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Differing Progressions of Cognitive Skill Development for Students with Additional Learning Needs and Autism Spectrum Disorder.

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Abstract

The aim of this paper is to present the results of an analysis designed to investigate the suitability of a cognitive skills instrument for students with additional learning needs. The SWANs cognitive skills instrument was developed in consultation with expert panels of special education teachers to measure the cognitive skills required by these students to productively function in their learning environment. Teachers from 52 mainstream and specialist schools completed the instruments in the form of an observation survey, to describe the learning of 661 students with additional learning needs and ranging in age from 3 to 18 years and over. This meant that students did not need to sit tests or participate directly in the assessment process. Rather, their current level of proficiency in foundational learning skills, such as attention, memory and executive functioning, was observed and described on a survey by their classroom teachers. Using Rasch partial credit modelling (Masters, 1982), analysis of person fit statistics suggested irregular patterns of teacher response to the survey items for students described as autistic (n=257). The student sample was separated into those with an intellectual disability and those with autism spectrum disorder and the data re-analysed for these two groups of students. The analysis revealed some differences in the difficulty order hierarchy of cognitive skill emergence for students described as autistic compared to those with an intellectual disability. Following procedures described by Griffin, Gillis and Calvitto (2004), the emergence of skills was investigated by an expert panel of special education teachers for clusters or themes that could be used to develop generalised progressions of skill emergence for reporting purposes. While there were overall similarities between the emergence of skills for each group, some specific areas of strengths and weaknesses for students with autism spectrum disorder became apparent. This suggested the possibility of reporting two different and interpretable progressions of cognitive skill development: one for students with an intellectual disability and one for those with autism spectrum disorder. This paper discusses these results and how the analyses were used to build reports that allow teachers to consider their pedagogical practices and intervention plans for these students within a developmental learning paradigm.

Differing Progressions of Cognitive Skill Development for Students with Additional Learning Needs and Autism Spectrum Disorder.

Educators are becoming increasing aware of the critical importance of developing an individual through stages and that this should be the aim of all education (Kohlberg & Mayer, 1972). It provides clear and rational education goals that make it possible to evaluate whether educational programs achieve objectives and encourages teachers to present stimulation in periods where the possibility for development is still open. Griffin (2009) argues that evidence-base teaching, learning and assessment is most effective when operating within a developmental framework. Optimal teaching practices differ for different students depending on the student's level of development. Effective teachers will be aware of these differences and will tailor their teaching to each student's individual needs. A developmental learning approach allows a focus on students' readiness to learn, scaffolding and building upon their current level of learning. This is opposed to a deficit approach to learning that focuses on teaching to overcome or ameliorate what the student cannot do. In developmental learning, a framework is provided within which teaching decisions can be made (Griffin 2007b), supporting students' needs for different teaching strategies at different developmental levels. Teachers who fail to teach in a developmental framework may teach the whole class with a single method (Brophy & Evertson, 1976). This fails their less competent students, because they move too fast, expect too much, and also will be relatively unsuccessful compared to what they could have accomplished. This also fails their most competent students, because they will be providing insufficient variety and challenge.

Locating a students' developmental level and making decisions on teaching instruction based on that level can be a challenging task for teachers. Regardless of disability, it is pertinent that the emphasis in education be on identifying students' emerging skills and scaffolding learning by providing appropriate and timely intervention (Vygotsky, 1978). Vygotsky (1986) argued that the point at which intervention will have the greatest impact and the student is most ready to learn is where teaching is to be focused. This is known as the student's zone of proximal development (ZPD) (Vygotsky). ZPD identification can be used by teachers to scaffold student learning by providing information about what the student can demonstrate, struggles to demonstrate and cannot demonstrate. Teaching below the ZPD can lead to boredom and teaching skills that are beyond a student's ability readiness can lead to frustration. Targeting intervention where it will have greatest impact enhances not only the student's development but also the educational experience of the student and teacher. Griffin and Nix (1991) argued that effective assessment instruments should promote students' learning by providing a basis for planning the instruction of students. By providing information about previous, current and next stages of learning, assessment becomes an integral part of teaching and learning.

Glaser (1981) and Masters and Evans (1986) stress that the importance of assessment is not whether an end point has been reached or knowledge or skill mastered. Instead, they emphasise that the purpose of assessment is locating a student's current level of attainment in an on-going line of development. Stages of competence or developmental progressions are more meaningful for teachers than assessment reported as a single score. These developmental progressions help teachers make informed choices about ways to engage students with content. The notion of developmental progressions can help teachers locate the purpose of any one lesson in a trajectory of lessons that will support learning over time. Assessment and developmental progressions enable teachers to identify what each student knows and support instructional decisions. Teachers need feasible assessment strategies that capture the range of student thinking in the classroom so they can build discussions and activities on student understanding, provide students with useful feedback, and make revisions in instructional plans (Cowie & Bell, 1999; Gearheart et al., 2006). Locating a level of student competence also indicates the students ZPD (Griffin, 2007a), and encourages teachers to focus on generalised developmental learning for their students.

