Learning Difficulties Information Guide

Numeracy

THE EDUCATION STATE

VICTORIA State Government | Education and Training

Contents

What is this guide?

The **Learning Difficulties Information Guide – Numeracy** is a foundation for understanding learning difficulties in numeracy, including dyscalculia, and a guide for what teachers can do to support this cohort of students.

This resource will sit alongside two accompanying guides:

- The Learning Difficulties Information Guide – Literacy
- The Learning Difficulties Information Guide – School Leaders

The School Leaders guide contains information to help schools understand how supporting students with learning difficulties fits within the broader vision of the Education State.

This guide and the literacy guide are more specialised, designed to help build the confidence and practical capability of teachers to **identify, assess and implement interventions to support students with learning difficulties** in day-to-day practice.

While the advice in all three guides is intended to help support students with learning difficulties, its application will help to improve the literacy and numeracy of all students (Gettinger & Stoiber 2007; Marston 2005).

Background

In June 2018, the Department of Education and Training (the Department) released its Literacy and Numeracy Strategy Phase 2 (the Strategy), outlining Victoria's plan to improve literacy and numeracy outcomes for all students. The Strategy ensures that teachers have access to relevant support and resources to meet the learning needs of their students and continuously improve their professional practice in the classroom.

The Strategy aims to support teachers in their daily practice and thereby lift literacy and numeracy achievement, so that every Victorian student, including those with learning difficulties, can expect:

- to receive the quality teaching they need to achieve success in literacy and numeracy (regardless of their background, circumstances or prior achievement)
- to be engaged in their learning, including working with their teachers to set immediate and longer-term literacy and numeracy goals, and to have their voice heard in designing their own learning.

What is the difference between a learning disability and learning difficulty?

Approximately 15–20 percent of students in every school, in every classroom, will have a learning difficulty (AUSPELD 2014). This is an umbrella term to describe students who are experiencing difficulty with learning because of a variety of reasons (for example, disability, living in out-of-home care) and who are unable to baccess the curriculum through high-quality instruction alone. This group of students, if they are provided with greater knowledge and practice, are more than capable of closing the gap between them and their peers.

Understanding the reasons why a student may be experiencing difficulties while learning is an important first step to help them better access the curriculum.

Learning disabilities are a subset of learning difficulties and are classified as congenital, neurological differences (that may or may not be diagnosed) which include specific learning disabilities, such as dyslexia and dyscalculia. Students with learning disabilities are predisposed to difficulties with their learning, no matter the circumstances they are born into, their school environment, or the quality of teaching they experience.

Not all students with neurological differences will present with a set of recognisable traits, which can make it hard to identify a learning disability. It is likely, however, that students with learning disabilities will respond less effectually and more slowly to intervention compared to those with other learning difficulties.

For the purposes of this guide, 'learning disabilities' will be viewed as a sub-set of the larger group of students generally referred to as experiencing learning difficulties.

Legal responsibilities

One in five Australians will have a disability at some stage in their lives. For some, the disability will be temporary. Others are affected for a lifetime. Whatever the case, everyone has the right to be an active member of their community and to have a say in the decisions that affect their lives. As a teacher, your attitudes, words, and actions have a huge impact on the lives of students with disability.

The Disability Standards for Education 2005 (the Standards) were developed under the *Disability Discrimination Act 1992* (DDA). The Standards clarify the obligations of education providers under the DDA, and seek to ensure that students with disability can access and participate in education on the same basis as other students. The definition of disability in the DDA includes physical, intellectual, mental health and learning disability.

School leaders and teachers should be aware of their obligations in supporting students with learning disabilities to ensure their compliance with the DDA and the Standards. Among other things, schools are obliged to make reasonable adjustments to ensure students with learning disabilities can access education on the same basis as their peers.

The DDA and the Standards in a nutshell

Together, the DDA and the Standards help to ensure that Australian school students with disability get the same opportunities at school as everyone else.

- The DDA is Commonwealth legislation that aims to eliminate disability-based discrimination and promote equal rights, opportunity and access for people with disability.
- The Standards help to clarify the DDA. They provide a framework about the educational rights of students with disability to enable them to access and participate in education on the same basis as other students.

(NCCD 2019)

Further information to help schools and other education providers understand their obligations under the DDA and the Standards is available on the Department's website as professional learning.

Personalised learning and support planning

To maximise engagement and outcomes for students with learning difficulties, a four stage personalised learning and support planning process is recommended. The four stages of **Assess, Plan, Teach** and **Evaluate** serve as a guide for identifying students' learning strengths and needs, and for designing, implementing and evaluating tailored teaching and intervention strategies, including the development of Individual Education Plans.

Individual Education Plans

An **Individual Education Plan (IEP)** describes the adjustments, goals and strategies designed to meet the educational needs of an individual student to enable them to reach their potential. An IEP is a living document that is essential in guiding the educational planning and monitoring of a student's unique learning needs.

IEPs are recommended for students with learning disabilities as an IEP serves to establish the process by which teachers and schools are meeting their legal obligations and accountabilities for students with additional learning needs under the *Disability Discrimination Act 1992* and the Disability Standards for Education 2005. An IEP:

- supports schools in developing a meaningful learning program for students and to track progress against SMART goals
- provides a means to share information between school, student, family and other support professionals
- helps schools to determine how best to use resources to support students
- promotes agency and student voice by involving the young person in the process.

