-six (N=36) educators, conveniently selected, (n=26) from special, and (n=10) from mainstream schools. Data analysis was conducted through the Statistical Package for Social Sciences. The results revealed a relationship between educators' knowledge levels and training preferences. Managing challenging behaviours emerges as the most significant challenge, with 63.9% of educators identifying it as their most crucial professional difficulty. Training needs are directly aligned with knowledge gaps, with 75% prioritising evidence-based behavioural interventions and % understanding neurodevelopmental conditions with 72.2%. Educators preferred hands-on training (55.6%) over theoretical approaches (19.4%), reflecting their need for practical skills to address immediate classroom challenges. The findings reveal an alignment between knowledge levels, professional challenges, and training preferences. A paradigm shift towards needs-based professional development initiatives is recommended.

Keywords: Adult learning theory; Educators' knowledge levels; Inclusive education; Neurodivergent learners; Professional development

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I. INTRODUCTION

THE EDUCATION field has transformed significantly due to rising diversity, with an estimated 10-20% of the global population being neurodivergent (Harrison et al., 2024). However, the global percentage of neurodivergent learners navigating education systems without diagnosis is unknown (Harrison et al., 2024). This statistical uncertainty compounds the complexity of educators' daily learner engagement (Keppens et al., 2021). In South Africa, policies support educator professional development, and educators receive this support, although training quality and accessibility vary across contexts such as provinces and educational contexts. This study examines the relationship between educators' knowledge levels, gaps, and training preferences to inform evidence-based professional development strategies that enhance South African educators' capacity to support neurodivergent learners in mainstream and special schools' contexts. While numerous South African studies document challenges educators face in supporting neurodivergent learners concerning professional capacity and competencies, a critical gap exists in understanding the relationship between educators' knowledge levels and training needs. There are no studies examining whether educators' preferred training modalities align with their actual knowledge gaps and professional challenges, a crucial factor in designing effective professional development programmes. Current studies examine these factors in isolation rather than exploring their interconnections and how this relationship might vary across educational contexts. Against this background, this study examines the relationship between educators' knowledge levels and training preferences to inform evidence-based professional development strategies that enhance South African educators' capacity to support neurodivergent learners in mainstream and special schools' contexts.

II. LITERATURE REVIEW

Global context of neurodiversity in education

Inclusion of neurodivergent individuals has a long and evolving history influenced by the medical model and various social models (Harrison et al., 2024). Thus, in educational settings, inclusion is characterised by different conceptual frameworks that affect issues, challenges, and dilemmas faced in educating neurodivergent learners (Manalili, 2021). According to the medical model, the most effective way to approach neurodevelopmental conditions is to consider them illnesses and impairments, to "treat" and view them from a strictly deficit perspective. The condition is positioned as a challenge (Shevidi, 2024). The social models emerged and challenged the medical model. According to social models, it is society, or the school environment, that disables neurodivergent learners, and therefore, any meaningful solution must be directed to changing the societal or school barriers and

attitudes (Retief & Letšosa, 2018). The school context disables neurodivergent learners through inaccessible environments, discriminatory practices, and negative stereotypes. Manalili (2021) argues that although educational systems globally are making inclusive education efforts, ableist ideology still informs educational policies, professional knowledge, and general educational practices. Education systems often label neurodivergent learners as having "special educational needs", reinforcing the assumption that these learners are "abnormal" (Manalili, 2021). Education systems implement policies and practices that reinforce segregation; for instance, "special schools" and "mainstream schools" still exist. Educators are often trained within an education system that reinforces ableist norms. While some educators believe they are inclusive and compassionate, their actions may intentionally marginalise neurodivergent learners by emphasising remediation or encouraging masking as neurodivergent learners suppress their natural ways of thinking and behaving to fit in (Manalili, 2021). Hence, Manalili (2021) emphasises that educator training must equip educators with skills to critically engage with neurodiversity and transform educational environments, not just accommodating them within unchanged systems.

Contemporary research studies now emphasise the importance of reimaging inclusive education through a neurodiversity lens. The concept of neurodiversity emphasises the variations in individual brain functions and their behavioural traits, regarded as part of normal variation in human beings (Clouder et al., 2020). Neurodiversity is not a diagnosis, but a broad term used to refer to a wide range of specific, non-specific, hidden or undetermined neurodevelopmental conditions (Mirfin-Veitch et al., 2020), these include, but are not limited to, autism spectrum disorder, attention deficit hyperactivity disorder (ADHD), speech and language disorders, sensory disorders, Tourette syndrome and specific learning needs, affecting education systems and frameworks, which should evolve to embrace the neurological diversity of learners (Ndou-Chikwena & Sefotho, 2025). These neurodevelopmental conditions can be acquired (developed after birth due to injury, illness, or environmental factors) or congenital (present from birth due to genetic or prenatal factors). The neurodiversity model distinguishes itself from the earlier discussed models as it focuses on the natural variation in human brain function. While the medical model views neurodevelopmental conditions as a deficit and disorder to be treated, cured, and managed by professionals, the neurodiversity model views neurodevelopmental conditions as part of an individual's identity and should focus on acceptance and inclusion. While the social model aims to remove environmental barriers so that neurodivergent individuals can fully participate, neurodiversity aims to celebrate, include, and value neurodivergent thinking.