Victorian Students with Additional Learning Needs

Within Victoria, the location of the study reported in this paper, the Department of Education and Early Childhood Development's (DEECD) Program for Students with Disabilities (PSD) is responsible for supporting the education of students with additional learning needs. In 2007, the PSD provided funding for around 17,300 students or 3.2 % of all students enrolled in government schools (Victorian Auditor General, 2007). In order to receive funding under the PSD in Victoria, a student must be assessed as belonging to one of seven disability categories of which intellectual disability and autism spectrum disorder (ASD) are the most common. The intellectual disability group account for 68% and the ASD group 14% of all students funded under this program (Victorian Auditor General, 2007).

Of particular concern to the DEECD, and also to a Senate Inquiry convened in 2002 to investigate the provision of educational opportunities for students with disabilities in all Australian states and territories (Senate Committee Report, 2002), is the increasing incidence and identification of ASD among school-aged children (Fombonne, 2001) and the growing demand this is placing on services and support. In 2009, the DEECD in conjunction with the Victorian Department of Human Services (DHS) launched the Autism State Plan aimed at developing approaches to meet growing demands on Victorian community and educational resources (DHS, 2009). In order to receive funding under DEECD's PSD on the grounds of autism spectrum disorder, a student requires assessments from several professionals such as a paediatrician and/or psychiatrist, psychologist, and speech pathologist for medical, communication, behavioural and cognitive evaluations (DEECD, 2009a). Diagnosis is based on information from these multidisciplinary evaluations in conjunction with criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, APA, 2000). Students with ASD are characterised by significant impairment in social interaction and communication, often associated with restricted repetitive and stereotyped patterns of behaviour and interests, unusual ways of learning, paying attention and reacting to sensations. The thinking and learning abilities of ASD sufferers vary, with approximately 80 per cent having an associated intellectual disability. They can also present with differences in perception, attention, and memory (DHS, 2009). These characteristics can make the education of students with ASD particularly challenging, and currently in Victoria there are five specialist government schools that specialise in the education of students with ASD.

Current Research

Current learning standard progressions for mainstream students do not extend to describe the expected developmental pathways of students with disabilities, where many teachers have little or no formal training (Senate Committee Report, 2002). There is an urgent need to provide teachers of students with additional learning needs with educational assessment procedures that allow them to locate their student along a developmental progression and make decisions about the strategies and resources to use that are specifically linked to their students' current level. Accordingly, the focus of the research described in this paper was the development of such assessment procedures and analysis of their suitability to the patterns of skill development observed amongst students with intellectual disabilities and ASD. It was part of a broader program of research into developmental assessment for students with additional needs that was supported by an Australian Research Council Linkage grant, and conducted in collaboration with the Victorian DEECD's Student Wellbeing Division and the Centre for Advanced Assessment and Therapy Services. The steering committee convened to guide the program of research agreed, at the outset of the study, on the identification of several key foundational areas of learning of local concern. One of these was students' cognitive abilities that support learning and that are required for students to productively function in their learning environment and participate in learning activities. These included foundational cognitive skills such as attention, memory and executive functioning. Other key foundational areas of learning for students with additional needs were identified as communication, literacy, emotional and social development (Coles-Janess & Griffin 2009; Roberts & Griffin, 2009; Woods & Griffin, 2008). This larger body of work is known locally as the Students with Additional Needs (SWANs) project and has resulted in measurement instruments and developmental progressions linked to intervention strategies across each foundational area.

The current paper presents the results of an analysis designed to investigate the suitability of the SWANs cognitive skills instrument and resulting cognitive skill developmental progressions for students with intellectual disabilities and those with ASD. Based on the idiosyncratic characteristics of students with ASD it was thought that differences in cognitive skill development may be present. As it is intended that the instrument provide information to teachers about their students' cognitive developmental level that allows them to make pedagogical practices and intervention plans, differences in skill progression may impact these practices.

Methodology

Participants

Teachers from 52 mainstream and specialist schools in Victoria that were participants in the SWANs Project were invited to complete observation surveys of their students' current level of cognitive functioning (i.e., the SWANs cognitive skill instrument). Four of these schools specialised in the education of students with autism spectrum disorder. Teachers were asked to complete surveys describing up to five students with additional learning needs who received PSD funding to support their learning.

