



Responding to neurodiversity in the education context:

An integrative literature review

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Executive Summary

Introduction

The New Zealand Ministry of Education is committed to developing a more comprehensive understanding of the evidence base related to the learning support required by students labelled as neurodiverse. This report presents findings of an integrative literature review designed as one response to the fourth of the strategic priorities articulated in the New Zealand Learning Support Action Plan 2019 – 2025: providing additional, more flexible support for neurodiverse children and young people. The review explored research and other resources in an attempt to identify any new or innovative strategies or approaches to neurodiversity with the potential to be implemented in primary and secondary school contexts in Aotearoa New Zealand. As highlighted in the Action Plan, there is an identified need to locate examples of practical strategies and innovative methods reported as being effective in supporting this large group of diverse students. The findings of the review directly respond to the Action Plan's goal of building teacher confidence and capability, by providing information that can inform and enhance teaching practice with neurodiverse students.

Terminology

As a starting point, it should not be assumed that there is widespread understanding of the term neurodiversity, nor that it is the only term used to describe the group of students who are the focus of this review. It is important to be clear that neurodiversity is not a diagnosis, rather it is a broad term used to encompass a wide range of specific, non-specific, hidden and/or undetermined diagnoses that include but may not be limited to: Learning (intellectual) and/or Developmental Disability (ID/DD); Communication Disorders (CD), autism or Autism Spectrum Disorder (ASD), Attention Deficit/Hyperactivity Disorder (ADHD); Specific Learning Disorders (SLD); Traumatic Brain Injury (TBI); and or Foetal Alcohol Syndrome Disorders (FASD).

The Learning Support Action Plan defines neurodiversity as:

Neurodisability is a broad term that includes (but is not limited to) dyslexia, dyspraxia, dyscalculia, dysgraphia, autism spectrum disorder, foetal alcohol spectrum disorder, attention deficit/hyperactivity disorder, trauma related disorders, and auditory visual processing disorders. It is a challenging concept because it encompasses needs across a wide spectrum of degree and intensity, and can be complicated further when children and young people are 'twice-exceptional' (by having more than one condition), making it difficult to understand and respond to their needs (Ministry of Education, 2019, p.32).

Method

An integrative literature review methodology (Whittemore & Khafli, 2005) was implemented for the purposes of this project. Integrative literature reviews combine data from both theoretical and empirical literature with the goal of determining practical solutions (Torraco, 2005). Integrative literature reviews allow a diverse range of literature, including both quantitative and qualitative academic studies, and other 'grey' literature such as reports, policy, and opinion pieces (Ganong, 1987).

Defined search terms, inclusion and exclusion criteria for selection of research, and specific processes by which articles were assessed, interpreted and synthesised were implemented. Data generated through this process were then analysed thematically. Following the thematic analysis of academic articles, a google search was conducted for online resources to supplement the evidence-based approaches outlined in our review. The resources identified were consistent with the selection criteria used in our systematic review.

Findings

Through a systematic process of identifying educational research with the potential to inform easily implemented, low cost, flexible supports for neurodiverse students in New Zealand primary and secondary schools, five key themes were exposed: prioritising and valuing relationships; developing agency; supporting students to understand and manage their own behaviour; creating inclusive environments; and embedding inclusive teaching strategies

Prioritising and valuing relationships

The theme prioritising and valuing relationships was found to be prominent within and across all of the research relating to neurodiverse students in the education context. Most significantly, educational outcomes were recognised as being greatly enhanced by efforts to ensure that neurodiverse students are both seen and heard by their teachers, and their peers. Teachers can build relationships with neurodiverse students by being respectful, warm, empathetic, actively listening, and making an effort to get to know the student and their interests (Rentenbach, Prislovsky, & Gabriel, 2017).

Teachers must also be active agents in facilitating neurodiverse students to foster relationships with their peers. The research calls for teachers to actively facilitate the student's efforts to make friends and to intervene promptly if bullying occurs. Peer collaboration can result in increased self-esteem of students as they learn to value and perceive each other more positively (Ncube, 2011). Finally, research also highlights the important role teachers should take in educating students about neurodiversity. When armed with increased knowledge, neurotypical students are more likely to understand and be more inclusive of their neurodiverse peers (Rentenbach et al., 2017).

Developing agency

Developing agency within neurodiverse students is essential in helping them to feel a sense of ownership over their learning. Independence can be nurtured within neurodiverse students by providing choice and flexibility in regards to their learning and can begin very simply with opportunities such as choosing between activities or the type of book they would like to read (Cook & Rao, 2018). Agency can also be developed by encouraging students to set their own goals and targets for learning, building insight into their own strengths and weaknesses, monitoring their own progress and effectively communicating with teachers or peers when they feel they need help (Hart & Brehm, 2013).

Supporting students to understand and manage their own behaviour

Neurodiverse students may behave in ways that do not always align with what is typically expected or accepted in classroom environments. Noticing and reinforcing the appropriate behaviour of (all) students can be very effective in encouraging them to continue to engage

with their learning. To be most effective, reinforcement needs to be consistent and to specifically identify the behaviour that is being rewarded. Students should be supported to understand and manage their own behaviours by selecting their own behaviour goals, observing and recording their behaviour, and being in control of their own reinforcement. Linked to the preceding theme of agency, self-management shifts some of the responsibility for behaviour management to the student, with the intent that the child or young person will have greater opportunity to interact with their peers and be more involved in classroom activities, if so desired (Crosland & Dunlap, 2012).

Creating inclusive environments

The classroom environment needs to be a space where neurodiverse students feel accepted and valued for being who they are. When neurodiverse students feel a sense of belonging, they are more likely to actively participate and engage with their learning. Along with supporting students to build supportive relationships, creating a structured and predictable environment with clear routines and rules is essential in supporting neurodiverse students to flourish at school. Making adaptations to the environment to reduce sensory overstimulation often needs to occur before neurodiverse students can begin to engage in learning.

Embedding inclusive teaching strategies

The importance of diversity and flexibility in the teaching methods used was an overarching theme highlighted in the majority of research included this review. Neurodiverse students are more likely to learn if information is presented to them in a range of ways that play to their strengths and interests. Moreover, this review also highlighted the importance of making adaptations to teaching instructions and the general learning curriculum to enable neurodiverse students to become active participants in their learning and have greater access to the general content being taught. Technology was also suggested as an accessible and cost effective way to support, engage and motivate neurodiverse students. Technology can range from a simple reading ruler or magnifying glass to more advanced computer software, alternative keyboards, virtual reality, and speech to text technology.

The research strongly suggests that commitment to the five principles or themes outlined above may provide the foundation for a flexible range of specialist supports required to better meet the needs of neurodiverse students. The strategies determined to be responsive to neurodiverse students and their learning support needs are heavily reliant on classroom teachers approaching each student, regardless of their label, as an individual. The literature also consistently recommends strategies for neurodiverse students that require teachers to deliver evidence-based educational methods and practise every day, and during every interaction with their neurodiverse students. Embedded within, or underpinning these recommendations is the expectation that schools and teachers will have a genuine commitment to inclusion and inclusive practices, and take a relationship based approach to inclusion within the classroom, and wider school.

While the strategies identified in the literature appear simple, it is clear that they are not yet foundational, expected experiences in all schools and classrooms. That said, applying and implementing such strategies consistently, and with full understanding of their origin and intent is not a simple undertaking for busy teachers. Learning Support Coordinators can take a pivotal role in building teacher confidence and capability to ensure that they are able to.

Limitations

There are a number of limitations to this review. (1) The all-encompassing and rapidly expanding conceptualisation(s) of neurodiversity makes it difficult to produce a definitive set of references that answer the question: what can the research tell us about evidence-based approaches to the learning support needs of neurodiverse students? (2) A significant challenge encountered in the work related to achieving adequate representation of the wide-ranging groups of primary and secondary students to be considered to be neurodiverse. Despite the fact that a significant number of student groups were included according to a diagnosis-based approach, there are more children and young people who we could, or perhaps should have also been included as neurodiverse, for example students who experience significant and ongoing mental distress due to trauma. (3) Despite the unique traits and characteristics of the broad and varied group of learners labelled neurodiverse, the literature showed very little variation when explored for strategies and innovations for ensuring that educational contexts are responsive to neurodiversity. This has led to a high degree of repetition within and across this report. (4) The available literature took a relatively generic approach to neurodiversity, and failed to consider multiple diagnoses in a single student, or other forms of intersectionality including ethnicity, culture, gender, sexuality, religion and/or other identities that neurodiverse students may have. It is particularly important to note that none of the reviewed literature considered neurodiversity from a Te Ao Māori perspective. (5) Linked to the preceding limitation, most of the literature assessed as being in-scope for this review originated from North America. While there was consistency and strength in the strategies identified and recommended, they were often presented using deficit-based language. In this review, we have actively sought to re-present these evidence-based strategies in more positive language aligned with contemporary understandings and expectations in Aotearoa New Zealand. (6) Finally, only a small amount of the reviewed literature was conducted by neurodiverse researchers, or was exclusively focused on the experiences and perspectives of neurodiverse students, however these experiences and perspectives were highlighted when found.

Conclusion

Neurodiversity should not be or be perceived to be synonymous with poor educational outcomes. However, the education sector, similarly to other sectors, is increasingly recognising that neurodiversity can (and unfortunately often does) have a negative impact on the educational experiences and achievements of neurodiverse students. Currently, neurodiversity can be a barrier to children and young people being a real part of “the world’s best education system” that New Zealand has expressed a commitment to building. Therefore, there is still much to learn and understand about how to identify neurodiversity, and subsequently, how to meet the learning needs of neurodiverse students.

This review has established that there is no ‘quick fix’ for the growing group of neurodiverse students who are recognised as not yet receiving the best possible education. A review of research literature did not unearth a ground-breaking innovation that can be universally applied, however it has strongly reinforced that the best way to be responsive to the learning needs of neurodiverse students is to prioritise and value relationships, support neurodiverse students to develop agency and to be involved in managing their own behaviours, create inclusive environments and embed inclusive teaching strategies. These are all familiar

concepts. Ideas that have long been apparent in educational pedagogy theorising and research. It could also be argued that they have often been overlooked or ignored because it is assumed that everybody knows them, therefore everyone is doing them. An alternative approach might be to assume that not everybody is doing them and that true innovation will occur when these well-recognised evidence-based educational methods and strategies are practised every day, by every teacher and student, and across all classrooms and schools and the supports and infrastructures that sit behind them. A concerted and systemic effort to commit to the elements of responsive practice outlined in this report may lead, over time, to more neurodiverse specific strategies and innovations. Alternatively, they may result in neurodiverse students simply becoming embedded in their classrooms and schools in a way that significantly reduces the need for them. Both of these outcomes would be positive.

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Introduction and background

In July 2019, the New Zealand Ministry of Education (MOE) released the Learning Support Action Plan 2019-2025 (hereafter referred to as the Action Plan). The Action Plan sets out a broad vision for Aotearoa New Zealand stating: “*We want to build the world’s best education system for all New Zealanders, and provide a range of different types of learning environments and settings to meet the needs of children and young people and their parents and whānau*” (p.4).

While the Action Plan can be viewed as a blueprint to guide the education needs of all students, it is primarily concerned with the estimated one in five children and young people currently in the Aotearoa New Zealand education system who require additional or different education support to reach their true and full potential. The children and young people referred to in this statistic have been recognised as needing this additional or different support for a range of reasons, including those related to disadvantage, disability, learning difficulties, physical or mental health, or behaviour issues. It is important to note that almost all of these children do not qualify for funding under the Ongoing Resourcing Scheme (ORS); a government funded scheme which provides support for students with significant learning needs (Ministry of Education, 2019).

