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Research Priorities in Neuroeducation: Exploring the Views of Early Career Neuroscientists and Educators

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Abstract: The field of neuroeducation, which integrates neuroscience findings into educational practice, has gained significant attention in recent years. Establishing research priorities in neuroeducation is crucial for guiding future studies and ensuring that the field benefits both neuroscience and education. This study aimed to address the need for collaboration between neuroscientists and educators by conducting a priority-setting exercise with early career professionals from both fields. Using the nominal group technique (NGT) with interquartile range (IQR) analysis, we identified seven key priorities in neuroeducation and assessed the level of consensus on these priorities. The top-ranked priorities were "Emotional and Mental Well-being", "Neurodiversity and Special Education Needs", and "Active and Inclusive Teaching Methods", though IQR analysis revealed varying levels of consensus. Lower-ranked priorities, such as "Role of Technology on Learning and the Brain", showed a higher consensus. This discrepancy between ranking and consensus highlights the complex nature of neuroeducation, reflecting differing perspectives between neuroscientists and educators. These findings suggest the need for interdisciplinary collaboration to bridge these gaps and foster evidence-based practices. We recommend that future research focuses on the specific neural mechanisms underlying emotional well-being, strategies for supporting neurodivergent learners, and practical approaches to integrating inclusive teaching methods in diverse educational contexts.

Keywords: neuroeducation; research priorities; nominal group technique

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1. Introduction

How can teaching methods be adapted to address the diverse needs of individual students, including those with learning differences? What role does brain development play in shaping the learning experiences of students? Neuroeducation, also referred to as educational neuroscience, seeks to address such critical questions by integrating knowledge from multiple disciplines including neuroscience, psychology, and education [1]. It has gained significant attention in recent decades as researchers and educators attempt to leverage insights about the brain to improve educational methods and outcomes [2]. Before the rise of neuroimaging techniques in the 1990s, "good teaching" principles were predominantly based on observed behavior [3]. However, as neurotechnology advanced, the intersection of neuroscience and education began to attract growing interest, with a particular focus on understanding neurodevelopment, cognitive function, and learning, as well as applying these insights to teaching practices [4]. The golden age of brain research has contributed to neuroscience becoming a field of interest in numerous institutes and programs, promoting interdisciplinary collaboration among neuroscientists, psychologists, educators, and policymakers [5]. The emergence of this interdisciplinary approach can be traced back to Gaddes [6], who proposed that educators of children with special educational needs should receive neuropsychological training to better understand their students' unique requirements and complex challenges. Since then, the field has strived to integrate our understanding of the brain's workings into educational practices, leading to a more holistic approach that combines neuroscience and education to enhance teaching methods and outcomes [7].

In the last decade, the field's popularity has led to a surge in programs, workshops, certificates, and degrees aimed at bridging the gap between neuroscience research and education [8,9]. Their primary goal is to apply the latest discoveries from neuroscientific research to enhance educational outcomes in the classroom [5]. However, despite its promising potential, several challenges have hindered the widespread adoption of neuroeducation [4]. For instance, while there are proposed models of teaching practices and environments that theoretically would better support learning and development, the field currently lacks empirical evidence of improved educational outcomes from such practices. This is partially due to the challenges of the implementation and objective measurement of these models [10].

As such, there has been criticism of the growing literature focusing too much on the promise of neuroeducation despite a lack of empirical evidence [1]. Critics argue that while neurotechnology has opened new avenues in this field, much of the research is still focused on behavioral testing under the "brand" of neuroscience [11,12]. They also express concerns about the misuse of neuroscience in education-related commercial products and political agendas [13]. For example, some "brain-based learning" programs have made unsubstantiated claims about increasing intelligence or optimizing learning by targeting specific brain functions [14]. While the field clearly shows a need for practical applications, researchers advocate for staying cautious about over-simplifying, generalizing, or commercializing findings that lack empirical support [11].

Based on the criticism, the direct applicability of neuroscience findings to classroom practices might still seem to be a "bridge too far" [15], and attempts to build this bridge have been blamed for contributing to the rise of neuromyths— misconceptions about the brain—that lead to ineffective teaching practices [5,16–18]. Some prevalent neuromyths include the ideas that people only use 10% of their brain or that individuals require learning to be delivered in their specific learning styles, as well as various neurodevelopmental misconceptions [9,17]. While research suggests that educators are less susceptible to these neuromyths than laypeople [19], the concepts are still widespread among educators and have been shown to influence their teaching practices and decision making in the classroom [4,20].

Increasing neuroscientific literacy—an understanding of the basic principles of brain function, as well as the ability to critically evaluate neuroscientific claims and their potential applications in education—among educational professionals is crucial for the effective implementation of neuroeducation [4,13,19]. Promoting skills such as critical thinking, research literacy, and actively debunking common neuromyths might be helpful ways to combat misinformation [14]. However, while neuromyths are one of the most widely discussed problems in neuroeducation, the core challenges stem from the theoretical and practical barriers between the fields, such as having different goals, language misinterpretation, and the lack of time for the two disciplines to work together [21]. Additionally, the field must address common interdisciplinary challenges such as the need for effective communication and collaboration between teams [11]. To address these issues, it is essential to find common ground between neuroscientists' evidence-informed ideas and educators' practical experience of implementation feasibility. Identifying research priorities based on classroom needs, while remaining within the limits of neuroscience research, could bring us closer to developing much-needed practical yet evidence-based solutions.

