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How do teachers support their students on the autism spectrum in Australian primary schools?

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This study investigated the supports and modifications made available to students on the autism spectrum in Australian schools. Teachers rated the importance of several factors in determining the grades of their students and reported on the frequency of student engagement with a range of instructional materials. Eighty-seven teachers identified the modifications, accommodations and additional assistance provide to primary school students on the autism spectrum. Teachers also compared the frequency of class engagement and methods of evaluating outcomes for students with and without autism. A range of modifications and adjustments were implemented to support students on the spectrum. There were no significant differences in the frequency of instructional material use of students on the autism spectrum compared to their classmates. However, teachers did report differences in their methods of determining the grades of their students with and without autism. This is an important first step in understanding the experiences of teachers who are educating students on the autism spectrum in Australian schools. The findings reveal that teachers are working to support the diverse learning needs of their students on the autism spectrum. Further investigation of the factors that are driving teachers' use of school-based supports is warranted.

Introduction

Autism is a lifelong neurodevelopmental condition, characterised by differences or difficulties in social communication and the presence of restricted and repetitive behaviours. The American population prevalence reported by the Centre for Disease Control and Prevention reveals a rise in autism over the last decade, increasing from 1 in 166 in 2006 to a current estimated prevalence of 1 in 59 (Baio, 2018). In 2015, approximately 83 700 Australian children and youth years (aged 5–20 years) with a diagnosis of autism were living in households and attending school (Australian Bureau of Statistics, 2015). This rise in prevalence is coupled with an increase in inclusive education, with 70% of children on the spectrum now attending mainstream primary schools (Clark, Vinen, Barbaro, et al., 2018). This means that the majority of teachers can reasonably expect to have one or more students on the autism spectrum in their classes each year. Autism, by definition, is highly heterogeneous, and the uneven cognitive profiles, academic fluctuation, and islets of ability mean there is no 'one size fits all' approach to ensuring inclusion in an education setting. The uniqueness of each student's profile means that a thorough understanding of each individual's strengths and needs is required to develop an individualised suite of strategies for each student within the class (Iovannone, Dunlap, Huber, et al., 2003; Roberts, 2019). Students on the autism spectrum have been shown to consistently underperform academically when compared to their classmates (Ashburner, Ziviani and Rodger, 2010; Keen, Webster and Ridley, 2015), highlighting the importance of implementing effective strategies to support educational progress and success within classroom settings.

Over the last few decades, the move from a medical to a social model of disability was grounded in legislation, such as the Australian Disability Discrimination Act (Australian Government, 1992) and the United Kingdom Disability Discrimination Act (United Kingdom Government, 1995) and resulted in a move towards inclusive education. This was considered by many to be a human rights issue and was enshrined in the Salamanca Statement (United Nations Ministry of Educational, Cultural Organization, and Science, 1994). Various countries have enacted legislation (e.g., the Australian Disability Standards for Education Act, Australian Government, 2005 and the UK Equality Act, 2010) stating that schools are to make reasonable adjustments to ensure that all students are able to participate in the curriculum on the same basis as their peers. A 2018 ruling in the UK ensures that children cannot be excluded for behaviour that is linked to their autism profile if no steps have been taken to put the right supports in place. Teachers are expected to make adjustments to the curriculum (content) including assessment and reporting, to methods of instruction (process) and to the environment. Adjustments may involve modifying programs and adapting curriculum delivery and assessment strategies, providing ongoing consultancy

support or professional learning and training for staff, specialised technology or computer software or equipment, provision of study notes or research materials in different formats, and services such as specialist support staff, tutors or aides. These strategies may be implemented at the individual, class or whole-school level.

Within Australia, the Nationally Consistent Collection of Data on School Students with Disability (Australian Government, 2018) was developed by the Education Council to promote fair and equitable access to and participation in school for all students, irrespective of their disability. Schools are required to provide evidence to record adjustments made (including how these were decided upon) and are invited to use reflective tools to continually evaluate and review their supports to improve the learning outcomes of their students with disabilities. However, these data are not diagnostic-specific: they only categorise the child's disability as cognitive, physical, sensory or social-emotional, which limits the possibility of using these data to explore the adjustments and supports being used to facilitate inclusion for students on the autism spectrum.

Whilst legislation supports the need for reasonable adjustments as part of efforts towards inclusion of students on the autism spectrum, there is a suggestion that regulations guiding inclusion remain well ahead of attitudes and real-world practice (Pellicano, Bölte and Stahmer, 2018). Given the move towards inclusion and the recognition of the importance of effective and tailored strategies to support each student on the spectrum in schools, it is surprising that there is limited literature exploring the strategies currently being used to support students on the autism spectrum. This is despite the availability of research-based knowledge of the key components needed for the successful inclusion of students with disabilities and autism, in particular within schools (Iovannone et al., 2003; Saggers, Klug, Harper-Hill, et al., 2015; Simpson, de Boer-Ott and Smith-Myles, 2003).