ORS funding allows students with the need for a high level of educational support to learn alongside their peers in regular classroom contexts. Because ORS funding is reserved for students with particularly high needs, the vast majority of students who need additional or different supports for learning are almost entirely reliant on their classroom teacher to deliver it. New Zealand research has reported, that on average, 15% of students in New Zealand schools are classified as having ‘special learning needs’ on school registers (NZEI Te Riu Roa, 2018), while only around 2% of all students attending school qualify for ORS funding (<https://www.educationcounts.govt.nz/statistics/learning-support/ongoing-resourcing-scheme>). The parameters of ORS funding mean that greater knowledge about inclusive teaching approaches that are cost efficient, easy to implement, and that can be universally applied to benefit all students are essential.

In Aotearoa New Zealand the Tiered Support Model is a framework that is used to describe the supports that are offered to students on a continuum of intensity – Universal (Tier 1), Targeted (Tier 2), or Individualised (Tier 3). *The Tiered Support Model* operates on the principle that most children and young people’s learning or behaviour needs will be adequately and appropriately met via Tier 1 - practises and systems that are undertaken by children, young people and staff across all educational settings. Tier 2 recognises that some learners require targeted approaches such as accessible materials for learning, or strengthened classroom practices, while Tier 3 delivers individualised supports tailored to their specific needs.¹ It is useful to reference the Tiered Support Model here as a way of clearly signalling the students who are the primary focus of this review. The underpinning assumption of the review is that most neurodiverse students in Aotearoa New Zealand classrooms are currently responded to via Tier 1 (Universal) or Tier 2 (Targeted) of the Tiered Support Model.

¹ The Tiered Support Model can be seen in the Ministry of Education’s Positive Behaviour for Learning (PB4L) initiative. (<https://nzcurriculum.tki.org.nz/System-of-support-incl.-PLD/School-initiated-supports/PB4L-School-wide>)

In recognising and attempting to respond to the needs of the estimated 15-20% of Aotearoa New Zealand early childhood, primary and secondary-school children the newly released Action Plan articulates six strategic priorities for implementation including:

1. introducing Learning Support Coordinators in schools and kura;
2. screening to enable teachers and educators to identify and respond to children's learning needs earlier;
3. strengthening early intervention;
- 4. providing additional, more flexible support for neurodiverse children and young people;**
5. increasing access to supports for gifted children and young people;
6. improving education for children and young people at risk of disengaging from education (Ministry of Education, 2019, p. 6).

The Action Plan responds to a number of critical documents including: the United Nations Convention of the Rights of the Child (UNCROC); the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD); the United Nations Convention on Refugees (UNCOR); and the New Zealand Disability Strategy (2016 - 2026) (NZDS). With specific reference to the UNCRPD's relationship with the Action Plan, this international treaty aims to protect the rights and dignity of persons with disabilities. It does not create new or different rights for disabled people, but rather promotes, protects and ensures that disabled people receive the fundamental freedoms that all people enjoy. Article 24 of the UNCRPD is specifically focused on the right to education, and as such directs States Parties to ensure an inclusive education system and commitment to lifelong learning. It also requires States Parties to train staff at all levels of the education system in disability awareness, alternative and augmentative communication, and techniques and formats that are responsive to persons with disabilities (refer to Appendix 1 for a complete version of Article 24 - Education). New Zealand ratified the UNCRPD in 2008, which means that the government has an obligation to ensure it is implemented.

At the national level, the NZDS holds and promotes the vision of a fully inclusive Aotearoa New Zealand and also has a significant influence on the Action Plan. The NZDS, like the UNCRPD, recognises the critical importance of education in the lives of disabled people, with Outcome 1 outlining the components required to achieve the vision of all people having the opportunity to realise their full potential. Most significantly, the NZDS highlights the need for a commitment to inclusion at all stages of the education system, for education to be provided in a way that is responsive to the personal, academic and social development of all students, and that inclusive education is a core competency of all teachers (refer to Appendix 2 for a comprehensive overview of Outcome 1).

Inclusion as an overarching principle

Given its strong recognition of the UNCROC, UNCRPD and the NZDS, the Action Plan is underpinned by notions of inclusion. While various conceptualisations of inclusion are explored and debated in the literature, inclusion is generally accepted to require and involve the implementation of policies, values and practices that enable equal participation and learning opportunities for all students, including those with diverse needs (Slee, 2019).

There is a huge body of research and writing on inclusion that has developed over more than three decades. New Zealand researcher MacArthur (2009) outlined the three main components of 'inclusion' for students with diverse needs in mainstream classroom settings. First, inclusion requires the presence of students with diverse needs in mainstream classrooms alongside their peers. Once students are included in the physical spaces of mainstream classrooms, MacArthur (2009) emphasised the second component of inclusion – *participation*. Students must have the opportunity to be active participants in the classroom and benefit from the classroom environment. Active participation can be achieved by giving students with diverse needs the opportunity to be self-determining and by encouraging them to form reciprocal relationships where they also contribute to the wellbeing and learning of their peers. Moreover, participation is also facilitated when the classroom environment makes students feel heard, valued, and respected (MacArthur, 2009). Through greater participation, students are more likely to experience a greater sense of inclusion and belonging. Finally, the third component of achievement is related to the recognition, dismantling and addressing of the unequal opportunities, exclusion and barriers students with diverse needs might face in an inclusive learning environment (Slee, 2019). The use of a universally designed curriculum and additional resources and interventions can help address these barriers and lead to a more inclusive learning experience for all students, including those labelled as neurodiverse. Similarly, a Norwegian education researcher recently argued that a non-categorical perspective on inclusion is indeed required stating that:

“A non-categorical approach is not concerned with adapting individuals in order to fit them within a static and unchanging school structure. Instead a non-categorical approach is concerned with creating inclusive environments where curriculum, practices and other organisations and structures in school are adapted to the variety of children (Snipstad, 2019, p. 6).

About this report

As outlined in the introduction, the New Zealand Ministry of Education is committed to developing a more comprehensive understanding of the evidence base related to the learning support required by students labelled as neurodiverse. This report presents findings of an integrative literature review designed as one response to the fourth of the strategic priorities articulated in The Action Plan: **providing additional, more flexible support for neurodiverse children and young people**. The review explored research and other resources in an attempt to identify strategies and approaches to neurodiversity with the potential to be implemented in primary and secondary school contexts in Aotearoa New

Zealand. As highlighted in the Action Plan, there is an identified need to locate examples of practical strategies (flexible supports) reported in the research literature as being effective in supporting this large group of diverse students. Therefore, the findings of the review can be seen as directly responding to the Action Plan goal of *building teacher confidence and capability*, by providing information that can inform and enhance teaching practice with neurodiverse students.

What is neurodiversity?

A discussion of terminology has been included at this stage of the report to ensure clarity about who we are referring to, and how the term is being used. As a starting point, it should not be assumed that there is widespread understanding of the term neurodiversity, nor that it is the only term used to describe the group of students who are the focus of this review. Regardless of the term used, it is important to be clear that neurodiversity is not a diagnosis. It is a broad term that is used to encompass a wide range of specific, non-specific, hidden and/or undetermined diagnoses that include but may not be limited to: Learning (intellectual) and/or Developmental Disability (ID/DD); Communication Disorders (CD), autism or Autism Spectrum Disorder (ASD), Attention Deficit/Hyperactivity Disorder (ADHD); Specific Learning Disorders (SLD); Traumatic Brain Injury (TBI); and or Foetal Alcohol Syndrome Disorders (FASD).² Indeed, the Action Plan appears to recognise the wide parameters of the neurodiversity “umbrella”, articulating a broad brief when describing it:

Neurodisability is a broad term that includes (but is not limited to) dyslexia, dyspraxia, dyscalculia, dysgraphia, autism spectrum disorder, foetal alcohol spectrum disorder, attention deficit/hyperactivity disorder, trauma related disorders, and auditory visual processing disorders. It is a challenging concept because it encompasses needs across a wide spectrum of degree and intensity, and can be complicated further when children and young people are 'twice-exceptional' (by having more than one condition), making it difficult to understand and respond to their needs (Ministry of Education, 2019, p.32).

Initially coined by Australian autism and disability activist Judy Singer, the term neurodiversity describes the varied neurological conditions present as part of normal genetic diversity in humans (Silberman, 2017). The term is influenced by the social model of disability in that it shifts the focus away from deficit constructions that position people as having inherently pathological neurological conditions. For example, a rigid set of learning and behavioural expectations within a classroom or school is likely to be disabling for an autistic student due to its failure to acknowledge or accommodate different modes and methods of being and learning. The term neurodiversity is used to honour and accept each individual's neurological condition as a natural form of human diversity (McGee, 2012). A range of writers have provided definitions or descriptions of neurodiversity that are relevant and useful in the context of this education-focused review. Rentenback, Prisolovsky & Gabriel (2017) described neurodiversity in the following way:

² These abbreviations are used throughout the report. The term(s) autistic children and young people, autistic child or young person or autistic student are used throughout the document to respect the preference that autistic people have for identity first language. When specific authors are quoted and use the term ASD, that convention is followed.

“Neurodiversity describes the idea that neurological differences like autism, ADHD, and dyslexia are natural human variations that have benefits. The neurodiversity movement values human differences that have often been pathologised, underscores the strengths associated with each unique neurological design, and demonstrates how partnerships and teams that include neurodiverse individuals can enhance problem solving in a complex world. Educators have a particularly important role to play in making the benefits of neurodiversity more widely appreciated and empowering different thinkers to contribute to mainstream life, thought, and culture” (p.59).

Similarly, Gonzalez (2018), whilst summarising the views of Thomas Armstrong, author of the book *“The Power of Neurodiversity”*, stated that:

“In relation to the education of educators, it is recommended to apprehend to recognize the positive attributes present in the multiple singularities of the human being, to structure the educational and formative processes from the confluence of their interests, motivations and interests ... the neurodiversity paradigm helps to support inclusion in the classroom, because we begin to see that everyone has differences in the ways in which they attend, learn, they behave, they think and they feel” (p. 162).

And Cascio (2012) also commented:

“‘Intervention’, the neurodiverse approach holds, ‘should aim at helping the autistic child manage and/or surmount his/her particular ‘surface’ sensory or social challenges without attempting to fundamentally alter his or her essential being” (p. 275).

So while neurodiversity and neurodiverse students is the terminology used in this review to acknowledge and affirm the conceptualisation and construction of difference outlined above, it is important to be aware that there are other terms used to describe the same population(s).

Neurodisability

Neurodisability is a term that is often used interchangeably with neurodiversity as a way of describing a group of conditions that share similar traits, including a need for resources and/or support across a range of systems including health and education. Neurodisability and its conceptualisation could be seen as straddling the medical and social models of disability given that it includes both a focus on the pathology of the person’s particular ‘condition’, but notes that their condition is not necessarily fixed, and inclusion of the term “disability” may indicate an acknowledgement of societal impacts.

Morris, Janssens, Tomlinson, Williams, & Logan (2013) stated that:

“Neurodisability describes a group of congenital or acquired long-term conditions that are attributed to impairment of the brain and/or neuromuscular system and create functional limitations. A specific diagnosis may not be identified. Conditions may vary over time, occur alone or in combination, and include a broad range of severity and complexity. The impact may include difficulties with movement, cognition, hearing and vision, communication, emotion and behaviour” (p. 1105 - 1106).

Neurodevelopmental disorders

Another commonly used term that also encompasses the group of students referred to as neurodiverse is neurodevelopmental disorder. This term is typically used in the context of diagnosis and is positioned within the medical model due to its focus on pathology, and only referring to the deficits that a person may experience. The diversity of the human condition is ignored, and there is little acknowledgement of the strengths and skills a person might have. The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V) defines neurodevelopmental disorders as:

“A group of conditions with onset in the developmental period. The disorders typically manifest early in development, often before the child enters grade school, and are characterised by developmental deficits that produce impairments of personal, social, academic, or occupational functioning. The range of developmental deficits varies from very specific limitations of learning or control of executive functions to global impairments of social skills or intelligence” (American Psychiatric Association, 2013, p. 31).