Early career researchers and educators play a crucial role in shaping the future of research and education. They often bring fresh perspectives, innovative ideas, and a strong motivation to contribute to their fields [22]. Early career researchers tend to be highly motivated to share their work, fostering collaboration and knowledge dissemination within academic communities [23]. Similarly, early career educators are instrumental in implementing new curricula, promoting student-centered learning approaches, and contributing to school development initiatives [24]. Typically more adaptable to new methodologies and technologies, early career professionals are well-positioned to drive positive changes in research culture and educational practice, and their unique position at the intersection of established practices and emerging trends makes them valuable participants in research [25].

Recognizing this potential, our study aimed to bring together early career neuroscientists and educators to share their ideas and experiences. We sought to answer the following research question: What are the top research priorities in neuroeducation as defined by early career neuroscientists and educators, and how do these priorities differ between the two groups? Specifically, the aims were to (1) identify key priorities in neuroeducation, (2) assess the level of consensus on these priorities, and (3) foster dialogue between neuroscientists and educators to help bridge the gap between research and practice.

2. Materials and Methods

The nominal group technique (NGT) was used to elicit and prioritize research topics from the participants [26]. NGT is a structured method that facilitates the generation and ranking of ideas in a group setting. It was chosen for this study due to its effectiveness in generating and prioritizing ideas in small group settings, as it facilitates the rapid generation of a large number of ideas, followed by a structured prioritization process [26]. This approach might be particularly valuable in interdisciplinary fields such as neuroeducation, where participants from different backgrounds may have varying perspectives. The 2-h process involves the silent generation of research priorities by each participant, group sharing of priorities, clarification and consolidation of priorities, individual ranking of priorities, aggregation of individual rankings to determine the group's final priorities, and group discussion (Figure 1).

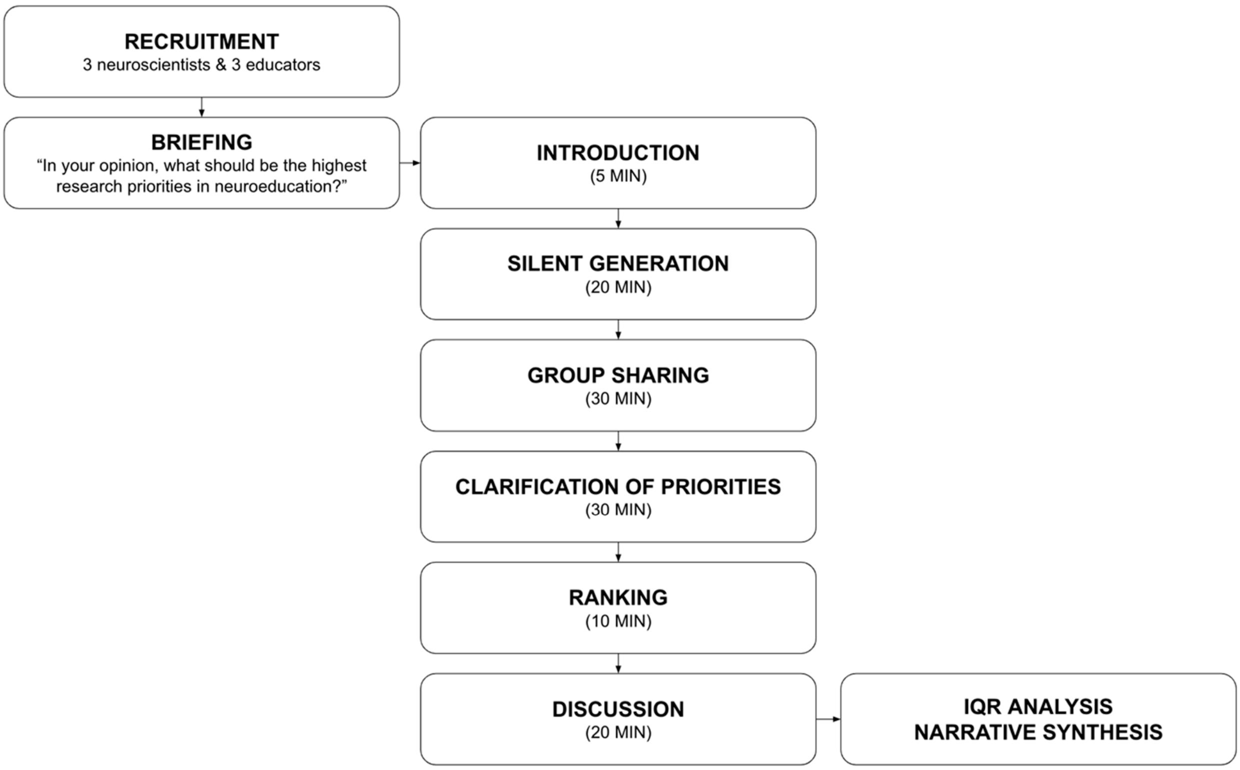

Figure 1. Nominal group technique flowchart.

The group session was hosted via Microsoft Teams and involved six early career participants, consisting of three neuroscientists (from either the commercial or academic sector) and three school-level teachers. This sample size is considered appropriate as the equal number of participants from each group (neuroscientists and educators) ensures a balanced representation of perspectives and priorities and is consistent with previous studies using NGT in healthcare and educational settings. For example, McMillan et al. [26] suggest that NGT is typically conducted with groups of 2–14 participants. To be eligible for the study, all participants had to have completed a postgraduate neuroscience or education qualification within the past five years and be aged 18 years or above. The exclusion criteria included individuals who are not currently employed in a neuroscience-related field or as a school-level teacher, who have a conflict of interest related to the research topic, or who are not fluent in English, as the NGT session and all study materials were presented in English.

