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# Precision Teaching: Supporting Formative Assessment for Children with Autism Spectrum Disorder

**The current article aims to provide a critical analysis of the potential of using Precision Teaching (PT) as a method of supporting formative assessment for children with Autism Spectrum Disorder (ASD) in an Irish context. PT is a method of programmed instruction which measures and evaluates learning in order to track students' learning progress (Binder, 1998; Binder & Watkins, 1990). PT has been utilised successfully with various populations to support improvements in a wide variety of subject areas. Thus, the authors of the current article consider the link between PT and ASD, with particular focus on the origins of such PT-usage in an Irish context. Thereafter, the use of formative assessment methods, particularly PT, are considered in terms of promoting the learning of pupils with ASD. Finally, both the strengths and limitations of the PT approach are outlined, with the aim of supporting a balanced approach to pupil teaching, learning and assessment**.

***Keywords:*** *precision teaching, autism spectrum disorder, formative assessment, special education*

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## INTRODUCTION

Recent years have witnessed a shift in thinking towards the central role of formative assessment in educational contexts (Bennett, 2011). From an Irish perspective, a number of significant documents, including 'Assessment in the Primary School Curriculum: Guidelines for Schools' (National Council for Curriculum & Assessment, 2007) and 'Literacy and Numeracy for Learning and

Life' (Department of Education & Skills, 2011), have recognised the importance of formative assessment in assisting with the overall learning and performance of students. This standpoint can be traced back to the work of Black and Wiliam (1998) and their seminal article entitled, *'Inside the Black Box: Raising Standards through Classroom Assessment'*. Grounded in a plethora of firm evidence, the authors highlighted the essential role of formative assessment in the classroom and its role in raising standards of achievement for all pupils. In this regard, formative assessment has been defined as

> *... the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited.*
>
> (Black and Wiliam, 2009, p. 9)

In order to reap maximum benefits from formative assessment, it is imperative that educational practitioners utilise methodologies which incorporate clear measurement principles that may also be applied across a series of subject areas or domains (Bennett, 2011). One such method is Precision Teaching (PT). This presents as an evidence-based educational approach, endorsed both nationally and internationally as an effective fluency-based approach for use in educational contexts (Kubina & Yurich, 2012; National Educational Psychological Service, 2012). The current article seeks to critically examine the potential use of PT as a method of formative assessment to support students with Autism Spectrum Disorder (ASD) in an Irish context, in light of empirical research in the field. Firstly, a brief overview of PT will be outlined, including key components of a PT lesson. Next, the application of PT across a range of populations and learning domains will be presented, including a critique on the application of PT within an educational context. Following this, the link between PT and ASD will be considered, with particular focus on the origins of PT-usage in an Irish context. Thereafter, the use of formative assessment methods, particularly PT, will be considered in terms of promoting the learning of pupils with ASD. Finally, both the strengths and limitations of the PT approach will be forwarded, with the aim of supporting a balanced approach to pupil teaching, learning and assessment.

## PRECISION TEACHING: A BRIEF OVERVIEW

Precision Teaching (PT) is a method of programmed instruction which measures and evaluates learning in order to track students' learning progress (Binder, 1998;

Binder & Watkins, 1990). Formulated by Ogden Lindsley in the 1960s, PT holds roots in theories of behaviourism, whereby Lindsley sought to empower teachers by transferring scientific principles of behaviourism to the classroom context. At the heart of PT is the pursuit of behavioural fluency. This is defined as the 'fluid combination of accuracy plus speed that characterizes competent performance' (Binder, 1996, p.164). Using the rate of response as a guide, the PT method was developed as a framework for evaluating pupils' learning and the effectiveness of a teaching approach by depicting pupil progress on a 'Standard Celeration Chart' (SCC) (Lambe et al., 2015). Using this standardised graph, daily PT sessions allow both the teacher and pupil to review pupil progress and make adjustments to the programme, where required. In this way, the PT approach has been shown to strongly align with the 'response-to-intervention' framework (Johnson & Street, 2013) and principles of formative assessment (Robert & Norwich, 2010).