In alignment with the DSM-V definition, Gelsomini (2016) described neurodevelopmental disorder as an umbrella term for *“a group of disorders often co-occurring deficits in the cognitive, social, and emotional spheres that severely affect adaptive behavior and the basic capabilities needed in everyday life”* (p. 343).

As illustrated above, arrival at the term neurodiversity has been a process that is reflective of changing philosophical models, however there are other terms that remain in common use and refer to the same group of people. These alternative terms are important to highlight because they are often used synonymously with neurodiversity, and are frequently used in the context of diagnosis, treatment, and access to resources. It is also important to be aware that the parameters of “who is in and who is out” with regard to the term neurodiversity are ever changing, and are likely to continue to change as the philosophy of diversity and difference as opposed to deficit-based thinking, rightly, takes a stronger and wider hold. An example of this fluidity can be seen in recent inclusion of and emphasis on trauma related disorders within neurodiversity in recognition that traumatic events can have a pervasive effect on the brain and development. Similarly, giftedness is also seen as neurodivergence given that the neurobiology of gifted students means that flexible, creative or adapted approaches are needed if they are to flourish socially and academically in education.³

Methodology

An integrative literature review methodology (Whittemore & Khafli, 2005) was implemented for the purposes of this project. Integrative literature reviews combine data from both theoretical and empirical literature with the goal of determining practical solutions (Torraco, 2005). Integrative literature reviews permit the inclusion of a diverse range of literature, including both quantitative and qualitative academic studies, and other ‘grey’ literature such as reports, policy, and opinion pieces (Ganong, 1987). This approach offers several

³ Neither trauma related disorders or giftedness were included as a focus of this literature for reasons on scope. The author’s acknowledge the importance of these areas, and the need for further research related to them in relation to responsiveness to neurodiversity in educational contexts.

advantages over alternative review methodologies, such as meta-analyses (which require data to be of similar nature) or systems analysis (which often exclude qualitative data) (Whittemore & Khafil, 2005).

Given the broad nature of integrative literature reviews, the potential for bias and error can be mitigated by using a systematic approach (Pope, Mays, & Popay, 2007). Based on the specific research question we established defined search terms, inclusion and exclusion criteria for selection of research, and implemented specific processes by which articles were assessed, interpreted and synthesised (Torraco, 2005; Whittemore & Knafl, 2005). Our approach is outlined in detail below.

A comprehensive literature search of the ERIC(ProQuest) database was conducted. The table below illustrates the keywords searched on the database.

Category	Search terms
Neurodisability	attention deficit hyperactiv* disorder OR ADHD OR conduct disorder* phonological disorder OR speech sound disorder OR language disorder OR fluency disorder OR stutter OR communication disorders specific learning disabil* OR SLD OR dyslexi* OR dyspraxi* OR dyscalculia traumatic brain injur* OR TBI foetal alcohol spectrum disorder OR FASD autism OR ASD OR “autism spectrum disorder” OR asperger “intellectual disabil*” OR “learning disabil*” NOT “specific learning disability” neurodisability* OR neurodiverse* OR “neurodevelopmental impairment”*
Age	child OR young person OR adolescent OR student OR teen NOT adult
Educational context and Intervention	interven* OR support OR skill OR modify OR strategy OR approach OR resource OR accommodat* OR recommend OR innovat* OR program* AND inclusi* AND Educat* OR learn* OR teach* OR school OR classroom OR engage OR participate OR instruct

These searches resulted in a total of 488 articles, which were reviewed in accordance with our eligibility criteria. Articles were included for analysis if they focused on interventions which were:

1. Feasible to implement (i.e., low cost; school or classroom based).
2. Administered by teaching professionals (including paraprofessionals such as teacher aides).
3. Intended for school students aged 5 to 18 years (i.e., primary to secondary school students) described in the article as neurodiverse or with a diagnoses generally accepted as being encompassed by the term neurodiversity.
4. Conducted in an inclusive education setting (not in segregated or special school settings).

Articles were excluded from our analysis if they discussed interventions which were:

1. Unfeasible to implement (i.e., expensive; not school or classroom based).
2. Administered by non-teaching professionals and persons (e.g., parents or health or allied health professionals).
3. Intended for adult students or those under the age of 5 years (i.e., students in preschool or post-secondary school education).
4. Conducted in non-inclusive education settings (such as segregated or special school settings).
5. Articles published before 2010.⁴
6. Publications not written in English.
7. Articles not available as full texts.

A three-stage process was conducted to review the publications in accordance with our eligibility criteria. All inclusion and exclusion decisions were recorded on an Excel spreadsheet to provide an audit trail. During the first stage, the titles of all articles found from our database searches were reviewed. Of the 488 reviewed, 293 articles appeared to meet our eligibility criteria and were recorded in an Excel document. A second, abstract review of the listed articles was then completed in accordance with our eligibility criteria. Of the 293 articles, 220 articles continued to meet our eligibility criteria. Finally, the full texts of all 220 articles were then reviewed. Of these articles, 85 publications continued to meet our eligibility criteria. The methodology and characteristics of these articles were summarised in table format (summary literature tables are available on request).

⁴ The inclusion criteria of articles published from 2010 to present only applied to the articles and resources related to neurodiversity in the education context. Articles and other reports and resources that were published prior to 2010 were used to describe the methodological approach and Conventions or other policy or legislation documents developed prior to 2010 were used to contextualise this research.

Research stage	Number of eligible articles
Literature search on database	489
Title review	294
Abstract review	221
Full text review	85
Number used in final report	66

Table 1. Summary of the research process for articles included for analysis.

The 85 articles that met the criteria for the review were then qualitatively analysed. The first step in this process was to conduct a thematic analysis of articles grouped by specific types of neurodiversity (refer to the table for the neurodisability search terms used). A second level of thematic analysis occurred across the entire body of data in order to identify and highlight these more universal strategies and approaches. Due to the broad parameters of neurodiversity, and the purpose of the review, it was considered necessary to present the findings of the review via each identified theme rather than by type of neurodiversity. The thematic findings generated through this analysis process are presented in the next section of this report. Of the 85 publications that met our eligibility criteria, 66 have specifically been referred to in this review. It is important to note that the body of literature identified and data extracted and analysed here reflects the unique inclusion and exclusion criteria used in this study. Therefore the authors acknowledge that other research will exist that has the potential to inform this topic, but did not meet inclusion criteria on this occasion.⁵

Following our thematic analysis, we also conducted a google search for online resources to supplement the evidence-based approaches outlined in our review. The resources we have included in this report offer easily accessible, web-based information on teaching strategies that can be used to support the learning of neurodiverse students (Refer to Appendix 3: Diagnostic and other information, references and resources related to specific types of neurodiversity). The resources are consistent with the selection criteria used in our systematic review and are underpinned by the overarching principle of inclusive education. A number of the evidence based resources identified have been created or endorsed by the New Zealand Ministry of Education and thus are in alignment with their vision for education in NZ. The Ministry of Education's own *Te Kete Ipurangi* website for example, was a central resource identified via this integrative methodology. This website provides information about the key concepts and experiences of neurodiverse students and key teaching strategies to support the learning of these students in inclusive education settings. This important resource can be accessed at (<https://www.inclusive.tki.org.nz/>)

⁵ For example, the imperative for low cost, easily implemented strategies eliminated inclusion of high-cost approaches that drew beyond the expertise of educational personnel, and the focus on primary and secondary level educational contexts prevented inclusion of strategies or initiatives seeded in early- or tertiary education contexts.

Strategies for responding to neurodiversity in classrooms and schools – key themes from the research

Through a process of analysis that enabled theme generation within clusters of research relating to particular groups of neurodiverse students, and across the whole body of data, five interrelated themes were identified: prioritising and valuing relationships; developing agency; supporting students to understand and manage their own behaviour; creating inclusive environments; and embedding inclusive teaching strategies. While we discuss each of the themes separately, it is important to acknowledge that there is a significant level of crossover between themes and theme content, as well as a high level of similarity within and across the strategies and approaches recommended for different groups of neurodiverse students. The themes were deliberately ordered to highlight both the strength and importance of relationship, and the primacy of student choice and control when seeking to achieve a high level of responsiveness for neurodiverse students.

Prioritising and valuing relationships

“Teachers must be willing to not just give me a desk and then leave me to fill the chair. I need to be asked questions, and given time for my thoughtful answers”

(Autism activist Jamie Burke, Wexler & Luethi-Garrecht, 2015, p. 16).

A significant and consistent theme evident within all the literature analysed as part of this review was the importance of **prioritising and valuing relationships**. A range of relationships were identified as critical including student – teacher, student – student, student - wider school community, and teacher – teacher (and other educational peers). Recognition that all of these relationships have an important role to play in the educational experience of neurodiverse students is underpinned by the notion that to do well, neurodiverse students need to be genuinely known by their teacher(s), their peers, and the wider school community.

Using the term neurodiversity in its broadest sense, Rentenbach and colleagues (2017) outline a number of strategies for teachers to use as a way of fostering meaningful relationships with neurodiverse students both in the classroom, and across the wider school context. Rentenbach and colleagues (2017) identified a number of areas for relationship building to achieve positive outcomes for neurodiverse students, three of which relate directly to the student – teacher relationship. First, they suggest that teachers should try to be happy, confident, and energetic when engaging with neurodiverse students to ensure they feel welcome and valued in the classroom. Their second suggestion refers to a need for teachers to listen and take notice of their students; a suggestion based on the premise that active listening enables teachers to respond appropriately to the specific needs of each individual. Linked to the previous point, the third area of importance they highlight is that teachers demonstrate a commitment to talking to and observing the student to identify their interests, likes, dislikes, and background. Investing in the student in this way helps build trust and enables the teacher to model the kind of social behaviour that they wish to see from all students, including neurodiverse class members.

Developing a mutually respectful, genuine relationship of the kind recommended by Rentenbach and colleagues (2017) means that teachers can utilise students' interests to maximise their learning. Knowing their neurodiverse students well also enables teachers to plan the daily class schedule in response to when neurodiverse students feel most calm or have better concentration.

The centrality of relationships to student experience is prominent across all the literature concerned with improving neurodiverse students' educational experience and, unsurprisingly, much of the impetus in this area comes from recognition of the need to challenge and counteract bullying. Students with ADHD for example, are more likely to experience bullying and peer rejection and are also twice as likely as typically developing children to not have reciprocal friendships (Mikami et al, 2013). This means that ensuring these students have positive social interactions with their peers and teachers in the school environment is critical. The following strategies have been suggested as effective in supporting students with ADHD to build meaningful relationships with others. Specifically, researchers working in this area urge teachers to commit to:

- modelling their own personal liking and acceptance of the student in front of the student's peers;
- engaging in warm, one-on-one interactions with the student including discussing their personal interests;
- developing and enforcing explicit rules against social exclusion and bullying;
- implementing reward systems that reinforce inclusive behaviour;
- identifying common interests between students and provide opportunity for and encouragement to discuss them;
- fostering a respectful and positive learning environment for all students;
- encouraging cooperative learning among peers (e.g., in pairs and groups) to support students to build relationships. Ideally, some structure and division of individual roles within each peer group is essential in promoting group cohesion (e.g., delegating different jobs within group, encouraging reciprocal teaching, feedback and support among peers);
- giving the neurodiverse student feedback about their social behaviour and rewarding socially appropriate behaviour (Higgins, Sluder, Richards, & Buchanan, 2018; Mikami et al., 2013; Mulrine & Flores-Marti, 2014).

Student to student relationships

"In elementary school, I simply had no idea of what to do or say to my peers, so I kept my distance" (Simpson, Gaus, Biggs, Williams, 2010, p. 54).