Numeracy learning difficulties

In the information age we need to keep track of and process an unprecedented amount of numerical data. Numeracy can be described as the knowledge, skills and behaviours that allow us to use mathematics in a range of everyday contexts, including study, the workplace, and our personal lives. Yet despite the best efforts of their teachers, some students will have a learning disability that affects their learning in numeracy (Butterworth 2005).

The more acute form of this disability is known as 'dyscalculia', from the Greek dys- ('difficulty') and the Latin calculare ('to count').

Why is numeracy important?

The application of numeracy is important for our participation in society and understanding of the world. We use numeracy every day, in all areas of our lives. Because life decisions are so often based on numerical information, students need to be numerate to make the best choices.

Throughout school, students are introduced to increasingly sophisticated and challenging numerical ideas and abilities, such as maths fluency, reasoning, modelling, and problem-solving. Grasping these numerical concepts enables students to engage with familiar and unfamiliar situations and make well-informed decisions (VCAA 2019).

While numeracy learning difficulties and dyscalculia have received less attention than other developmental learning disorders in Australia, international prevalence rates suggest that approximately eight percent of people worldwide have dyscalculia—rates comparable to those of dyslexia (Reeve 2019).

Characterising learning difficulties in numeracy

In the past, learning difficulties in numeracy have been characterised as general cognitive problems (for example, low IQ). It is now understood that a student may be experiencing difficulty in mathematics for a range of reasons, including:

Student related factors

- chronic absenteeism
- sensory impairment(s)
- delayed acquisition of language
- social-emotional difficulties
- specific cognitive problems (for example, issues with working memory)
- overlap with a literacy learning difficulty

Social and/or environmental factors

- limited early language and literacy exposure
- low socio-economic status
- family history of learning disabilities
- disrupted learning (for example, school refusal)
- if English is not a student's first language, or the primary language spoken at home, this may contribute to initial difficulties while the child masters the language.

Dyscalculia is regarded as a specific learning disability, resulting from differences in the brain that affects the typical acquisition of numerical skills (Butterworth 2019). The American Psychiatric Association DSM V (2013) defines dyscalculia as a **learning deficit associated with difficulties processing numerical information, learning arithmetic facts, and performing calculations.**

In approximately 25 percent of cases, dyscalculia overlaps with dyslexia (Butterworth 2005) and since many maths problems also rely on literacy and language skills (for example, arithmetic word problems) a learning difficulty in numeracy can be exacerbated by a learning difficulty in literacy.

There is no easy method for identifying students with a learning difficulty in numeracy, nor is there a 'one size fits all' approach to providing support to these students. Understanding each learner's individual needs is critical to determine appropriate interventions and the different kinds of supports they require.

Identifying numeracy learning difficulties and dyscalculia

It is important that classroom teachers understand why a student is having difficulty with mathematics before devising and delivering interventions. Effective interventions for students with delayed acquisition of basic number concepts differ from those for students with dyscalculia.

As explained previously, there are many reasons why a student might struggle with mathematics (Reeve & Waldecker 2017). Many assessment methods simply identify students with low achievement, rather than helping teachers to understand the nature of the difficulty itself.

Dyscalculia affects the typical acquisition of numerical abilities. Research has isolated two 'markers' that can help to identify students' core number ability, specifically:

- the ability to rapidly and precisely enumerate; that is, to establish the number of small sets of objects without explicitly counting them (subitising)
- the ability to efficiently compare the approximate magnitudes of quantities; for example, by identifying which set of squares contains more squares (approximate magnitude) (Butterworth 2019; Landerl 2019).

Both markers are indicators of capability in mathematics, and can be identified early in life.

Students exhibiting problems with the core number abilities of subitising and approximate magnitude may have dyscalculia and should be distinguished from students experiencing difficulties with learning for other reasons. These abilities and the way they present in the classroom are explained in the following sections.

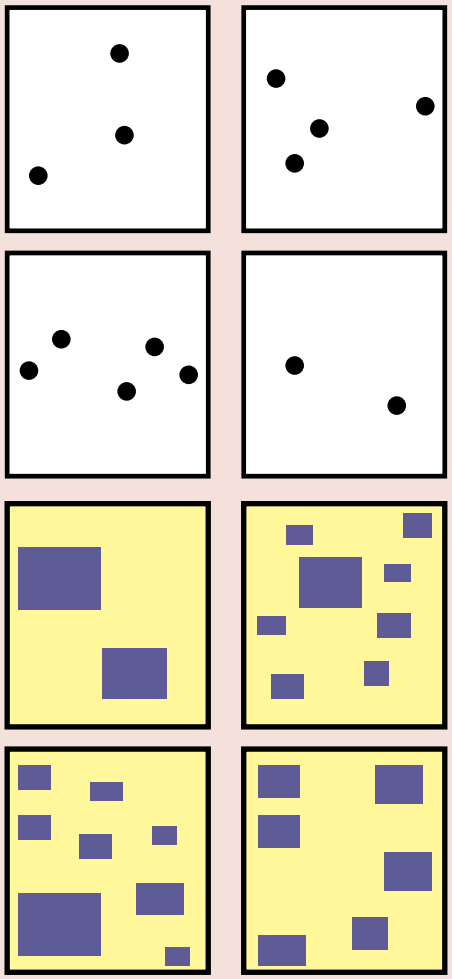

Figure 1: An example of a subitising exercise (top) and approximate magnitude exercise (bottom).