The study was advertised via email and social media, providing potential participants with a brief overview. The recruitment of early career educators was also conducted through the alumni group associated with the PGCE teacher training program at King's College London. Interested individuals were asked to complete a short online form or questionnaire, collecting information about their educational background, current employment, and relevant experience. The inclusion criteria for participation in the study required participants to be early career professionals in neuroscience or education. Early career neuroscientists were defined as individuals who had completed a postgraduate neuroscience qualification (e.g., MSc or PhD) within the past five years and were currently employed in either the commercial or academic sector. Early career educators were defined as individuals who had completed a postgraduate education qualification (e.g., PGCE) within the past five years and were currently employed as school-level teachers. Participants who met the inclusion criteria were sent a formal invitation to participate in the study, along with a participant information sheet and consent form. The study was approved by the King's College London Research Ethics Committee (MRA-23/24-42487).

To assess the level of consensus among participants, the interquartile range (IQR) was calculated for each priority. The IQR is a measure of statistical dispersion, representing the difference between the 75th and 25th percentiles of the data [27]. An IQR of 1 or less on a 4- or 5-point Likert scale typically indicates a high level of consensus [28,29]. In this study, we used a 7-point ranking scale, where 1 is the highest priority and 7 is the lowest. Given this scale, an IQR of 0.75 indicates high consensus, as 50% of the rankings fall within less than one rank of each other. An IQR between 1 and 2 suggests moderate consensus, while an IQR above 2 indicates low consensus. This metric was calculated to provide an objective measure of the agreement among participants.

NGT is specifically designed to mitigate biases by using a structured, round-robin approach that ensures equal participation and idea generation from all participants, minimizing dominance by any single participant, thus enhancing the reliability of the data collected. In addition, several steps were taken to further minimize potential biases. The study was facilitated by one researcher (A.L.), while another (H.C.W.) took detailed notes and a third researcher (P.K.) observed the session to monitor for any potential bias in facilitation. After the initial pass of data analysis by (A.L), a meeting was held with (H.C.W.) and (P.K.) to compare notes, expand on findings, and make changes where necessary. A fourth researcher (E.J.D.) independently reviewed the data and provided alternative explanations to challenge any assumptions that may have arisen during the analysis. Finally, all researchers involved in the study contributed to the final draft to eliminate any remaining biases.

3. Results

A total of 42 discrete ideas were collected following the silent generation phase, which were recorded on a shared whiteboard for further discussion and clarification (Figure 2).

Neuroscientists (Ns) and educators (Es) presented different ideas that reflected their unique perspectives (Supplementary Materials S2). N1 emphasized the importance of "emotional resilience", suggesting research into how emotional outcomes impact learning is important. E1 proposed exploring "short intense learning periods" akin to high-intensity interval training for cognitive tasks, which focused more on practical applications in classroom settings. N3 introduced the idea of investigating the cognitive effects of hormonal changes during adolescence, while E2 focused on mental health and stress-related issues in secondary school students and their impact on learning and memory. N2 discussed individual differences in learning, influenced by genetic, developmental, and environmental factors, and E3 suggested further research into the effectiveness of teacher-led instruction versus more student-centered approaches.

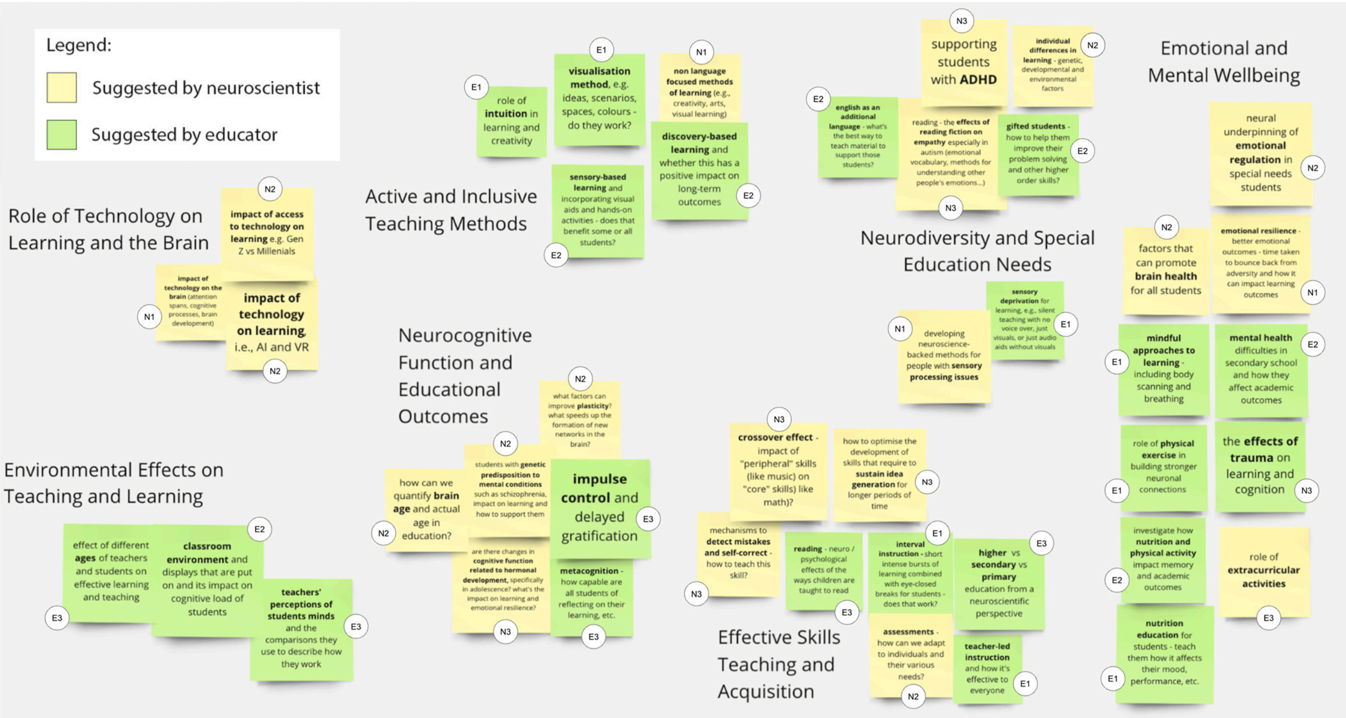

Figure 2. Ideas generated during the nominal technique group session.