Educators are essential in the execution of inclusive education policies. They are entrusted with the responsibility of nurturing the intellectual and academic development of the learners. Thus, their engagement in ongoing professional development activities is not merely encouraged but deemed obligatory (He et al., 2024). In many mainstream contexts, every educator is responsible for supporting neurodivergent learners (Lopes & Oliveira, 2021). However, while the curricula are formulated for the general learner demographic, they must also be adapted for neurodivergent learners, a requirement that many educators are not sufficiently prepared to meet. Most educators are trained to instruct neurotypical learners. Nevertheless, they are expected to set personalised goals, modify their teaching approaches, and evaluate neurodivergent learners alongside their peers, an expectation frequently not met in practice (Lopes & Oliveria, 2021).

Professional Development challenges in supporting neurodivergent learners

Although educators play a key role in implementing Inclusive Education (IE), several factors may impede or enhance educators' efficiency in supporting neurodivergent learners (Tebele & Chaka, 2024). The study focuses on education professional development. Educator training programmes increasingly prioritise the skills and sensitivity needed to support neurodivergent learners (Chris & Stephanie, 2025) effectively. There are two categories of in-service education and training programmes. Educational institutions such as colleges and universities offer long-term courses. Short-term programmes, called continuing professional development, are conducted in educators' resource centres or schools. These programmes have been instrumental in upgrading educators' capabilities and facilitating various educational initiatives (Phiri et al., 2023). Essential fundamental elements must be incorporated into any successful professional development initiatives. These elements include content focus, active participation, coherence, duration, and the collective involvement of educators. There should be a dedicated focus on specific subject matters that educators are to learn, with an expectation for them to engage actively and collectively in the process, rather than simply being passive recipients of knowledge (Chitiyo et al., 2019). Effective professional development can significantly enhance educators' self-efficacy in supporting neurodivergent learners (Lapon et al., 2025). Professional development integrating multi-sensory techniques and explicit teaching practices has been proven to increase educators' knowledge and effectiveness in supporting various learners (Gonzalez, 2021). Therefore, educators must be trained in evidence-based practices tailored for neurodivergent learners (Layden et al., 2023).

Educators' professional development in training programmes incorporating neuroscience is gaining momentum. These programmes are designed to transform educators' perceptions of neurodevelopmental conditions and tackle educational support inequalities (Leyton & Stentiford, 2025). (Walker et al., 2019) argue that the possibilities offered by educational neuroscience in the context of teacher training and continuous professional development have been widely discussed. However, the application of knowledge translation is largely absent in the field. A considerable lack of awareness and understanding of neurodiversity among educators impedes effective diagnosis and support for neurodivergent learners (Hannant, 2021). These challenges vary across contexts and countries, and studies reveal that limited professional development of educators is one of the main barriers affecting IE implementation in developing countries (Judijanto, 2024; Sijuola & Davidova, 2022). Jardinez and Natividad (2024) outline that due to a lack of/inadequate educator training, educators encounter challenges in establishing inclusive learning environments and tailoring support to meet the diverse requirements of neurodivergent learners. (Dewi, 2024) argues that the lack of professional development and training for educators is the most striking factor limiting inclusive education implementation in Indonesia. Educators have not been equipped with the skills to manage diverse classrooms. Similar sentiments were highlighted in a study conducted in India (Dwivedi, 2022). Ng'andu (2023) revealed that educators in Zambia expressed that they required continuing professional development on effective teaching in inclusive settings and developing competencies in adapting teaching resources to suit the needs of neurodivergent learners. (Chris & Stephanie, 2025) and (Layden et al., 2023) assert that insufficient educator preparation limits educators' competencies in supporting neurodivergent learners. Chitiyo et al (2019) further explain that although professional development programmes are organised, the programmes are dictated to educators, as most of the efforts in professional development planning do not seem to include educators' needs assessment for whom these initiatives are created.

Policy versus practice in the South African context

South Africa's inclusive education journey began with transitioning from the apartheid era of segregated special schools to a unified system embracing all learners. The country's commitment to inclusive education is formalised through adopting the Salamanca statement and framework in supporting neurodivergent learners (Nembambula et al., 2022) and alongside the implementation of Education White Paper 6: Special Needs Education by the South African Department of Basic Education in 2001 (Majoko, 2019) and the Screening, Identification, Assessment and Support (SIAS) policy of 2014 (Nemambula et al., 2022;

Skae et al., 2020).

Despite efforts to amend and improve these policies, implementing inclusive education has remained one of the biggest challenges (Nemambula et al., 2022). Extensive research has been conducted regarding the inclusion policies and their implementation alongside educators' views and perceptions (Skae et al., 2020). Educators face challenges supporting neurodivergent learners in mainstream, special, and full-service school settings. These challenges can be categorised into systemic (Moosa & Bekker, 2021; Solomon et al., 2024; Motitswe, 2025; Hove, 2014), resource-related (Themane & Thobejane, 2019; Tibane et al., 2024; Tebele & Chaka, 2024; Motitswe, 2025; de Andrade & Bava, 2025; Liaga et al., 2025) and the limited or absence of tailored professional development initiatives (Themane & Thobejane, 2019; Hove, 2014; Moosa & Bekker, 2021; Tebele & Chaka, 2023; Motitswe, 2025; Liaga et al., 2025; Solomon et al., 2024; Masuku et al., 2023; Mavuso, 2022; Tibane et al., 2024; Nhlumayo, 2022; Mokhampanyane, 2024). The critical gap between educators' competencies and classroom demands is evident when examining specific professional development-related défis.