A lack of models and procedures to facilitate the successful inclusion of students on the spectrum in mainstream schools means that some staff in schools do not feel supported and are faced with the task of designing programs in the absence of clear guidelines and procedural protocols (Simpson et al., 2003). In mainstream school settings, school staff have reported a lack of training in relation to students on the spectrum; for example, in a recent study in Sweden, only 14% of staff reported that they had received any formal education in teaching students with neurodevelopmental disabilities (Bartonek, Borg and Berggren, 2018). Consequently, teachers often feel ill equipped, stressed and anxious about meeting the needs of students on the spectrum in their classrooms (Beauchamp, 2012) and consider themselves to be less than fully capable of meeting their social, learning and behavioural needs (Marks, Shaw-Hegwer, Schrader, et al., 2003; National Association of Schoolmasters Union of Women Teachers (NASUWT), 2013).

Education professionals believe that teachers require more collegial support to include students on the spectrum compared to other students with disabilities (Sansosti and Sansosti, 2012). Limited knowledge, and difficulty in addressing individual student needs, have been perceived as challenging and stressful for teachers (Soto-Chodiman, Pooley, Cohen, et al., 2012). Research also indicates that school principals lack sufficient knowledge to make decisions, manage resources and create school cultures and programs that support students on the autism spectrum (Ashburner et al., 2010). In another study, school management and subject teachers believed that they lacked continuing professional development opportunities and felt they would benefit from further training (Humphrey and Symes, 2013), which is an important consideration given that teachers' knowledge and confidence have been identified as key factors in their selection and implementation of appropriate strategies to support students on the spectrum (Anglim, Prendeville and Kinsella, 2018; Chung, Chung, Edgar-Smith, et al., 2015; Saggers et al., 2015; Soto-Chodiman et al., 2012). Without knowledge about both autism and the needs of each individual student, strategies employed by teachers are likely to have been informed by personal experience and tested through trial and error (Roberts and Simpson, 2016; Soto-Chodiman et al., 2012). This creates the potential for a regressive series of interactions which, despite the best of intentions, may negatively impact students and diminish the confidence of teachers (Carrington, Berthelsen, Nickerson, et al., 2016; Garrad, Rayner and Pedersen, 2019). The importance of knowledge and understanding of autism is also highlighted by students on the spectrum themselves, who stress that education professionals require greater understanding of autism and the impact that factors such as environmental noise and crowding can have on their participation at school (Roberts and Simpson, 2016).

The current study

The heterogeneity in cognitive and language profiles associated with the autism spectrum results in both unique and diverse learning needs (Bauminger-Zviely, 2013; Hart and Malian, 2013; Morrier, Hess and Heflin, 2010). As such, the nature and frequency of adjustments used to support the learning of students on the spectrum may differ from what is applied to suit the learning needs of their classmates. Despite this clear need for adjustments, there is a lack of information available describing the use of school-based provisions for students on the autism spectrum. Consequently, there is a limited understanding of how students on the autism spectrum are being supported within their school environment, a place where they spend a large proportion of their time. In particular, little is known about how teachers modify their practice when delivering the curriculum to students on the autism

spectrum, and whether this differs from their approach to teaching the whole class.

To that end, the current study explored the classroom practices of teachers educating Australian students on the autism spectrum, with a specific focus on the adaptations and modifications made to support and assess the learning of students on the autism spectrum. The following research questions were posed:

Research questions

1. What are the most frequently reported strategies (supports, accommodations and additional assistance) used by teachers to support the learning of students on the autism spectrum?
2. Do teachers report using these strategies/modifications specifically for the student on the autism spectrum or are they implemented with the same frequency classwide?
3. Do teachers report differences between students on the autism spectrum and the remainder of the class in:
   a. student engagement and participation in school activities?
   b. the strategies endorsed as important when evaluating the grades of their students?

Method

Procedure

Data presented in this paper were collected as part of a larger Longitudinal Study of Australian Students with Autism (LASA), the full protocol for which is published in Roberts et al. (2018). In brief, parents of children with a diagnosis on the autism spectrum aged 4–5 or 9–10 were recruited across Australia. Potential participants received invitations to take part in a 6-year study, with annual data collection via an online survey that was advertised through clinics and social media. The sample was self-selecting and, therefore, the research team was not given details of potential participants who were provided with recruitment information but who did not choose to enrol into the study. Ethical approval was obtained from all participating universities and health authorities. Upon enrolment into the larger longitudinal study, parents were asked to provide copies of their child's diagnostic reports and completed the Social Communication Questionnaire Lifetime Version (SCQ; Rutter, Bailey and Lord, 2008). The SCQ is not a diagnostic tool but was included as a parent-reported measure of autism characteristics in the absence of direct child assessments to confirm diagnoses of autism. When using the SCQ as a screener, a cut-off score of 15 or above is indicative of high levels of autism characteristics providing insight into each child's symptomatology. Children with an SCQ score below 15 were only included in the study if detailed diagnostic reports were provided to confirm diagnosis on the autism spectrum.

Data collection from schools began in the second year of the longitudinal study (2016). Each year, caregivers were asked if they consented for the research team to contact the child's school. If parents consented, the principal of the child's school was contacted and asked to invite the child's teacher to complete an online questionnaire. Each Teacher also provided written consent prior to participating in the study. Confidentiality of Teacher responses was ensured to protect their anonymity.