Responses from teachers described 661 students with additional learning needs. Of these students, 422 (63.9%) were male and 238 (36%) female. The students ranged in age from 3 to 18 years (*M*=10.47, *SD*=3.65) and scored an average of 43.68 (*SD*=15.63) on the SWANs cognitive skill instrument. Two hundred and fifty seven (38.9%) of the students were described by their teachers as having ASD.

SWANs Cognitive Skill Instrument

The SWAN's Cognitive Skill instrument is a multiple choice observation survey designed to be used by teachers of students with additional learning needs. It had previously been developed, calibrated and mapped in terms of increasing competence or proficiency following a protocol for defining standards-referenced frameworks (Gillis & Griffin, 2004; Griffin, 2007a) that relied on the collaboration of experienced special education teachers and subject matter experts, working within the format of a partial credit latent trait model (Masters, 1982). The instrument gathers some demographic and background information about each student, including questions about gender, chronological age, autism spectrum disorder and other areas of additional learning need. It is comprised of 24 content items with 75 response choices and covers a range of applied student cognitive skills such as attention, self-understanding, memory, and task performance. The attention questions cover topics such as responding, attending to changes, ignoring distractions, and controlling internal distractions. The self-understanding questions cover topics such as recognition, independence, pride, and responsibility. The memory questions cover topics such as short-term memory for visual and auditory material, memory of people, places physical routines, personal experiences, factual information, intentions and schedules. Finally, the task performance questions cover topics such as making choices, performance in unfamiliar locations, accommodation of new ideas and activities, starting tasks, organising materials, simultaneous performance and organising task sequence.

Data Analysis

A Rasch analysis for partial credit data (Masters, 1982) was used to analyse teachers' responses to the Cognitive Skill instrument, and to empirically derive the interpretation of the cognitive skills progressions. Several different analyses were undertaken in order to explore suitability of the SWANs cognitive skills instrument and resulting cognitive skill developmental progressions for students with intellectual disabilities and those with ASD. Quest (Adams & Khoo, 1995) and ConQuest (Wu, Adams, & Wilson, 1998) software packages were used to obtain discrimination, reliability, separation and item and person fit indices and to produce visual mappings of the item difficulty and student ability parameters.

Establishing Progressions with Expert Panelling

An expert panel of six experienced special education teachers was nominated by representatives of DEECD's Student Wellbeing Division to review the statistical output of the data analysis and attempt to interpret bands of cognitive skill progression. The panel members were chosen for their expertise in the area of special education and their experience working with students with additional learning needs and ASD. They were presented with items hierarchically ordered in terms of their difficulty parameters, and were asked to examine and interpret clusters of items with similar difficulty. Following procedures described by Griffin, Gillis and Calvitto (2004), the interpretation process involved a content analysis of items of similar difficulty along a continuum and the establishment of cut points or levels where there is an identifiable change in the cognitive skills and item difficulty.

Results

Initial Analyses

Indices of test reliability and separation (Wright & Masters, 1982) were used to examine the construct validity of the establishment of developmental pathways. Rasch item separation reliability indicates whether the item estimates are adequately spread out along an ability continuum to make comparisons between students of different levels of proficiency. If the separation of items and students along the variable is poor, it suggests that the assessment does not adequately represent the ability of the student sample. In addition, Cronbach's Alpha is an index of the internal consistency or reliability of an instrument. That is, the degree to which the items as a set measure a single latent construct. The Standards for Educational and Psychological Testing (AERA & APA, 1999) state that alpha values of 0.9 are minimally acceptable for assessments used to make high-stakes decisions. Together these indices of reliability can be used to examine whether an instrument could reasonably separate students based on their ability. Overall, the alpha reliability was 0.97, together with a Rasch item separation reliability of 0.97 and a student separation reliability of 0.97.

An analysis of person fit statistics was performed to examine the data for students whose teachers returned unexpected or irregular patterns of response to items on the instrument. In terms of the Rasch model it is expected that a person with more ability has greater probability of success on an item than a person of less ability and a person is more likely to perform better on an easier item than a hard item (Rasch, 1960). Mean square infit is a measure of the degree of fit between the observed and expected pattern of responses based on the Rasch model. The expected value for this mean square statistic is 1.0 when the data fit the model and range from 0 to infinity. Mean squares greater than 1 indicate the responses are less predictable than the Rasch model expects and when greater than 2 can distort the measurement system (Wright & Linacre, 1994). There are no rules for infit cut off points, although Wright et al. recommend an infit value between 0.5 and 1.7 for observation data. Examination of the student person fit data showed 3.2% had poor fit or, in other words, that their teachers had returned irregular or unexpected patterns of responses to items.