As can be seen above, across the spectrum of research literature reviewed, the need to create environments where student to student relationships can flourish is very strongly emphasised. In a study focused on students with autism (Simpson et al. 2010) it was highlighted that autistic children and young people can struggle to initiate play and other social interactions with their peers because they experience difficulty understanding social cues, making eye contact, engaging in reciprocal conversation, and understanding the "rules" of friendship. In contradiction to some common assumptions about the extent to which autistic people seek out relationships, Simpson and colleagues (2010) emphasise that:

“individuals with ASD desire social interaction with others. Their social difficulties frequently stem from a lack of skill in initiating and responding to various situations.” These authors also describe autistic children as having a tendency to interpret what is said to them very literally and, consequently, can find it challenging to adapt to the social demands placed on them at school (Simpson et al, 2010). They can also struggle with using and understanding verbal and nonverbal communication in social conversation, interpreting the emotional states of others, and/or developing play skills (Hart & Whalon, 2011). However, despite experiencing difficulty with these social conventions, quality relationships have many positive impacts on autistic children, and are therefore critical to invest in. Having friends has been shown to increase pro-social skills, as well as academic progress, and to make it more likely that a student will stay in school rather than drop out (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010).

There are a variety of social skills interventions reported in the literature that have been found to improve the social skills of autistic children and young people including video modelling, visual or written scripts, priming, social stories, and self-management. A key link has been found between the use of behaviour focused interventions such as peer modelling, prompting and positive reinforcement and improvements in social interaction (Camargo et al, 2014). Informed by this knowledge, a range of strategies are reported in the research literature as being effective in assisting autistic children and young people to build their social skills and to develop and maintain social relationships with their peers in education contexts, including:

- encouraging social interactions by pairing students together and allowing them to work with a partner or partners;
- instituting class wide peer tutoring by pairing all children in the class. Combining self-monitoring with peer-mediated strategies can improve the social interaction of students with autism;
- establishing peer mentors by training peer buddies who can encourage appropriate social interactions;
- monitoring social interactions to ensure all students are able to stay on task and take an equal role in conversation so that no one student either dominates, or is absent from group discussions;
- using visual cues to help students who have the tendency to dominate or control conversations or discussions (e.g., developing a sign to share privately with the student that can cue to them to allow others to take part in the conversation);
- using role-playing activities to teach conversational interactions and other social skills;
- using social stories to assist with the development of social skills;⁶
- developing concrete supports such as visual aids and cues to assist students when they are taking part in group;
- building self-management strategies such as assisting students to develop self-monitoring checklists that they can use to remind themselves of the steps needed to complete a given activity;

⁶ Social stories can mirror the issue or situation that a student may be finding difficult, allowing the student to reflect on how to better respond or to see the situation from the perspectives of others.

- being alert to any and all opportunities for the student to be social and prompt the student to engage in the social moment successfully;
- incorporating each student's specific interests into class-based activities as a way of encouraging and enhancing socialisation. (Crosland & Dunlap, 2012; Dev, 2014; Hart & Whalon, 2011; Koegel, Vernon, Koegel, Koegel, & Paullin, 2012; Rossetti & Goessling, 2010; Simpson et al., 2011).

“Children with and without disabilities could engage in all kinds of play and talk and play games then people would know they are capable and can do stuff better than they think. They can be asked what they are good at and then we can play together that way”- School student, Nowicki & Brown, 2013, p. 260.

The research concerned with students with an intellectual disability also identified that developing and maintaining social relationships can be a challenging aspect of classroom and wider school life. Similarly to the research that focused on autistic children and young people, it is asserted that positive social relationships with peers increases the self-esteem of students with an intellectual disability, enabling them to better focus on their learning (Alquraini & Gut, 2012). Gaining strong social interaction skills was also found to be a predictor of better post-secondary education and employment opportunities and outcomes as well as positive self-determination skills (Chung, Douglas, Walker & Wells, 2019).

The strong theme of relationship in the intellectual disability focused literature emphasised the role of peer relationships. Peer buddies have been suggested as being able to take an important role in modelling appropriate social behaviour, helping their peer stay focused, and in challenging bullying (Alquraini & Gut, 2012; Lucas, 2011). However, as well as providing support and feedback for their neurodiverse peers (Biggs, Carter, & Gustafon, 2017), peer buddies have also been recognised as having the potential to be an important conduit between students with intellectual disability, teachers, and other members of the classroom. (Biggs et al., 2017). Chung et al (2019) suggest that it is important for teachers and para professionals to be aware of their proximity to neurodiverse students as this can be a barrier to them interacting with their peers. These authors assert that it is best to take a facilitation role and strategically fade supports. In a general sense, implementing peer-buddy systems, whether at the individual or group level have been found to encourage students to develop communication skills and facilitate relationship building between students (Chung et al., 2019; Nowicki & Brown, 2013).

Through increased collaboration and greater building of relationships, the amount of prejudice and social intolerance of students with intellectual disability is also likely to reduce, particularly if students work towards mutual goals in a group setting (Ncube, 2011). Peer collaboration results in an increase in the self-esteem of all students as they learn to value and perceive each other more positively (Ncube, 2011). Pairing or grouping students with a mixed range of academic ability can also be a useful and mutual learning experience for both students with intellectual disability and their non-disabled peers who reinforce their own learning through teaching (Ncube, 2011).

A number of education researchers emphasised the need for teachers to provide an opportunity to educate all students about intellectual disability as a way of challenging negative stereotypes and to foster social acceptance and inclusion of students with

intellectual disability in classrooms and schools (see for example Chung et al., 2019; Nowicki & Brown, 2013). Creating opportunities for students to work in small groups with peers of mixed ability levels can be beneficial in building relationships and learning from each other (Alquraini & Gut, 2012; Nowicki & Brown, 2013). Such collaborative learning can assist students to learn different ways to solve problems as well as to acquire the important skills of cooperation and leadership (Alquraini & Gut, 2012).

The need for serious and sustained effort to support positive relationships was also emphasised in the research focused on students with communication difficulties (CD's). Due to a fear of being evaluated negatively by their teacher and peers, it is seen as vital that teachers set strict rules against bullying (e.g., mimicking a child with a speech disorder) and foster safe and accepting schools and classrooms (Sari & Gökdağ, 2017; Zebron, Mhute, & Musingafi, 2015). Teachers should demonstrate empathy and warmth as a model for all members of the classroom to follow, and educate peers about the student's communication difficulties (Sari & Gökdağ, 2017). Modelling understanding, patience, and acceptance will enable all students, including those with communication difficulties to feel safe to express themselves without judgement (Zebron et al., 2015).

Mirroring research with other groups of neurodiverse students, Sari & Gökdağ (2017) highlights the importance of asking students with CD's about their interests and encouraging them to engage in activities that extend beyond verbal learning in the classroom (e.g., sports and art) as a way of building their self-confidence (Sari & Gökdağ, 2017). Finally, providing opportunities for students to regularly practice one-on-one conversations or play games that encourage speech with a peer or within a group can also be a reciprocal learning strategy that builds relationships and facilitates learning and participation for all students (Sari & Gökdağ, 2017; Wickremesooriya, 2015; Zebron et al., 2015).

With direct reference to students with specific learning disorders (SLD), a number of researchers have emphasised peer collaboration, either in pairs or small groups, as a way of promoting the formation of social relationships (Obiakor & McCollin, 2011). Students can learn from each other and also learn teamwork and leadership skills (Ylonen & Norwich, 2012). Finally, group work enables students to learn through each other as opposed to teacher instruction, giving the teacher more time to work closely with particular students that might need more attention (DeRoche, 2013).

While the focus of this review is on children and young people who do not qualify for ORS funding, and are therefore unlikely to have "their own" teacher's aide, it is possible that some of these students may have access to teacher's aide support. Teacher aides have been described as *"school support staff who work under the direction of a certified teacher and assist students with instruction, social/emotional/behavioural skills, and sometimes, personal care."* (Rossetti & Goessling, 2010). In the Aotearoa New Zealand context a contemporary description of the role of teacher's aides can be accessed at: (<https://parents.education.govt.nz/assets/Documents/Special-Education/The-role-of-the-teachers-aide.pdf>):

Teacher aides have been recognised as having the potential to take an important role in the facilitation of friendships and social interactions by preparing neurodiverse students for upcoming social interaction or exchanges with their peers. This might be by suggesting students spend time with their peers at a specific point in the day or by being aware of

social opportunities that neurodiverse student could be involved in but might not identify for themselves (Rossetti & Goessling, 2010).

Teacher – educational professional peers – family

As noted in the introduction to this theme, the need to prioritise and value the relationships that are important to and encompass neurodiverse students extends beyond the student, and their teacher and peers. There is recognition of the fact that collaboration between classroom teachers and other professionals involved with a student's learning can help increase the success of inclusion and access to education for neurodiverse students. Research focused on students with an intellectual disability, for example, highlights the importance of meetings between professionals where they can identify the strengths and needs of the child or young person, and then discuss ways to work together on meeting these unique needs (Alquraini & Gut, 2012; Biggs et al., 2017). By sharing responsibilities and collaborating on common goals, professionals can gain support from each other to obtain the best outcomes for the student (Alquraini & Gut, 2012).

With specific reference to FASD, recent literature emphasises the importance of a wider collaboration that includes families (Job et al., 2013; Millar et al., 2017).

“... I like dealing with the teacher beforehand... I say ‘okay, this is what works, this doesn’t work... and we need to work together’... I make that very plain from the beginning that we are in this together.” - Parent of student with FASD (Job et al., 2013, p. 50)

It is essential for all persons involved with the student's learning to collaborate together to devise a comprehensive assessment and individualised educational plan (Millar et al., 2017). The plan should outline the student's needs, strengths, as well as the specific teaching style, curriculum, and physical environment that will best facilitate their learning (Carpenter, 2011; Millar et al., 2017).

Developing agency

A second theme evident within the literature is concerned with supporting neurodiverse students to become active participants in their own learning. This can be achieved by equipping neurodiverse students with the skills and strategies that enable them to build independence and assist them to develop and exercise personal agency (choice and control).⁷ For some students, assistance with very practical strategies that enable them to self-manage their learning is a necessary starting point. For example, when considering students with ADHD, Majeika and colleagues (2011) recommend that teachers provide a self-monitoring checklist of the tasks that need to be completed throughout the day. They contended that reviewing this list at the end of the day can enable students to take charge of their own learning (Majeika et al., 2011). Another strategy suggested by Majeika and colleagues (2011) is for students to use a previously agreed symbol (e.g., a nonverbal gestures or code word) if they are feeling overstimulated. They can also have a list of self-chosen alternative activities that they know helps them to calm down and refocus when this does occur.

⁷ Agency is a theme reflected in the Ministry of Education's own set of resources and can be found at: (<http://nzcurriculum.tki.org.nz/Curriculum-resources/NZC-Online-blog/>)

With regard to SLDs, literature in this area also highlights the importance of encouraging students with SLD to develop agency and build independence as a way of facilitating their learning and making them feel more empowered in the classroom setting (Cook & Rao, 2018). Getting students to monitor their own academic progress has been shown to improve behavioural and academic outcomes for students with SLD (Cook & Rao, 2018). Fostering independence within a student begins by encouraging the student to understand their own strengths, weaknesses, and interests, and then by providing them with the skills to effectively communicate their choices and needs (Hart & Brehm, 2013). This gives students ownership over their learning. Hart & Brehm (2013) outline a written plan that can be collaboratively created with a teacher to practice self-determination:

1. getting parental consent;
2. assisting students with academic goal setting (for example improving their ability to stay on task or developing their reading skills);
3. creating a plan around how the student will meet their goals, including the specific steps that would be required to meet their goals;
4. discussing the available strategies and accommodations available to meet the goals set (e.g., increased reading time during tests);
5. modelling the chosen strategies and accommodations so students can learn which strategy is most useful for them;
6. helping the student determine when and why they should be receiving the accommodations (e.g., using graphics organiser during silent reading time);
7. helping the student to understand the importance of their accommodation and how to ask for it when they need it;
8. evaluating progress with a teacher and making any changes as necessary.