There are five steps involved in a classic PT session (Griffin & Murtagh, 2015). Firstly, the teacher pinpoints learning objectives or target skills for the student to improve on; for example, the student's level of sight vocabulary (Nitti, 1990). Secondly, the materials which are to be used throughout the programme are developed, including individualised time probes (see Figure 1 for a time probe based on sight vocabulary). The student then engages in practice by reading this fluency probe daily, whereby the number of correct and incorrect responses is recorded, as well as the time taken. From this, the student's score in responses correct per minute (WCPM) is calculated and recorded on a SCC (see Figure 2 for a child-friendly version). This provides both the student and teacher with an accurate 'picture' of the learning taking place; in a successful PT programme, an upward slope on the chart indicates an improvement in that student's performance. This provides invaluable information for teachers to inform the final stage of the PT session, which involves making a data-based decision on whether or not to continue with the programme or alter it in some way to support student learning (Chiesa & Robertson, 2000). For further information on using the PT approach in mainstream settings, please see NEPS (2012a; 2012b).

## PT AND APPLIED USAGE: A CRITICAL REVIEW

A review of the literature shows that the PT approach has been applied in a myriad of educational settings and across a variety of populations. This includes the use of PT with typically-developing children (Lambe, Murphy & Kelly, 2015), as well as with individuals with learning disabilities (Sulgrove & McLaughlin, 2004), emotional and behavioural disorders (Kubina, Amato, Schwilk & Therrien, 2008),