To allow for the maximum size cohort and a spread of ages, teacher data for this study were drawn from both Year 2 and Year 3 of the longitudinal study; if a child had two complete teacher data sets, only the data from Year 3 of the longitudinal study was used within this study.

Participants

Datasets were provided by 87 classroom teachers educating students on the autism spectrum in Australia. Of the teachers involved, 61 (70.1%) were teaching in mainstream classes with or without support, 24 (27.5%) were teaching students on the autism spectrum in specialist classes or schools, and for two students, school placement information was not provided. The teachers were predominantly female (n = 76; 87.4%). Teaching experience varied across the sample, with the sample spread of total years of experience as a classroom teacher and the experience of teaching students with disability summarised in Table 1.

Forty-seven teachers were educating students from the younger cohort, aged between 5 and 7 years, and 40 teachers were educating students from the older cohort aged between 9 and 12 years at the time the data were collected. Student demographics, SCQ scores and information on school placement are presented in Table 2.

Measures

Demographics. Demographics were collected from teachers to document current class size, workload and

Table 1: Demographics of 87 teachers: Mean and standard deviation of teacher experience and class size

Teaching workload	Full-time	n = 79 (90.8%)
	Part-time	n = 8 (9.2%)
	M (SD)	Range
Classroom demographics		
Class size	20.43 (7.81)	4–30 students
Number of students with disabilities in class	4.08 (4.12)	1–23 students
Teaching experience in years		
Overall teaching experience	13.15 (9.98)	1–42 years
Experience with this year level	6.54 (6.81)	1–40 years
Experience teaching in disability	8.92 (7.80)	1–36 years

Table 2: Student demographics and school placement

Cohort	
Student age	
Range	5–10 years
Mean (SD)	6.86 years (2.54)
SCQ score	
Mean (SD)	21 (7.18)
School placement of whole cohort	
Mainstream	*n* = 61 (70.1%)
Special education	*n* = 24 (27.5%)
Not provided	*n* = 2 (2.29%)

SCQ Score: Social Communication Questionnaire Score.

teaching experience (in months for overall teaching experience, experience teaching current year level and experience educating students with disability).

Classroom practices. These items in the teacher questionnaire pack were originally developed as part of the National Longitudinal Transition Study-2 and the Longitudinal Study of Australian Children (2003). A copy of the questionnaire is available by emailing the project lead (see contact details on Roberts et al. 2018). Teachers were firstly asked to tick (yes/no) whether specified supports were provided because they had a student on the autism spectrum in their class. They were also asked which assessment modifications/adjustments and specified assistance were provided to this specific student on the spectrum within the class setting. Finally, teachers were asked about instructional materials, level of engagement in instructional activities, and factors important in determining grades and evaluating progress in relation to (i) the student on the autism spectrum, and (ii) the class as a whole. These three sections of questions were all rated on a 3-point scale, with those asking about instructional materials and level of engagement in instructional activities rated as 0 – *never or rarely*, 1 – *sometimes*, 2 – *often*, and those asking about the importance of specific factors in relation to determining student grades being rated as 0 – *not important*, 1 – *somewhat important*, 2 – *very important*.

Data analysis

Descriptive statistics were used to describe the whole-class and autism-specific classroom practices used. Wilcoxon signed ranks tests were used to assess for teacher-reported differences in the instructional materials used and the engagement of the student on the spectrum relative to their classmates. A power analysis for a Wilcoxon signed-rank test was conducted in G*Power to determine the sample size required using an alpha of 0.05, a power of 0.80, a medium effect size ($dz = 0.5$), and two tails (Faul, Erdfelder, Lang, et al., 2007). Based on the aforementioned assumptions, the desired sample size is 35, therefore, the sample size of 87 is adequate for the comparisons to be calculated.

The Wilcoxon signed-rank test, a non-parametric equivalent to a related samples t-test, was chosen as the groups are not independent of each other; two sets of scores were provided by the same teacher who reported on each item twice, firstly for the student on the autism spectrum and for a second time in relation to their class as a whole. The importance of factors involved in the evaluation of progress and in determining the grades of the student on the spectrum specifically, and how this compared to evaluating the class as a whole, was also compared. Although the design required multiple analyses which potentially raised the possibility of increased Familywise error, Bonferroni correction was considered too conservative (Perneger, 1998), especially for exploratory analyses. Thus, the decision was made to set the alpha to 0.005 to balance type I and type II errors associated with multiple comparisons. According to Cohen (1988), effect sizes are reported as r and interpreted as follows: small effect ($r = 0.10$), medium effect ($r = 0.30$) and large effect ($r = 0.50$).

Results

Classroom modification and supports for students on the autism spectrum

Teachers were asked to identify which of the supports were provided because the student on the autism spectrum was in their class. On average, teachers stated that they were provided with three of the eight classroom supports listed (range 1–8). Two (2.3%) teachers stated that none of the supports listed had been provided. As summarised in the left-hand column of Table 3, the most frequently reported supports were: being provided with *information about the students' needs or abilities* (73%) and being provided with *teacher aide support* (71.3%).