Subitising

The ability to rapidly enumerate small sets of objects at a glance, without explicit counting, is known as subitising. Testing students' subitising skills can help identify numeracy learning difficulties. Typically, when presented with small sets of objects (up to five), students can quickly and accurately name the number of objects in a set without needing to count them individually.

A student with dyscalculia, however, will not be able to do this quickly. They may need to count each object individually, saying the numbers aloud ('One, two, three…'), sometimes pointing to the objects while they count.

The ability to subitise is associated with our ability to 'recognise or operate on sets' (for example, knowing that three dots represent a value of three, but also the symbol '3'). Since this ability is linked to a symbolic understanding of numbers, students with a subitising difficulty will struggle in situations where they are required to apply this type of understanding (in particular, mathematics).

Subitising also impacts a student's ability to effectively compute answers to addition problems and to use appropriate problem-solving strategies. Students who lack typical subitising abilities are at a distinct disadvantage mathematically. Their acquisition of numerical abilities is inhibited, which in turn affects their acquisition of more complex mathematical concepts.

Comparing approximate magnitudes

The ability to efficiently compare the approximate magnitudes (sizes) of quantities is also considered an indicator of numerical ability and can help teachers identify students who may have a learning difficulty in numeracy.

Teachers can check this ability by assessing the speed and accuracy with which students identify the relative magnitude of two numerical values, for example, 'Which quantity/number is larger?'

In the bottom example (Figure 1), a student would be asked to identify the array with the most squares. Students with dyscalculia, compared to their peers, are less accurate and significantly slower in making comparison judgements like this. As with subitising, their ability to compare approximate magnitudes of quantities is a strong predictor of their abilities in mathematics (Butterworth 2019).

The ability to quickly and efficiently compare the relative magnitude of numbers or quantities is an important conceptual competence associated with estimation abilities and, in turn, the ability to approximate answers. In absence of this ability, mathematical problems tend to be solved procedurally, relying solely on rote processes.

For more detailed information on the reasons students may experience learning difficulties in numeracy, visit the Learning Difficulties in Numeracy video series:

- **Video 1 –** Numeracy and the Brain
  An introduction to the neuroscience of numeracy learning difficulties and core number abilities.
- **Video 2 –** Numeracy and the Curriculum
  Factors underlying numerical understanding in the primary and secondary mathematics curriculum.

A three-phase maths assessment process

Once a student has been identified as experiencing difficulties in numeracy, teachers can use the following three-phase process as a guide for understanding their needs, and for developing and delivering appropriate interventions.

First phase

In the first phase of assessing a student, a teacher should observe and record the student's maths performance over a set period (for example, between two to six months).

During this phase, teachers should focus on using the Victorian F-10 Mathematics Curriculum as a measure of ability, assessing a student's:

- number skills
- mastery of number facts
- calculation skills
- understanding of maths concepts.

Assessment resources

The Department provides a range of resources to assist teachers to understand a student's learning needs in the Numeracy Portal.

Resources include:

- The Mathematics Teaching Toolkit
- The Mathematics Online Interview
- Birth to Level 10 Numeracy Guide

The aim is to inform intervention by creating a profile of a student's strengths and identifying areas for growth. Teachers should also aim to collect information about other factors that could explain a student's maths performance (such as missing key lessons, or disruptions at home).

Second phase

In the second phase, teachers can administer more detailed maths assessment based on observation, to isolate a student's key numerical abilities.

Teachers may consider implementing a 'dynamic assessment' approach to better understand the student's ability.

What does dynamic assessment 'look like'?

Dynamic assessment involves the teacher constructing a 'mini learning progression' within a relatively narrow maths domain.

A teacher might, for example, choose to focus on simple word problems.

The steps required to solve a problem are specified to the student, and the teacher and student collaborate to solve the problem. The student may not have the competence to solve the entire problem independently, but with help from the teacher, can complete the steps, one by one, to solve the problem. The teacher might use prompts such as, 'Okay, what do we do now?' or 'What do you think we need to do next?', handing the student responsibility to then solve like problems.

During this exercise, the teacher can also gauge the student's learning needs, specifically the nature and amount of help needed to solve problems independently. The ability to transfer skills to different problems, provides an index of what is learned and a measure of learning potential.

(Note that students with dyscalculia will find it difficult to apply learning to new problems, even when they appear to have just cemented a skill.)

Dynamic assessments like this can help students to internalise problem-solving concepts and procedures.

Third phase

The third phase involves identifying and using appropriate interventions based on data and informed by teacher observations from the first two phases. All interventions should use the Victorian F-10 Mathematics Curriculum as the basis for teaching students skills and knowledge.