Of the students showing irregular response patterns, slightly more than half were students with ASD (52%) although students with ASD comprised only 38.9% of the sample. The disproportionate number of ASD students whose teachers returned irregular patterns of response to the instrument indicated that student scores may not be able to be interpreted in the same manner for students with ASD as for those with an intellectual disability. Indeed, if the teachers of a high proportion of students with autism spectrum disorder responded to the instrument in ways that did not fit the underlying Rasch model in the same way as for other students in the sample, this suggested that the emergence of cognitive skills and abilities might differ for these students. To investigate this possibility, the data set was divided into two sub-sets: one comprising only students with ASD and one comprising all other students with an intellectual disability but not ASD, and separate Rasch analyses were conducted as described below.

Analyses on Divided Data Set

Separate Rasch partial credit analyses (Masters, 1982) were performed on the responses divided by whether the student was described as Non-Autistic (*N*=404) or Autistic (*N*=257) by their teacher. The Non-Autistic students ranged in age from 3-18 years (*M*=10.82, *SD*=3.72) and the Autistic students ranged in age from 4 to 17 years (*M*=9.92, *SD*=3.48).

Classical discrimination indices for the instrument items ranged between 0.52 and 0.84 for the Non-Autistic group and 0.47 and 0.81 for the Autistic group indicating high discrimination for all items. The discrimination index is the correlation between a student's score on an item and their total score on the questionnaire. High discrimination indices flag items that are able to discriminate well between people. Item discrimination should be at least 0.2 but preferably closer to or in excess of 0.4 (Ebel, 1972).

Analysis of data for the Non-Autistic group showed that the instrument had an alpha reliability of 0.97, a Rasch item separation reliability of 0.99 and a student separation reliability of 0.97. For the group described as Autistic, the instrument had an alpha reliability of 0.96, a Rasch item separation reliability of 0.99 and student separation reliability of 0.96. These very high reliability estimates suggested a high level of internal consistency among items for both sub-sets of students and that the items were well dispersed, conducive to the identification of the underpinning variable, establishment of progressions and to differentiate students along those progressions.

Fit indices for all items fell between the range established by Wright *et al* (1994) as productive for scale construction. Most ranged between 0.7 and 1.4 with only one item showing some evidence of misfit. All items had ordered difficulty (delta) parameters for response choices. A reduction in the incidence of students showing misfit was also observed when the data was divided into two sub-sets. For the Autistic group only 2.3% of students showed misfit and for the Non-Autistic group only 2.2% showed misfit.

Variable maps conjointly show person ability and item difficulty against a logit (or logarithm of the odds of success) scale. They allow a visual evaluation of the match of test items to the ability of the students in the testing population. Where a student and a response choice are matched along the logit scale, the probability at which a student can demonstrate that response choice or higher is 50:50. Variable maps for the Rasch analyses of the two sub-sets of data appear in Figures 1 and 2. For the Non-Autistic group there is a match of the spread of item difficulty to the spread of student ability (Figure 1). However for the Autistic group (Figure 2), the range of student ability appears to be higher than some of the low ability items. Also for the autistic group there appears to be one student whose ability is far beyond that of the other nearest autistic students (approximately 2 logits). This was interpreted as an indication that the student had autism spectrum disorder combined with very high cognitive functioning, as is commonly observed among students with Asperger's Syndrome.

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 7             |
              X|
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 6           XX|23.4
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 5            X|8.3
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           XXXX|10.4
 4         XXXX|17.3 20.3
        XXXXXXX|3.3 23.3 24.4
          XXXXX|4.3 19.3
 3       XXXXXX|7.3 9.4
        XXXXXXX|15.2
       XXXXXXXX|1.4 14.2 16.3 20.2
 2     XXXXXXXX|11.4 17.2 18.3 24.3
     XXXXXXXXXX|8.2
      XXXXXXXXX|9.3 10.3 12.3 13.3
 1    XXXXXXXXX|6.2 19.2 21.2 23.2
        XXXXXXX|22.2
        XXXXXXX|24.2
          XXXXX|7.2 16.2
 0        XXXXX|3.2 11.3
           XXXX|1.3 12.2
            XXX|5.2 13.2 18.2
-1            X|9.2 10.2 14.1 15.1
            XXX|4.2
            XXX|2.2 7.1 8.1 22.1
-2           XX|1.2 11.2
             XX|6.1
              X|16.1 23.1 24.1
-3            X|4.1 17.1
               |5.1 12.1 13.1
              X|19.1 20.1 21.1
-4            X|
              X|3.1 9.1
              X|
-5            X|10.1 18.1
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-6             |2.1
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-7             |
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-8             |
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Figure 1. Map of latent distribution and thresholds for Non-Autistic group. Each 'X' represents 3.0 cases. The labels for the thresholds show the levels of item, and category, respectively.