Teachers were asked to identify which assessment or task accommodations were used for this student because of their diagnosis on the autism spectrum. On average, teachers stated that they provided students with four of the 10 task or assessment adjustments or modifications listed (range 1–10). Summarised in the middle column of Table 3, the most commonly reported assessment adjustments/modifications for the student on the autism spectrum (from those endorsed on the list) were the provision of *modified or alternative test* (74.7%) and *slower-paced instructions* (67.8%). Teachers also reported *simplifying their language* (58.6%) as a frequent accommodation made to support the learning of the student on the spectrum.

The average number of additional assistance options provided to the student because of their diagnosis of autism was four (range 1–10). Summarised in the right-hand column of Table 3, the most commonly reported support or

Table 3: Summary of supports, accommodations and additional assistance made available to the student on the spectrum – sorted from most to least endorsed by teachers (n = 87)

Supports provided due to having student with diagnosis on the autism spectrum in class		Assessment/task accommodations for student on the autism spectrum		Additional assistance provided to student on autism spectrum in class	
Information about the student's needs or abilities	64 (73%)	Modified test/alternative test	65 (74.7%)	Visual support schedules	65 (74.7%)
Teachers' aides/individual student aides	62 (71.3%)	Slower-paced instruction	59 (67.8%)	Teacher aid or personal aid	62 (71.2%)
Consultation with special education staff	41 (47.1%)	Simplified language	51 (58.6%)	Specific learning strategies	46 (52.8%)
PD relating to the needs of this student	35 (40.2%)	More time to take tests	47 (54%)	Student progress monitored by special education staff	37 (42.5%)
Special equipment/materials to use with the student	29 (33.3%)	Additional time to complete assignments	41 (47.1%)	Allied health	35 (40.2%)
Smaller class size or student load	27 (31%)	More frequent feedback	41 (47.1%)	Behaviour support plan	28 (32.1%)
Co-teaching with special education staff	19 (21.8%)	Test read to student	34 (39%)	Self-management training	22 (25.2%)
Support for playground/non-teaching time	18 (20.68%)	Physical adaptations to classroom	32 (36.7%)	Peer tutoring	14 (16%)
None of the above	2 (2.3%)	Shorter or different assignments	29 (33.3%)	Tutoring from another adult	10 (11.5%)
		Modified grading standards	23 (26.4%)	Reader or interpreter	10 (11.5%)

PD: Professional Development; Allied Health: Occupational Therapy, Speech Pathology, Psychologist, Mental Health Services.

assistance available to the student in the classroom was *visual support schedules* (73%) and *teacher aide or personal aide* (69.7%). Three teachers reported no use of additional classroom supports for their student on the autism spectrum. Additional exploratory analyses revealed no significant differences in teacher-reported supports for children in the younger and older cohorts.

Pedagogy and factors used to evaluate progress for students on the autism spectrum compared to the remainder of the class

Classroom instructional materials. The overall use of instructional materials documented in Table 4 was similar for the student on the spectrum and the remainder of the class. The scores for each instructional material item were compared using Wilcoxon signed-rank tests. As reported in Table 4, there were no significant differences in any of the teacher-reported instructional materials used to support the learning of the student on the spectrum and the remainder of their class.

Engagement in instructional activities. The frequency of engagement in instructional activities of students on the autism spectrum and the whole class are presented in Table 5. The proportion of students on the spectrum who *often* engaged in the instructional activity of *responding to questions* (37.2%) was a little over half the rate reported for the whole class (70.9%). Similarly, the proportion of students on the spectrum who *often* engage in *working independently* was 32.1%, which is a little over half that reported for the whole class (60%). As can be seen in Table 5, the instructional activity which the highest proportion of students on the spectrum *often* engages with was *individual instructions from the teacher* (70.9%) or *another adult* (54.1%). In contrast, teachers reported that the instructional activities that the highest proportion of the class engages in *often* were *responding to questions* (70.9%) and *listening to small group instructions* (68.6%).

Wilcoxon signed-rank tests were used to compare the reported frequency of engagement in instructional activities. There were significant differences in seven of the 11 items comparing the classroom engagement for the student on the autism spectrum to the remainder of the class. The four items where there were no significant differences (i.e., the frequency of reported engagement was comparable) between the student on the spectrum and those used for the whole class were *attending daytime excursions* ($Z = -0.577$, $P = 0.56$, $r = 0.05$), *overnight excursions* ($Z = -1.89$, $P = 0.059$, $r = 0.19$), *listening to whole class instruction* ($Z = -2.33$, $P = 0.020$, $r = 0.23$), *small group instruction* ($Z = -2.53$, $P = 0.011$, $r = 0.25$) and *taking quizzes/tests* ($Z = -2.71$, $P = 0.007$, $r = 0.27$). See Table 5 for group comparisons of all instructional activities.

