Understanding early cognitive development: Using PAT Early Years to support student learning

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Abstract

The correlation between early cognitive and psychosocial development is well established. For this reason, some measurement tools, such as UNICEF's Early Childhood Development Index (ECDI2030), provide a single score as an overall indicator of a child's development because performing poorly in one area is likely to mean inadequate development across all areas. While these broad indicators can be useful at a system level, understanding children's development in discrete domain areas is essential for meaningful intervention. This presentation will explore how measurement tools, such as ACER's Progressive Achievement Tests (PAT) for the Early Years, can be used to support targeted intervention across a range of learning areas. PAT Early Years will be situated within the broader context of ACER's early learning descriptions of progress, which establish oral language as a foundational skill and highlight the importance of recognising each child's progress over time regardless of their starting place.

Introduction

In early childhood (0 to 8 years), as in all stages of education, different measurement tools can serve different purposes. Some, such as UNICEF's Early Childhood Development Index (ECDI2030), aggregate many areas of learning into a single indicator to ascertain whether a cohort of children are developmentally on track (UNICEF, 2023). Others, such as Australia's Early Years Toolbox, distinguishes between learning areas and provides scores for each that are set against age expectations (Early Years Toolbox 2013–19). Whether an assessment provides a broad-brush indication of developmental levels or offers a diagnostic approach to different learning areas, an in-depth understanding of foundational skills, and how they progress, is key to supporting further development.

Quality assessment data is most constructive when used to promote a rich and deep understanding of how children learn the skills the instrument claims to measure, and what typical development in these skills looks like. Without the broader context of a developmental progression, there is a risk that isolated skills become the focus of interventions. A 'one size fits all' approach to intervention

ignores the learning needs of children who are not yet ready for these skills or have moved beyond them. Reporting against a developmental progression supports recognition of each child's progress regardless of their starting place. ACER's Progressive Achievement Tests (PAT) for Early Years is an example of an assessment that supports teachers' understanding of the key skills that underpin early cognitive development and how they typically progress. Using PAT Early Years data, interventions can be made that target children at their point of need. While the format of the assessment is important, and there are many considerations to be made on the best assessment methods for young children, developmental progressions are essential to making assessment practices productive and meaningful at all stages of development.

The principles of assessment

In evaluating the role measurement can meaningfully play in early childhood, it is worth considering the principles relating to quality assessment practices. Quality assessments are fit for purpose and have clarity and consistency of purpose. They are objective, transparent, ethical and fair, and demonstrate technical rigour (ACER & UIS, 2017, p. i). While these principles are more commonly associated with standardised assessment, they can be applied more broadly. Even in classroom contexts where assessment practices are much less formal, there is value in incorporating fundamental principles of quality assessment (Bennett, 2011).

The role of assessment in early childhood contexts, in particular early childhood education and care (ECEC, 0 to 5 years), has received significant attention in the recent past. The importance of using psychometrically sound assessment instruments that can identify learning needs, with specific implications for practical pedagogical interventions, is now well established (Care et al., 2010, p. 19). According to this position, assessment validity is key, and leaders would benefit from recognising validity as 'the most fundamental technical consideration in the evaluation of educational assessment systems' (Lane & Moore, 2011, p. 266).

Decontextualised assessments in early childhood have been treated with scepticism. A significant concern relating to decontextualised assessments is that they could lead to the decontextualised teaching of discrete skills at the expense of meaningful application and integration (Invernizzi et al., 2010, p. 439). A focus on discrete skills neglects the complexity of the learning process, coming 'at the expense of the support for multiple aspects of development that has long been the hallmark of high-quality early childhood education' (Casbergue, 2010, p. 13). In response to these arguments, concerns have been raised about the technical rigour of contextualised, or authentic, assessment practices. Moreno and Klute (2011) have argued that well-known, teacher-employed authentic assessments tend to have limited evidentiary support, lacking 'peer-reviewed evidence documenting that they can be reliably and validly employed by the broad swath of caregivers and teachers expected to implement them' (p. 485).

These positions can be at least partially reconciled when the focus is shifted towards a common goal – the meaningful development of children's foundational skills (Snow, 2006, p. 228). An opportunity exists for the development of measures that are technically rigorous across a wide range of early learning skills, and specifically developed with young children in mind. The potential of these measures to improve children's learning is more likely to be realised if considered in terms of their implications for practice; how they can be used to promote teacher's conceptual engagement with the target skills; and the multitude of ways they can be incorporated into their teaching practice. (Raban et al., 2012, pp. 8–9, 17).

This paper proposes 4 criteria for quality assessment practices that are appropriate for young children, and that complement the assessment principles already outlined. These criteria are continuity, self-confidence, feedback and collaboration. PAT Early Years will be used to illustrate how these criteria can be realised in practice. However, in using PAT as a case study, this paper does not

propose that these assessments are used in all early childhood contexts; the assessing of young children, particularly 4 years and younger, is a complex process that requires thoughtful planning (Bradbury & Robert-Holmes, 2017). PAT is an online school-based assessment that has not been designed with ECEC environments in mind. What PAT Early Years demonstrates is the ways in which a progressive achievement approach to assessment can be used to build teacher's understanding of key foundational skills and provide valuable insight into children's learning at all stages of education and development.