**Figure 1: Time Probe for a Student Learning Five Sight Words (sourced from Griffin & Murtagh, 2015, p. 189)**

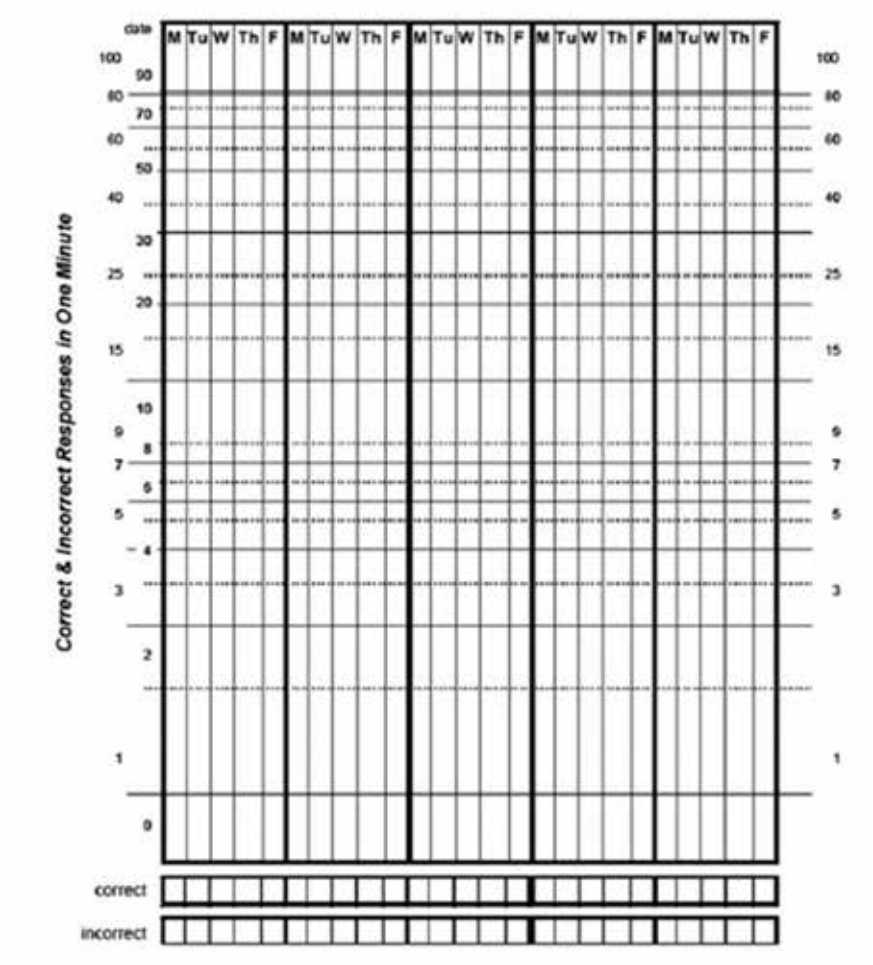

**Figure 2: An Adapted, Child-friendly SCC (Taylor, 2014; sourced from Griffin & Murtagh, 2015, p. 190)**

| | | | | |
|---|---|---|---|---|
| can | like | to | went | come |
| like | went | come | to | can |
| to | come | like | can | went |
| like | can | went | come | to |
| went | to | can | like | come |
| can | come | went | to | like |
| come | can | to | like | went |
| like | went | to | can | come |

traumatic brain injury (Chapman, Ewing & Mozzoni, 2005) and ASD (Kerr, Smyth & McDowell, 2003). In addition, there are numerous success stories regarding the implementation of a PT approach and related improvements in students' learning and performance across a variety of domains, including reading comprehension, mathematics, spelling and second language acquisition (Chiesa & Robertson, 2000; Cuzzocrea et al., 2011; Kubina & Yurich, 2012; Mannion & Griffin, 2018; Nitti, 1990). Most notably, PT has been utilised to enhance reading fluency, specifically in the area of sight vocabulary. A wealth of studies report increases of 20-40 percentile points in tests of reading skills relevant to sight vocabulary following PT intervention programmes (e.g. Beck & Clement, 1991; Kubina et al., 2009; Roberts & Norwich, 2010). Research has also shown that incorporating a PT approach into students' programmes can serve as a motivator for learning, with students who have undertaken a PT programme reporting greater levels of student satisfaction, enthusiasm and positive attitudes in relation to their work (Daly & Cooper, 1993). However, practitioners must also reflect on the limitations of over-relying on PT and the principles of behaviourism in the teaching/learning process. Such issues have been criticised on numerous occasions across the literature, mostly in terms of behaviourism's 'narrow' view of learning (Moran, 2008, p. 212). In particular, the technical, stimulus-response focus of the PT approach has come under question, whereby it can render teachers to 'miss out on rich pedagogical opportunities for the pupils' (pp. 212-213). Considering such issues, Griffin and Murtagh (2015) acknowledge how PT offers 'a limited view of learning and assessment in which it fails to promote higher-order thinking skills in the learning process' (p. 204). In this regard, teachers must not rely exclusively on the method but rather, ensure that their use of PT is positioned within the core, child-centred principles of the Primary School Curriculum (DES, 1999), in order to facilitate a balanced, holistic approach to education.

## PRECISION TEACHING, ASD AND FORMATIVE ASSESSMENT

Indeed, PT can be a particularly useful method of formative assessment for teachers of students with ASD. From an Irish perspective, the origins of PT in educational contexts can be traced back to the field of Applied Behaviour Analysis (ABA) and the pre-existing ABA schools in Ireland (see Leslie & Tierney, 2013). Stemming from that period, researchers reported on the effective use of PT with children with ASD to address an array of curricular and functional skills (Kerr, Campbell & McGrory, 2002). For almost fifty years, interventions based on ABA principles have been highly successful in developing desired behaviours in many populations (Swanson & Sachse-Lee, 2000) and are now internationally