Evaluating progress or determining student grades. Teachers rated the importance of a number of factors when evaluating the grades and academic progress of their student on the autism spectrum and the whole class. As documented in Table 6, teachers reported that *children's participation in class*, *performance on daily activities* and *attitude/behaviour* were endorsed as *somewhat* or *very important* factors when evaluating progress for a large proportion of the students on the spectrum, the first two of which were also rated as

Table 4: Teacher-reported frequency of instructional material use for the student on the spectrum and the whole class – sorted from highest to lowest for *often* rating for the student on the spectrum

	Student on the spectrum			Whole class			
Instructional materials	Never/rarely	Sometimes	Often	Never/rarely	Sometimes	Often	Group comparison
Visual support materials (e.g., schedules)	4 (4.7%)	13 (15.3%)	68 (80%)	4 (4.7%)	20 (23.5%)	61 (71.8%)	$Z = -0.791$, $P = 0.43$, $r = 0.08$
Curriculum materials (textbooks, worksheets)	11 (12.9%)	23 (27.1%)	51 (60%)	8 (9.3%)	22 (25.6%)	56 (65.1%)	$Z = -1.34$, $P = 0.18$, $r = 0.13$
Games and toys for instructional purposes	10 (11.6%)	29 (33.7%)	47 (54.7%)	9 (10.5%)	32 (37.2%)	45 (52.3%)	$Z = -0.447$, $P = 0.65$, $r = 0.04$
Digital technologies for internet use	11 (12.8%)	31 (36%)	44 (51.2%)	8 (9.3%)	29 (33.7%)	49 (57%)	$Z = -1.51$, $P = 0.13$, $r = 0.15$
Digital technologies for academic skills practice/reinforcement	16 (18.8%)	34 (40%)	35 (41.2%)	13 (15.3%)	37 (43.5%)	35 (41.2%)	$Z = -0.707$, $P = 0.48$, $r = 0.72$
Screen-based media (TV, videos)	6 (7.1%)	40 (47.1%)	39 (45.9%)	6 (7.0%)	42 (48.8%)	38 (44.2%)	$Z = -0.447$, $P = 0.65$, $r = 0.04$
Word and spreadsheet applications	29 (33.8%)	34 (39.5%)	23 (26.7%)	22 (25.6%)	40 (46.5%)	24 (27.9%)	$Z = -1.15$, $P = 0.25$, $r = 0.11$
Communication devices (iPad, AAC)	33 (38.4%)	32 (37.2%)	21 (24.4%)	31 (36%)	31 (36%)	24 (27.9%)	$Z = -0.905$, $P = 0.36$, $r = 0.09$
Supplementary materials (e.g., maps, newspapers)	41 (47.7%)	38 (44.2%)	7 (8.1%)	42 (48.8%)	36 (41.9%)	8 (9.3%)	$Z = -1.00$, $P = 0.31$, $r = 0.10$

AAC: Augmented or alternative communication.

somewhat or *very important* when evaluating progress or determining the grades of the whole class. Teachers endorsed two additional factors that were important when determining the grades of the whole class only: *performance relative to a set standard* and *attendance*.

The strategies used by teachers when evaluating progress or determining the grades of the student on the autism spectrum and the class as a whole were compared using Wilcoxon signed-rank tests. Teachers endorsed *performance relative to a set standard* ($Z = -2.82$, $P = 0.005$, $r = 0.30$), *performance relative to the rest of the class* ($Z = -2.82$, $P = 0.005$, $r = 0.29$) and *homework* ($Z = -3.31$, $P = 0.001$, $r = 0.34$) as significantly more important when evaluating progress or determining the grades of the whole class, and less important when evaluating progress or determining the grades of the student on the spectrum. No factors were significantly more important for evaluating progress or determining grades of students on the spectrum than the whole class. Group comparisons and importance of factors related to determining student grades are found in Table 6.

Discussion

Teachers are increasingly likely to have one or more students on the autism spectrum in their classes; yet, there is a paucity of research into the nature and number of supports being used by teachers for both their students on the spectrum specifically, and their classes more generally in Australian schools. This paper adds to the existing body of knowledge by describing the most frequently reported supports, accommodations and additional assistance provided for students on the spectrum. To the authors' knowledge, this is the first study to compare the frequency of use and engagement with instructional materials, and the importance of different factors in evaluating the progress and determining the grades of their students who do and do not have a diagnosis on the autism spectrum. The findings indicate that although there were no differences in the frequency of use of instructional materials for students on the spectrum compared to their class, there were significant differences in the students' frequency of engagement in these activities as well as significant differences in some of the factors that teachers use to evaluate progress and determine grades.