Continuity

Continuity refers to an assessment that is based on a continuum of learning and development. When the skills targeted in an assessment are understood in the context of a developmental progression, learners can be separated based on their acquisition of the skills being assessed, and teachers can identify where learners are in their development, as well as the next steps to improvement (Anderson, 2016, p. 108; Förster et al., 2018, p. 98; O'Reilly et al., 2014, p. 404). An understanding of how key skills develop can support teachers in tracking learners' progress over time and in recognising that learners develop at different rates and in individual ways. Developmental progressions can be approached from the point of view of learning theory, as well as from a social and cultural perspective that takes into account children's interests and prior community experiences (Brookhart, 2018). A well-thought-out and evidence-based developmental progression can support assessment development and the interpretation of assessment data, while also informing teaching programs and teaching practices, providing the essential basis for setting strategic aims, planning instructions, and guiding on-the-fly decisions that have to be taken while in the midst of teaching and assessing (Wilson 2018, p. 9; Australian Council for Educational Research [ACER], 2019). It can support teachers' understanding of the key skills that underpin growth and help them to recognise where and how these skills interact.

Continuity and PAT Early Years

PAT Early Years is a suite of tests in reading and mathematics. There are 4 separate assessments for each domain, to be delivered over the first 2 years of formal schooling (at approximately 6- to 9-month intervals). They are tablet-based assessments consisting of a few item (question) types and formats that are designed for young children.[1] They assess a range of key components (called 'strands') in each domain area. In reading, students are assessed in phonics and phonemes, print conventions and environmental print, vocabulary, listening comprehension, and reading comprehension. In mathematics, they are assessed in number, algebra, statistics, measurement and space. A new addition to PAT Early Years Reading is currently underway: a series of assessments in key areas of literacy development that are designed to provide more significant diagnostic feedback.

Rather than receive raw scores indicating which questions students got 'right' or 'wrong', PAT uses Rasch measurement to put student scores on a continuum of learning. Rasch measurement transforms categorical data, such as the encoding of responses to items as 'right' and 'wrong', into linear measures that have interval properties. Rasch measures place items and students on the same measure, so that meaningful comparisons can be made both of the distance between items (how much more easy or difficult an item is compared to another) and the distance between students (how far ahead or behind a student is compared to another). The same can be applied to a single student, telling us how much growth we observe over repeated assessments. In PAT, as in many standardised assessments, each domain area is represented on a single scale. This means

1 The new reading assessments will include embedded practice items and provide clearer guidance that supports young children to navigate independently.

that students can be tracked from beginner to advanced stages of reading and mathematical ability (or development). These skills are described as a student progresses along the scale for each domain area using Achievement Band Descriptions.

Teachers can use the PAT Early Years assessment data and reports to improve their understanding of foundational skills in reading and mathematics. They will gain insights into the independent nature of these skills (for example, how listening comprehension supports reading comprehension) and the way they work as unique learning areas in which a learner's performance differs (for example, the ways in which a student may perform well in decoding but poorly in comprehension). In PAT Early Years Reading, for example, a teacher may find that a student is performing well in phonemic awareness but demonstrating low-level ability in listening comprehension. Using this information, the teacher provides support for the student where they are most in need and can monitor growth through future assessments. Without this information, it could be assumed that a student with strong decoding skills is a strong reader generally. Without early support in comprehension, such a student could struggle as an independent reader and quickly lose engagement.

As part of the progressive achievement approach, the PAT tests are supported by the PAT Teaching Resources Centre (TRC). These resources are aligned to the PAT scale and mapped to individual test items; in other words, they are targeted to students' ability levels as indicated by the PAT data. The TRC provides a way for quality assessment data to be constructively incorporated into teaching practice.

Self-confidence

Self-confidence in assessment relates to both the context in which the assessment takes place and nature of the communication between teacher and learner. Self-confidence is not intrinsic to assessment but rather concerns the facilitation of positive attitudes through practice. Whether an assessment is decontextualised or takes place in an authentic context, the interpretation of the data can contribute to improving communication with the learner and better supporting their confidence. Assessments should consider contexts that are likely to promote a positive experience and, in ECEC environments particularly, should be compatible with warm, responsive relationships and child-centred play-based programs. While young learners should only be assessed in familiar environments that relate to everyday routines, notions of authenticity do not need to be limited to observation-based assessment practices. Authentic contexts can be created within the 'world' of the assessment. This could mean, for decontextualised assessments, delivering test items within a storybook context and/or asking questions grounded in familiar and engaging topics and themes.