The government has amended policies and invested in various in-service professional development programmes. Nhlumayo (2022) outlines various policies which direct and support Educator Professional Development (EPD): Continuing Professional Teacher Development (CPTD) (2014), The National Policy Framework for Teacher Education and Development (NPFTED) (2007), The Integrated Strategic Planning Framework for Teacher Education and Development (ISPFTED) (2011) and the Quality Management System (QMS), which was formally known as the Integrated Quality Management Systems. Through the proper execution of EPD, educators and learners continuously enhance their teaching and learning capabilities and can effectively respond to unforeseen crises. However, Nemambula (2022) argues that various challenges exist in planning and executing these programmes, such as a lack of research-based planning leading to training that is disconnected from the practical classroom needs of educators and poor administration of the programmes.

III. THEORETICAL FRAMEWORK

Background to the theory

The theoretical foundation acknowledges that educators' professional development programmes rely on various theories of student learning and educator learning theories (AbdulRab, 2023). Adult learning principles are especially important for developing educator skills. This study is based on Adult Learning Theory (Andragogy), developed by Malcom Knowles. This theory offers a framework for understanding how educators, as adult learners, gain knowledge and skills to support neurodivergent learners. Malcom Knowles, in his 1973 book "The adult learner: A neglected species", made a key distinction between adult learning and children's learning. This laid the foundation for understanding how educators approach professional development (Sasere & Makhasane, 2023). His theory is based on the idea that adult learners come from educational settings with a wealth of experience and knowledge (Seserei & Makhasane, 2023). This idea is relevant to this study, as it focuses on how educators' existing knowledge, professional challenges, and training preferences interact to shape evidence-based professional development strategies.

Relevance to this study

The theory includes six principles of adult learning: the need to know, self-concept, experience, readiness to learn, orientation to learning, and intrinsic motivation (Seserei & Makhasane, 2023). Knowles emphasised that effective adult education must be purposeful, practical, and focused on the learner (Papathanasiou, 2023). Adults need clear reasons for learning and how it directly connects to their immediate needs and interests. Learning should build on adults' previous experiences, including their mistakes, as these provide a base for new understanding. Training should emphasise practical application instead of just theoretical memorisation, allowing the adult learners to find their own solutions (Papathanasiou, 2023). This theory is relevant to this study as it provides a framework for understanding how educators, adult learners, approach professional development based on their existing knowledge, experience, and practical needs when supporting neurodivergent learners. The theory highlights the importance of problem-centred learning, indicating that successful professional development must focus on the specific challenges educators face in the classroom rather than on abstract theoretical concepts. The principle that adults are motivated to learn upon recognising specific gaps in their practice provides a valuable perspective for investigating how educators' self-identified knowledge gaps might influence their preferences for training.

IV. OBJECTIVES OF THE STUDY

The study examined the complex relationship between educators' knowledge levels, professional gaps, and training preferences to enhance their support for neurodivergent learners in eight schools across South Africa. In achieving this objective, the study is guided by the following research questions:

1. How do professional challenges differ between educators who have received formal inclusive education training versus those who have not?
2. What is the relationship between educators' self-reported knowledge levels and the frequency of reported professional challenges?
3. How do training preferences align with current knowledge levels and knowledge gaps among educators supporting neurodivergent learners?

V. METHODS

This study adopted a quantitative research paradigm. This paradigm is based on the positivist tradition, which maintains that knowledge aims to describe the observable and measurable phenomena (Cleland, 2015). This paradigm was chosen as it highlighted the importance of objectivity and reliability, and it was used to uncover relationships between variables (Alford & Teater, 2025): South African educators' knowledge levels, professional gaps, and training preferences when supporting neurodivergent learners. Although this paradigm is criticised for its rigidity, it provided precise, quantifiable data that can be statistically analysed. Researcher bias was reduced with structured methodologies.

Research design

This study employed a descriptive design. Descriptive design was employed to outline the characteristics of the educator's neurodiversity knowledge levels, gaps, and preferred training modalities (Alford & Teater, 2025). This design offered comprehensive descriptions of variables and their characteristics, which is critical for understanding the range and nature of the research problem (Briggs, 2024). Using basic statistical measures enabled the researcher to interpret the findings more easily (Briggs, 2024). Although no research design can eliminate bias, this method minimised the likelihood of the researcher impacting the respondents' responses (Siedlecki, 2020) through its organised and standardised data collection methods. Therefore, this design provided a means for objectively measuring educators' current knowledge levels, professional challenges, and training preferences in supporting neurodivergent learners.