acknowledged as being one of the most effective methods of treatment available to children with ASD (Larsson et al., 2005). One of the cornerstones of ABA interventions and programmes is positive reinforcement, whereby students are encouraged to display desired behaviours through the repeated use of a motivator or reward (Dillenburger et al., 2010). The utilisation of positive reinforcement to promote learning is a principle shared by both ABA and PT interventions. Notably, research points to the particular suitability of PT in supporting persons with ASD. In this regard, research has focused on the significant difficulties that persons with ASD can present in terms of behaviour dysfluency. In fact, the lack of fluency in skill demonstration within this population has been recognised as a core deficit of individuals with developmental disabilities and one which can serve to restrict their advancement in both social and educational settings (Kubina, Morrison & Lee, 2002; Weiss, 2001). Such dysfluency can be characterised by slow, inaccurate or halting behaviours, in addition to prompt dependency, stimulus over-selectivity and poor generalisation of skills (Kubina & Wolfe, 2005; Kubina, Morrison & Lee, 2002; Ramey et al., 2016). Considering such difficulties, a host of studies have shown PT to be highly effective in supporting the acquisition of behavioural fluency for individuals with ASD, spanning a range of subject areas, ages and disability levels (Moors & Fabrizio, 2003; Ramey et al., 2016). Moreover, the additional learning outcomes associated with behavioural fluency, including skill retention, endurance and application, have been shown to support the functionality of skill learning for students with ASD (Kubina & Wolfe, 2005). Reflecting on such outcomes, Kubina et al. (2002) outline how the scientific merit of the approach make it 'eminently valuable' (p. 241) for teachers of students with autism and adaptable for use across curricula and instructional interventions.

One particular case study, namely that presented by Kerr et al. (2003), highlighted the potential benefits of utilising a PT intervention programme to improve the skillset of 'Seán', a four year old child with ASD. Séan attended the Saplings Model of Special Education in Ireland and was diagnosed with ASD at a young age. He displayed skill deficits in many areas, with particular difficulties in the receptive identification of objects. Specifically, Seán was unable to choose the correct item from an array of objects, having listened to a vocal instruction from his teacher on which item to choose. Following a series of seven PT interventions during which Seán's progress was closely monitored and recorded using a SCC, Séan's scores increased dramatically from baseline data; prior to engaging with the PT intervention, Seán could identify only three items correctly within a time frame of one minute. Having completed the PT progamme, results revealed that Seán had surpassed mastery level and was capable of identifying twenty objects correctly within a one minute time frame (Kerr et al., 2003). The results of this

study, coupled with those aforementioned, emphasise the potential value of PT as a method of facilitating the learning of pupils with ASD across a variety of contexts.

## PRECISION TEACHING, ASD AND FORMATIVE ASSESSMENT

Considering ASD and assessment, it must be acknowledged that from an early age, many children with autism are subject to a wide range of assessments, including diagnostic assessments, psychometric assessments, evaluations of learning abilities and standardised tests. While such assessments may be useful in providing children with ASD with access to SEN provisions, they can also be extremely exclusionary. In fact, Lebeer et al. (2011) argue that by maintaining a focus on deficiencies, the results of these assessments often cause low expectations of children with ASD, which in turn may lead to a self-fulfilling prophecy. In contrast, the use of formative assessment can aid to shift the focus towards engaging in assessment *for* learning (formative assessment) with such pupils (Black & William, 1998). Specifically, by using evidence gathered in the classroom, teachers can effectively modify their practice to suit the needs and progress of students with ASD. In fact, educational policy has noted the need to develop ongoing assessment procedures which directly inform teaching and learning for all students, including those with SEN (European Agency for Development in Special Needs Education, 2008).

There is a wealth of research which supports the use of formative assessment in the classroom; when implemented correctly, it can lead to substantial learning gains for pupils (Crooks, 1988; Natriello, 1987). It is widely recognised that ASD is characterised by qualitative differences in functioning in the areas of communication, social functioning and flexibility (Powell & Jordan, 2012). Notably however, formative assessment may become less effective for children with ASD when teachers base their assessment practice on assumptions of typical cognitive development (Ravet, 2013). Therefore, in order to fully reap the benefits of formative assessment, teachers of pupils with ASD must respond appropriately to their students' specific needs by incorporating methods of formative assessment which are individualised and pupil-centred.