Teacher-reported supports, accommodations and additional assistance

Approximately 86% of students on the autism spectrum require additional supports in their school setting (Australian Government, 2018). Encouragingly, almost all teachers reported being provided with at least one form of support due to having a student on the spectrum in their class. The three most common classroom supports provided to teachers were (i) being provided with information about the students' needs or abilities, (ii) being

Table 5: Teacher-reported frequency of engagement in instructional activities of the student on the autism spectrum compared with students in their class – sorted from most to least engaged for *often* rating for the student on the spectrum

	Student on the autism spectrum			Whole class			
Engagement	Never/rarely	Sometimes	Often	Never/rarely	Sometimes	Often	Group comparison
Individual instruction from teacher	3 (3.5%)	22 (25.6%)	61 (70.9%)	1 (1.2%)	39 (45.3%)	46 (53.5%)	$Z = -2.98$, $P = 0.003$, $r = 0.30$
Individual instruction from another adult	10 (11.8%)	29 (34.1%)	46 (54.1%)	11 (12.9%)	44 (51.8%)	30 (35.3%)	$Z = -2.83$, $P = 0.005$, $r = 0.29$
Listens to small group instruction	4 (4.7%)	39 (45.3%)	43 (50%)	2 (2.3%)	25 (29.1%)	59 (68.6%)	$Z = -2.53$, $P = 0.011$, $r = 0.25$
Listens to whole class instruction	13 (15.1%)	38 (44.2%)	35 (40.7%)	10 (11.6%)	26 (30.2%)	50 (58.1%)	$Z = -2.33$, $P = 0.020$, $r = 0.23$
Responds to questions	14 (16.3%)	40 (46.5%)	32 (37.2%)	5 (5.8%)	20 (23.3%)	61 (70.9%)	$Z = -3.12$, $P = 0.002$, $r = 0.31$
Works with peers/in group	13 (15.3%)	44 (51.8%)	28 (32.9%)	4 (4.7%)	35 (40.7%)	47 (54.7%)	$Z = -3.38$, $P = 0.001$, $r = 0.34$
Works independently	20 (23.8%)	37 (44%)	27 (32.1%)	6 (7.1%)	28 (32.9%)	51 (60%)	$Z = -3.04$, $P = 0.002$, $r = 0.31$
Performs/speaks in front of class	25 (29.1%)	42 (48.8%)	19 (22.1%)	8 (9.3%)	53 (61.6%)	25 (29.1%)	$Z = -3.07$, $P = 0.002$, $r = 0.31$
Attends one-day excursions	19 (22.1%)	49 (57%)	18 (20.9%)	18 (20.9%)	49 (57%)	19 (22.1%)	$Z = -0.577$, $P = 0.56$, $r = 0.05$
Takes quizzes/tests	29 (34.1%)	40 (47.1%)	16 (18.8%)	21 (24.4%)	42 (48.8%)	23 (26.7%)	$Z = -2.71$, $P = 0.007$, $r = 0.27$
Attends overnight excursions	72 (83.7%)	13 (15.1%)	1 (1.2%)	67 (77.9%)	16 (18.6%)	3 (3.5%)	$Z = -1.89$, $P = 0.059$, $r = 0.19$

provided with a teacher aide, instructional assistant or individual student aide and (iii) accessing consultations with special education staff. Despite lack of knowledge and skills being consistently identified by teachers as a critical factor in their ability to include students on the autism spectrum in their classes (Beauchamp, 2012), only 40.2% of teachers reported that they were provided with professional development specifically related to supporting their student on the spectrum. Only two teachers (2.3%) reported that none of the listed supports was available to them in their school. Taken together, these findings suggest that teachers are being provided with

Table 6: The importance of factors for determining grades and evaluating progress of the student on the autism spectrum and the whole class – sorted from most to least important for the student on the spectrum

	Student on the autism spectrum			Whole class			
Determining grades	Not important	Somewhat important	Very important	Not important	Somewhat important	Very important	Group comparison
Performance on daily activities/projects	2 (2.4%)	17 (20%)	66 (77.6%)	2 (2.4%)	11 (12.9%)	72 (84.7%)	$Z = -2.82$, $P = 0.005$, $r = 0.29$
Class participation	1 (1.2%)	21 (24.7%)	63 (74.1%)	0 (0%)	14 (16.5%)	71 (83.5%)	$Z = -2.30$, $P = 0.021$, $r = 0.24$
Attitude/behaviour	0 (0%)	28 (33.7%)	55 (66.3%)	2 (2.4%)	30 (35.3%)	53 (62.4%)	$Z = -1.41$, $P = 0.15$, $r = 0.14$
Attendance	6 (7.1%)	29 (34.1%)	50 (58.8%)	6 (7.1%)	25 (29.4%)	54 (63.5%)	$Z = -2.00$, $P = 0.046$, $r = 0.20$
Performance relative to a set standard	11 (12.9%)	31 (36.5%)	43 (50.6%)	8 (9.4%)	23 (27.1%)	54 (63.5%)	$Z = -2.82$, $P = 0.005$, $r = 0.30$
Performance on special activities/projects	9 (10.7%)	37 (44%)	38 (45.2%)	9 (10.6%)	33 (38.8%)	43 (50.6%)	$Z = -2.11$, $P = 0.035$, $r = 0.22$
Student portfolio	18 (22%)	33 (40.2%)	31 (37.8%)	18 (22%)	31 (37.8%)	33 (40.2%)	$Z = -1.63$, $P = 0.10$, $r = 0.16$
Results of tests	21 (25%)	36 (42.9%)	27 (32.1%)	14 (16.7%)	37 (44%)	33 (39.3%)	$Z = -2.82$, $P = 0.005$, $r = 0.29$
Performance relative to the rest of the class	44 (51.8%)	28 (32.9%)	13 (15.3%)	38 (44.7%)	29 (34.1%)	18 (21.2%)	$Z = -2.82$, $P = 0.005$, $r = 0.29$
Homework	49 (57.6%)	27 (31.8%)	9 (10.6%)	45 (52.9%)	27 (31.8%)	13 (15.3%)	$Z = -3.31$, $P = 0.001$, $r = 0.34$