More information about the frequency, intensity and nature of tiered intervention for learning difficulties in numeracy can be found in the following section.

For more detailed information on identifying and assessing students with numeracy learning difficulties, including dyscalculia, visit the Learning Difficulties in Numeracy video series, specifically:

- **Video 3 –** Characteristics of Dyscalculia
  Specific advice for teachers about recognising the characteristics of dyscalculia and supporting students with dyscalculia in the classroom.
- **Video 4 –** Classroom Assessments
  Advice about assessment practices and clearly establishing the purpose of these assessments (for example, assessment for support, intervention or understanding).

Numeracy intervention

There is no 'one size fits all' approach to supporting students with learning difficulties in numeracy. Understanding each student's individual learning needs is critical to determining appropriate interventions, and students with different kinds of numeracy learning difficulties require different kinds of learning support and interventions.

Given the range of skills and abilities involved in solving mathematical problems, a comprehensive assessment is often required to evaluate the factors affecting students' maths skills. This is key to understanding the nature of students' needs and to deciding upon the appropriate form of support.

Careful analysis by teachers of students' numeracy performance (or 'maths profile') over time can help them to identify learning needs, plan and deliver appropriate support.

In making evaluations, teachers should note how students respond to intervention, and consider the cause or causes of difficulties. They can then tailor support accordingly.

Response to Intervention and numeracy learning difficulties

The Response to Intervention (RTI) framework can be helpful for thinking about how to implement approaches to support students with learning difficulties.

Described below, RTI is a framework of academic support that is often embedded within a Multi-tiered System of Support (MTSS), alongside School-wide Positive Behaviour Support (SWPBS). RTI divides support into three tiers of increasing intensity, organised according to need (Figure 2). RTI provides a useful model to consider how best to embed academic support for students with learning difficulties within a school-wide approach to teaching and learning.

The RTI framework is a functional, dynamic means of identifying students who are struggling with numeracy, based on how well they are responding to the current instruction or intervention being provided at each tier.