Population

Non-probability convenience sampling was used to select the respondents. This selection was based on ease of access and availability (Suen et al., 2014). The researcher obtained respondents from the Centre for Neurodiversity's database of educators. This was a quick and cost-effective method, and a strict quantitative methodology was adopted to reduce any possibilities of researcher bias. The researcher was more focused on capturing the actual needs of educators in supporting neurodivergent learners from mainstream and special schools.

Data collection tools

This study used a closed-end questionnaire with predefined answer choices that were developed and distributed using Google Forms to 36 educators. This type of questionnaire facilitated easy data analysis and comparison across respondents (De Vaus, 2016). The questionnaire comprised 12 items organised into four main sections: demographic information, current knowledge levels, professional challenges, and training preferences. The first section had four questions, which collected data on the workstation type, teaching experience, and previous inclusive education training. The second section has thirteen items measuring self-reported expertise across neurodiversity related areas using a 5-point Likert scale (No knowledge, Basic, Moderate, Good, Expert). Areas assessed included Autism Spectrum Disorders, ADHD management strategies, specific learning needs, sensory processing disorders, developmental language disorders, behavioural intervention techniques, emotional regulation support, inclusive teaching methods, crisis de-escalation techniques, individual Education Plan development, family collaboration strategies, assistive technology, and legal rights advocacy. The third section assessed the frequency of difficulties using a 5-point scale (Never, rarely, sometimes, often, Always) across areas, including behavioural management, communication barriers, sensory adaptations, resource limitations, time management, parental support, and limited professional development. Respondents were also requested to identify their most significant professional challenge in supporting neurodivergent learners and their training needs. Then, in the last section, respondents were required to identify preferred delivery methods and formats for professional development programmes. The questionnaire's face validity was established through a review by my supervisor and a colleague.

Research site

The Centre for Neurodiversity is located at the University of Johannesburg, Soweto Campus in South Africa. The Centre supports stakeholders, including neurodivergent individuals, educators, educational psychologists, parents, and caregivers, in promoting the well-being and inclusion of neurodivergent individuals through psychological services, research, advocacy, and professional development initiatives. The Centre collaborates with the Gauteng Department of Education and community-based organisations, such as the Paul and Humile Mashatile Foundation, to strengthen support for neurodivergent individuals. This study was conducted online, and respondents were recruited through the Centre for Neurodiversity database, which maintains contact details of educators who have previously engaged with neurodiversity-related initiatives and expressed interest in professional development opportunities.

Data analysis

The data analysis process involved systematic preparation and statistical examination of collected responses. Data was prepared through variable coding and entry into the Statistical Package for the Social Sciences (SPSS) before analysis. Questionnaire items were transformed into measurable variables with appropriate coding schemes for statistical analysis (Do-Thi & Do, 2022). Descriptive statistics analysis was conducted using the SPSS software to generate frequency distributions, cross tabulations, and measures of central tendency for key variables, including educators' knowledge levels, professional challenges, and training preferences. Visual presentations were created using SPSS and Microsoft Word chart functions.

Ethical considerations

This study received clearance from the University of Johannesburg's ethics committee (Clearance No. SEM 1-2025-036). Respondents were invited to participate in the study and provided informed consent. Given the online nature of data collection, respondents also provided informed consent electronically before accessing the questionnaire. Key issues such as voluntary participation and confidentiality were clearly explained. The respondents were informed of their right to withdraw from the study at any point, and their personal information was not disclosed. Comprehensive online data protection measures were established; Google Forms data were exported to the University's secure data repository system. Only the primary researcher and supervisor can access the raw data and cannot be shared with schools or other parties. The questionnaire was designed to be completed within 15-20 minutes over the school holidays to avoid disrupting the respondents' professional responsibilities and resting period. The questionnaire items were reviewed for cultural appropriateness within the South African educational context.

VI. RESULTS

This section presents the findings from the analysis of data collected from 36 educators about their knowledge levels, professional challenges, and training needs in supporting neurodivergent learners. The results are organised to address each research objective systematically, beginning with the respondent demographics and contextual factors, then examining knowledge levels, professional challenges, training needs, and preferred training modalities. The findings offer clear insights into how these variables relate to each other. They also show patterns that guide practical professional development strategies.

Educator workstation

Table 1: Educators' workstations

Workstation	N	%
Mainstream Primary school	10	27.8%
Special School	26	72.2%

Among 36 educators surveyed, a significant majority (72.2%) reported working in special schools, while only 27.8% were in mainstream primary schools. A binomial test revealed that this distribution deviates from an equal proportion ($p = 0.11$), indicating that most respondents' perceived needs and perspectives are grounded in specialised contexts rather than mainstream settings. The uneven distribution between mainstream and special school respondents reflects the sampling frame available through the Centre for Neurodiversity database and differential response rates across the educational sector. More special school educators have been actively engaging with the Centre than mainstream educators.