The diversity of these contributions highlighted the interdisciplinary nature of the group, covering both neuroscientific and educational perspectives. For instance, E3 remarked "whether explicit teaching is more beneficial for some students than others is crucial to understand", pointing to a practical concern in educational methods. On the other hand, N3 stressed that "understanding cognitive changes related to hormonal developments in adolescents could greatly enhance tailored educational strategies". These illustrate the educators' relative focus on practical teaching methods and the neuroscientists' interest in underlying cognitive mechanisms. The clarification and discussion led to a round-robin iterative categorization process, where participants collaboratively identified overlaps and grouped similar ideas.

The group consolidated the 42 ideas into seven thematic categories, which participants were asked to rank based on their perceived importance (Supplementary Materials S1). The overall rankings and the corresponding interquartile ranges (IQRs) are presented in Table 1. The identification of these priorities reflects the focus of early career professionals on issues related to mental health, inclusive education, and practical teaching methods, areas that are critical to advancing neuroeducation research (Aim 1).

The IQR analysis revealed varying levels of consensus among participants for different priority areas, providing a more nuanced understanding of agreement levels beyond the simple rank order (Aim 2). Notably, while some priorities received high overall rankings, they did not necessarily demonstrate a strong consensus as indicated by their IQRs. The priorities with the highest level of consensus (IQR = 0.75) were the *Role of Technology on Learning and the Brain*, the *Relationship Between Neurocognitive Function and Factors Relevant to Educational Outcomes*, and *Environmental Effects on Teaching and Learning*. This suggests that while these areas may not have been ranked as the highest priorities overall, there was strong agreement among participants about their relative importance. Conversely, the top-ranked priorities showed less consensus, with *Emotional and Mental Well-being* and *Neurodiversity and Special Education Needs* both having an IQR of 2.25, and *Active and Inclusive Teaching Methods* having the highest IQR of 3.5. This indicates a wider range of opinions among participants regarding the importance of these areas, despite their high overall rankings. For instance, neuroscientists tended to rank *Neurodiversity and Special Education Needs* higher than educators, while educators seemed to prioritize *Effective Skills Teaching and Acquisition* more highly (Supplementary Materials S1). However, it is important to note that these subgroup differences should be interpreted cautiously due to the small sample size.

Table 1. Top priorities in neuroeducation research.

Rank	Neuroeducation Research Priority	IQR
1	Emotional and Mental Well-being	2.25
2	Neurodiversity and Special Education Needs	2.25
3	Active and Inclusive Teaching Methods	3.50
4	Role of Technology on Learning and the Brain	0.75
5	Relationship Between Neurocognitive Function and Factors Relevant to Educational Outcomes	0.75
5	Effective Skills Teaching and Acquisition	2.75
6	Environmental Effects on Teaching and Learning	0.75

More importantly, the IQR analysis reveals a more complex picture of consensus among all participants. *Emotional and Mental Well-being* and *Neurodiversity and Special Education Needs* were ranked first and second overall, but both had an IQR of 2.25, indicating a lack of strong consensus. *Active and Inclusive Teaching Methods* ranked third but had the highest IQR of 3.5, suggesting the widest range of opinions among participants. The priorities with the strongest consensus (IQR = 0.75) were *Role of Technology on Learning and the Brain*, *Relationship Between Neurocognitive Function and Factors Relevant to Educational Outcomes*, and *Environmental Effects on Teaching and Learning*, despite their lower overall rankings. This discrepancy between overall ranking and level of consensus highlights the complexity of prioritizing research areas in neuroeducation.

While neuroscientists emphasized the importance of understanding underlying cognitive and emotional mechanisms, educators were more concerned with the practical application of these insights to improve teaching methods and support student well-being. The differences between the top priorities of neuroscientists and educators reflect the distinct professional focuses of each group. For instance, in our small sample, educators seemed to place a higher emphasis on the immediate application of neurocognitive research to educational outcomes, though larger studies would be needed to confirm this trend. E1 commented, “Understanding the brain’s response to learning strategies is crucial for improving educational practices”, highlighting the practical importance of applying scientific findings directly to classroom techniques. This perspective was mirrored in other educators’ priorities, suggesting an interest in innovative teaching methods that are directly informed by neuroscientific research.

During the ranking phase, N1 highlighted the increasing importance of mental health in education, stating “There has been a rise in mental illness, especially since COVID-19, impacting students’ ability to focus and learn”. This concern for student well-being was a common theme among both neuroscientists and educators. E2 noted, “The mental health of our students is paramount. We have seen a significant increase in social, emotional, and mental health needs, particularly in younger students entering secondary school”. These observations suggest a critical need for neuroeducation research focused on emotional and mental well-being to support students’ overall educational experience. Furthermore, N3 stated, “An increased focus on neurodiversity is crucial for broadening our understanding of human cognition and enhancing educational strategies for all students”. This perspective was supported by E1, who discussed the practical applications of such research in classroom settings: "Incorporating physical exercises and mindfulness practices can greatly benefit students with various special educational needs by improving their focus and cognitive function".

