Australian Education Research Organisation

Evidence-based teaching practices

This report provides a summary of the recommended course content for initial teacher education (ITE) based on the research evidence base. The recommendations align with the graduate teacher standards and focus on three key areas of evidence-based teaching practices: the brain and learning, effective pedagogical practices, and classroom management. In addition, three key areas that are enabling factors for learning are also covered: cultural responsiveness, family engagement, and diverse learners.

Background

This report has been produced to support the Teacher Education Expert Panel in advising Education Ministers on key reforms needed to strengthen ITE programs to deliver confident, effective, classroom-ready graduates (Teacher Expert Panel Terms of Reference, 2022). It outlines the key evidence-based practices ITE graduates should be taught to meet the Australian Professional Standards for Teachers (APST), paying particular attention to teaching reading, literacy and numeracy, classroom management, cultural responsiveness, teaching students with diverse needs and working with families/carers.

Scope for this report

Defining evidence-based teaching practices

Key questions considered when preparing the research for this report:

- What are the evidence-based teaching practices which should be covered in ITE to deliver effective classroom-ready graduates?
- What are the key evidence-based teaching practices which support the graduate teacher standards?
- Which practices should have the greatest focus in ITE courses (e.g., during early career development)?

Context

The quality of teaching delivered to students is the most impactful factor within an education setting which can improve student outcomes, particularly for those who are most marginalised and disadvantaged. As a profession, teachers dedicate their lives and careers to trying to improve outcomes for their students, including in challenging environments where numerous factors that impact achievement are outside of the control of a teacher or school.

Many teachers rely on intuitive expertise gained from years of arduous trial and error, ongoing on-the-job professional learning, and engagement with successful and accomplished colleagues to find the most effective and successful practices, often encountering inconsistent or contradictory advice in this process. The time expended upskilling on fundamental knowledge on-the-job could be more effectively used to further enhance expertise if these foundations were consistently taught through ITE programs.

Evidence-based practices in education are practices backed up by research evidence. This means there is broad consensus from rigorously conducted evaluations that they work in many cases across various contexts, for different subgroups of students and various locations. Additionally, there is extensive rigorous research on approaches to teaching subject-specific content, such as reading and numeracy, that can complement generic evidence-based pedagogical approaches.

Greater gains in positive student outcomes and a significant reduction in teacher workload could be achieved if teachers were armed with a knowledge and understanding of what works best and why. This knowledge should be built up from core foundational content delivered first through ITE, then tried and tested during professional experience, and built on coherently through ongoing professional learning and practice.

The content outlined in this report does not set out the full ITE curriculum for pre-service teachers

Initial teacher education is complex, and it remains appropriate for individual providers to use their subject matter expertise to design appropriate curricula. The content presented in this report, however, aims to lift and prioritise the knowledge and practices which are essential for all pre-service teachers, regardless of specialisation or stage of learning, as they are shown to have the most effective and efficient impact on student learning. It does not intend to meet all Graduate Level Australian Professional Standards for Teachers (APST), nor does it attempt to address the subject-specific content and the related knowledge of the curriculum. Mapping to the Graduate level APST can been seen in **Table 1**.

Table 1: Content alignment with the Graduate level Australian Professional Standards for Teachers