Teaching experience

Table 2: Educators' work experiences

Work experiences	N	%
0-5 years	14	38.9
5-10 years	9	25.0
11-20 years	7	19.4
20-+	6	16.7
Total	36	100

The distribution of teaching experience among respondents varied, with the largest group having 0-5 years (38.9%) of experience, followed by 5-10 (25%),

Training in inclusive education or neurodiversity

Table 3: Educators who have received training in inclusive education

N		%
No	14	38,9
Yes	22	61,1
Total	36	100

Table 4: Cross-tabulation for workstation and inclusive education training

Workstation	No		Yes		Total	
	N	%	N	%	N	%
MPS	0	0.0	10	45.5	10	27.8
SS	14	100.0	12	54.5	26	72.2
Total	14	100.0	22	100.0	36	100.0

MPS: Mainstream primary schools
SS: Special school

Over 60% of educators indicated they had received formal training in inclusive education in the past five years, while 38.9% had not. The implication is that professional development in inclusive practices may not be uniformly available, and gaps may exist in preparation for supporting neurodivergent learners.

The cross-tabulation examining the relationship between workstation type and formal training in inclusive education in the past

five years shows that all mainstream school educators have received training. In contrast, only 12 out of 26 educators in special schools have received the training.

Perceptions on curriculum responsiveness

Educators were asked how well the current curriculum meets the learning needs of neurodivergent learners; their responses varied. Most educators felt the curriculum only "slightly" (38.9%) or "moderately" (36.1%) addressed the needs, while few felt it met "very" (2.8%) or "extremely well" (5.6%). Notably, 16.7% felt it did not meet the "at all" needs.

Table 5: Relevance of the curriculum in catering for neurodivergent learners

Relevance of the curriculum	N	%
Not at all	6	16.7
Sightly	14	38.9
Moderately	13	36.1
Very	1	2.8
Extremely well	2	5.6
Total	36	100

In addition, the cross-tabulation examining how well the curriculum caters to neurodivergent learners' needs reveals significantly different perspectives between mainstream and special school educators. Mainstream educators (n=6) rate the curriculum as inadequate, believing it caters "not at all" to neurodivergent learners' needs, while the remaining four rate it as only "slight" in meeting these needs. This reflects their experience with the general CAPS curriculum. Special school educators show more positive views about the curriculum, with the majority (n=13) rating the curriculum as "moderately", 38.5% (n=10) as "slight", and small numbers rating it "very" (3.8%, n=1) or "extremely well" (7.7%, n=2) suited to neurodivergent learners. No special school educator rated the curriculum as inadequate, reflecting their use of the specialised DCAPS curriculum explicitly designed for neurodivergent learners. The significant difference in perceptions aligns with the curricula context: mainstream teachers work within constraints of CAPS, while special school educators utilise DCAPS, which is purposefully designed to cater for learners with specific requirements.

Table 6: Cross-tabulation of workstation and curriculum responsiveness

Work	Not at all		Sightly		Moderately		Very		Extremeliwell		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
MPS	6	100	4	28.6	0	0.0	0	100	0	100	10	27.8
SS	0	0.0	10	71.4	13	100	1	100	2	100	26	72.2
Total	6	100	14	100	13	100	1	100	2	100	36	100

MPS: Mainstream primary schools
SS: Special school

Frequency of challenges: Behavioural, social, sensory, resource, and workload

This section presents the frequency of behavioural, social, sensory, resource, and workload challenges. About 33.3% educators "always" encounter behavioural and emotional difficulties, and another 33.3% "sometimes", while 30.6% selected "often". Only 2.8% chose "rarely", indicating high prevalence.

Figure 7: Managing behavioural and emotional difficulties

Managing behavioural	N	%
Rarely	1	2.8
Sometimes	12	33.3
Often	11	30.6
Always	12	33.3
Total	36	100

Table 8: Communication and social interaction barriers

Communication	N	%
Never	2	5.6
Rarely	4	11.1
Sometimes	13	36.1
Often	10	27.8
Always	7	19.4
Total	36	100

Table 8 indicates communication and social interaction barriers are common when working with neurodivergent learners. More than one-third (36.1%) face these challenges "sometimes", while nearly half deal with them frequently or constantly (27.8% "often" and 19.4% "always"). Only a small minority of educators report rarely (11.1%) or never (5.6%) experiencing barriers to communication and social interactions. This suggests that communication.

Table 9: Sensory and academic adaptation needs

N		%
Never	2	5.6
Rarely	6	16.7
Sometimes	9	25.0
Often	10	27.8
Always	9	25.0
Total	36	100

Table 9 presents educators' ratings of how frequently they encounter sensory and academic adaptation needs when working with neurodivergent learners. The data indicate that these challenges are prevalent, with most educators experiencing at least "sometimes". More than half of the respondents encounter sensory and academic adaptation needs frequently, with equal proportions rating them as "often" (27.8%) and "always" (25%). Very few educators report infrequent encounters with these challenges, with 16.7% experiencing them "rarely" and 5.6% "never".

Table 10: Limited resources and support systems

Limited resources	N	%
Not at all	3	8.3
Sightly	8	22.2
Moderately	10	27.8
Very	7	19.4
Extremely well	8	22.2
Total	36	100

Table 10 indicates how educators frequently encounter limited resources and support systems when working with neurodivergent learners. The data reveal that resource limitations are a widespread challenge. Most educators encounter these constraints at least "sometimes" (27.8%). Then other significant proportions facing them regularly- 19.4% "often" and 22.2% "always". The fact that most educators deal with limited resources and support systems "sometimes", "often", and "always" highlights a systemic issue in educational provision for neurodivergent learners.