The discussion during the ranking phase highlighted the potential practical implications of these neuroeducation research priorities (Supplementary Materials S2). Educators such as E3 highlighted the importance of active and inclusive teaching methods, remarking, "Innovative teaching methods can bridge gaps and make learning more accessible to all students, including those with special needs". This sentiment was echoed by E2, who commented on discovery-based learning and hands-on activities: "Incorporating more interactive and sensory-based learning activities can significantly enhance students' understanding and retention, making education more inclusive". This collaborative ranking allowed for the production of a well-rounded list of priorities highlighting the interdisciplinary nature of neuroeducation and fostered a rich dialogue between neuroscientists and educators, allowing for the exchange of ideas that bridged the gap between research and practice (Aim 3).

4. Discussion

This study aimed to identify the research priorities in neuroeducation as defined by early career neuroscientists and educators. Through the nominal group technique (NGT), we identified seven key priority areas. Interestingly, while the overall rankings highlighted *Emotional and Mental Well-being*, *Neurodiversity and Special Education Needs*, and *Active and Inclusive Teaching Methods* as the top three priorities, the interquartile range (IQR) analysis revealed varying levels of consensus among participants. The fact that some lower-ranked priorities, such as *Role of Technology on Learning and the Brain* (ranked 4th, IQR = 0.75), showed a higher consensus than top-ranked priorities, such as *Emotional and Mental Well-being* (ranked 1st, IQR = 2.25), suggests that while there is agreement on the importance of certain foundational aspects of neuroeducation, there is still considerable debate about which emerging areas should take precedence. This could reflect the interdisciplinary nature of the field, where different expertise and perspectives lead to varying priorities. It also highlights areas where more dialogue and research may be needed to build consensus.

The prominence of *Emotional and Mental Well-being* as a top priority reflects a growing recognition of its importance in educational settings, where the role of mental health has been increasingly recognized in recent years [30]. Research has shown that students' emotional states can significantly impact their ability to learn, interact with information, and perform academically [31,32]. However, while the importance of this area is acknowledged by most practitioners, there is still a need for more targeted research to understand the specific mechanisms by which emotional and mental well-being can affect learning outcomes so that evidence-based interventions can be developed. Ideas for further research grouped under this theme included the neural underpinnings of emotional regulation, emotional resilience and its impact on learning outcomes, mental health difficulties and their effects on academic performance, the impact of trauma on learning and cognition, and the role of extracurricular activities. This broad range of topics highlights the complex interplay between emotional well-being and educational outcomes. While previous studies have focused on general social–emotional learning programs [30], our participants called for research into the more specific neural mechanisms underlying emotional well–being, with the need for neuroscience to directly inform practical interventions. The divergence in the consensus level (IQR = 2.25) suggests ongoing debate within the field, which may be due to differing disciplinary perspectives on how best to approach these issues.

The second priority, *Neurodiversity and Special Education Needs*, suggests an interest in addressing the needs of neurodivergent students and developing effective support strategies for all students. This theme included ideas such as supporting students with attention deficit hyperactivity disorder (ADHD), understanding individual differences in learning (including genetic, developmental, and environmental factors), addressing sensory processing issues, catering to gifted students, and exploring the effects of reading fiction on empathy, particularly in autism, where this could help with the acquisition of emotional vocabulary and methods for understanding other people's emotions. While our small sample size precludes definitive conclusions, there was an indication that neuroscientists might prioritize this area more highly than educators. This difference might reflect neuroscientists' greater awareness of the neurological basis of learning differences and the potential for targeted interventions based on neuroscientific research [33]. If confirmed by larger studies, this could suggest an opportunity to bridge potential gaps between neuroscientific insights and classroom applications [34]. In addition, unlike much of the existing literature which often focuses on specific neurodevelopmental conditions [33], our study revealed a broader range of neurodiversity-related research interests, such as the role of sensory-processing issues. These findings suggest that early career professionals are particularly interested in applying neuroscientific insights to a wider array of neurodivergent traits. Additionally, as neuroscientists in our study tended to prioritize this area more highly than educators, this echoes findings that suggest that educators may prioritize immediate classroom challenges over deeper neuroscientific research into cognitive diversity [5].

Active and Inclusive Teaching Methods was ranked as the third priority in our study. Participants proposed investigating a range of approaches including visualization techniques, non-language-focused methods of learning (e.g., creativity, arts, visual learning), discovery-based learning, sensory-based learning, and leveraging intuition in learning and creativity. These suggestions align with the existing research on multisensory and active learning approaches showing their positive impact on student engagement and learning outcomes [35]. For instance, the use of visual aids and hands-on activities has been shown to benefit students with diverse learning styles and needs [36]. Similarly, discovery-based learning approaches have been associated with improved long-term retention and transfer of knowledge [37]. The emphasis on these methods reflects a growing recognition of the need for inclusive teaching strategies that can accommodate the varied learning needs of students in modern classrooms. Our findings also highlight a practical focus unique to early career educators, as participants emphasized the importance of applying creativity and intuition in learning, which contrasts with the more theoretical approaches often emphasized in neuroscience research. This distinction suggests a gap between theoretical research and practical application in classrooms, highlighting the need for further investigation. The high IQR of 3.5 reflects the diversity of opinions on these topics, pointing to the ongoing debate about how best to implement them in different educational settings. Overall, these findings indicate that researchers and practitioners see a need for further investigation in these areas within the context of neuroeducation.

Other priorities identified in the study included the *Role of Technology on Learning and the Brain*, *Effective Skills Teaching and Acquisition*, the *Relationship Between Neurocognitive Function and Factors Relevant to Educational Outcomes*, and *Environmental Effects on Teaching and Learning*. Effective skills teaching and acquisition remains a fundamental concern in education, with ongoing research needed to identify optimal methods for developing various cognitive and academic skills [38]. The relationship between neurocognitive function and educational outcomes is a core focus of neuroeducation, requiring continued investigation to translate neuroscientific findings into practical educational strategies [39]. Finally, the impact of environmental factors on teaching and learning acknowledges the crucial role that physical and social environments play in shaping educational experiences and outcomes [40].