Supporting students to understand and manage their own behaviour

A third theme drawn from the analysis of the literature is *supporting students to understand and manage their own behaviour*. To a large extent this theme interlinks with the previous theme, developing agency. Neurodiverse students are often perceived to be challenging in the classroom environment. Therefore, it is unsurprising that research about neurodiversity in classrooms and schools frequently takes a behavioural focus.

With reference to autistic children and young people, for example, there is widespread recognition that this specific group of neurodiverse students can experience varying levels of anxiety, stress, depression, and hyperactivity when in educational settings. They may also have a need for routines and rituals that are perceived by others to be unnecessarily repetitive or obsessive. This can result in autistic students experiencing difficulty transitioning from one activity or situation to another, which in turn, can lead to emotional meltdowns and noncompliance with instructions (Simpson et al., 2010; Strain et al., 2011). These kinds of behaviours, which are perceived to be unacceptable or inappropriate at school, are one of the most common reasons for students to be excluded from mainstream classrooms, which makes it important to find effective strategies to support positive behaviour in general education (Strain, Wilson, & Dunlap, 2011).

One strategy for supporting autistic students to manage their own behaviour when the particular behaviour is risking their involvement in the classroom (or wider school), is *The Prevent-Teach-Reinforce (PTR) model* (Strain et al., 2011).

The basic elements of this approach are:

- a functional behavioural assessment
- antecedent procedures
- instructional strategies
- arrangement of reinforcement contingencies

In the PTR model these intervention strategies are based on the information gained from the functional assessment and the behaviour intervention plan includes at least one antecedent manipulation, instructional strategy, and arrangement of reinforcement contingency. This model is based on the idea that a favourable outcome is much more likely if multiple strategies are put in place at the same time (Strain et al., 2011; Crosland & Dunlap, 2012).

First, a functional behavioural assessment provides information about the individual child. This assessment allows for the child's teachers to put together a unique behaviour support plan (Von der Embse, Brown, & Fortain, 2011). Next the school and classroom environment should be modified to manage the level of stimulus the child experiences. These are called 'antecedent procedures' and they make it less likely for an unwanted behaviour to occur. Examples of such procedures include priming and visual schedules. Priming involves reviewing information or activities with the student before they engage in them. This prepares them for the next step in their routine. Visual Activity schedules are used to visually communicate upcoming events and ease the student into transitions between activities. They are a series of images, photos, pictures or line drawings and they have been shown to decrease meltdowns during transitions (Crosland & Dunlap, 2012; Knight et al., 2015; Macdonald, Trembath, Ashburner, Costley, & Keen, 2018). Instructional strategies are then utilised during the teaching of content and are designed to elicit alternative responses (other than problem behaviours). An example of this would be the use of visual aids for autistic children. Reinforcement contingencies are then put in place to support the positive behaviours (Strain et al., 2011).

Students can be taught self-management strategies, which in turn can be included in the PTR model (or used more generally). This can include selecting their own goals, taking responsibility for observing and recording their own behaviour, and being in control of their own reinforcement. Research with individuals with intellectual and developmental disabilities has shown that better outcomes are reached with teachers who use goals and objectives that are tailored to the individual and that also resemble the learning outcomes of their peers without disabilities (Chung et al., 2019). Creating the opportunity for students who are perceived to have "behavioural issues" to be part the solution via increased self-management skills shifts some of the responsibility to the student and also gives them more opportunities to interact with their peers and be more involved in classroom activities (Crosland & Dunlap, 2012). Similarly, peer support interventions can also be used to shift (some of) the responsibility for challenging and modifying behaviour that causes disruption or distress in the classroom from the teacher to other students in the class. It is suggested that the peers of autistic students, for example, can be taught to identify off task behaviour and then to

reinforce the desired behaviour. Peers can also serve as models of target behaviour (Lang et al., 2011; McCurdy & Cole, 2014). Other strategies that can be used to support positive behaviour include:

- using consistent reinforcement systems for the student when reinforcing rules and appropriate social interactions;
- giving the student a private/personal area where they can de-escalate when frustrated;
- providing predictability in teaching and class schedules and activities;
- limiting unstructured time;
- establishing clear rules and consequences;
- reducing excessive noise;
- simplifying the task: if the child is becoming frustrated or exhibiting negative behaviours it may be because they are struggling with the task. Simplifying the task may therefore help them to succeed and at the same time limit inappropriate behaviours. (Simpson et al., 2010).

Students with an intellectual disability can also behave in ways that confront the narrowly prescribed set of social expectations that often govern classroom settings. A number of strategies, which are similar to those outlined above with reference to autistic students, have been identified as having the potential to respond to behaviours that are challenging to manage or particularly disruptive within the classroom context including:

- using behaviour contracts and outlining the appropriate and inappropriate ways of behaving in the classroom and playground (Lucas, 2011);
- reinforcing on task and appropriate behaviour (e.g., through praise and rewards) (Lucas, 2011; Pennington & Koehler, 2017);
- creating a behaviour plan by identifying possible triggers and taking steps to avoid these triggers;
- observing the student to understand the purpose a particular behaviour is serving in the wider classroom context (e.g., acting out to gain attention, avoid difficult tasks, etc.) (Lucas, 2011);
- applying behavioural plans consistently and involving peers in maintaining and reinforcing the plans (Alquraini & Gut, 2012).

Behaviour management strategies reported as useful in minimising unwanted behaviours associated with ADHD are prefaced with the need for teachers to gain a clear understanding of the triggers and reasons for off task behaviour (Majeika et al., 2011). Such an understanding can be developed through discussion and observation. Often, students engage in off task behaviours (e.g., talking to peers or using their phone) because they are finding it difficult to pay attention, keep up with the pace of learning, or want individual attention from the teacher (Majeika et al., 2011). Teachers can positively reinforce on task behaviours (e.g., through praise and rewards) and ignore off task behaviours (Higgins et al., 2018). Application of these behaviour strategies needs to be consistent and transparently identify the behaviour that the teacher is trying to target (Mikami et al., 2013).

Creating inclusive environments

“Including students with disabilities in general education settings is a successful approach for ensuring that students with disabilities develop skills in many different areas, as well as obtain the same educational rights as their peers” (Alquraini & Gut, 2012, p. 47)

A fourth and central theme within the literature is that optimal educational outcomes are achieved when there is commitment to creating genuinely inclusive educational environments. Overwhelmingly, the research literature points to the need for classrooms to be both relationally and environmentally inclusive in order for neurodiverse students to thrive socially and academically. Much of the research reviewed included a focus on creating classrooms that are environmentally responsive to the needs of neurodiverse students. Similarly, to earlier themes, the suggested strategies relate to specific groups of neurodiverse students, but share a high degree of consistency in terms of the types of environmental adaptations that are seen as universally beneficial to neurodiverse students. Examples of how to achieve inclusive environments are provided across the spectrum of neurodiversity to illustrate this point.

Adaptations to the classroom environment that have been identified as being responsive to students with intellectual disability include:

- having a structured environment with consistent routines and rules in order to make transitions between different activities easier (Lucas, 2011);
- creating checklists and picture sequence cards that illustrate the steps of an activity or transition;
- seating the student close to the source of instruction and away from known distractions (Alquraini & Gut, 2012);

Creating a classroom that is free from clutter and that is calm can also reduce distraction for students with FASD (Carpenter, 2011; Millar et al., 2017). Reducing the level of visual, verbal, and auditory stimulation has been found to help students with FASD to remain focused on their learning. Some practical ways to achieve a tangible reduction in stimulation are removing posters from the walls, using curtains to block out harsh light or busy walls, using headphones so student only hears the teacher, keeping the classroom door closed, seating the student away from windows and near the source of instruction (Carpenter, 2011; Millar et al., 2017). Providing a defined space away from other students for the student to go to if they are feeling overwhelmed can also be useful in reducing sensory overload among students with FASD (Millar et al., 2017).

Attention to the environment is also a feature of literature focused on students with ADHD who can find it difficult to regulate themselves in the face of a high level of stimulus. Creating a stable and predictable environment for students for ADHD can be achieved by:

- setting out clear and mutually agreed school-wide and classroom rules, responsibilities, and expectations for all students;
- establishing a positive school and classroom culture (e.g., rules against bullying);
- creating a structured classroom routine, which enables all students to understand the daily timetable or goals for the day and to have them recorded in a place that they can

be easily referred to if required. It is also essential to include regular breaks during this structured routine;

- establishing clear boundaries about expected classroom behaviour;
- seating the student near the source of instruction and away from known distractions;
- trying to reduce the number of visual distractions in the classroom;
- providing a 'getaway area' away from the main teaching area and peers, where the student with ADHD can go if they feel overwhelmed or overstimulated. It can be useful to give the student a small list of exercises or activities they can independently do in the getaway area (Higgins et al., 2018; Majeika et al., 2011; Mikami et al., 2013).

In the case of autistic children and young people it is widely recognised that they can experience heightened anxiety due to interacting with their environment in a more sensory mode (Wexler & Luethi-Garrecht, 2015). Sensory overload can be minimised by reducing excessive noise in the classroom by using nonverbal signals such as light systems, pictorial cues or hand signals to request appropriate noise in the classroom rather than clapping or speaking loudly (Menear & Smith, 2011). Minimising background noise and eliminating fluorescent lighting is a positive strategy as many students with ASD have heightened sensitivities to these elements. Organising the space and materials of the classroom to ensure predictability can also help to create an inclusive environment for children with ASD. This can involve strategies as simple as clearly labelling materials and being consistent about the location of activities (Simpson et al., 2010; Darretxe & Sepulveda, 2011). Adjustable and ergonomic chairs and tables allow for a more dynamic workspace that allowance for "free movement of the body particularly addresses the need for many autists to experience their bodies in space." A movable workspace with movable tables also allows children with ASD to engage and disengage from groups of their peers when they feel they need to (Wexler & Luethi-Garrecht, 2015, pg. 17).

Embedding inclusive teaching strategies

"In my classroom, I arranged a variety of activities and learning strategies throughout each unit. In every lesson I attempted to include all four modalities (visual, auditory, tactile, and kinesthetic) so that every student would have an activity that really got them focused and engaged in their own learning."

- Teacher (Frey, Andres, McKeenman & Lane, 2012).

The manner in which neurodiverse students are taught is critical to maximising their learning. As a fundamental principle, and as highlighted earlier in this report, it is critical to assess each student's strengths and weaknesses in order to provide universally designed strategies that will enable the student to thrive in the learning environment (Frey et al., 2018). A number of strategies are outlined below that, if implemented consistently, are reported as making it more likely that neurodiverse students will have equitable access to the best possible education. While these strategies are central to the theme of embedding inclusive support, many also demonstrate significant crossover with the content of earlier themes.

Diverse methods of instruction

Methods most often identified as responsive to neurodiverse students are teaching techniques and strategies well-recognised and, arguably, easily implemented by contemporary educators. Researchers considering neurodiverse students pinpoint visual aids, verbal instructions, games, gestures, digital formats such as audio, written instructions, role playing, using graphics organisers, class-wide peer tutoring, and using objects as staples in the repertoire of neuro-responsive modes of instruction (Frey et al., 2012; Reichrath, de Witte, & Winkens, 2010; Rentenbach et al., 2018). Visual aids, for example, can help students understand and process what is expected of them, retain information better, and communicate rules, making students less reliant on teachers and other staff (Cohen & Demchak, 2018; Frey et al., 2012).