resources within their school and that teachers are using these resources to support students on the spectrum. This aligns with the growing body of work into the use of accommodations and adjustments within the classroom to support the diverse learning needs of students on the autism spectrum (Carter, Stephenson and Strnadová, 2012; Hess, Morrier, Heflin, et al., 2008; Sulek, Trembath, Paynter, et al., 2018). However, it is important to recognise that the type of support provided may not be the support that is most needed (e.g., professional development for teachers). In addition, it is not clear whether schools are providing a comprehensive range of supports which teachers are only partially accessing (the average number of supports accessed was three of the eight possible), or whether most teachers only have access to a limited range of supports.

Assessment task accommodations utilised by teachers for students on the spectrum in the current study highlight teacher awareness of the challenges and strengths common in autism. In particular, to compensate for comprehension challenges often experienced by individuals on the spectrum (Just, Cherkassky, Keller, et al., 2004; Kana, Keller, Cherkassky, et al., 2006), many teachers assisted students with slower paced instruction (69%) and simplified language (59%) in the classroom. To accommodate processing challenges associated with autism (Kwon, Kim, Choe, et al., 2007; Siegal and Blades, 2003), more than half of the teachers reported allowing more time for assessments (54%). Recognition of each student's unique challenges is essential in order to provide them with appropriate supports. The findings by Soto-Chodiman et al. (2012) reiterate the importance of providing teachers with professional development opportunities to ensure they are equipped with the skills to identify the needs of their students on the autism spectrum, to then tailor supports that align with each child's specific learning needs and unique challenges.

On average, teachers in the current study reported providing four of 10 types of additional assessment assistance listed to students on the spectrum, indicating that teachers are modifying their practices to support their students' learning needs, although further work is needed to explore whether these modifications are sufficient and/or effective in meeting that particular students needs in that context.

Instructional activities for students with autism compared to their peers

There were no significant differences between the use of classroom instructional materials for students on the autism spectrum and for the whole class. Students on the autism spectrum engaged with a range of instructional materials including visual support schedules, communication devices, curriculum materials (i.e., text books), digital technologies and the Internet in a similar manner to their TD classmates. Teachers reported *often* using visual support schedules for the student on the spectrum (80%) but such supports were also *often* used as a method of learning support for the whole class (71.8%). These findings align with the findings of a recent online survey study of 155 general education teachers by Sulek et al. (2018), which reported that visual support schedules were the most frequently used empirically supported treatment for students on the autism spectrum within mainstream classrooms. Although other studies have also endorsed the use of visual schedules to support students on the spectrum at school (Fleury, Thompson and Wong, 2015; Hayes, Hirano, Marcu, et al., 2010; Schneider and Goldstein, 2010), this is the first study to report on the high uptake of visual schedules as a class-wide approach, suggesting that teachers find the use of visual guides beneficial for all students in the class, both those on the autism spectrum and those without autism. Implementing supports at a class-wide level has the effect of balancing the increasingly diverse student population with the challenges of delivering a standard curriculum to a large group of students. Using visual schedules for the whole class, rather than just for the student on the spectrum, would also support other students in the class who have differences or difficulties with their attention, executive functioning, memory, or processing speed (Lynch and Warner, 2008). Such class-wide approaches have been associated with preventing behavioural difficulties and increasing academic engagement (e.g., see meta-analysis of Universal Design for Learning; Capp, 2017 ; Solomon et al., 2012).

Student engagement

Although there were no differences in the instructional activities used, teachers were aware of differences in the frequency of engagement of students with and without autism across seven of the 11 instructional activities. For example, although the class as a whole frequently participated in group instructions and responded to questions, students on the spectrum engaged more frequently in individual instructions from the classroom teacher or individual instructions from another adult. It may be that the difficulties in listening, comprehension and interpretation experienced by students on the spectrum specifically (Griswold, Barnhill, Myles, et al., 2002; Troyb, Orinstein, Tyson, et al., 2014) contribute to their preference for engaging in one-on-one rather than whole-class instructions. Anxiety, which is found to affect children on the spectrum at a much higher rate than their typically developing peers (van Steensel, Bogels and Perrin, 2011), and can present across home, school and community (Adams, Simpson and Keen, 2018; Adams, Young, Simpson, et al., 2019), may explain why students on the spectrum less frequently engage in potentially anxiety-invoking activities such as speaking in front of the class. Anxiety may also be impacting the frequency of engagement in peer/partner group work, which may also be impacted by social communication differences, communication difficulties or difficulties with executive functions. Executive

function difficulties can include problems with attention that can make it difficult to maintain attention during group work and individual tasks, with the need for redirection to stay on task (Corbett, Constantine, Hendren, et al., 2009; Hill, 2004). Of course, the differences in frequency of engagement are unlikely to be due to one specific factor, but rather to a combination of factors which interact to make a unique learning profile for many students on the spectrum.