PT presents as a particularly useful method of formative assessment for teachers of students with ASD. Notably, a reflection on PT shows the clear alignment of the stages of a PT lesson with the key tenets of formative assessment. By providing both students and teachers with constant visual feedback on the learning progress, as central to use of the SCC in a PT lesson, teachers can make data-based

instructional decisions with the student to support his/her progression (Chiesa & Robertson, 2000). Black and Wiliam (2009) also posited that formative assessment principles can enable teachers to identify 'where learners are in their learning', 'where they are going' and 'what needs to be done to get them there' (p. 7). The PT process itself is implicit in such promoting; precision teachers pinpoint specific learning objectives for individual students based on their own progress, as well as design appropriate materials for the programme based on the learning objective (Kubina & Yurich, 2012).

## LIMITATIONS AND FUTURE RESEARCH

Although an array of literature supports the use of PT with pupils with ASD, it is paramount that all teachers consider the usage of this approach through a critical lens. As highlighted previously, the PT approach and the use of behaviourist methods of teaching in general have been criticised on numerous occasions, with Simmons (1995) stating that such approaches are a mere 'matter of applying appropriate external methods and techniques to evoke the appropriate response' (p. 124). One must also be aware of the limited PT research base, particularly with students with ASD in an Irish context. While Irish researchers have begun to engage in more research in the field of PT (e.g. Griffin & Murtagh, 2013; Mannion & Griffin, 2018; McTiernan, Leonard, Holloway & Healy, 2014), the need for a more comprehensive database of studies using PT with students with ASD is recognised, both nationally and internationally (Kubina et al., 2002; Ramey et al., 2016). While some international studies attest to the strength of this approach with pupils with ASD (Kubina & Wolfe, 2005), a recent systematic review of the literature, as conducted by Ramey et al. (2016), highlights a dearth of literature relating to the application of PT to developmental disabilities. Moving forward, increased levels of research are required in this field, with a focus on rigorous research designs and more detailed participant descriptions. Teachers need to continue to be critical consumers of knowledge, by reflecting on cutting-edge national and international research, as well as by engaging in applied research within their own classrooms.

Overall however, the potential value of PT to facilitate formative assessment for children with ASD requires acknowledgement. As highlighted previously, there is a multitude of evidence which supports the use of PT as a method of assessment and learning across a variety of educational domains (Chiesa & Robertson, 2000; Cuzzocrea et al., 2011; Kubina & Yurich, 2012; Nitti, 1990). Additionally, PT has been extremely successful in supporting the acquisition of behavioural fluency

for pupils with ASD (Moors & Fabrizio, 2003; Ramey et al., 2016). In light of this evidence and considering the strong links between the fundamental principles behind PT and ABA, teachers and educational practitioners should heighten their awareness to the potential of PT to support fluency acquisition and formative assessment of pupils with ASD. However, the PT approach should be adopted by practitioners with caution, as its limited view of learning has attracted criticism over its role in education (Moran, 2008). Therefore, practitioners utilising PT should implement it as part of a broader formative assessment scheme, which encompasses both behaviourist and constructivist aspects.

## REFERENCES


Beck, R., & Clement, R. (1991) The Great Falls Precision Teaching Project: An Historical Examination. *Journal of Precision Teaching*, Vol. 8, pp. 8-12.

Bennett, R. (2011) Formative Assessment: A Critical Review. *Assessment in Education: Principles, Policy & Practice*, Vol. 18 (1), pp. 5-25.

Binder, C. (1988) Precision Teaching: Measuring and Attaining Exemplary Academic Achievement. *Youth Policy,* Vol. 10 (7), pp. 12-15.

Binder, C. (1990) Precision Teaching and Curriculum Based Measurement. *Journal of Precision Teaching*, Vol. 7 (2), pp. 33-35.