Domain	PROFESSIONAL KNOWLEDGE		PROFESSIONAL PRACTICE			PROFESSIONAL ENGAGEMENT	
Standard	1. Know students and how they learn	2.Know the content and how to teach it	3. Plan for and implement effective teaching and learning	4. Create and maintain supportive and safe learning environments	5. Assess, provide feedback and report on student learning	6. Engage in professional learning	7. Engage professionally with colleagues, parents/carers and the community
Foundational core content area	**The brain and learning** And **Enabling factors for learning**	**Effective pedagogical practice**	**Effective pedagogical practice**	**Classroom management**	**Effective pedagogical practice**		**Enabling factors for learning**
High-level standard elaboration	**Novice vs expert learners (1.1)** **How the brain learns and retains information (1.2)** ○ Short- and long-term memory ○ Cognitive load **How the brain masters knowledge (1.2)** ○ Retrieval and application in familiar and unfamiliar contexts **Neuromyths (1.1)** **Cultural responsiveness (1.1, 1.3, 1.4, 1.5, 2.4, 4.1, 4.4)** ○ Self-reflection (positionality) ○ First Nations histories, cultures and perspectives ○ Culturally responsive practices **Diverse learning needs (1.1, 1.5, 1.6, 4.1, 4.4)** ○ Suitability of effective pedagogical practices for diverse needs	**Effective practice in subject areas (2.1, 2.3, 2.5)** ○ Early reading/phonics ○ Explicit mathematics instruction ○ Explicit teaching of reading and writing in other KLAs	**Most Effective pedagogical practices: (2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1, 4.2)** ○ Planning and sequencing ○ Explicit modelling and scaffolding ○ Assessment and feedback **Multi-tiered systems of support (MTSS) (1.5, 1.6, 3.2, 3.4, 4.1, 5.4** ○ Increasing frequency and intensity of effective pedagogical practice	**Rules and routines (3.5, 4.2, 4.3, 4.4)** ○ Establishing and maintaining ○ Habits and cues ○ Practical examples **Proactive practices (1.2, 3.1, 3.5, 4.1, 4.2, 4.3, 4.4)** ○ High expectations ○ Goal setting ○ High-quality and explicit teaching ○ Predictable environment **Managing behaviour (4.3, 4.4)** ○ Pre-plan and use calm, consistent, proportional responses. ○ Modelling desired behaviour ○ Responding to persistent misbehaviour	**Effective pedagogical practice: (5.1, 5.2, 5.3, 5.4)** ○ Assessment and feedback		**Family engagement (7.1, 7.3, 7.4, 3.7)** ○ Primary practices ○ Secondary practices

This is a high-level mapping only. It should be read alongside the full graduate teacher standards elaborations and within the context of this report. The nature of the standards means that some core content maps to multiple standards and that in some cases, content only partially maps to standards.

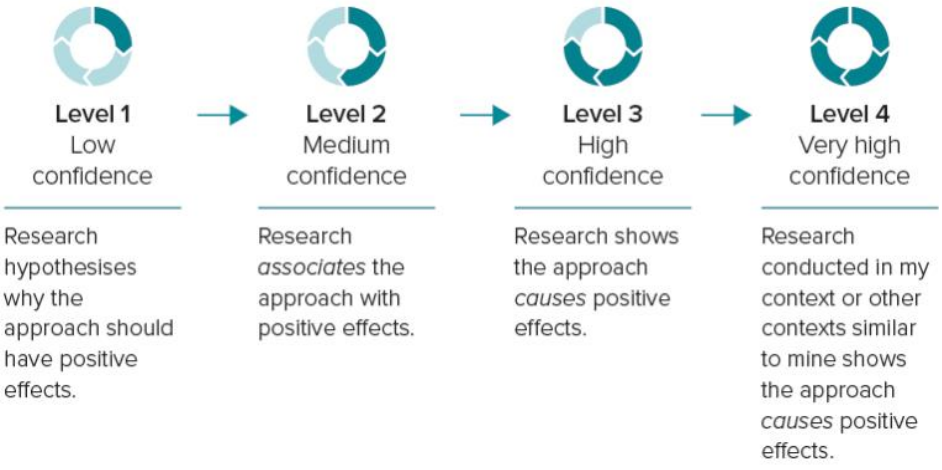
Methodology

This work synthesises the most rigorous and relevant evidence-based practices from meta-analyses, systematic reviews, and literature reviews. AERO has rated these sources of information against its 'Standards of evidence,' focusing on evidence generated in an Australian context where possible. AERO's standards of evidence outline what constitutes rigorous and relevant evidence.

Rigorous evidence is defined as evidence produced using research methods (whether qualitative, quantitative, or mixed methods) that isolate the specific impact of a particular educational approach. Relevant evidence is defined as evidence produced in contexts that are like one's own. Evidence is also relevant when it is derived from many studies conducted over a wide range of contexts, as this suggests that the educational approach is not dependent on any particular contextual factor.

AERO acknowledges that all evidence has limitations, is not static and can evolve over time. To present the most rigorous and relevant findings, research is assessed using the standards of evidence (Figure 1). The use of these standards to make consistent and transparent judgements gives confidence that the best available research evidence has been selected.