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 8            |
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              |23.4
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             X|
 5           X|7.4 21.3 22.3 24.5
            XX|
            XX|8.3
 4           X|20.3
            XX|
           XXX|3.3 4.3 17.3
          XXXX|19.3 23.3 24.4
 3        XXXX|1.4
        XXXXXX|7.3 10.4 20.2
        XXXXXX|18.3
        XXXXXX|11.4 14.2
 2       XXXXX|9.4 15.2 16.3
        XXXXXX|8.2 12.3 24.3
      XXXXXXXX|19.2
     XXXXXXXXX|
 1  XXXXXXXXXX|7.2 13.3 17.2 21.2
      XXXXXXXX|6.2 9.3 10.3 22.2 23.2
     XXXXXXXXX|
      XXXXXXXX|
 0   XXXXXXXXX|1.3 11.3 12.2
    XXXXXXXXXX|14.1 15.1 16.2 24.2
     XXXXXXXXX|3.2 5.2 7.1 8.1
-1     XXXXXXX|4.2 13.2
      XXXXXXXX|10.2
         XXXXX|2.2 18.2
          XXXX|9.2 11.2
-2       XXXXX|1.2
          XXXX|
           XXX|6.1 12.1 22.1
           XXX|
-3         XXX|16.1 24.1
             X|5.1 10.1 13.1 19.1
              |4.1 20.1 23.1
              |2.1 9.1 17.1
-4            |1.1 3.1
              |21.1
              |18.1
              |
-5            |11.1
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              |
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-6            |
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              |
-7            |
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Figure 2. Map of latent distribution and thresholds for Autistic group. Each 'X' represents 1.4 cases. The labels for the thresholds show the levels of item, and category, respectively.

The difficulty (delta) parameters of each item on separated Autistic and Non-Autistic sub-sets of data were compared. Figure 3 shows a scatter plot of the Non-Autistic vs Autistic deltas with 95% confidence bands around the regression line. Items appearing in the top half of the graph contain skills that are more difficult for Non-Autistic students to demonstrate and items appearing in the bottom half of the graph contain skills that are more difficult for the Autistic students to demonstrate.

Differences in low difficulty items are difficult to interpret due to the higher starting point of Autistic student's ability in the sample. In general Figure 3 shows that the item difficulty trajectory between the two groups is similar but also highlights those items where the differences are largest. Items appearing close to the lower confidence band (skills harder for Autistic students to demonstrate) had content around displaying pride in achievements, responding to people, taking responsibility for actions and controlling internal distractions. For example, item 7.1 was 'Displays positive emotion at completion or partial completion of task'. Items appearing close to the upper confidence band (skills harder for Non-Autistic students to demonstrate) had content around visual and auditory short term memory, use of school schedules and organising task sequences. For example item 10.4 was 'Repeats a sequenced series of numbers or words in order, perhaps by using mnemonic strategies (e.g., rehearsal)'.