Binder, C. (1996) Behavioral Fluency: Evolution of a New Paradigm. *The Behavior Analyst,* Vol. 19 (2), pp. 163-197.

Binder, C., and Watkins, C. L. (1990) Precision Teaching and Direct Instruction: Measurably Superior Instructional Technology in Schools. *Performance Improvement Quarterly,* Vol. 3 (4), pp. 74-96.

Black, P. and Wiliam, D. (1998) *A*ssessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice,* Vol. 5 (1), pp.7-74.

Black, P. and Wiliam, D. (2009) Inside the Black Box: Raising Standards through Classroom Assessment. *Phi Delta Kappan*, Vol. 92 (1), pp. 81-90.

Chiesa, M., and Robertson, A. (2000) Precision Teaching and Fluency Training: Making Maths Easier for Pupils and Teachers. *Educational Psychology in Practice,* Vol. 16, pp. 297–310.

Chapman, S., Ewing, C. and Mozzoni, M. (2005) Precision Teaching and Fluency

Training Across Cognitive, Physical, and Academic Tasks in Children with Traumatic Brain Injury: A Multiple Baseline Study. *Behavioral Interventions,* Vol. 20 (1), pp.37-49.

Crooks, T.J. (1988) The Impact of Classroom Evaluation Practice on Students. *Review of Educational Research,* Vol. 58, pp. 338–481.

Cuzzocrea, F., Murdaca, A., and Oliva, P. (2011) Using Precision Teaching Method to Improve Foreign Language and Cognitive Skills Iin University Students. *International Journal of Digital Literacy and Digital Competence,* Vol. 2 (4), pp. 50-60.

Daly, P. and Cooper, J. O. (1993) Persuading Student Teachers and Inservice Teachers to Use Precision Teaching After the Course is Over. *Education and Treatment of Children,* Vol. 16 (3), p. 316.

Department of Education and Skills (DES) (1999) *Primary School Curriculum*. Dublin: Government Publications.

Department of Education and Skills (DES) (2011) *Literacy and Numeracy for Learning and Life*. Dublin: Government Publications.

Dillenburger, K., Keenan, M., Doherty, A., Byrne, T. and Gallagher, S. (2010) Living with Children Diagnosed with Autistic Spectrum Disorder: Parental and Professional Views. *British Journal of Special Education,* Vol. 37 (1), pp. 13-23.

European Agency for Development in Special Needs Education (EADSEN) (2008) *Recommendations on Inclusive Assessment*. Limassol: Cyprus.

Griffin, C.P., and Murtagh, L. (2015) Increasing the Sight Vocabulary and Reading Fluency of Children Requiring Reading Support: The Use of a Precision Teaching Approach. *Educational Psychology in Practice*, Vol. 31 (2), pp. 186-209.

Kerr, K., Campbell, A. and McGrory, S. (2002) The Saplings Model of Education: Case Studies in Autism. *Journal of Precision Teaching & Celeration*. Vol. 18, pp. 49–60.

Kerr, K., Smyth, P. & McDowell, C. (2003) Precision Teaching Children with Autism: Helping Design Effective Programmes. *Early Child Development and Care*, Vol. 173 (4), pp. 399-410.

Kubina, R., Morrison, R., and Lee, D. (2002) Benefits of Adding Precision Teaching to Behavioral Interventions for Students with Autism. *Behavioral Interventions*, Vol. 17 (4), pp. 233-246.

Kubina, R., Amato, J., Schwilk, C. and Therrien, W. (2008) Comparing Performance Standards on the Retention of Words Read Correctly Per Minute. *Journal of Behavioral Education*, Vol. 17 (4), pp. 328-338.

Kubina, R. M., and Yurich, K. K. L. (2012) *The Precision Teaching Book*. Lemont, PA: Greatness Achieved.

Lambe, D., Murphy, C. and Kelly, M.E. (2015) The Impact of a Precision Teaching Intervention on the Reading Fluency of Typically Developing Children. *Behavioural Interventions,* Vol. 30, pp. 364-377.