Figure 1: AERO's Standards of evidence



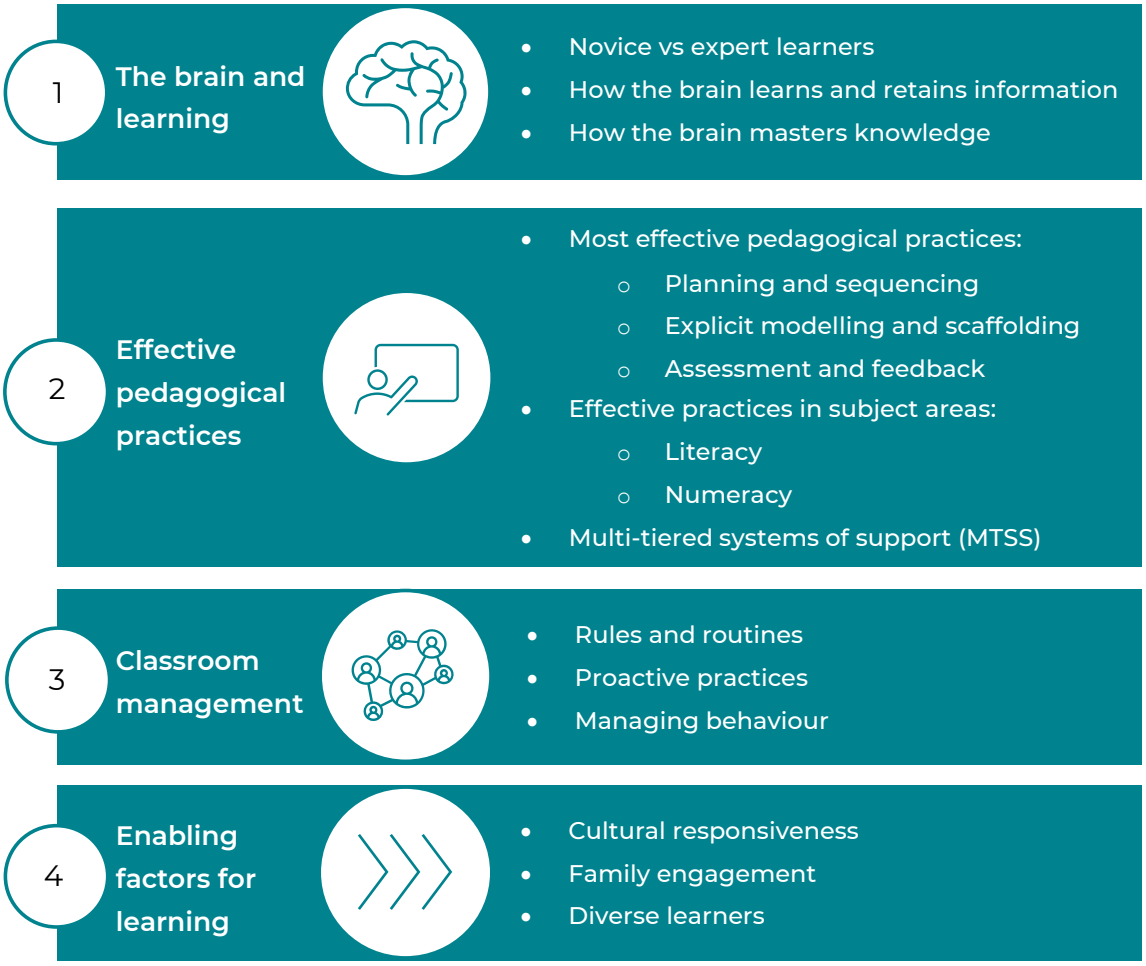
Suitability for primary, secondary and different subjects

The practices identified in this report have been shown to be effective across a variety of contexts including primary and secondary, across different subjects and for students with additional learning needs. Suitability across these contexts was a criterion for inclusion in this report. This is to promote the teaching of practices that suit the largest range of learners possible and to support graduate teachers in being classroom-ready, whatever that classroom may look like. As such, they form the essential foundations for *all* teachers, regardless of specialisation or age range of students. While the *practices* have been deemed relevant for both primary and secondary contexts, some of the illustrative *examples* of the practices offered may not apply to all contexts.

Summary of the evidence

The evidence is clear on what constitutes the most effective teaching practices to accelerate student learning. The foundational core of ITE programs should be based on building knowledge and understanding of what these practices are, when and how to implement them in the classroom and why they work. They should also have a strong focus on the essential enabling factors that allow for these practices to be effective in the classroom.