Determining student grades

The Australian Disability Standards Education Act (Australian Government, 2005) has been implemented for a dual purpose: to ensure fair, inclusive participation of all students in education, as discussed earlier, and to govern the way that progress of students with disabilities is assessed in Australian schools. In brief, this policy outlines the need to adjust to a more equitable approach to assessing the progress of students with disabilities that does not require the same assessment to be undertaken by all students if deemed not suitable for the student with a disability (Cumming, Dickson and Webster, 2013).

The differences noted in the factors endorsed as important when determining the progress of their students with and without autism suggest some adjustment of assessment methods, as per the Disability Standards Education Act. Teachers rated the importance of five of the 10 items differently when evaluating the performance of their students on the spectrum compared to the whole class. Student *performance on daily activities, class participation, performance relative to a set standard*, *performance relative to the rest of the class* and *homework* were considered as more important for determining the academic progress of the whole class; no items were significantly more important when assessing performance for students on the spectrum. This suggests that teachers may be aware of the difficulties that some students have with certain tasks due to their autism characteristics (rather than their ability) and therefore, adjust the importance they place upon such tasks to measure progress. For example, homework challenges are frequently reported for children on the spectrum, with some suggestions that this links to differences or difficulties with executive functioning, attention (Endedijk, Denessen and Hendriks, 2011), generalisation between settings (Hume, Plavnick and Odom, 2012) and self-management (Hampshire, Butera and Bellini, 2015). Therefore, homework for students on the spectrum may be impacted by a range of factors other than academic knowledge, and consequently, teachers may have rated it as less important in determining progress in their students with autism (compared to their peers). The additional exploratory analysis highlighted no differences between the younger and older cohort in terms of teacher ratings, suggesting that teachers are applying similar processes to accommodate the needs and evaluate the grades of older and younger students on the spectrum.

Limitations and future directions

As with any study, the results need to be considered within the study's limitations. It can be difficult for teachers to participate in school-based research in addition to their high workloads. The barriers of teacher involvement in research, including small sample sizes, were recently documented in a systematic review of autism focused school research, finding that studies often report on sample sizes of 60 teachers or fewer (Adams, Young and Keen, 2019). Based on this review of sample sizes in other published studies, the current sample of 87 teachers is large enough for the comparisons undertaken, especially since the analysis is non-parametric. However, it is important to acknowledge that with the current sample size, and the heterogeneity of autism, inference is limited.

The study focussed on differentiation within the class, and consequently did not consider how the students' education setting may have impacted the supports they received. Further research is therefore needed to explore the school supports available to students on the autism spectrum across mainstream and specialist education settings.

Because these data were collected as part of a longitudinal study collecting data from parents and teachers of individuals on the spectrum, the teachers were asked to report on only their accommodations and adjustments for the study child. However, 74 teachers (88%) reported having two or more students on the spectrum in their classroom at the time of the study. As such, it is difficult to identify whether teachers modified their approach when accommodating the needs of the individual student on the spectrum taking part in the study, or whether they have adopted a broader, generic set of modifications to support the range of complex needs in a class with several students on the spectrum. The latter may see an increase in class-wide rather than individual accommodations and adjustments used to ensure more widespread rather than individualised support. The processes involved in supporting the needs of multiple students on the spectrum within the same classroom, albeit beyond the scope of the current study, represents an important avenue for future research. With the move towards inclusive education, mainstream primary school teachers will likely need to support several students on the spectrum in their classroom concurrently.

It is currently unclear what is driving teacher accommodations and modifications to support the learning of students on the spectrum. This is another important area for future research, as there may be a number of factors that influence the use of accommodations and adjustments in the classroom, including teacher factors (years of teaching experience, experience with disability, number of students with disability in their class) or child factors (the student's cognitive or language abilities, autism symptom severity or co-occurring diagnoses). Such knowledge would provide a more in-depth understanding of teachers

approaches to supporting the learning of students on the autism spectrum.

Summary

This study is an important first step towards understanding the ways in which students on the autism spectrum are supported within their school environments. It is encouraging to see that supports are being utilised, including the use of adaptations and modifications to accommodate the complex and diverse learning needs of students on the autism spectrum in Australian classrooms. Further research would be of benefit to explore how teacher practices and supports for students on the autism spectrum within Australian schools compared to what is happening internationally across schools in the US, Canada and the United Kingdom.

Conclusions

The findings provide a preliminary description on instructional methods, engagement and method of evaluating the progress of Australian students on the autism spectrum and how this differs from that used for other students in the class without autism. The differences in classroom engagement of students on the autism spectrum compared with their classmates found in the current study, may help to inform the delivery of curriculum content to align with how students on the spectrum engage best in classroom activities.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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