The *Role of Technology on Learning and the Brain* emerged as an area of interest in our study, with some indications of differing perspectives between the neuroscientists and educators in our small sample, which aligns with broader discussions in the literature about the role of technology in education. The importance of technology in education has grown particularly in light of recent global events that have accelerated the adoption of digital learning tools [41]. Previous research has explored how neuroscientists and educators might approach technology in learning contexts from different perspectives [42,43]. Our findings merely suggest that the role of technology in learning and its impact on the brain could be an area worthy of further investigation in neuroeducation. Larger-scale studies might also explore whether there are indeed systematic differences in how neuroscientists and educators prioritize technology in learning and, if so, what factors contribute to these differences.

Overall, the study revealed variations in rankings between the neuroscientists and educators in a small sample, which may offer preliminary insights into the current state of neuroeducation research and practice. While both groups appeared to prioritize emotional and mental well-being, there were indications of potential divergence on other priorities. For instance, the educators in our study seemed to favor areas with immediate classroom applications, such as effective skills teaching and active teaching methods. In contrast, neuroscientists appeared to place higher emphasis on areas like neurodiversity and technology. These potential differences, if confirmed by larger studies, could reflect varying professional focuses and suggest that further collaboration is needed to build upon this study and foster continuous dialogue and collaboration between researchers and practitioners in the field of neuroeducation [2].

The lack of strong consensus on the top-ranked priorities, as indicated by their higher IQR values, might stem from the interdisciplinary nature of neuroeducation, where professionals from different backgrounds may have varying perspectives on what constitutes the most pressing issues. It could also reflect the rapidly evolving nature of the field, where emerging research continually shifts perceived priorities. This lack of consensus suggests a need for more interdisciplinary dialogue and collaborative research to build a shared understanding of these critical areas. It also highlights the importance of considering both ranking and consensus when setting research agendas in neuroeducation. While high-ranked priorities such as *Emotional and Mental Well-being* highlight areas of perceived importance, high-consensus priorities such as the *Role of Technology on Learning and the Brain* represent areas where interdisciplinary agreement might facilitate immediate progress. Educators could benefit from professional development that combines insights from both sets of priorities, for instance, learning to use technology to support students' emotional well-being or to accommodate neurodiversity in the classroom.

While focusing on early career researchers and educators offers valuable insights, this approach has potential limitations. The experiences and perspectives may not fully represent the broader academic community [44]. Early career professionals often face unique challenges, such as job insecurity and pressure to establish themselves, which could influence their responses [45]. Additionally, their limited experience might result in a narrower view of long-term trends and systemic issues in research and education [46]. Future studies might benefit from a comparative approach, including mid-career and senior professionals to provide a more comprehensive understanding of the neuroeducation landscape. In addition, while we confirmed the participants' status as school-level teachers, we did not specifically collect data on the grade levels they taught. This may have influenced their research priorities, as concerns and priorities in neuroeducation can vary significantly depending on whether teachers are working with younger children (elementary level) or older students (secondary level). Future research should consider collecting detailed information on teaching grade levels to better understand how teaching context influences research priorities.

Although the NGT proved to be an efficient and effective method for this study and the whiteboard approach facilitated easy tracking of ideas and groupings by ensuring all participants could contribute and follow the process, the technique has some limitations. Challenges arose in categorizing research priorities due to overlaps and differing opinions on groupings. The limited discussion time may have also constrained participants' ability to fully align their understanding of each group's representation or to critique others' ideas effectively, which may have contributed to the lack of consensus. In addition, it is important to note the limitations imposed by the small sample size (n = 6). With only three participants from each subgroup (educators and neuroscientists), individual opinions can have a disproportionate effect on the results. This limits the generalizability of the findings and means that any differences observed between subgroups should be interpreted with caution. Future studies with larger sample sizes are needed to confirm and expand upon these preliminary findings. These limitations mean that while our findings provide valuable insights into potential research priorities in neuroeducation, they should be viewed as preliminary.

By comparing the perspectives of early career neuroscientists and educators, this study contributes to a better understanding of the needs and expectations of both researchers and practitioners in the field of neuroeducation. The findings can inform future research directions and facilitate more effective collaboration between neuroscience and education. Further research should address these limitations by conducting further focus groups to discuss the identified priorities in more depth and larger-scale studies, potentially using Delphi methods to provide more robust rankings and consensus. Future studies should also consider including a more diverse range of participants in terms of experience levels and educational contexts. This could involve expanding the scope to include educators from various levels, such as those involved in adult education and vocational training, which could provide a more comprehensive view of neuroeducation priorities across the lifespan and reveal how research priorities might shift across different career stages and educational settings, potentially uncovering new areas of focus for neuroeducation research. As the field of neuroeducation continues to evolve, exploring and addressing these research priorities will be crucial in developing evidence-based practices that can significantly enhance teaching and learning outcomes for all students.