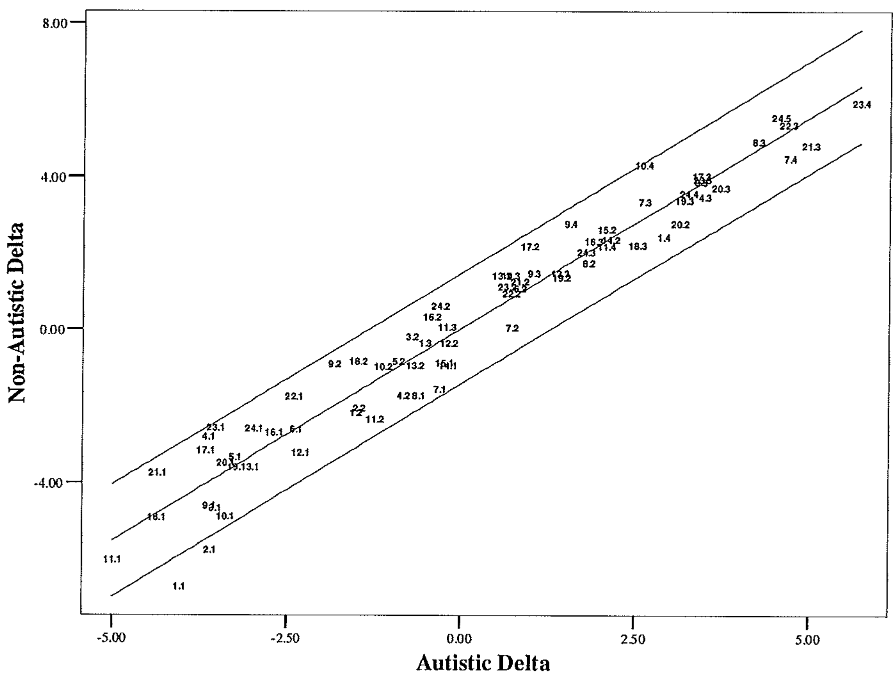

Figure 3. Scatter plot of Non-Autistic and Autistic delta scores for each item with a 95% confidence bands around the regression line.

Empirical Establishment of Progressions

Using the results from the Rasch partial credit analysis (Masters, 1982) on separated Autistic and Non-Autistic sub-sets of data, the expert panel examined clusters of item difficulty (delta) parameters to establish meaningful cut points (see Figure 4 and Figure 5). For both groups this resulted in eight qualitatively different interpretable bands of skill progression. Summary statements of the criteria present in each band for the Non-Autistic and Autistic groups are shown in Tables 1 and 2 respectively.

For both Non-Autistic and Autistic groups, up to the first cut point or level 1, the bulk of the items' content involved the students developing the ability to engage with the objects, sounds and people in his/her environment through gestures, vocalisations and visual orientation. At this level the items also involved students learning to make a choice between two alternatives and following a simple instruction with repeated support and prompting.

In Level 2 for both groups almost all the items' content involved the student learning to participate in simple classroom tasks with support such as attempting new activities, using new materials and performing tasks in new locations with encouragement from others. At this level the item content also involved students demonstrating a developing sense of self and independence as indicated by tasks such as self-recognition in a mirror or refusing requests of others.

From the second cut point (Level 3), a marked difference in the interpretation of the Non-Autistic and Autistic developmental progressions was observed. For the Non-Autistic group almost all the items' content involved learning to become socially aware and responsive to others in their classroom environment. For example the items involved students becoming aware that they operate in a social environment, accepting or rejecting familiar people, and learning about the responsibility of their actions. This was in contrast to the Autistic group, where almost all the items' content at this level involved the use of memory skills, such as developing the skills required to make simple choices, match objects, repeat words, mimic actions and follow simple instructions. For both groups, however, there was an item at this difficulty level that involved learning to differentiate communicative responses.

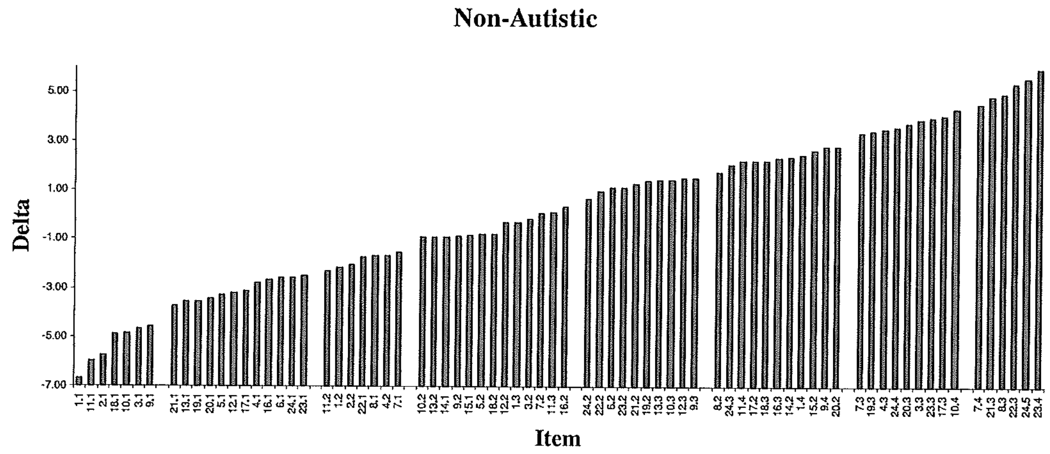

Figure 4. Delta scores of each SWANs cognitive skill instrument items for Non-Autistic responses. Gaps along the X axis indicate the position of cut scores placement by expert panel.