Table 11: Time and workload management pressures

Time and workload management presures	N	%
Never	1	2.8
Rarely	3	8.3
Sometimes	14	38.9
Often	3	8.3
Always	15	41.7
Total	36	100

Table 11 presents educators' ratings of how frequently they encounter time and workload management pressures when working with neurodivergent learners. The data reveal that time and workload pressures are the most pervasive challenge among all the barriers examined, with an overwhelming number of educators experiencing these pressures at "always". However, this frequency is not statistically significant (p=.405), possibly suggesting this challenge is universally expected in teaching contexts.

Table 12: Limited parental support

Limited parental support	N	%
Rarely	10	27.8
Sometimes	14	38.9
Often	6	16.7
Always	6	16.7
Total	36	100

A spread of responses on the frequencies of limited parental support shows "sometimes" as the most frequent, with a smaller proportion reporting "often" and "always". This suggests some parental engagement, but also gaps.

Table 13: Limited professional development

Limited professional development	N	%
Never	2	5.6
Rarely	6	16.7
Sometimes	18	50.0
Often	9	25.0
Always	1	2.8

Total	36	100	

Table 13 shows that half of the educators' experience limited professional development "sometimes" (50%), while others selected "often" (25%) or "always" (2.8%). These results indicate that professional development limitations are widespread but variably experienced.

Current knowledge level

Table 4 presents educators' self-reported knowledge levels across 13 areas related to neurodivergent learner support, with most areas showing predominantly basic or moderate knowledge levels. Inclusive teaching methods emerge as the strongest knowledge area, with over half of educators rating themselves as having good to expert knowledge. Individual Education Plan development also shows relatively strong knowledge, reporting good to expert levels. However, sensory processing disorders and legal rights and advocacy represent basic to null knowledge. Crisis de-escalation techniques show the highest concentration at the moderate levels. The statistical significance tests (p-values) indicate significant deviations from expected equal distribution across knowledge levels, suggesting genuine knowledge concentration patterns.

Table 14: Educators' knowledge levels

Variables	Level	N	%	Proportion	p
Autism Spectrum Disorders	No Knowledge	3	8.3	0.083	< .001
	Basic	12	33.3	0.333	0.065
	Moderate	9	25	0.250	0.004
	Good	11	30.6	0.306	0.029
	Expert	1	2.8	0.028	< .001
ADHD management strategies	No Knowledge	3	8.3	0.083	< .001
	Basic	14	38.9	0.389	0.243
	Moderate	8	22.2	0.222	0.001
	Good	10	27.8	0.278	0.011
	Expert	1	2.8	0.028	< .001
Specific learning needs	No Knowledge	4	11.1	0.111	< .001
	Basic	5	13.9	0.139	< .001
	Moderate	18	50	0.500	1.000
	Good	9	25	0.250	0.004
Sensory processing disorders	No Knowledge	6	16.7	0.167	< .001
	Basic	14	38.9	0.389	0.243
	Moderate	9	25	0.250	0.004
	Good	7	19.4	0.194	< .001
Development of Language Disorders	No Knowledge	5	13.9	0.139	< .001
	Basic	13	36.1	0.361	0.132
	Moderate	10	27.8	0.278	0.011
	Good	7	19.4	0.194	< .001
	Expert	1	2.8	0.028	< .001
Behavioural intervention techniques	No Knowledge	2	5.6	0.056	< .001
	Basic	14	38.9	0.389	0.243
	Moderate	13	36.1	0.361	0.132
	Good	6	16.7	0.167	< .001
	Expert	1	2.8	0.028	< .001
Emotional regulation support	No Knowledge	4	11.1	0.111	< .001
	Basic	12	33.3	0.333	0.065
	Moderate	11	30.6	0.306	0.029
	Good	8	22.2	0.222	0.001
	Expert	1	2.8	0.028	< .001
Inclusive teaching methods	No Knowledge	1	2.8	0.028	< .001
	Basic	5	13.9	0.139	< .001
	Moderate	11	30.6	0.306	0.029
	Good	12	33.3	0.333	0.065
	Expert	7	19.4	0.194	< .001
Crisis de-escalation techniques	No Knowledge	5	13.9	0.139	< .001
	Basic	11	30.6	0.306	0.029
	Moderate	15	41.7	0.417	0.405
	Good	4	11.1	0.111	< .001
	Expert	1	2.8	0.028	< .001
Individual Education Plan development	No Knowledge	1	2.8	0.028	< .001
	Basic	5	13.9	0.139	< .001
	Moderate	13	36.1	0.361	0.132
	Good	8	22.2	0.222	0.001
	Expert	9	25	0.250	0.004
Family collaboration strategies	No Knowledge	3	8.3	0.083	< .001
	Basic	10	27.8	0.278	0.011
	Moderate	14	38.9	0.389	0.243
	Good	7	19.4	0.194	< .001
	Expert	2	5.6	0.056	< .001
Assistive Technology	No Knowledge	5	13.9	0.139	< .001
	Basic	8	22.2	0.222	0.001
	Moderate	14	38.9	0.389	0.243
	Good	8	22.2	0.222	0.001
	Expert	1	2.8	0.028	< .001
Legal rights and advocacy	No Knowledge	8	22.2	0.222	0.001
	Basic	10	27.8	0.278	0.011
	Moderate	10	27.8	0.278	0.011
	Good	6	16.7	0.167	< .001
	Expert	2	5.6	0.056	< .001