Strategies as simple as being patient and providing students with extra time to complete tasks, process instructions and respond to questions (Rentenbach et al., 2018) litter the neurodiversity literature. Also present is an awareness that teaching strategies should consider the way in which particular neurodiverse students experience their bodies. For example, because students with ADHD often learn best when their bodies are active (Rentenbach et al., 2018) teachers could think creatively about how these students (and others for whom movement is inherent to who they are) can work and move. Teachers might consider walk and talk sessions to discuss ideas, or allowing students to use a swiss ball instead of a chair so that some movement is possible.

“I learn better when things are presented in a visual way. My brain does not always cope with the words the teacher says. I would say to teachers, “Please show me, don’t tell me...” - Student with FASD (Carpenter, 2011, p.39)

There are a number of strategies that are reported as having a high degree of positive impact in regards to how information and curriculum is presented to students with FASD. Researchers focused on the educational needs of students with FASD such as Carpenter (2011) and Millar et al. (2013) recommend:

- breaking tasks into small steps and keep instructions short;
- using simple language and providing cues to support student to arrive at the answer;
- repeating instructions and checking in with the student about their understanding of the task;
- conveying curriculum in a variety of ways (e.g., visual aids, role play and rehearsal of common scenarios, and use of tactile objects);
- providing frequent, short breaks where the student can move around and release any restlessness from sitting for too long;
- trying to identify and then utilise the student’s strengths and interests to increase their engagement with the curriculum;
- teaching students various hand gestures to communicate their understanding of particular instructions;
- using a range of technology to support learning (iPads, smart boards, laptops, and headphones);
- praising students for desired behaviour to encourage its frequency.

“No two children with arithmetical difficulties are the same. It is important to find out what specific strengths and weaknesses an individual child has; and to investigate particular misconceptions and incorrect strategies that they might have.” - Scherer, Beswick, DeBlois, Healy, & Opitz, 2016, p.639.

With specific reference to students with SLD, Nagro, Hooks, Fraser, & Cornelius (2018) also stress that the manner in which instructions and curriculum is presented has a significant impact on their level of engagement in the classroom. General strategies for learning across the SLD literature are consistent with the previous list in that they support:

- using a range of modalities to convey information or instructions including verbal, visual, gestural, written or digital (Nagro et al., 2018; Ylonen & Norwich, 2012);
- giving students a range of ways to communicate and be actively involved in responding to the content presented in class. (Nagro et al., 2018);
- shortening, chunking, and sequencing written and verbal instructions (Obiakor & McCollin, 2010; Ylonen & Norwich, 2012).
- For support with reading useful strategies include:
 - using organisers to assist with enhancing reading comprehension (Awada & Plana, 2018);
 - repeated reading to improve oral reading fluency in students with SLD (Boon & Barbetta, 2017; Cook & Rao, 2018);
 - asking students to summarise and answer questions about the text they read to promote their understanding (Awada & Plana, 2018);
 - making students aware of the important areas to focus on within the text before they start reading (McFall & Fitzpatrick, 2010);
 - coming up with creative ways to discuss the text (e.g., through illustrating what particular characters might look like, playing ‘Guess Who’ with story characters) (McFall & Fitzpatrick, 2010);
 - story mapping to improve students’ ability to identify, organise, and analyse story elements⁸ (Boon, Paal, Hintz, & Corenelius-Freyre, 2015; Narkon & Wells, 2013).
- using curriculum that the student is particularly interested in to improve engagement and participation (Kang, McKenna, Arden, & Ciullo, 201; Cook & Roa, 2016). Current events, real life stories and examples can also stimulate interest (McFall & Fitzpatrick, 2010);
- giving the student guided notes prior to the lesson (Boyle, Forchelli & Cariss, 2015);
- slowing down the pace and providing frequent pauses while giving verbal instructions when students are required to take notes (DeRoche, 2013);
- seating the student close to the source of instruction and away from peers that are known to distract them (DeRoche, 2013);
- formulating an inclusive maths curriculum by considering a range of ways to convey mathematical concepts and relationships (e.g., using pictures, diagrams, blocks and other objects) (Scherer et al., 2016);

⁸ Story mapping is a graphic representation of the setting, characters, contexts and events that take place in the story.

“My mind is completely visual and spatial work like drafting is easy for me. I remember that I taught myself to draft in six months. I have designed large steel and cement buildings such as stables for keeping livestock, but I still find it difficult to remember a telephone number or to add”

(Darretxe & Sepulveda, 2011, p. 881)

While the largest body of educational research on low cost supports and strategies for neurodiverse children and young people was centred on autistic students, the recommended approaches did not extend beyond those suggested for other groups. This is despite the fact that autistic children and young people are recognised as processing information differently to their neurotypical (and many of their neurodiverse) peers (Simpson et al., 2010). Consistently reported instructional strategies for autistic students include:

- giving small amounts of instruction at a time and reducing the number of activity requirements;
- reducing complex steps in an activity;
- providing simple and concrete instructions and give clear explanations of the skill or task required of the student;
- offering guided practice and more than one opportunity to practice and apply the knowledge they have learned;
- giving the student the choice to integrate their specific interests and abilities into activities;
- designing games and activities for break times that encourage social interaction;
- limiting the number of ways to perform a skill or task;
- using explicit language as many children with ASD have difficulty with the use of expressions or figurative speech;
- using visual supports;
- developing social narratives or social stories;
- utilising technology such as video modelling procedures to enhance strengths in visual processing (Constable, Grossi, Moniz, & Ryan, 2012; Fleury, 2014; Hall, Hollingshead, & Christman, 2019; Koegel et al., 2012; Lang et al., 2011; Simpson et al., 2010).

By way of contrast to the relatively large knowledge base relating to autism, only one article on students with Traumatic Brain Injury (TBI) met the criteria for inclusion in this review (Schutz & McNamara, 2011).⁹ The strategies reported in this article have synergies with all of the themes generated, but are reported in detail under current theme as a useful blueprint or approach when supporting students who have experienced a TBI. Shultz & McNamara (2011) recommend a commitment to:

- monitoring the student’s behaviour and progress in learning to see whether any interventions are required. Older students may be asked to self-monitor their progress;
- facilitating collaborative discussions between the student, teacher, parents, and other professionals to discuss the unique strengths and needs of the student;
- devising a plan that best utilises student’s strengths and meets their needs;

⁹ For further information on TBI refer to <https://www.inclusive.tki.org.nz/guides/brain-injury/>

- ensuring the student pays attention when verbal instructions are provided by printing out written instructions to supplement the oral instructions, repeating the instructions when the student's eye gaze meets the teacher's, or alerting the student before speaking to them directly;
- creating structured and consistent environments where there are minimal changes to their routine;
- orientating the student to a new classroom before other students arrive, providing them with a daily schedule for the day's activities, and assisting them with transitioning between different activities;
- announcing major transitions that might take place throughout the day and allow for increased time for students to disengage from their previous activity;
- performing rituals that can swiftly shift the pace from one activity to the next can also assist students to transition between activities (e.g., playing music for a few minutes as the students remove their materials from a previous activity and become ready for the next);
- teaching students a quick relaxation strategy (e.g., breathing) to help manage any distress;
- using a variety of methods to help students retain information (e.g., transcribing lessons, recording lessons for future reference, highlighting important aspects of a text, getting students to test each other or self-test, and breaking down study into smaller time blocks).

"If they're stuck on a question you can help them out - like not give them the answers but help them out in a way. Sometimes teachers do it in a way that grown-ups understand, do it in a kind way that they'd understand" - Peer of student with ID, Nowicki & Brown, 2013, p. 258

Curriculum adaptations and teaching instructions can both be essential components for students with intellectual disability to have greater access to the core curriculum (Alquraini & Gut, 2012). Those gleaned from the ID literature focused mirror the strategies presented above, further illustrating the consistency in approaches reported as having utility for neurodiverse students. A range of ID education researchers suggest:

- using simple, short sentences (Lucas, 2011);
- repeating instructions frequently, providing adequate feedback, and checking if the student needs further clarification (Hudson, Browder, Wood, 2013; Lucas, 2011);
- pausing, being patient, and allowing students time to explain and demonstrate their understanding (Lucas, 2011);
- breaking work down into smaller tasks and ensuring that each smaller task has been mastered before moving to the next task (Nowicki & Brown, 2013);
- implementing a range of modalities to communicate content (e.g., visual aids, gestures and sign language, video modelling, checklists) (Lucas, 2011; Nowicki & Brown, 2013; Pennington & Koehler, 2017);
- providing choices so that students feel they are more in control and active participants in their learning (Lucas, 2011);

- using embedded instructions and problem solving techniques that provide a student with a structured approach to solve problems they may naturally face during classroom activities and routines (Alquraini & Gut, 2012).¹⁰ These strategies can also be taught to peers who can provide support when students with ID are trying to engage in this process (Hudson et al., 2013);
- ensuring the student is only given instructions for a short amount of time and given regular short breaks (e.g., the student is allowed to leave the classroom to run an errand or get a drink of water).

Finally, for students with communication disorders, it is recognised as important for teachers to speak in a loud, clear voice. Moreover, using simple language, repeating instructions, making eye contact when speaking to the student, providing information through various means (e.g., visual picture cards) and breaking tasks down into smaller steps, can all promote greater understanding and facilitate learning (Wickremesooriya, 2015; Zebron et al., 2015). Allowing the student extra time or to be given the text they are expected to read aloud in class before time to practice (e.g., a day before) can also lessen their anxiety and make such learning experiences less daunting (Sari & Gökdağ, 2017).

Technology

Although the body of literature relating to this mode of instruction was smaller than anticipated, the use of technology consistently reported as a relatively cost effective method for supporting the learning needs of all students, including those who are neurodiverse. Technology can support learning by improving skills in academic areas, increasing engagement, and motivating students (Brunvand & Byrd, 2011). Depending on each particular student's needs, a whole spectrum of technology is available to make the teaching curriculum more accessible for students with SLD for example (Messinger-Williman & Marino, 2010). Assistive technology can range from a simple pencil grip, reading ruler, magnifying glasses or slanted board to more advanced word prediction computer software and speech to text technology (Messinger-Williman & Marino, 2010). For instance, the LiveScribe Pen can store handwritten notes and audio messages. A student can listen to the teacher's recording as many times as they need to (Harper, Kurtzworth-Keen & Marable, 2017). Technology use can remove barriers, increase access to learning, and enable a student to feel more independent and empowered with their learning (Harper et al., 2017).

The development of new technological advancements can also encourage the effective participation of students with an intellectual disability in the education context. Augmentative and alternative communication technology such as computers, specialised software, and communication boards are effective ways to facilitate communication for students with an intellectual disability (Alquraini & Gut, 2012). The use of technology can also facilitate the learning of students with ADHD and lead to greater participation in the classroom. Sorensen and Andersen (2017) discuss several technological methods such as speech to text technology, iPad use, writing templates, and various applications (e.g., AppWriter) that can be used to help students to improve their focus and keep up with the teaching in class. For instance, writing templates provide a framework for the student to keep track and

¹⁰ For instance, students can apply the 'self-directed knowledge chart' as a way to inquire about a problem they are facing (K: What do you know?, W: What do you want to know?, H: How will you find out?, L: What did you learn?; (Jimenez, Browder, Spooner, Dibiase, 2012).

remind them about their progress when they lose focus. Another option is speech to text technologies which can predict type what is being said by the teacher in the classroom, allowing the student to listen carefully without having to divide their attention between listening and writing notes simultaneously. While it is possible to identify some examples of software that has been the subject of empirical or evaluative research, the rapid development of education technology means that new and emerging software and other technology specifically designed to support learning, including neurodiverse learners is constantly becoming available. It is therefore important that schools, teachers, and other educators with responsibility for neurodiverse students are alert to these new learning support technologies.

Discussion and conclusion— What can the research tell us about responding to neurodiversity in New Zealand schools and classrooms?