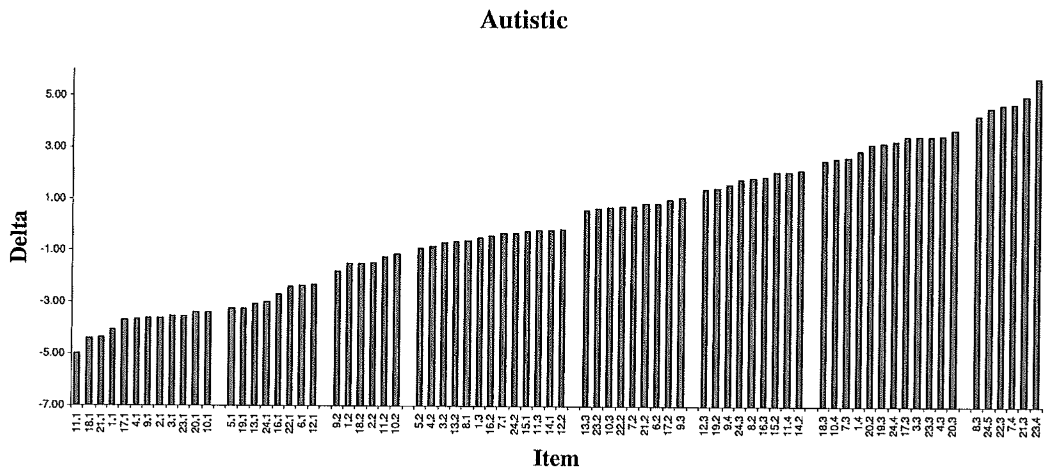

Figure 5. Delta scores of each SWANs cognitive skill instrument items for Autistic responses. Gaps along the X axis indicate the position of cut scores placement by expert panel.

A difference in the interpretation of progressions between the two groups continued for Level 4. At this level for the Non-Autistic group the items involved the students building their verbal, visual and auditory memory skills to complete classroom activities that involve recall, naming, sorting, choosing and matching. This was in contrast to the items at this level for the Autistic students in which the content involved the students learning to use and respond to language. For example, this may be to name people, objects and places or to respond to questions about personal experiences or topics of interest.

From the next level, Level 5, the band interpretation between the two groups was largely the same with a few minor differences. For both groups, Level 5 mainly contained items involving the student learning to recall strings of information within a familiar and/or supported context and starting to assert competence in the classroom. This might include, for example, skills such as repeating series of words, sequences of familiar tasks, or copying images, wanting to do tasks on their own and independently starting and stopping tasks.

For Level 6, most of the item content involved the students learning to take charge of their own classroom activities, elaborate on experiences, choices and intentions and admitting responsibility for actions. For the Autistic group this level also involved items where the student was learning to cope with substitutions of familiar objects.

The majority of item content at Level 7 involved students learning to generalise their classroom knowledge from one task to another, incorporate change, refocus after distraction and successfully switch between activities. For the Non-Autistic group it also involved item content on spending time finishing, improving and refining work whereas the for the Autistic group it involved item content on participating in conversations involving several people simultaneously.

For the highest ability level, Level 8, the item content centred around learning to plan and adapt classroom tasks strategically, for example by employing organisational systems and focusing on multiple task aspects. Also at this level were items involving the student displaying pride in their classroom achievements and attempting to remedy the consequence of their action.

In general for the Autistic group, items involving memory, mimicking and patterns and structure appeared earlier in the developmental progressions and items involving connections to others, emotional display and language development appeared later in the developmental progressions compared with the progressions of the Non-Autistic group. For example the bulk of memory skills appeared in Level 3 for the Autistic students and Level 4 for the Non-Autistic students. Level 4 for the Autistic students was dominated by symbolic language development whereas language development for the Non-Autistic students was not a discrete interpretable stage, it occurred in conjunction with learning to operate within a social environment

(Non-Autistic Level 3) and developing memory skills (Non-Autistic Level 4). Level 3 for the Non-Autistic students was dominated by a discrete stage where the student was learning to operate in a social environment.

Table 1

Summary of Progression of Cognitive Skills Development for Non-Autistic Students

8. Uses systems and strategies to plan and adapt activities
7. Generalises knowledge and copes with change and distractions
6. Independence, and describes and remembers activities and experiences
5. Recalls sequences or steps within familiar and/or supported contexts
4. Developing memory skills for recall, naming, sorting, choosing and matching
3. Socially aware and responsive to others
2. Relying on support to participate in simple tasks
1. Engaging with their environment

Table 2

Summary of Progression of Cognitive Skills Development for Autistic Students

8. Uses systems and strategies to plan and adapt activities
7. Generalises knowledge and copes with change, distractions and interactions involving multiple people
6. Independence, and describes and remembers activities and experiences, and copes with substitutions of familiar objects
5. Recalls sequences or steps within familiar and/or supported contexts
4. Using and responding to language
3. Using memory to make simple choices and match objects
2. Relying on support to participate in simple tasks
1. Engaging with their environment