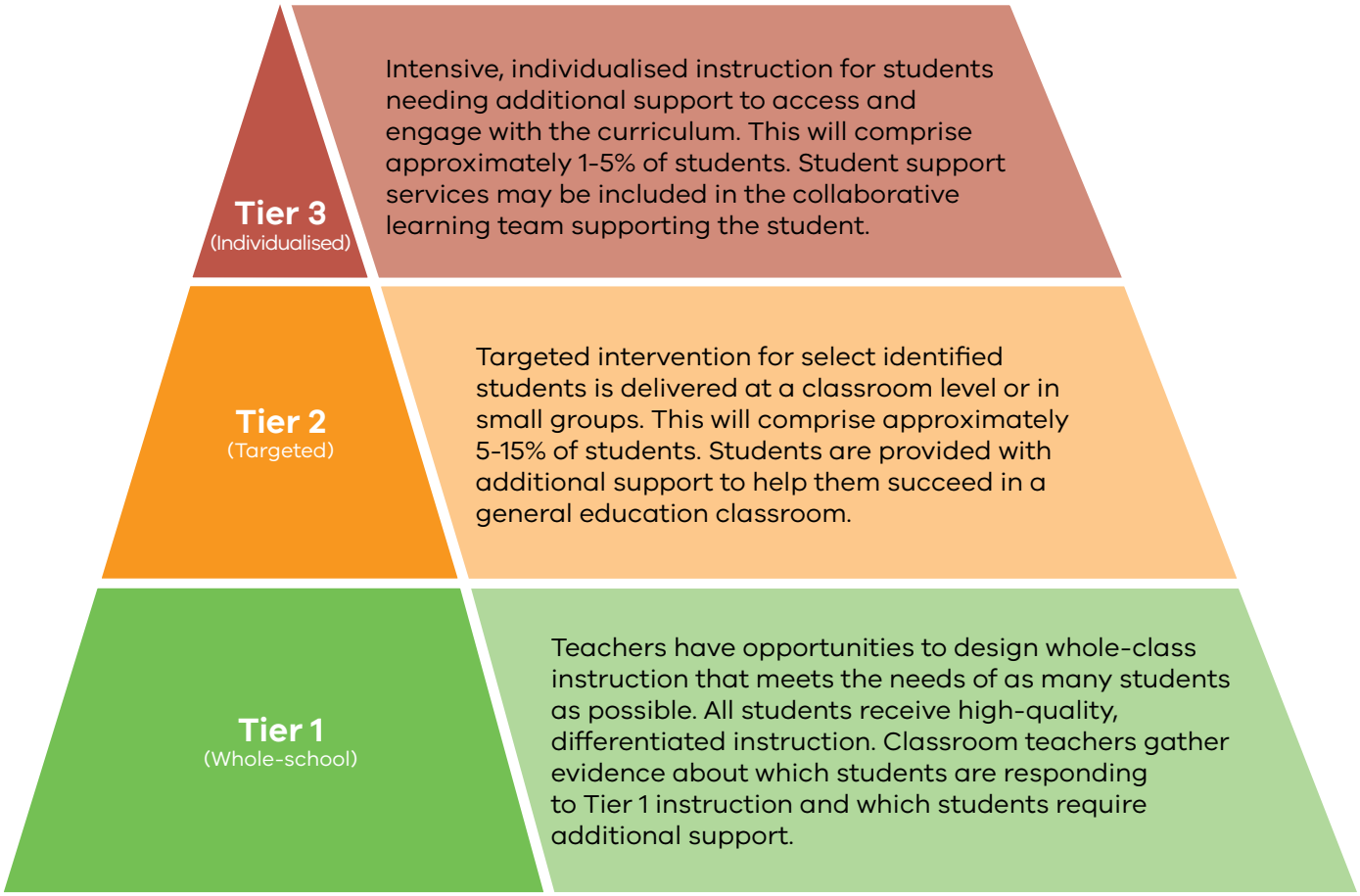

Figure 2: Response to Intervention tiers of academic support (adapted from Buffum, Mattos, & Weber 2012).

Figure 3 describes how the tiered framework model can be used to identify and support students needing numeracy intervention.

Tier 1 - All students receive high-quality, differentiated instruction in the classroom. High-Impact Teaching Strategies (HITS) are effective for all students at Tier 1, including students with learning difficulties.

Students who do not respond adequately to Tier 1 are identified and elevated to Tier 2.

Tier 2 – Supplementary support is provided to students (in addition to Tier 1 instruction). The nature of the support depends on the nature of the student's learning difficulty. A student may have a learning disability (such as dyscalculia), a high rate of absenteeism, disrupted learning, for example, due to placement in out-of-home care, specific cognitive problems (such as problems with working memory), or simply delayed progression.

For some students exhibiting delayed progress, small-group sessions targeting specific skill areas may be appropriate; however, students with dyscalculia will gain most benefit from the targeted, individualised, one-to-one programs described in Tier 3.

Tier 3 – Students who do not respond adequately to Tier 1 instruction and Tier 2 intervention (or who have been identified as having dyscalculia) will benefit from Tier 3 intervention.

Intervention strategies at Tier 2 address the individual needs of the students. At Tier 3, these strategies are delivered with greater intensity, frequency and duration. It is likely that intervention support will need to be delivered on a one-to-one basis.

For students with dyscalculia, interventions that make use of tangible materials (for example, wooden counting blocks) and other non-symbolic forms that represent numbers (for example, special number lines) help to reinforce relationships with symbolic forms.

Figure 3: Using Response to Intervention as a tool for identification and support.

High Impact Teaching Strategies

The High Impact Teaching Strategies (HITS) are 10 instructional practices that reliably increase student learning. For students with learning difficulties in numeracy, the HITS represent a collection of evidence-based strategies to help support teaching and learning in numeracy.

For example, research conducted into effective numeracy intervention shows that logically sequenced instruction (**Structuring Lessons**) and instructions that directly address the information a student needs to learn (**Explicit Teaching**) are highly effective at helping students with learning disabilities access maths content (Fuchs et al. 2008).

Teachers, who know their students and their students' learning styles well, can readily judge whether HITS or another strategy will work best to teach a particular concept or skill. Note, however, that using HITS to teach any concept or skill reliably increases the chance that students will learn it, regardless of whether they have a learning difficulty.

Appendix 1.1: Structuring Lessons and **Appendix 1.2: Explicit Teaching** provide more detailed information about two of the HITS. In addition, the Department's Excellence in Teaching and Learning resource provides overviews and examples that illustrate each of the 10 strategies in action.

Hallmarks of effective numeracy intervention

Teachers are best-placed to understand the learning needs of their students and the most appropriate types of interventions. Fuchs et al. (2008) suggests seven guiding principles for planning effective numeracy intervention:

1. Instructional explicitness where teacher instruction directly addresses the information a child needs to learn.
2. Transparent instructional design that minimises confusion for a student about what they need to do. Explanations are clear, precise and ordered logically.
3. A strong conceptual basis is needed for all procedures. When students have a genuine understanding of what they are learning, gaps in learning are less likely to develop. A strong conceptual basis also helps students maintain skills and reduces difficulties with the integration of skills.
4. Skill practice is appropriate only once a thorough understanding of the target concept has been established.
5. A cumulative review should be conducted regularly. This should include not only what has just been taught, but also what was known prior.
6. Intrinsic and extrinsic motivators can help students to focus and demonstrate positive behaviours. Helping students to recognise the value or relevance of what they are learning encourages *intrinsic* motivation. Praise or rewards are examples of *extrinsic* motivation. When a student becomes convinced a skill or activity is too difficult for them, not relevant or experiences repeated failure, they may start to display avoidance behaviours or signs of stress.
7. Ongoing progress monitoring to determine whether the intervention is effective for the student. Teachers can utilise the Victorian F–10 Mathematics Curriculum and administer tests to assess specific concepts/applications or calculations. These assessments can be short, lasting only a few minutes, helping teachers and students avoid 'testing fatigue'.

Intervention

Examples of targeted intervention include:

- teaching students the link between non-symbolic number arrays and the symbols and words used for numerosities (for example, the number three can be represented by the word 'three', the symbol '3', or as a set of objects: ●●●)
- teaching for a better understanding of place value and its use in multi-digit subtraction.