Figure 2: Foundational core content



This may appear, at first, to be a somewhat over-simplified, reductionist approach to what is a complex regulatory and expert academic tertiary environment. However, the intent is to lift and prioritise content with the strongest evidence and aligned most appropriately to the defined need. This includes putting a spotlight on the importance of including essential enabling factors for learning. The foundational core content presented provides a simplified and clear-cut set of 'non-negotiables' for ITE to best support graduates to be adequately prepared for the classroom, arming them with a foundational understanding of what works most efficiently and effectively based on the evidence.

Relationship between the brain and learning, effective pedagogical practices, classroom management, and the enabling factors for learning

This report presents two types of ITE foundational core content: pedagogical practices (i.e. brain and learning, effective pedagogical practices and classroom management) and enabling factors for learning. The pedagogical practices are those practices with the most rigorous and relevant evidence behind them. The report also acknowledges, however, that these practices need to be enacted in certain ways to respect the local context, and, as such, this report also includes 'enabling factors for learning'. These enabling factors for learning are the additional considerations that ensure that the pedagogical practices are being enacted in ways that are contextually appropriate and respond to student need.

Foundational core content

The brain and learning

Why is this important?

ITE programs should teach cognitive science content that directly relates to how students learn. Understanding the function of the human brain as it learns and retains information gives teachers a foundational understanding of *why* specific instructional practices work, and *how* to implement the practice with fidelity.

What is the evidence?

Cognitive science principles related to memory and learning such as cognitive load theory are supported by a large number of peer-reviewed, randomised control trials. These principles have significant implications for effective teaching practice. A teacher's ability to effectively select the most appropriate and impactful instructional method is enhanced by knowledge of how the brain learns and stores information. Research shows that an understanding of these principles to support effective instructional methods has a real effect on rates of learning and retention of information in the classroom.

The following works provide an overview of the extensive evidence base. Further research specific to each component of 'the brain and learning' is also cited throughout this section.

Table 2: Summary of seminal works

Seminal works
Cognitive Science in the Classroom: Evidence and Practice Review (Perry et al. 2021). A review of 499 studies found that understanding and managing cognitive load can have a positive impact on learning outcomes. Cognitive science principles were significant factors affecting rates of learning and retention of information in the classroom.
The Science of Learning (Deans for Impact 2015). Summarises existing cognitive-science research on how students learn and connects it to practical implications for teaching.
Cognitive Load Theory (Centre for Education Statistics and Evaluation 2017). This literature review provides an overview of cognitive load theory, which is a theory of how human brains learn and store knowledge. Grounded in a robust evidence base, cognitive load theory provides support for explicit models of instruction
Understanding the Brain: *Towards a New Learning Science*, Organisation for Economic Cooperation and Development (OECD) (OECD 2002). Examines how scientific developments in understanding how the brain works can help educators and educational policymakers develop new and more efficient methods for teaching and developing educational policies and highlights the significance of the distinction between nature and nurture in learning and brain development.
How Learning Happens: Seminal Works in Educational Psychology and What They Mean in Practice (Kirschner and Hendrick 2020). Exploring 28 key works on learning and teaching, chosen from the fields of educational psychology and cognitive psychology, the book offers a roadmap of the most important discoveries in how learning happens.

What should teachers learn?

Cognitive science content on how the brain learns is crucial foundational knowledge needed to support teachers to make informed, real-time decisions in applying the most effective teaching practices. The fields of neuroscience and psychology have made rapid advancements in the past two decades, amplifying knowledge about learning processes, brain function and the implications for teaching. For teachers to be able to deploy the most effective practice in response to a learner, they require a strong foundation of *why* those practices are effective in terms of a learner's brain.

This content has been structured into three key areas that teachers need to know and is sequenced in line with the process of knowledge acquisition and mastery in the learner's brain.

1. Novice vs expert learners
2. How the brain learns and retains information
3. How the brain masters knowledge

Novice vs expert learners

Preparing to teach school-aged students is to prepare to teach novice learners, that is, learners who experience information as new. This is an important distinction for teachers to understand and address, as the brain of a 'novice' processes information differently from the brain of an 'expert', even when they are exposed to the same information. Things that novices see as separate pieces of information, experts see as an organised set of facts (or a schema).