Discussion

The current research investigated the suitability of the SWANs cognitive skills instrument and resulting cognitive skill developmental progressions for PSD students with additional learning needs and those who also have ASD. Instrument reliability and validity indices flagged that the instrument was suitable for the development of cognitive skills progressions and that the order of cognitive skill emergences differed based on whether the students had an intellectual disability or whether their additional learning need belonged to category of developmental disability most commonly described as autism spectrum disorder. The differences in the order of skill emergence resulted in the interpretation of two developmental progressions, each with eight qualitatively different levels of cognitive skill progression (Table 1 and Table 2).

While the two progressions have some similarities at the bottom and top levels of the developmental progressions, through the middle levels there appeared to be different developmental 'forks in the road' that these two groups undergo. In line with Vygotsky's (1993) views that children with disabilities may have 'developed differently' with idiosyncratic patterns of strengths and abilities, these two groups appear to have different cognitive progressions with particular strengths and abilities. For the Non-Autistic students (made up largely of students with an intellectual disability, or with an intellectual disability and other specific disabilities such as physical impairment, hearing loss, blindness or severe ill health) connections to others and some language acquisition appeared earlier in their developmental progressions compared to the Autistic group. For the Autistic group attainment of memory skills, mimicking and certain items involving patterns and structure appeared earlier in their developmental progressions. These skill acquisition differences are not surprising when taking the characteristics of the defining features of ASD into consideration: impairment in social interaction and communication, often associated with restricted repetitive and stereotyped patterns of behaviour and interests.

In comparing the two developmental progressions derived from the analyses, similarities in the qualitative interpretations of the levels were present in both the lower and higher levels. Similarities at the bottom levels of the progressions where students are learning to engage with stimulations in their environment and learning to participate in simple tasks with support are difficult to interpret. This is due to the ability of the Autistic group appearing above the difficulty of the lower level items.

One reason may be due to students requiring certain levels of cognitive ability before a diagnosis of ASD can be determined or the domination severe intellectual disability of students functioning at this level makes. At the higher levels, once both groups had acquired a certain level of language ability, the progressions were largely the same with only minor differences in the emergence of skills involving emotional display, such as taking pride in achievements, addressing novel situations, such as performing a task in an unfamiliar location, and social situations, such as paying attention in conversations that involve several people.

Interpreting the SWANs assessment material in a standard-referenced manner and reporting students scores in the format of a developmental progression allows teachers to make and evaluate decisions about their students' current level of proficiency and the sorts of teaching interventions that should be established for them. It provides systematic information about expected cognitive developmental standards for students with disabilities and begins to fill the lack of such information provided to teachers. It has also has been used to inform new curriculum progressions of Pre-Level 1 Personal Learning Curriculum standards and indicators for the Victorian Essential Learning Standards (DEECD, 2009b).

The differences in skill emergence and resulting progressions of cognitive skill development found in the current research hold implications for the practice of teachers of students with additional learning needs. The cognitive skills and tasks that a student is ready to learn need to be differentiated based on not only the level the student is assessed at and whether ASD is present. For example a teacher working with an ASD student who is assessed at Level 3 or 'using memory to make simple choices and match objects' should be differentiating their teaching practices to help this student progress to Level 4 or 'using and responding to language'. Introducing tasks that involve recalling of sequences and steps (Level 5) and concepts from the highest levels is aiming above the students ZPD and can lead to frustration about lack of progress and understanding for both student and teacher. Likewise focusing on Level 2 content fails to provide sufficient variety and challenge for such a student.

For a teacher who is not experienced or trained in working with students with additional learning needs, the SWANS assessment instrument becomes an important starting point to systematically and holistically gauge a student's cognitive, emotional, social, communication and literacy levels. They can be performed quickly by the teacher based on their classroom observations of the student. Once a teacher is able to establish where a student is developmentally and what the next logical stage is for that student, their next task to best match the most successful pedagogical practices and interventions for a student functioning at that particular level. As there is a lack of systematic information about effective intervention strategies for students with disabilities (Senate Committee, 2002), what these practices and interventions are becomes the next step following on from the current research. Future plans for the research include evaluating the use of the progressions to guide teaching strategies and resources that are specifically linked to their students' current developmental level or ZPD by monitoring teachers' use. It also includes the evaluation of the most successful pedagogical practices and interventions at different levels for developing a student and aims to provide links of levels to interventions to teachers working with students with additional learning needs.

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