5. Conclusions

This study identified and ranked key research priorities in neuroeducation as defined by early career neuroscientists and educators. The analysis revealed a diverse set of priorities with varying levels of consensus. While "Emotional and Mental Well-being", "Neurodiversity and Special Education Needs", and "Active and Inclusive Teaching Methods" emerged as the top-ranked priorities, the interquartile range analysis indicated a lower consensus in these areas. Conversely, some lower-ranked priorities such as "Role of Technology on Learning and the Brain" showed a higher consensus. This discrepancy between ranking and consensus highlights the multifaceted nature of neuroeducation and the diverse perspectives within the field. Based on our findings, we recommend that future research in neuroeducation focuses on several key areas. First, there is a need for more targeted studies exploring the specific neural mechanisms underlying emotional and mental well-being, as this was identified as a high-priority area with a lower consensus. Further research could also explore how neuroscientific insights can inform practical interventions in the classroom, particularly in addressing mental health challenges. In the area of neurodiversity, we suggest more collaborative research efforts between neuroscientists and educators to develop strategies that can accommodate a wider array of neurodivergent traits, such as sensory-processing issues, and address the distinct needs of neurodiverse learners. Finally, research on the integration of active and inclusive teaching methods, including multisensory learning approaches, should continue to investigate the best ways to apply these strategies across diverse educational contexts. This study suggests the need for enhanced collaboration and communication between neuroscientists and educators to address varying perspectives and build on points of consensus. As the field of neuroeducation continues to evolve, addressing these research priorities while remaining mindful of the varying levels of agreement can guide the development of evidence-based strategies that integrate insights from neuroscience, psychology, and education to enhance learning outcomes for all students, ultimately contributing to more inclusive educational environments.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/educsci14101117/s1, Supplementary Materials S1: Nominal group technique raw ratings for neuroscientists (Ns) and educators (Es) as well as the overall ratings; Supplementary Materials S2: Nominal group technique session transcript.

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Data Availability Statement: The original contributions presented in this study are included in the article and Supplementary Materials; further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Thomas, M.S.C.; Ansari, D.; Knowland, V.C.P. Annual Research Review: Educational neuroscience: Progress and prospects. *J. Child Psychol. Psychiatry Allied Discip.* **2019**, *60*, 477–492. [CrossRef] [PubMed]
2. Ansari, D.; Coch, D.; Smedt, B. Connecting Education and Cognitive Neuroscience: Where will the journey take us? *Educ. Philos. Theory* **2011**, *43*, 37–42. [CrossRef]
3. Fuller, J.K.; Glendening, J.G. The neuroeducator: Professional of the future. *Theory Into Pract.* **1985**, *24*, 135–137. [CrossRef]
4. Jolles, J.; Jolles, D.D. On Neuroeducation: Why and How to Improve Neuroscientific Literacy in Educational Professionals. *Front. Psychol.* **2021**, *12*, 752151. [CrossRef]
5. Feiler, J.B.; Stabio, M.E. Three pillars of educational neuroscience from three decades of literature. *Trends Neurosci. Educ.* **2018**, *13*, 17–25. [CrossRef]
6. Gaddes, W.H. A Neuropsychological Approach to Learning Disorders. *J. Learn. Disabil.* **1968**, *1*, 523–534. [CrossRef]
7. Gola, G.; Angioletti, L.; Cassioli, F.; Balconi, M. The Teaching Brain: Beyond the Science of Teaching and Educational Neuroscience. *Front. Psychol.* **2022**, *13*, 823832. [CrossRef]
8. Dubinsky, J.M.; Guzey, S.S.; Schwartz, M.S.; Roehrig, G.; MacNabb, C.; Schmied, A.; Hinesley, V.; Hoelscher, M.; Michlin, M.; Schmitt, L.; et al. Contributions of Neuroscience Knowledge to Teachers and Their Practice. *Neuroscientist* **2019**, *25*, 394–407. [CrossRef]
9. Howard-Jones, P.A. Neuroscience and education: Myths and messages. *Nat. Rev. Neurosci.* **2014**, *15*, 817–824. [CrossRef]
10. Zadina, J.N. The Synergy Zone: Connecting the Mind, Brain, and Heart for the Ideal Classroom Learning Environment. *Brain Sci.* **2023**, *13*, 1314. [CrossRef]
11. Dougherty, M.R.; Robey, A. Neuroscience and education: A bridge astray? *Curr. Dir. Psychol. Sci.* **2018**, *27*, 401–406. [CrossRef]
12. Scurich, N.; Shniderman, A. The selective allure of neuroscientific explanations. *PLoS ONE* **2014**, *9*, 107529. [CrossRef] [PubMed]
13. Hruby, G.G. Three requirements for justifying an educational neuroscience. *Br. J. Educ. Psychol.* **2012**, *82 Pt 1*, 1–23. [CrossRef] [PubMed]
14. Busso, D.S.; Pollack, C. No brain left behind: Consequences of neuroscience discourse for education. *Learn. Media Technol.* **2014**, *40*, 168–186. [CrossRef]
15. Bruer, J.T. Education and the Brain: A Bridge Too Far. *Sage J.* **1997**, *26*, 4–16. [CrossRef]
16. Dekker, S.; Lee, N.C.; Howard-Jones, P.; Jolles, J. Neuromyths in Education: Prevalence and Predictors of Misconceptions among Teachers. *Front. Psychol.* **2012**, *3*, 429. [CrossRef]
17. Grospietsch, F.; Lins, I. Review on the Prevalence and Persistence of Neuromyths in Education—Where We Stand and What Is Still Needed. *Front. Educ.* **2021**, *6*, 665752. [CrossRef]
18. Torrijos-Muelas, M.; González-Víllora, S.; Bodoque-Osma, A.R. The Persistence of Neuromyths in the Educational Settings: A Systematic Review. *Front. Psychol.* **2021**, *11*, 591923. [CrossRef]
19. Bei, E.; Argiropoulos, D.; Herwegen, J.; Incognito, O.; Menichetti, L.; Tarchi, C.; Pecini, C. Neuromyths: Misconceptions about neurodevelopment by Italian teachers. *Trends Neurosci. Educ.* **2024**, *34*, 100219. [CrossRef]
20. Macdonald, K.; Germine, L.; Anderson, A.; Christodoulou, J.; McGrath, L.M. Dispelling the Myth: Training in Education or Neuroscience Decreases but Does Not Eliminate Beliefs in Neuromyths. *Front. Psychol.* **2017**, *8*, 1314. [CrossRef]
21. Devonshire, I.M.; Dommett, E.J. Neuroscience: Viable Applications in Education? *Neuroscientist* **2010**, *16*, 349–356. [CrossRef] [PubMed]