This report presents findings generated through a systematic process of identifying educational research with the potential to inform easily implemented, low cost, flexible supports for neurodiverse students in New Zealand primary and secondary schools. From the body of relevant literature, five key themes were exposed and are summarised here.

Prioritising and valuing relationships

The theme prioritising and valuing relationships is prominent within and across all of the research relating to neurodiverse students in the education context. Most significantly, educational outcomes are recognised as being greatly enhanced by efforts to ensure that neurodiverse students are both *seen and heard* by their teachers, and their peers. Across the spectrum of neurodiversity, the literature consistently identifies that positive and meaningful relationships with peers and teachers enhance learning and lead to genuine inclusion of neurodiverse students. Teachers can build relationships with neurodiverse students by being respectful, warm, empathetic, actively listening, and making an effort to get to know the student and their interests (Rentenbach et al., 2017).

Teachers must also be active agents in facilitating neurodiverse students to foster relationships with their peers. The research calls for teachers to actively facilitate the student's efforts to make friends, and to intervene if bullying occurs. This can occur quite naturally by assigning peer buddies or identifying commonalities between students, and providing both the opportunity and encouragement to explore them. Moreover, teachers can foster positive relationships among peers by encouraging them to engage in peer or group activities. Through these activities, students are able to learn academic skills from each other, form friendships and learn important social skills (Ylonen & Norwich, 2012). Peer collaboration has been found to result in an increase in the self-esteem of students as they learn to value and perceive each other more positively (Ncube, 2011).

Finally, research also highlights the important role teachers can take in educating students about neurodiversity. It is recommended that teachers should provide all students with an understanding that neurodiversity is part of the normal variability of human beings and discuss the benefits and difficulties neurodiverse students might experience. Armed with increased knowledge, neurotypical students are more likely to understand and be more inclusive of their neurodiverse peers (Rentenbach et al., 2017) and thus to continue to erode deficit conceptualisations of diversity and human difference.

That said, it is important not to assume a “one-size-fits-all” approach to neurodiverse students, and vital to consider each student’s strengths and needs, and to tailor the strategies for each unique student. Teachers can assess and utilise a student’s strengths and difficulties by collaborating with them, their family, and other educators and relevant professionals to develop a mutually agreed plan that meets the student’s learning needs. All educational plans should uphold the primacy of neurodiverse students as experts on their own needs within this process.

Developing agency

Developing agency within students with neurodiversity is essential in helping them feel a sense of ownership over their learning. Fostering this agency can make students feel empowered and encourage them to strive for the best possible academic outcomes. Independence can be nurtured within neurodiverse students by providing them with choice and flexibility in regards to their learning and can begin very simply with opportunities such as choosing between activities or the type of book they would like to read (Cook & Rao, 2018). Agency can also be developed by encouraging students to set their own goals and targets for learning, building insight into their strengths and weaknesses, monitoring their own progress, and effectively communicating with teachers or peers when they need help (Hart & Brehm, 2013).

Supporting students to understand and manage their own behaviour

Neurodiverse students can behave in ways that do not consistently align with what is typically expected or accepted in classroom environments. To create positive changes in behaviour, an initial functional assessment of the student’s behaviour can seed the development of a behaviour intervention plan that focuses on mitigating the triggers that are identified as leading to inappropriate behaviour and provide rewards (e.g., praise and positive feedback) for appropriate or desired behaviour. It is essential for students to feel that learning is a rewarding experience (Nagro et al., 2016). Noticing and reinforcing the appropriate behaviour of (all) students can be very effective in encouraging them to continue to engage with their learning. To be most effective, reinforcement needs to be consistent and to specifically identify the behaviour that is being rewarded. Students should be supported to understand and manage their own behaviours by selecting their own behaviour goals, observing and recording their behaviour, and being in control of their own reinforcement. Self-management shifts some of the responsibility of behaviour management to the student, giving that child or young person greater opportunity to interact with their peers and be more involved in classroom activities (Crosland & Dunlap, 2012).

Creating inclusive environments

The classroom environment needs to be a space where neurodiverse students feel accepted and valued for who they are. When neurodiverse students feel a sense of belonging, they are more likely to actively participate and engage with their learning. Along with supporting students to build supportive relationships, creating a structured and predictable environment with clear routines and rules is essential in supporting neurodiverse students to flourish at school. Making adaptations to the environment to reduce sensory overstimulation often needs to occur before neurodiverse students begin to engage in learning. This can be achieved by seating the student away from visually stimulating classroom walls, harsh fluorescent lighting, and too much noise. Clearly labelling materials and the location of activities to ensure that the structures of the environment are consistent is also seen as important for neurodiverse students who benefit from predictability (Simpson et al., 2010; Darretxe & Sepulveda, 2011). Finally, providing students with a mutually agreed space in the classroom away from their peers can help neurodiverse students who experience agitation or anxiety to be able to calm themselves.

Embedding inclusive teaching strategies

The importance of diversity and flexibility in the teaching methods used was an overarching theme stressed in the majority of research included in this review. Neurodiverse students are more likely to learn if information is presented to them in a range of ways that play to their strengths and interests (e.g., visual, verbal, tactile, and kinaesthetic) (Frey, Andres, McKeenman & Lane, 2012). Moreover, this review also highlighted the importance of making adaptations to teaching instructions and the general learning curriculum to enable neurodiverse students to become active participants in their learning and have greater access to the general content being taught. Adaptations included keeping instructions simple, breaking tasks into smaller steps, slowing down the pace, providing simplified versions of the curriculum, and giving students extra time to process and respond to the information provided. Research also called for unique ways for students to learn not only specific academic content but also about the learning process itself, through strategies such as problem solving.

A range of cost effective technology was also suggested as a viable way to support, engage, and motivate neurodiverse students. Technology can range from a simple reading ruler or magnifying glass to more advanced computer software, alternative keyboards, virtual reality and speech to text technology. Using technology in the classroom setting can make the learning curriculum more accessible by removing barriers to learning (Harper et al., 2017). It is important to note, however, that technology and software develops so quickly that the published academic research literature may not be the most relevant and current place to identify specific technology that might be useful for neurodiverse students.

The research strongly suggests that commitment to the five principles or themes outlined above may provide the foundation for a ***flexible range of specialist supports required to better meet the needs of neurodiverse students***. However, overwhelmingly, these foundational principles and strategies determined to be responsive to neurodiverse students and their learning support needs are strongly reliant on classroom teachers approaching each student, regardless of their label, as an individual. The literature also consistently

recommends strategies for neurodiverse students that require teachers to deliver long-established evidence-based educational methods and practice every day, and during every interaction with their neurodiverse students. Embedded within, or underpinning these recommendations is the expectation that schools and teachers will have a genuine commitment to inclusion and inclusive practices, and take a relationship based approach. In advocating such an approach, the strategies for responsiveness to neurodiversity in the education context drawn from this review, mirror other fields or contexts also wanting to better meet the needs of neurodiverse people.¹¹ Furthermore, the research clearly points to classroom teachers as an essential conduit to positive academic and relational experiences for neurodiverse students. While the strategies identified in the literature may, on the surface of it, sound simple, it is clear that they are not yet foundational, expected experiences in all schools and classrooms. This suggests that implementing such strategies consistently, and with full understanding of their origin and intent is not a simple undertaking for busy teachers.

Limitations

The current review explored academic literature related to neurodiversity in the education context. It was a complex task. First, the all-encompassing and rapidly expanding conceptualisation(s) of neurodiversity means that it is difficult to produce a definitive set of references that answer the question: **what can the research tell us about evidence-based approaches to the learning support needs of neurodiverse students?** As has been well established throughout this report, the term neurodiversity refers to a very wide spectrum of students.

Despite a growing awareness of neurodiversity and its potential to impact on learning outcomes, the evidence-based practice with this diverse group of learners could be seen to be at an emergent stage. A significant challenge encountered in the work was to achieve adequate representation of the groups of primary and secondary students generally considered to be neurodiverse. As noted in the introductory section of this report, neurodiversity is an ever-expanding construct, and a label that does not yet have universal understanding. For this reason it was necessary to approach this review in a way that 'broke down' the broad term into specific diagnoses in order to access the relevant literature. Despite the fact that we included a significant number of student groups based on this diagnosis-based approach, there arguably, are yet more children and young people who could have been included. For example, we did not include students who experience significant and ongoing mental distress due to trauma, or neurodiverse children under five years of age due to reasons of scope.

The research literature assessed as being in-scope for this review primarily originated from North America and it is important to acknowledge that none of the reviewed research considered neurodiversity from a Te Ao Māori perspective, which is a significant limitation. While there was consistency and strength in the strategies identified and recommended in the literature, they could be seen as falling into a category of literature referred to by Haug (2017) as impairment oriented teaching strategies. This meant that effective and evidence-

¹¹ For example, a range of research relating to responding to neurodiversity in the legal system identifies the need for a focus on conveying information in a manner that the person can access and understand, slowing the pace of information, developing trusting relationships, and providing opportunities and strategies for the person to control the environment to reduce anxiety and to increase the chance that they will be able to be meaningfully engaged in the legal matters that concern them.

based strategies were often presented using deficit-based language. For the purposes of this review, we actively sought to re-present these evidence-based strategies in more positive language aligned with contemporary understandings and expectations in Aotearoa New Zealand. In addition, the available literature generally failed to consider multiple diagnoses in a single student or the impact of other forms of intersectionality including ethnicity, culture, gender, sexuality, religion and/or other identities important to individual neurodiverse or young people.

Also related to the above point, only a small amount of the reviewed literature was conducted by neurodiverse researchers, or was exclusively focused on the experiences and perspectives of neurodiverse students, although these were highlighted wherever possible throughout this review.

Finally, despite the unique traits and characteristics of the broad and varied group of learners labelled neurodiverse, the literature showed very little variation when explored for strategies and innovations for ensuring that educational contexts are responsive to neurodiversity. This has led to a high degree of repetition within and across this report. Furthermore, and perhaps most significantly, this detailed examination of the research literature did not uncover one specific innovation or approach that had been trialled, evaluated, and found to be the “best way” to support neurodiverse students. Instead, the literature highlighted that unwavering commitment to the philosophy of inclusion, and practising evidence-based teaching methods with all students, all of the time were the strategies most likely to lead to neurodiverse primary and secondary students achieving the positive social and academic outcomes throughout their educational journey.

Conclusion

In the introduction to this report it was noted that the Learning Support Action Plan 2019 – 2025 expresses the following aspirations:

New Zealanders want an education system where all children and young people can take part in education and can learn, and achieve, whatever their needs. We want to build the world’s best education system for all New Zealanders and provide a range of different types of learning environments and settings to meet the needs of all children and young people and their parents and whanau. (pg. 4).

Despite its breadth, this statement provides an important platform from which the learning support needs of neurodiverse students can begin to be addressed. The education sector, like many others, is increasingly recognising that neurodiversity can have a negative impact on the educational experiences of students who are so labelled. However, while there is increased recognition that neurodiversity can be a barrier to children and young people being a real part of “*the world’s best education system*” that New Zealand is committed to building, there is still much to learn and understand about how to identify neurodiversity, and subsequently, how to meet the learning needs of neurodiverse students.

This review has established that there is no ‘quick fix’ for the growing group of neurodiverse students who are recognised as not yet receiving the best possible education. A review of research literature did not unearth a ground-breaking innovation that can be universally applied, however it has strongly reinforced that the best way to be responsive to the learning

needs of neurodiverse students is to prioritise and value relationships, support neurodiverse students to develop agency, understand and manage their own behaviours, create inclusive environments and embed inclusive teaching strategies. These are all familiar concepts. Ideas that have been forwarded many times before, and ideas that, unfortunately, have often been overlooked or ignored because it is assumed that everybody knows them, therefore everyone is doing them. An alternative approach might be to assume that not everybody is doing them and that true innovation will occur when these well-recognised evidence-based educational methods and strategies occur every day, and are practised by every teacher and student, and the schools infrastructures that sit behind them.