Larsson, H., Eaton, W., Madsen, K., Vestergaard, M., Olesen, A., Agerbo, E., Schendel, D., Thorsen, P. and Mortensen, P. (2005) Risk Factors for Autism: Perinatal Factors, Parental Psychiatric History, and Socioeconomic Status. *American Journal of Epidemiology,* Vol. 161 (10), pp. 916-925.

Lebeer, J., Birta-Szekely, N., Demeter, K., Bohács, K., Candeias, A.A., Sønnesyn, G., Partanen, P., Dawson, L. (2011) Re-assessing the Current Assessment Practice of Children with Special Education Needs. *School Psychology International*, Vol. 33 (1), pp. 69-92.

Leslie, J. and Tierney, K. (2013) Behaviour Analysis in Ireland. *The Irish Journal of Psychology*, Vol. 34 (3-4), pp.156-162.

Mannion, L. & Griffin, C.P. (2018) Precision Teaching Through Irish: Effects on Isolated Sight Word Reading Fluency and Contextualised Reading Fluency. *Irish Educational Studies,* pp. 1-20.

Moors, A. and Fabrizio, M. (2002) Using Tool Skill Rates to Predict Composite Skill Frequency Aims. *Journal of Precision Teaching and Celeration*, Vol. 18 (2), pp. 28-29.

Moran, S. (2008) After Behaviourism, Navigationism? *Irish Educational Studies*, Vol. 27, pp. 209–221.

National Council for Curriculum and Assessment (NCCA) (2007) *Assessment in the Primary School Curriculum: Guidelines for Schools*. Dublin: NCCA.

National Educational Psychological Service. (2012) Effective Interventions for Struggling Readers: A Good Practice Guide for Teachers and Resource Pack.

Available at http://www.education.ie/en/Education-Staff/Information/NEPS-Literacy-Resource/neps_literacy_good_practice_guide.pdf and http://www.education.ie/en/Education-Staff/Information/NEPSLiteracy-Resource/neps_literacy_resource_pack.pdf

Natriello, G. (1987) The Impact of Evaluation Processes on Students. *Educational Psychologist*, Vol. 22 (2), pp. 155–175.

Nitti, J. (1990) *Utilizing Precision Teaching to Measure Growth of Reading Comprehension Skills in Low Achieving Students.* Unpublished doctoral dissertation, Nova University.

Powell, S., and Jordan, R. (2012) *Autism and Learning: A Guide to Good Practice* (2nd ed). London: Routledge.

Ramey, D., Lydon, S., Healy, O., McCoy, A., Holloway, J. and Mulhern, T. (2016) A Systematic Review of the Effectiveness of Precision Teaching for Individuals with Developmental Disabilities. *Review Journal of Autism and Developmental Disorders*, Vol. 3 (3), pp.179-195.

Ravet, J. (2013) Delving Deeper into the Black Box: Formative Assessment, Inclusion and Learners on the Autism Spectrum. *International Journal of Inclusive Education*, Vol. 17 (9), pp. 48-96.

Robert, W., and Norwich, B. (2010) Using Precision Teaching to Enhance the Word Reading Skills and Academic Self-Concept of Secondary School Pupils: A Role for Professional Educational Psychologists. *Educational Psychology in Practice,* Vol. 26, pp.279–298.

Simmons, S. (1995) The Teacher Education Consortium: A New Network for Professional Development within Experiential Education. *Journal of Experiential Education*, Vol. 18 (3), pp. 120-127.

Sulgrove, M.K. and McLaughlin, T.F. (2004) The Effects of an Additional Timed Reading on Reading Rate. *Journal of Precision Teaching & Celeration,* Vol. 20 (1), pp. 9-16.

Swanson, H. and Sachse-Lee, C. (2000) A Meta-Analysis of Single-Subject-Design Intervention Research for Students with LD. *Journal of Learning Disabilities*, Vol. 33 (2), pp. 114-136.