Professional challenges when working with neurodivergent learners

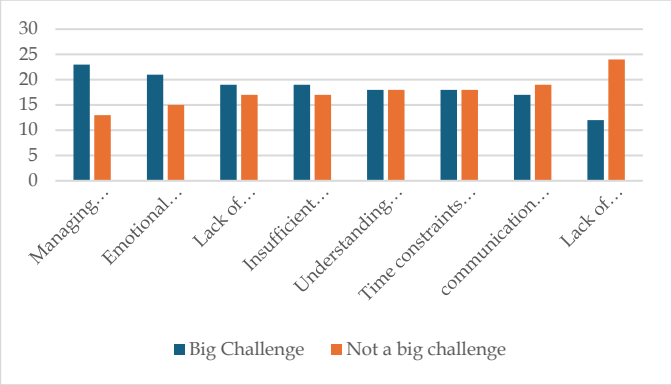

Figure 1: Professional challenges

This data reveals the professional challenges educators face when supporting neurodivergent learners. Managing challenging behaviours emerges as the most significant challenge, with 63.9% of educators identifying it as their most crucial professional difficulty. Emotional demands of the role rank second at 58.3%. Four areas show moderate challenge levels around 50-53%: lack of specialised training, insufficient resources and materials, understanding specific individual needs, and time constraints with workload. Communication with families presents a moderate challenge for 47.2% of educators. Lack of administrative support is the least commonly cited challenge at 33.3%, suggesting that while other systemic issues persist, administrative backing may be relatively adequate. Therefore, data indicate that behavioural management and emotional resilience are the primary areas where educators need support.

Educators' training needs

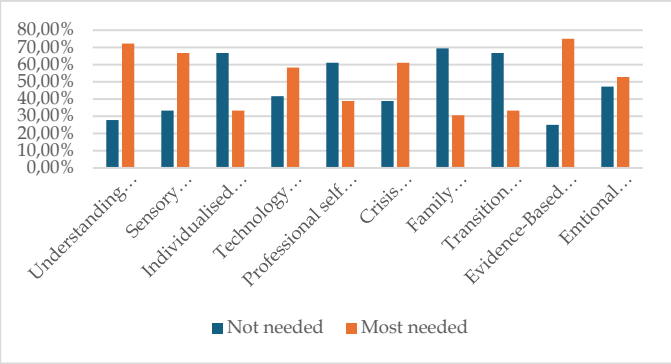

Figure 2: Educator training needs

Data reveals educators' training priorities, showing a clear hierarchy of needs. Evidence-based behavioural interventions emerge as the highest priority, with 75% identifying this as a top training need, followed closely by understanding different neurodevelopmental conditions, 72.2%. Sensory integration techniques rank third with 66.7% requesting this training, while crisis prevention and intervention (61.1%) and technology integration for learning (58.3%) rank second. Several areas show low training demand: family engagement and collaboration, professional self-care and stress management, individualised education plan development, transition planning, and life skills. These results indicate educators' prioritisation of practical and

immediate classroom intervention skills.

Preferred mode of training

The study results indicate educators strongly prefer active, experiential training formats over passive or theoretical approaches. Most educators rated practical hands-on sessions as most effective at 55.6%, followed by mentoring/coaching programmes at 52.8%. All other formats receive significantly lower effectiveness ratings: one-day workshops and weekly sessions (33.3% each), 3-day programmes and online modules (27.8%), hybrid approaches (22.2%), and theory-based presentations (19.4%). These clear patterns indicate educators want applied, personalised learning experiences rather than traditional lectures or comprehensive programmes, suggesting effective professional development should prioritise hands-on practice and ongoing mentorship over theoretical presentations.