PAT Early Years and self-confidence

PAT Early Years is a tablet-based assessment, and as with many tablet-based early childhood products, positive student engagement is an integral consideration in the design. Beautifully drawn illustrations help enliven the test-taking experience. The test items are situated in familiar and engaging contexts. Reading, for example, includes a series of story-based units that reflect the kinds of topics and themes young children commonly encounter, such as family play in the park, talking animals, and imaginative self-play. The Reading assessments currently in development are set in a story context (such as aliens trying to get to their home planet) to encourage students as they go through the items. However, an enjoyable testing experience, while important, is not sufficient to promote positive student learning. The extent to which PAT Early Years promotes self-confidence depends in part on how the data is used. The potential for using the PAT data for positive feedback is explored in the next section.

Feedback

Positivity is further encouraged through assessment data that identifies the learner's achievements and supports the provision of constructive feedback. Feedback is most constructive when it is drawn from evidence of the knowledge and skills the learner has in place, those they are consolidating and those that require more attention. Such evidence allows teachers to communicate the learner's achievements and help them to recognise their own progress. Learners can be encouraged, as they develop, to take ownership of their assessment outcomes and to help drive where they need to go next. Quality assessment data can also help uncover a learner's self-efficacy and the strategies they use spontaneously and with scaffolding. This information can be incorporated into feedback; understanding learner's attitudes and beliefs towards their learning can be essential to overcoming obstacles and supporting further development. Feedback should also not be considered a one-way street. Learners benefit from self-reporting; that is, from the opportunity to inform adults about their skills and learning and to reflect on their own knowledge (Danielson & Phelps, 2003).

PAT Early Years and feedback

A strength of the PAT suite of tests is the rich data sets they provide, offering insights into the performance of students in specific strand areas along a continuum of learning. The PAT Early Years Reports provide opportunities for teachers to improve their understanding of the key skills underpinning reading and mathematics, such as through the skill descriptions attached to each item and the Achievement Band Descriptions that describe progression along a scale. It is, however, up to teachers and educational institutions to decide how this evidence is fed back to the students to promote positive attitudes towards their learning. PAT data can be used to indicate how students have progressed, and feedback can focus as much on the learning they have in place as where they need to go next. This approach is more likely to promote self-confidence and ownership over learning than one that focuses on comparing a student's performance with their peers.

Collaboration

An assessment methodology can foster partnerships, encouraging communication between teachers, families and the wider community. It can support teachers to communicate what a learner's family might do to support the learner's development, identifying an explicit learning pathway that is referenced in the learner's home life, and specifying family support activities. This support depends on constructive interpretation of technically rigorous assessment data. Clear and concise communication of the assessment outcomes needs to be a priority of the reporting design. Collaboration can also be encouraged through knowledge sharing between teachers and other early childhood professionals working outside educational settings (VCAA, 2013, p. 9). Teachers who work in partnership with other professionals can collate and use the evidence of children's prior and current learning and development. This enables them to build continuity in learning and development across services and transition points (VCAA, 2017, p. 16).

PAT Early Years and collaboration

The PAT methodology is centred on a continuum of learning that is domain-specific and detached from age or grade. Quality assessments with evidence-based developmental progressions provide significant opportunities for collaboration. Explicit teaching of reading and mathematical skills begins from the first year of official schooling, but children are building their skills in these areas long before explicit instruction begins. For example, children increase their awareness of the sounds in words through rhyming songs and storybooks that play on repetition and alliteration. They increase

their vocabulary and comprehension by engaging in conversations with parents, carers and teachers about storybooks that are read to them. They recognise numbers and can play boardgames that support the development of counting skills. Assessments based on a continuum of learning can support transition between different stages of schooling. They encourage a shared understanding of key skills and how they develop, and a shared language that can be used in communicating and collaborating with families, learners and other teachers. PAT Early Years data can also be used to encourage collaboration across subject areas; literacy and numeracy are now well acknowledged as interdisciplinary foundational skills that interact with other developmental areas, such as executive function (Fuchs et al., 2010; Welsh et al., 2010). Insight into students' ability in early literacy and numeracy can usefully inform teaching practice in many other areas of student learning.

Conclusion

Principles and methodologies relating to quality assessment practices need to be applied at all stages of learning and development. All assessments can be designed to be fit for purpose, ethical and fair, and technically rigorous. All assessments can promote continuity in learning through the use of developmental progressions, and can prioritise self-confidence, and positive and constructive feedback, and promote collaboration between all parties invested in the learner's ongoing development. Quality, evidence-based measurement tools can build teachers' understanding of foundational skills: the key skills learners need to learn, how they develop and how they interact. Some of these criteria for quality assessment practices take on particular importance in early childhood, where play-based programs dominate teaching, and nurturing relationships are integral to children's development. But these criteria do not need to be prioritised at the expense of others; decontextualised assessments can take place in familiar environments for children, and can be aligned with developmental progressions that contextualise seemingly discrete skill areas. PAT Early Years is built on the premise that learning is continuous, and that quality, evidence-based descriptions of learning can improve our understanding of key skills and guide learners' ongoing development. This methodology can apply equally to ECEC contexts, so long as appropriate methods for assessing young children are worked into the design. ACER is currently conducting research into the development of descriptions of progress through quality assessments designed for ECEC contexts, with the aim of exploring how teachers can best be supported in their understanding and teaching of key foundational skills for young children.

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