It takes more time for novices to master new information than experts because novices first need to build the mental models of understanding that experts already have. Once those schemas are in place, a student can start to move from understanding what they are learning as isolated facts to seeing how and why those pieces of information connect, and what relationships exist between them (Kirschner and Hendrick 2020). This allows for more efficient, effective, deeper learning of more complex information (Kirschner and Hendrick 2020; Willingham 2021). Understanding how a student's brain moves from being a novice to an expert when learning new information will support teachers to tailor and target instruction appropriately. For example, a self-directed approach is not an effective or efficient starting point for novices to support the acquisition of new information.

How the brain learns and retains information

The human brain has a unique cognitive architecture that includes aspects directly related to the way we learn. Aspects such as working memory, long-term memory and cognitive load perform essential functions in the process of learning and retaining new information (Sweller 2016). Teachers should develop a strong understanding of the cognitive process of learning including *how* the human brain moves information into long-term memory, potential barriers to the acquisition of knowledge and how to teach to optimise this process.

Research in cognitive science shows that learning involves processing new information through working memory and moving it to long-term memory where it can later be retrieved and used. Working memory has limits and can only process information while it is being thought about and focused. The volume of new information and retrieval of existing information while making sense of a new concept or idea can overload working memory known as 'cognitive overload', and risk being misunderstood or forgotten (Chen et al. 2018).

Teachers should know that a lack of explicit instruction can lead to cognitive overload. When minimal guidance is provided and students are completing new tasks or identifying new learning by themselves, without prior instruction or scaffolding from their teacher, their attention is focused on the process and goal of completing the task, rather than thinking about the new learning and moving it to long-term memory (Centre for Education Statistics and Evaluation 2017).

Complex instruction can also lead to cognitive overload. Students do not learn efficiently if they are presented with additional information that is not directly relevant to their learning (Centre for Education Statistics and Evaluation 2017). A high cognitive load is also placed on students' working memory when they must process two or more new pieces of information at once (Chen et al. 2018).

Recognising the limits of the human brain in learning new information helps teachers to structure learning tasks so that students can most efficiently connect new information with prior knowledge to develop understanding and skills. For example, the limits of working memory explain why breaking down and sequencing limited amounts of new information will support effective learning (Rosenshine 2012).

How the brain masters knowledge

An essential component of effective learning is for students to move beyond information retention and be able to apply knowledge to increasingly complex and unfamiliar contexts. Teachers should understand the process that occurs in a student's brain as they progress towards mastery and know how to adjust their practice to support this process. When students initially attain a level of expertise in the background knowledge of a subject, they can practise and extend their learning effectively through independent problem-solving (Sweller 2021). Once they have mastered a set of knowledge and built a mental model that connects relevant information, they are then able to apply their knowledge and skills to solve unfamiliar problems (Sweller 2016, 2021). For example,

evidence shows that learning through worked examples is initially more effective, but as a student's familiarity with the knowledge of a subject increases, then they learn more effectively through more challenging problem-solving (Sweller 2021).

A note on neuromyths

The relationship between brain research and education has led to the development of neuromyths (Geake 2009; Sousa 2011). OECD (2002) defined these neuromyths as "misconceptions generated by a misunderstanding, a misreading or a misquoting of facts scientifically established (by brain research) to make a case for use of brain research in education and other contexts" (p. 69). The prevalence of neuromyths around (a) left vs. right brain people, (b) the 10% of the use of our brain, (c) visual, auditory, and kinaesthetic (VAK) learning styles, and (d) multiple intelligences have led to widespread misunderstanding of how the human brain learns, resulting in ineffective instruction (Howard-Jones 2014).

The evidence against neuromyths is robust. For example, research in neuroimaging shows that both hemispheres of the brain are responsible for most processes and are constantly working together, even though they differ in their functions (Ansari 2008), countering myths such as left vs. right brain people, VAK or multiple intelligences (Geake 2008).

It is important to note that most neuromyths have been formed because of oversimplifications, misinterpretations or flawed interpretations (Pasquinelli 2012; Howard-Jones 2014) of valid scientific findings (Dekker et al. 2012) and, as such, will be often defended by the research they were adulterated from.