In both cases, the use of concrete materials that can be manipulated (such as wooden counting blocks) can help students experiencing difficulties to understand concepts and use them in arithmetic calculation.

Students with dyscalculia, in particular, do not have an abstract view of numbers and cannot immediately picture an array of objects or dots when seeing a symbol for a number. Repeated association between tangible materials and symbols through matching tasks, and through using the physical objects to perform arithmetic operations, helps to build the link between non-symbolic and symbolic numbers.

For multi-digit subtraction, students can use wooden counting blocks (representing units, tens and hundreds) to perform a calculation—exchanging a hundred block for 10 x ten blocks and a ten block for 10 x one blocks. This can help to build a better understanding of the decimal properties of numbers for students with dyscalculia after numbers than an abstract procedure involving 'borrowing' and crossing out of digits.

For detailed information on interventions for students with learning difficulties, including dyscalculia, visit the Learning Difficulties in Numeracy video series:

- **Video 5 –** Intervention Strategies
  Evidence-based intervention strategies for students with learning difficulties in numeracy. The video provides intervention advice relating to:
  - core number
  - arithmetic
  - word problems
  - fractions
  - algebra

Adjustments for students with learning difficulties

In addition to targeted interventions, certain adjustments can help students get the most out of classroom instruction. Accommodations can also be made in relation to undertaking assessment tasks and completing school work (including projects, in-class tasks and homework).

Table 1 lists some potential strategies, which will vary depending on a student's particular learning needs. It is followed by links to resources for further ideas.

Adjustments to help students get the most out of classroom instruction include:	• simplified worksheets that build on the student's mathematics skills • highly explicit, direct instructions • displaying task instructions on a whiteboard • instructions broken down into smaller steps • additional opportunities for practice and questions • individual assistance with problems presenting challenges.
Environmental adjustments can include:	• a desk close to the teacher • limiting distractions while the student is working.
Adjustments to help students fully demonstrate their knowledge when being assessed, and/or when completing school work include:	• assistive technology (such as calculators, or graded online maths tasks where progress is based on success) • keeping tangible materials readily to hand • additional time to complete work.

Table 1: Examples of adjustments and accommodations to support students with learning difficulties.

Student support services

Student support services (SSS) assist children and young people who face barriers to learning and achieving their educational and developmental potential. They provide a range of strategies and specialised support at the individual, group, school and area levels.

SSS comprises a broad range of professionals employed by the Department, including: psychologists, speech pathologists and social workers. SSS staff work as part of an integrated health and wellbeing team within areas of schools, focusing on providing group-based and individual support, workforce capacity-building and specialised services.

The SSS Referral Process identifies children and young people most in need, and matches student/school needs with the expertise of SSS team members.

Case example

Improvements to teaching practice and student learning are strongly dependent on effective implementation within an evidence-based improvement cycle. The four stages of the FISO improvement cycle supports teachers to focus on better outcomes for our students and can be used at different levels, from the whole-school to the classroom, and over different time periods, from four-week cycles to annual cycles.

Learning difficulties in the classroom	Connections
Mason is a Year 5 student in Ms. Beattie's class. Mason's previous end-of-year report indicates that he is 12 months behind his peers in Mathematics. The class is currently learning about decimal fractions. Ms. Beattie notices that Mason finds it difficult to understand and use place values (such as hundredths, thousandths) accurately. Ms. Beattie also notices that Mason will often use his fingers to count out maths solutions and that he has trouble telling time, especially on analogue clocks. He also finds it difficult to apply maths concepts to new problems, even when he appears to have just cemented the skill. Ms. Beattie decides to follow Mason's maths performance closely over the next two months and to build a profile of his strengths and areas for growth. She also sets aside time for more detailed, dynamic assessments to isolate Mason's numerical abilities. At the end of the two months, Ms. Beattie feels confident that she has a better understanding of Mason's numeracy needs. She finds that Mason has difficulty understanding the relationship between symbolic and non-symbolic numbers (for example, understanding that 50 cents is equal to half of a dollar) and that he often misunderstands the meaning of operational language and notation (for example, what the word 'equivalent' means and confusing + and -).	• **Evaluate and diagnose** 'What is the problem?' (Collect and use data and evidence to consider reasons for a student's performance) • Understanding numeracy learning difficulties (p. 10)
Ms. Beattie organises a meeting with her school's numeracy leader to look over some examples of Mason's work and to discuss her observations. Based on this data, they prioritise some immediate numeracy goals, these include: • advancing Mason's mastery of number facts (for example, that 5 + 3 = 3 + 5) • increasing Mason's familiarity with maths terminology and notation. They also set some long-term numeracy goals, these include: • improving Mason's ability to recognise and operate on sets (for example, knowing that three dots represents a value of three, but also the symbol '3') • embedding his understanding of the relationships between symbolic and non-symbolic numbers.	• **Prioritise and set goals** 'What outcome do we want?' (Set immediate and long-term goals in the context of understanding need and required support) • Understanding numeracy learning difficulties (p. 10)