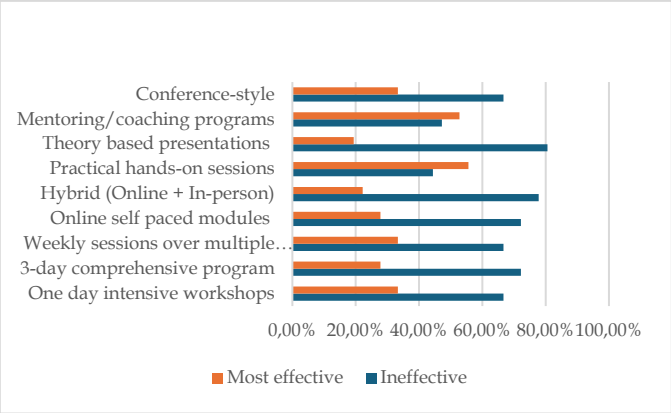

Figure 3: Preferred mode of training

VII. DISCUSSION

The adult learning theory highlights the significance of interactive teaching methods, self-guided learning, and life-oriented experiences to facilitate effective professional development (Bergkvist et al., 2023). An analysis of educators' self-reported knowledge levels across thirteen areas reflects the adult learning theory that effective professional development should build on what educators already know and have experienced. According to the adult learning theory, the common challenges create readiness to learn, as adults become motivated to learn when they experience specific needs in their practice (Papathanasiou, 2023). Educators' difference in curriculum perception (special school educators using DCAPS and mainstream school educators using the CAPS) demonstrates how contextual factors may influence learning needs and professional development requirements. Their preference for practical, hands-on training sessions over theoretical presentations demonstrates the adult learning principle of problem-centred orientation (Papathanasiou, 2023), where adult learners seek immediate applicable solutions to their real experiences in the classroom, supporting neurodivergent learners in the classroom.

Educator professional development initiatives are critical components in the South African education system reforms since the end of apartheid. Initial policies sought to enhance educators' ability to make independent decisions, based on school contexts and learners' needs (Bertram & Mxenge, 2023). However, the focus is currently on monitoring learners' academic support and well-being and educators' work management (Bertram & Mxenge, 2023). Frameworks such as the National Policy Framework for teacher education and development and the Integrated strategic planning framework for teacher education and development (Steyn, 2013) have been designed to assist educators in adapting to changing educational elements, including content, pedagogical knowledge, and social and cultural engagements (Marais et al., 2015). However, educators struggle to cope with the current trends in neuroscience and often lack tailored training to support neurodivergent learners, leading to challenges in implementing inclusive practices (Almakrob et al., 2024). In South Africa, many educators lack the skills to appropriately support neurodivergent learners (Masuku et al., 2023; Mavuso, 2022).

Furthermore, balancing curriculum standards with the individual needs of neurodivergent learners is a complex and ongoing challenge (Jones, 2017). Notable differences in curriculum perceptions between special school educators (using DCAPS) and mainstream educators (using CAPS) highlight the impact of contextual factors on shaping learning and professional growth needs. The priority for evidence-based behavioural interventions (75%) and understanding neurodevelopmental conditions (72.2%) shows that professional development should concentrate on practical skills, which can be immediately applied in supporting neurodivergent learners rather than broad theoretical knowledge on inclusive education. These findings align with (Boesch et al., 2025; Justus et al., 2025) who purport that training preferences that encompass practical strategies, mentorship, and address the specific needs to address specific challenges in supporting neurodivergent learners.

VIII. CONCLUSION

This study reveals the interconnectedness of educators' knowledge levels, knowledge gaps, and training recommendations for developing effective educator professional development initiatives to enhance their support for neurodivergent learners in mainstream and special schools. The findings indicate that educators' self-reported knowledge gaps relate directly to the most common professional challenges faced in interactions with neurodivergent learners and strongly influence their training preferences. The highest professional challenges are reported in behaviour management and emotional demands, which coincide with their moderate to basic knowledge levels in behavioural intervention techniques and emotional regulation support. Inclusive teaching methods emerge as the strongest knowledge area, with over half of educators rating themselves as having good to expert knowledge. However, educators may struggle to apply their knowledge of inclusive education to meet the diverse needs of neurodivergent learners. This is indicated by educators' identifying evidence-based behavioural interventions (75%) and understanding neurodevelopmental conditions (72%) as top training needs.

A paradigm shift in educator professional development is recommended. Effective professional development should begin with a comprehensive needs assessment to identify specific knowledge gaps, ensuring the educator training addresses the immediate, practical concerns of the educators. Focusing on an umbrella concept of inclusive education may leave educators' specific knowledge gaps unaddressed. Effective professional development should also prioritise hands-on, experiential learning opportunities for educators to practice new skills in supportive environments with ongoing mentoring and coaching support. Due to the advent of online teaching methods, most professional development initiatives are being conducted online. However, this has proved to be a cheaper way of delivering training and can accommodate larger numbers of respondents across diverse geographical contexts and educational settings. However, these online sessions are often ineffective as respondents may multitask during training, attending to other responsibilities while supposedly participating in training. Online sessions limit meaningful engagement with training content and restrict hands-on and experiential approaches that adult learning theory identifies as essential for effective professional development. Adult learners require active participation, immediate application of skills, and collaborative problem-solving opportunities that are difficult to replicate in virtual environments, particularly addressing sensitive issues like behavioural interventions, conceptualising neurodevelopmental conditions, and how to support the diverse needs of neurodivergent learners.

This study acknowledges several limitations that may affect the interpretation and generalisability of the findings. The use of convenience sampling limits the generalisability of this study as respondents were not randomly selected and may represent educators

more interested in professional development related to neurodiversity support. The sample size of 36 is relatively small and cannot represent the broader population of South African educators. The unequal distribution of resources across two educational contexts may skew the findings towards educators' perspectives in special schools. The study also faces contextual limitations as the data collection was confined to educators in specific contexts in South Africa, potentially missing educators' experiences across different provinces with varying resource allocation, policy implementation and educational contexts.

IX. CONFLICT OF INTEREST

There are no conflicts of interest in this article.

X. DATA AVAILABILITY STATEMENT

Data are available upon request.

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