ITE programs should explore and address these misconceptions head-on to correct the dialogue between neuroscience and education so that these myths can no longer perpetuate. Instructional choices based on these myths at best have no impact on student learning and at worst, can be detrimental to student progress.

What should teachers demonstrate?

1. A clear understanding of what it means to be a 'novice' learner in comparison to an 'expert' and relate to implications for practice.
2. An understanding of the most efficient and effective process of knowledge acquisition in the brain, including the function of memory and the concept of cognitive overload.
3. Knowledge and understanding of the process that occurs in a novice brain during progression towards mastery and understand the need to adjust practice in response.

Graduate teacher standards

This content aligns best with the Graduate descriptors for Professional Knowledge: Standard 1: Know students and how they learn. Specific links to standard elaborations are shown below.

PROFESSIONAL KNOWLEDGE				PROFESSIONAL PRACTICE						PROFESSIONAL ENGAGEMENT			
1 Know students and how they learn		2 Know the content and how to teach it		3 Plan for and implement effective teaching and learning		4 Create and maintain supportive and safe learning environments		5 Assess, provide feedback and report on student learning		6 Engage in professional learning		7 Engage professionally with colleagues, parents/carers and the community	
1.1	**1.2**	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	7.2
1.3	1.4	2.3	2.4	3.3	3.4	4.3	4.4	5.3	5.4	6.3	6.4	7.3	7.4
1.5	1.6	2.5	2.6	3.5	3.6	4.5		5.5					
				3.7									

Effective pedagogical practices

Why is this important?

Evidence shows that explicit modelling, scaffolding and formative assessment practices that support student mastery have the highest impact on improvement in student learning outcomes. These practices effectively and efficiently support student learning because they are responsive to how the brain processes, stores, and retrieves information.

What is the evidence?

The effective pedagogical practices presented here have been proven to work and are supported by research in cognitive science, as well as research on the most effective classroom practices of master teachers. There is a high level of consistency across different academic fields on effective pedagogical practices, further strengthening confidence in the validity of these practices.

These practices draw on the work of Rosenshine (2012), who presents 10 research-based principles of instruction that have been shown to most effectively address how a student's brain learns. Rosenshine presents findings from three distinct and divergent bodies of research: (a) research on cognitive processing, (b) research on teacher effects, that is, studies of teachers whose classes made the highest achievement gain compared to other classes, and (c) intervention studies in which students were taught cognitive strategies they could apply to their learning. His findings point to a set of common instructional practices that delivered the highest impact on improving student outcomes. AERO has synthesised evidence to detail the practices that have been proven to make a difference, the summary of which is outlined below.

Table 3: Summary of evidence syntheses

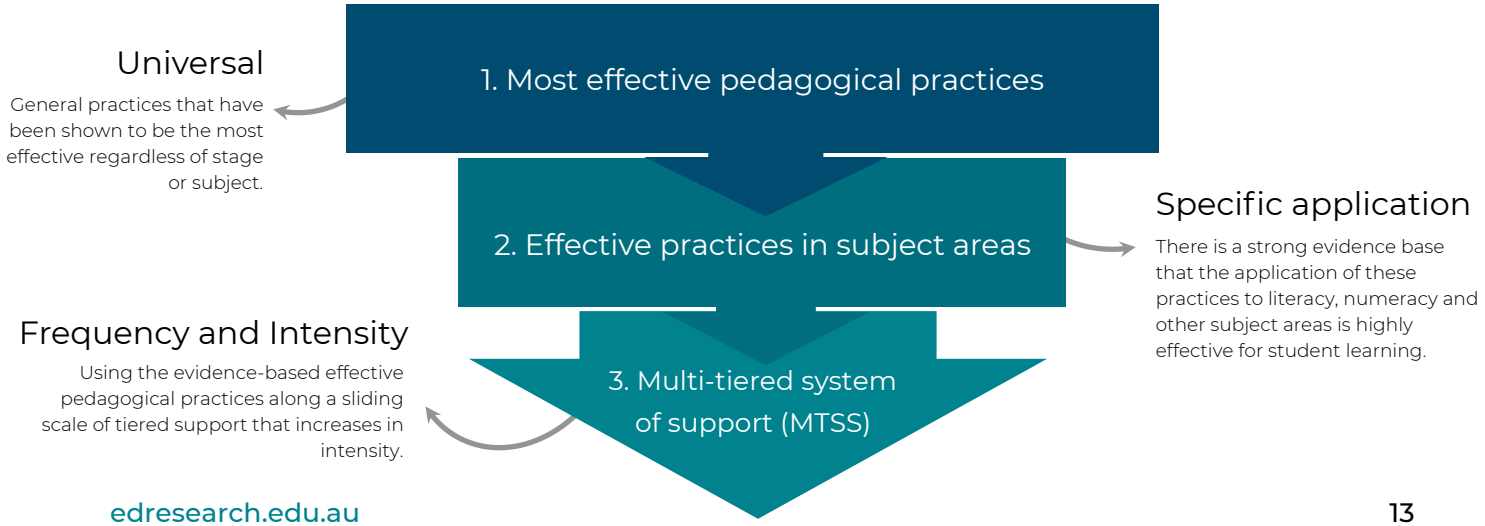
Practice	Evidence	Studies conducted across various locations suggest that it:
Mastery Learning	AERO conducted a review of 81 studies.	• has a positive impact on achievement in mathematics, sciences, social studies, and English and foreign languages • works for primary and secondary students • is effective particularly for lower achieving students, with higher achieving students also benefitting.
Formative Assessment	AERO conducted a review of 138 studies.	• has a positive impact on student achievement in mathematics, reading, writing, social science, and foreign languages • works for primary and secondary students • benefits students with and without additional learning needs.
Explicit Instruction	AERO conducted a review of more than 328 studies.	• has a positive impact on student achievement in mathematics, reading, spelling, problem-solving and science • works for primary and secondary students • benefits students with and without additional learning needs.