22. Kent, B.A.; Holman, C.; Amoako, E.; Antonietti, A.; Azam, J.M.; Ballhausen, H.; Weissgerber, T.L. Recommendations for empowering early career researchers to improve research culture and practice. *PLoS Biol.* **2022**, *20*, 3001680. [CrossRef]
23. Merga, M.; Mason, S. Early career researchers' perceptions of the benefits and challenges of sharing research with academic and non-academic end-users. *High. Educ. Res. Dev.* **2021**, *40*, 1482–1496. [CrossRef]
24. Antonsen, Y.; Aspfors, J.; Maxwell, G. Early career teachers' role in school development and professional learning. *Prof. Dev. Educ.* **2024**, *50*, 460–473. [CrossRef]
25. Hemmings, B.; Kay, R. Research self-efficacy, publication output, and early career development. *Int. J. Educ. Manag.* **2010**, *24*, 562–574. [CrossRef]
26. McMillan, S.S.; King, M.; Tully, M.P. How to use the nominal group and Delphi techniques. *Int. J. Clin. Pharm.* **2016**, *38*, 655–662. [CrossRef]
27. Scheibe, M.; Skutsch, M.; Schofer, J.IV.C. Experiments in Delphi methodology. In *The Delphi Method: Techniques and Applications*; Linstone, H.A., Turoff, M., Eds.; Addison-Wesley: Boston, MA, USA, 2002; pp. 257–281.
28. Raskin, M.S. The Delphi study in field instruction revisited: Expert consensus on issues and research priorities. *J. Soc. Work Educ.* **1994**, *30*, 75–89. [CrossRef]
29. Rayens, M.K.; Hahn, E.J. Building consensus using the policy Delphi method. *Policy Politics Nurs. Pract.* **2000**, *1*, 308–315. [CrossRef]
30. Durlak, J.A.; Weissberg, R.P.; Dymnicki, A.B.; Taylor, R.D.; Schellinger, K.B. The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Dev.* **2011**, *82*, 405–432. [CrossRef]
31. Immordino-Yang, M.H.; Damasio, A. We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind Brain Educ.* **2007**, *1*, 3–10. [CrossRef]
32. Immordino-Yang, M.H.; Darling-Hammond, L.; Krone, C. *The Brain Basis for Integrated Social, Emotional, and Academic Development: How Emotions and Social Relationships Drive Learning*; The Aspen Institute National Commission on Social, Emotional, and Academic Development: Washington, DC, USA, 2018.
33. Butterworth, B.; Kovas, Y. Understanding neurocognitive developmental disorders can improve education for all. *Science* **2013**, *340*, 300–305. [CrossRef] [PubMed]
34. Goswami, U. Neuroscience and education: From research to practice? *Nat. Rev. Neurosci.* **2006**, *7*, 406–413. [CrossRef]
35. Shams, L.; Seitz, A.R. Benefits of multisensory learning. *Trends Cogn. Sci.* **2008**, *12*, 411–417. [CrossRef]
36. Mayer, R.E. Multimedia instruction. In *Handbook of Research on Educational Communications and Technology*; Springer Science & Business Media: Berlin, Germany, 2014; pp. 385–399.
37. Alfieri, L.; Brooks, P.J.; Aldrich, N.J.; Tenenbaum, H.R. Does discovery-based instruction enhance learning? *J. Educ. Psychol.* **2011**, *103*, 1. [CrossRef]
38. Hattie, J.A.; Donoghue, G.M. Learning strategies: A synthesis and conceptual model. *npj Sci. Learn.* **2016**, *1*, 16013. [CrossRef]
39. Sigman, M.; Peña, M.; Goldin, A.P.; Ribeiro, S. Neuroscience and education: Prime time to build the bridge. *Nat. Neurosci.* **2014**, *17*, 497–502. [CrossRef]
40. Barrett, P.; Davies, F.; Zhang, Y.; Barrett, L. The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Build. Environ.* **2015**, *89*, 118–133. [CrossRef]
41. Williamson, B.; Eynon, R.; Potter, J. Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. *Learn. Media Technol.* **2020**, *45*, 107–114. [CrossRef]
42. Howard-Jones, P.A.; Varma, S.; Ansari, D.; Butterworth, B.; Smedt, B.; Goswami, U.; Laurillard, D.; Thomas, M.S. The principles and practices of educational neuroscience: Comment on Bowers (2016). *Psychol. Rev.* **2016**, *123*, 620–627. [CrossRef]
43. Selwyn, N. *Is Technology Good for Education?* John Wiley & Sons: Hoboken, NJ, USA, 2016.
44. Sutherland, K.A. Constructions of success in academia: An early career perspective. *Stud. High. Educ.* **2017**, *42*, 743–759. [CrossRef]
45. Bosanquet, A.; Mailey, A.; Matthews, K.E.; Lodge, J.M. Redefining 'early career' in academia: A collective narrative approach. *High. Educ. Res. Dev.* **2017**, *36*, 890–902. [CrossRef]
46. Brownell, S.E.; Tanner, K.D. Barriers to faculty pedagogical change: Lack of training, time, incentives, and…tensions with professional identity? *CBE—Life Sci. Educ.* **2012**, *11*, 339–346. [CrossRef] [PubMed]