A concerted and systemic effort to commit to the elements of responsive practice outlined in this report may lead, over time, to more neurodiversity specific strategies and innovations. Alternatively, they may result in neurodiverse students simply becoming embedded in their classrooms and schools in a way that significantly reduces the need for them. Both outcomes would be positive.

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Appendices

Appendix 1: United Nations Convention on the Rights of Persons with Disabilities Article 24 – Education (in full)

1. States Parties recognize the right of persons with disabilities to education. With a view to realizing this right without discrimination and on the basis of equal opportunity, States Parties shall ensure an inclusive education system at all levels and lifelong learning directed to:

- (a) The full development of human potential and sense of dignity and self-worth, and the strengthening of respect for human rights, fundamental freedoms and human diversity;
- (b) The development by persons with disabilities of their personality, talents and creativity, as well as their mental and physical abilities, to their fullest potential;
- (c) Enabling persons with disabilities to participate effectively in a free society.

2. In realizing this right, States Parties shall ensure that:

- (a) Persons with disabilities are not excluded from the general education system on the basis of disability, and that children with disabilities are not excluded from free and compulsory primary education, or from secondary education, on the basis of disability;
- (b) Persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live;
- (c) Reasonable accommodation of the individual's requirements is provided;
- (d) Persons with disabilities receive the support required, within the general education system, to facilitate their effective education;
- (e) Effective individualized support measures are provided in environments that maximize academic and social development, consistent with the goal of full inclusion.

3. States Parties shall enable persons with disabilities to learn life and social development skills to facilitate their full and equal participation in education and as members of the community. To this end, States Parties shall take appropriate measures, including:

- (a) Facilitating the learning of Braille, alternative script, augmentative and alternative modes, means and formats of communication and orientation and mobility skills, and facilitating peer support and mentoring;
- (b) Facilitating the learning of sign language and the promotion of the linguistic identity of the deaf community;
- (c) Ensuring that the education of persons, and in particular children, who are blind, deaf or deafblind, is delivered in the most appropriate languages and modes and means of communication for the individual, and in environments which maximize academic and social development.

4. In order to help ensure the realization of this right, States Parties shall take appropriate measures to employ teachers, including teachers with disabilities, who are qualified in sign language and/or Braille, and to train professionals and staff who work at all levels of

education. Such training shall incorporate disability awareness and the use of appropriate augmentative and alternative modes, means and formats of communication, educational techniques and materials to support persons with disabilities.

5. States Parties shall ensure that persons with disabilities are able to access general tertiary education, vocational training, adult education and lifelong learning without discrimination and on an equal basis with others. To this end, States Parties shall ensure that reasonable accommodation is provided to persons with disabilities.

Appendix 2: The New Zealand Disability Strategy Outcome 1 – Education (in full)

Outcome 1: Education. The strategies vision:

- Provide learning pathways that support individuals with a disability to develop friendships, social skills, resilience and confidence. These skills will give these individuals a sense of belonging, develop identity and prepare them for life beyond compulsory education.
- All schools and education services should be welcoming and provide inclusive education for individuals with disability. Teachers ought to be trained and believe in the progress and achievement of individuals with disability and value their contribution to the learning environment.
- Education is provided in a way that supports people with disabilities' personal, academic, and social development. For instance, using various modes and means of communication (e.g., NZSL).
- Teachers and peers to treat people with disability with respect and dignity.
- Inclusion of family and whanau to help support the individual's progress in education.
- Ensure transitional periods during education (e.g., moving onto tertiary education) are smooth and the right information and supports are in place.
- Disabled people are consulted on and actively involved in the development and implementation of legislation and policies concerning education, including early childhood, primary, secondary and tertiary education.
- Access to mainstream education is inclusive (including policy, practice and pedagogy).
- Services that are specific to disabled people are high quality, available and accessible.
- Inclusive education is a core competency for all teachers and educators.
- Decision-making on issues regarding education of disabled people is informed by robust data and evidence.

Appendix 3: References and resources related to specific types of neurodiversity

Specific Learning Disability (SLD)

Resources

Dyslexia Foundation of New Zealand. (2014). Dyslexia: Recognition, understanding, action. Retrieved from http://www.dyslexiafoundation.org.nz/pdf/DFNZ_Brochure_2014_web.pdf

- This resource outlines the definition of dyslexia, its prevalence in New Zealand and discusses how teachers can support students with dyslexia to unlock their full potential.

International Dyslexia Association. (2017). *Dyslexia in the classroom: What every teacher needs to know*. Retrieved from <https://dyslexiaida.org/wp-content/uploads/2015/01/DITC-Handbook.pdf>

- This resource outlines the definition of dyslexia, its signs and symptoms, the connection between dyslexia and mental distress, and the ways in which schools can implement academic accommodations and modifications to help students with dyslexia to succeed.

Ministry of Education. (2008). *About Dyslexia*. Retrieved from <https://www.inclusive.tki.org.nz/assets/inclusive-education/resource-documents/About+Dyslexia.pdf>

- This resource is for classroom teachers with students who show signs of dyslexia. It provides teachers with practical strategies they can use to help identify the difficulties these students experience, along with supporting teaching strategies that build on these student's strengths.

Te Kete Ipurangi. (n.d.). *Dyslexia and learning*. Retrieved from <https://www.inclusive.tki.org.nz/guides/dyslexia-and-learning/>

- This website provides information for teachers to learn the key concepts and strategies to support students with dyslexia in primary and secondary school education.

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Boyle, J. R., Forchelli, G. A., & Cariss, K. (2015). Note-taking interventions to assist students with disabilities in content area classes. *Preventing School Failure: Alternative Education for Children and Youth*, 59(3), 186-195.

Cook, S. C., & Rao, K. (2018). Systematically applying UDL to effective practices for students with learning disabilities. *Learning Disability Quarterly*, 41(3), 179-191.

DeRoche, C. (2013). Loose coupling and inhabited institutions: Inclusion policy and teacher strategies. *Brock Education: A Journal of Educational Research and Practice*, 23(1), 77-95.

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Autism Spectrum Disorder (ASD)

Resources

Te Kete Ipurangi. (n.d). ASD and learning. Retrieved from <https://www.inclusive.tki.org.nz/guides/asd-and-learning/>

- This website provides information for teachers to learn about the key concepts and experiences of students with ASD and key strategies to support these students in their learning.

Ministry of Education. (2016). Autism spectrum disorder (ASD): A resource for educators. Retrieved from <http://seonline.tki.org.nz/ASD/Resources-and-tools/ASD-for-educators/Read-online-version>

- This resource examines how ASD can influence learning and provides strategies teachers can use in the classroom.

Ministry of Health and Education. (2016). New Zealand autism spectrum disorder guideline. Retrieved from <https://www.health.govt.nz/publication/new-zealand-autism-spectrum-disorder-guideline>

- Part three of this guideline provides recommendations about the approaches to teaching for learners with ASD.

Autism Speaks. (2012). School community toolkit. Retrieved from <https://www.autismspeaks.org/sites/default/files/2018-08/School%20Community%20Tool%20Kit.pdf>

- This kit provides helpful information about students with autism and strategies that can be used to achieve positive interactions and increasing learning for all members of the school community.

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Traumatic Brain Injury (TBI)

Resources

Te Kete Ipurangi. (n.d.). Supporting learners with acquired brain injury. Retrieved from <https://www.inclusive.tki.org.nz/guides/brain-injury/>

- This website provides information for teachers to learn about the key concepts and experiences of students with acquired brain injury and key strategies to support these students in their learning.

Jantz, P. B., Davies, S. C., & Bigler, E. D. (2014). Working with traumatic brain injury in schools: Transition, assessment, and intervention. Routledge.

- This book is a comprehensive guide for teachers to employ effective school based interventions for students who have experienced a traumatic brain injury.

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Intellectual Disability

Resources

Downing, J. (2010). Academic instruction for students with moderate and severe intellectual disabilities in inclusive classrooms. Corwin Press.

- This book discusses instructional strategies with students with disabilities. This resource can help teachers adapt their curriculum, work collaboratively, develop accurate assessments and track student progress.

Te Kete Ipurangi. (n.d.). Down Syndrome and learning. Retrieved from <https://www.inclusive.tki.org.nz/guides/down-syndrome-and-learning/>

- This website provides information for teachers to learn about the key concepts and experiences of students with Down Syndrome and key strategies to support these students in their learning.

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Foetal Alcohol Spectrum Disorder (FASD)

Resources

Healthy Child Manitoba and Manitoba Education and Training. (2018). What educators need to know about FASD: Working together to educate children in Manitoba with fetal alcohol spectrum disorder. Retrieved from https://www.gov.mb.ca/healthychild/fasd/fasdeducators_en.pdf

- This guideline provides information on understanding the needs of students with FASD and how these needs can be addressed by using a range of teaching strategies.

National Organisation on Fetal Alcohol Syndrome. (2012). FASD: What school systems should know about affected students. Retrieved from <http://www.nofas.org/wp-content/uploads/2012/05/students-school.pdf>

- This is a one page summary outlining the characteristics of FASD, how FASD affects learning and behaviour, and successful strategies for educating children with FASD.

National Organisation on Fetal Alcohol Syndrome. (2009). Fetal alcohol spectrum disorders education strategies. Retrieved from <https://www.usd.edu/-/media/files/medicine/center-for-disabilities/handbooks/fasd-educational-strategies-handbook.ashx?la=en>

- This handbook provides education strategies to help teachers who work with students with FASD who have difficulties with communication, executive functioning, behaviour and social skills.

Parsonson, B.S. (2015). Fetal alcohol spectrum disorder: Strategies for learning, behaviour and communication, Ministry of Education. Retrieved from <https://inclusive.tki.org.nz/assets/inclusive-education/MOE-publications/Barry-Parsonson-Revision-06-07-15.pdf>

- This review outlines the nature and consequences of prenatal alcohol exposure and summaries a number of learning and behaviour management strategies for children with FASD in the classroom setting.

Zieff, C.D., & Schwartz-Bloom, R. D. (2008). Understanding fetal alcohol spectrum disorders: A comprehensive guide for pre-k - 8 educators. Retrieved from https://sites.duke.edu/fasd/files/2016/04/FASD_Guide.pdf

- This guideline discusses key information about FASD and provides an overview of the challenges a student with FASD might face in regards to their learning and behaviour in the classroom. The resource also provides effective strategies to support students to overcome these challenges.

Te Kete Ipurangi. (n.d.). FASD and learning. Retrieved from <https://www.inclusive.tki.org.nz/guides/fetal-alcohol-spectrum-disorder-and-learning/>

- This website provides information for teachers to learn about the key concepts and experiences of students with FASD and key strategies to support these students in their learning.

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Communication Disorders (CD)

Resources

Te Kete Ipurangi. (n.d.). Speech, language and communication needs. Retrieved from <https://www.inclusive.tki.org.nz/guides/speech-language-and-communication-needs/>

- This website provides information for teachers to learn about the key concepts and experiences of students with speech, language and communication needs and key strategies to support these students in their learning.

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Attention deficit/hyperactivity disorder

Resources

Te Kete Ipurangi. (n.d) ADHD and learning. Retrieved from <https://www.inclusive.tki.org.nz/guides/adhd-and-learning/>

- This website provides information for teachers to learn about the key concepts and experiences of students with ADHD and key strategies to support these students in their learning.

Ministry of Education. (2015). Attention-deficit/hyperactivity disorder: A resource for teachers. Retrieved from <https://www.inclusive.tki.org.nz/assets/inclusive-education/MOE-publications/MOESE0040-ADHD-booklet.pdf>

- This resource provides information on how ADHD can influence learning and provides strategies teachers can use in the classroom. It examines key areas where students with ADHD may need support and features some whole class strategies that may benefit all students, particularly those with ADHD.

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