Evidence-based effective pedagogical practices can be used along a sliding scale of tiered support that increases in intensity to meet the individual needs of learners and support them on their journey towards mastery. The evidence points to the use of a multi-tiered system of support (MTSS) framework to do this. MTSS uses a combination of evidence-based teaching practices, data-based decision making and ongoing progress monitoring to provide targeted support to students who are struggling with general whole class instruction. The evidence shows that when instruction is high-quality, the use of this framework is highly effective. Furthermore, meta-analyses have found that when general whole class instruction is based on the evidence-based effective practices outlined above, an average of 80% of students were able to meet intended learning progress goals with the remaining 20% benefiting from effective targeted and timely small group interventions, and only 6% of these students needed more intensive and individualised intervention (Burns and Symington 2002; Burns et al. 2005).

What should teachers learn?

Teachers should learn the most effective classroom strategies for student learning and knowledge acquisition. These practices are responsive to cognitive science that details how a student's brain learns. The effective pedagogical practices defined here are inclusive only of strategies that directly relate to the learning, retention, and application of curriculum content. It does not seek to describe broader influences, content knowledge, family and community engagement practices or other enabling factors that foster engaged learning environments, which are discussed here. This content has been structured into three key areas that teachers need to know:

1. Most effective pedagogical practices
   - Planning and sequencing
   - Explicit modelling and scaffolding
   - Assessment and feedback
2. Effective practices in subject areas
   - Literacy
   - Numeracy
3. Multi-tiered system of support (MTSS)



Most effective pedagogical practices

Planning and sequencing

Practices that support the coherent and deliberate planning and sequencing of tasks and lessons have been shown to positively impact student learning. Starting with the curriculum or syllabus, teachers should understand the common progression of learning in the subject area and note in advance the critical knowledge needed for students to progress with a plan to check understanding at these points (Schildkamp et al. 2020). Lessons and tasks should be driven by curriculum-aligned learning objectives which are responsive to student needs (Ellis and Worthington 1994; Guskey 2010). The design of these learning objectives should be paired with a clear description of how students will show evidence of mastery (Bloom 1968; Schildkamp 2019).

When pre-service teachers are learning to plan a sequence of lessons, emphasis should be given to the incorporation of spacing and retrieval practice (Carpenter et al. 2012) with reference to why this practice works effectively in relation to a learner's memory and brain. For example, spacing a particular concept or skill across two or more lessons (Cepeda et al. 2006, 2008), using routines that embed retrieval, such as bell ringers, exit tickets and question prompts (Adesope et al. 2017), and allowing multiple opportunities across a unit of work help students to retrieve past learning and consolidate it in long-term memory (Carpenter et al. 2012).