Learning difficulties in the classroom	Connections
Ms. Beattie decides to create a vocabulary bank with definitions of maths terminology and examples that she and Mason can add to throughout the year. She decides that this practice would be beneficial for all of her students, and incorporates it into her approach to teaching new units (Tier 1). Ms. Beattie also introduces concrete materials to help represent problems using the maths groups in her classroom. During this group work, she works with Mason cutting, folding, and manipulating wooden unit blocks to help him cement the association between symbolic and non-symbolic numbers (Tier 2). Throughout the term, Ms. Beattie continuously monitors Mason's progress through the use of dynamic assessments. These 'mini learning progressions' help her to get a sense of how Mason is responding to the interventions and help Mason to internalise problem-solving concepts and procedures as the two collaborate to solve problems (Tier 3). Ms. Beattie records all of her planning in an Individual Education Plan (IEP).	• **Develop and plan** 'What will be done about it?' (Develop a plan of action that details what will be done, when, where, and with what support) • Understanding numeracy learning difficulties (p. 10) • Using RTI to support numeracy learning difficulties (p. 14) • Dynamic assessment (p. 13) • Individual Education Plans (p. 7)
Ms. Beattie identifies the criteria that will be used to evaluate the impact of the plan: • increased familiarity with key terminology and accuracy of use (including notation) • improvement in Mason's ability to draw information from word problems • increased independence in performing procedures Following six weeks of intervention, Ms. Beattie and the Learning Specialist meet to review how Mason is responding to these interventions. Ms. Beattie has observed an improvement in Mason's knowledge of key terminology and accuracy when applying relevant procedures, but notes that issues with his understanding of the relationship between symbolic and non-symbolic number still remain. Nonetheless, Mason is responding well to the interventions and is making incremental, but consistent progress. Ms. Beattie and the team decide to continue with these intervention strategies until the end of the term when they will meet again to review his progress.	• **Implement and monitor** 'How will we know it worked?' (Continue to monitor student progress and evaluate the student's response to instruction / intervention) • Understanding numeracy learning difficulties (p. 10) • Using RTI to support numeracy learning difficulties (p. 14)

Learning difficulties and student wellbeing

Students with learning difficulties often face daily struggles at school as they attempt to deal with various related challenges. Research suggests that students with learning difficulties are at greater risk of having a poor sense of academic self-concept and may hold negative beliefs about themselves that are directly linked to their performance in class, such as 'I am no good at reading', 'I can't spell', or 'I am stupid' (AUSPELD 2014).

While students with high self-esteem are typically more adaptable and do better in social environments, students with learning difficulties who have low self-esteem tend to be less effective in engaging with others, experience feelings of powerlessness, feel disconnected from their peers, and have difficulty coping with setbacks (Hattie 2009).

Experiencing low self-esteem / efficacy for long periods of time can also increase the possibility of developing mental health issues such as anxiety, depression, and behavioural problems. Students with learning difficulties may become withdrawn, appear disengaged, disruptive, rude or even aggressive as a result of the frustration they may feel not being able to keep up with the demands of the classroom. These behaviours often become more pronounced as students become older, as their identity and sense of self-worth becomes increasingly associated with their experiences of academic and social success.

On the other hand, when students begin to cultivate a positive self-view and feel connected to their peers, teachers and their learning, there is a marked improvement in academic achievement (Suldo, Thalji & Ferron 2011; Howell 2009). As teachers you have an opportunity to assist all students, including those with learning difficulties, to become determined, resilient, and committed learners.

Empowering students

Students' success is strengthened by a robust sense of self-efficacy; that is, a firm belief in their ability to succeed at school. This sense of achievement in their learning, and what students see as the meaning and purposefulness of their actions, come together to build a strong sense of agency and self-determination.

> 'Learning with agency is an entirely different cognitive and physical activity leading to powerful learners who choose to take on challenges with their whole being.' (Williams 2017)

Developing a strong sense of agency and self-efficacy is particularly important for students with learning difficulties, who are more vulnerable to feelings of powerlessness, and to feeling that they have limited control over their learning and futures (AUSPELD 2014).

Students with a strong sense of agency...

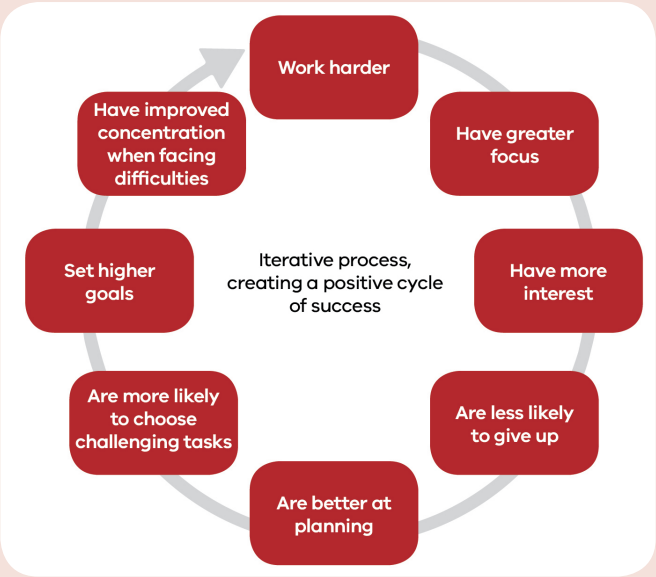

Figure 4: Generating a positive cycle of learning (Johnston 2004).

Amplify is a practice guide created by the Department for school leaders and teachers. It presents an evidence base and practical school-based examples to help school communities explore and enhance their understanding of student voice, agency, and leadership—the key elements for empowered students.

Engaging with families

The partnerships between schools and families are incredibly impactful throughout students' school years. Incorporated in productive ways, these relationships have the potential to:

- support differentiated instruction and study at home
- improve student outcomes
- enhance satisfaction for all stakeholders (Forlin & Hopewell 2006).

It is important that teachers are proactive in their communication with families and acknowledge the contribution that parents, guardians, and carers make in a child's development. This is crucial, since research demonstrates a clear and positive relationship between family involvement at home and students' academic achievement (Bakker et al. 2013; Castro et al. 2015). To achieve a positive relationship it is important that families have *confidence* in their child's teachers, feel *welcome* at school, and experience *reciprocity* in their communications with schools (Epstein 2018).

However, establishing this relationship comes with challenges, and barriers can exist that hinder a constructive relationship between school staff and families. Considering how to involve students in this process, as individuals who are familiar with the cultures of both home and school, is important to help bridge these potential barriers and achieve a positive and productive partnership.

See the Department's website for advice on building positive partnerships with parents to help support students' literacy and numeracy development at home.

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APPENDIX 1.1

High Impact Teaching Strategy
Structuring Lessons

Effective teachers plan and deliver structured lessons which incorporate a series of clear steps and transitions between them, and scaffold learning to build students' knowledge and skills.

Strategy overview

A lesson structure maps teaching and learning that occurs in class. Sound lesson structures reinforce routines, scaffold learning via specific steps/activities, and optimise time on task and classroom climate using smooth transitions. Planned sequencing of teaching and learning activities stimulates and maintains engagement by linking lesson and unit learning.

How effective is it?

The way teachers structure lessons has a significant impact on student learning. Research shows student achievement is maximised when teachers structure lessons so that they:

- begin with overviews and/or review objectives
- outline the content to be covered and signal transitions between lesson parts
- call attention to main ideas
- review main ideas at the end

A sound lesson structure contributes to effective scaffolding of student learning.

This strategy is demonstrated when the teacher:

- explains to students the steps in the lesson, including presenting learning intentions, explicitly presenting new knowledge, identifying planned opportunities for practice, outlining questioning techniques the class will use, and describing the assessment formats
- makes clear connections between the learning goals, activities and assessment tasks
- creates transparent, predictable and purposeful routines for students
- identifies clear transitions between each step in the lesson
- plans the sequence of steps to scaffold student learning
- monitors student understanding and provides feedback.

This strategy is demonstrated when students:

- understand the learning goals and success criteria
- understand the lesson routine and confidently negotiate the sequence of steps/activities.

This strategy is not demonstrated when:

- lesson structures keep changing, producing unhelpful unpredictability in the classroom environment.

Resources:

- Well-sequenced mathematics teaching
- Birth to Level 10 Numeracy Guide – Structuring Lessons
- Australian Curriculum – Numeracy

APPENDIX 1.2

High Impact Teaching Strategy
Explicit Teaching

Effective teachers use explicit teaching to provide instruction, demonstrate concepts and build student knowledge and skills. In explicit teaching practice, teachers show students what to do and how to do it, and create opportunities in lessons for students to demonstrate understanding and apply the learning.

Strategy overview

When teachers adopt explicit teaching practices they clearly show students what to do and how to do it. Students are not left to construct this information for themselves. The teacher decides on learning intentions and success criteria, makes them transparent to students, and demonstrates them by modelling. In addition, the teacher checks for understanding, and at the end of each lesson revisits what the lesson has covered and ties it all together (Hattie, 2009).

How effective is it?

Explicit teaching is effective in accelerating student performance. The aim is to teach generalisations beyond rote learning, and to sequence learning. In explicit teaching practice, teachers constantly monitor students' progress towards challenging goals.

The effects of explicit teaching are similar for students in all school settings. In addition to numeracy, explicit teaching also has the highest effect size for reading among students at every year level. It supports both low and high level comprehension.

This strategy is demonstrated when the teacher:

- explains what students need to know and be able to do by the end of the lesson or unit
- uses worked examples to show students how to do something
- allows students sufficient time to practice what they have learned
- guides student practice by monitoring their work and providing help when it is needed
- reinforces the main points at the end of the lesson.

This strategy is demonstrated when students:

- understand the learning goals and success criteria
- have access to multiple examples before undertaking the learning task
- master the new knowledge and skills before moving on
- receive feedback as needed.

This strategy is not demonstrated when:

- the teacher is didactic, with few opportunities for students to be active in the learning
- classroom discussion is restricted and student input is discouraged
- the teacher responds judgmentally to students' attempts at problem solving activities rather than treating each attempt as an opportunity for further learning.

Resources:

- AITSL – Explicit instruction
- Birth to Level 10 Numeracy Guide – Explicit Teaching


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