The evidence strongly supports the sequencing of tasks that build upon each other and meet students where they are in their learning, i.e., neither too easy nor too challenging (Bloom 1968; Panadero and Jonsson 2013; Sweller et al. 1998). Students learn best when teachers clearly explain how each task is related and builds on previously learnt objectives, helping them to understand the progression of skills needed to attain mastery.

Explicit modelling and scaffolding

The evidence shows that explicit teaching, modelling, and scaffolding practices are highly effective across a variety of contexts. Practices include breaking down what students need to learn into smaller learning outcomes and modelling each step so that students can see what is expected of them. Doing this reduces the mental effort required of students, allowing them to process new information more effectively. ITE programs should emphasise that these practices are the foundation for effective teaching and are highly responsive to how a student's brain learns and retains information.

Teaching should begin with a clear explanation of what students are expected to learn, including its purpose and relevance, and understand each objective's success criteria before presenting any new material (Black and Wiliam 1998a, 1998b). When presenting new material, learning should be chunked into small, manageable tasks with well-defined goals (Black and Wiliam 1998a; Hughes et al. 2017). Additionally, all information required to complete these chunked tasks should be presented in one place and at one

time, excluding information not directly related to the task (Sweller et al. 1998). Research shows that by doing this, students can manage the memory overload of learning something new without struggling to 'hold' information in their heads that pertain to instructions rather than content.

New skills and content must be explicitly modelled through 'worked examples' that clearly and concisely demonstrate how to complete the task. Modelling should show each discrete step required to complete a task, undertake a procedure, or solve a problem (Kirschner et al. 2006). This worked example then provides a foundation for the gradual introduction of other examples that introduce different elements of the task, one new point at a time. Scaffolding should then be progressively removed as students become more proficient, and worked examples are replaced with independent problem-solving and ample opportunities to practice (Martin and Evans 2018; Sweller et al. 1998). Research supports the use of spaced practice by using appropriately challenging structured recall activities to further assist students in retaining new skills and knowledge (Adesope et al. 2017; Agarwal 2019; Kang 2016; Roediger and Butler 2011).

Pre-service teachers should learn to continuously check for understanding and mastery so that they can meet students where they are with the learning. For example, re-teaching tasks to students who have not met learning objectives or providing enrichment opportunities for students to reach mastery early (Guskey 2010). ITE programs should incorporate explicit modelling and scaffolding paired with assessment and feedback practices detailed in the following section.

Assessment and feedback

Formative and summative assessment and teacher feedback are commonly used terms in the teaching profession and throughout ITE. However, the evidence shows that some practices are more effective than others when undertaking assessment and delivering feedback. Formative assessment practices are those which gather and interpret information about student learning as learning is taking place. Formative assessment allows teachers to monitor student learning and to adapt their teaching to meet student learning needs. Summative assessment practices provide necessary checkpoints when assessing students against a standard or benchmark to gain an understanding of the level of mastery attained.

Identifying where a student is in their learning by assessing what they know, or think they know, before starting a new unit of work supports teachers in pitching the introductory lessons at an appropriate level. For example, setting an informal pre-quiz to gain insight into possible misconceptions and existing knowledge is an effective way to plan for instruction and efficiently target learning (Heitink et al. 2016). When explicitly teaching students new skills or concepts, formative assessment should be occurring after each discrete task. It is important to emphasise that these assessments need not be time intensive or formal but are focused on showing what students have or have not learned so that corrections can be made before progressing to the next skill or task (Black and Wiliam 1998a; Bloom 1968).

Effective questioning is a core part of effective formative assessment. For example, the use of simple, low-key assessments such as exit slips, quick quizzes or targeted oral questioning (beginning with 'why', 'why-not', 'how', 'what if', 'how does X compare to Y' and 'what is the evidence for X') that prompt students to articulate their reasoning should help identify common student misconceptions, check for retention of learning and assist in planning future instruction (Heitink et al. 2016; Martin and Evans 2018).

An important use of the information gathered through formative assessment is a teacher's ability to reflect and refine their practice in response to student data. Consideration and critical self-reflection of how instruction may contribute to misconceptions or identify patterns in what students are not learning leads to more effective and efficient teaching practice (Heitink et al. 2016).

While assessment is used to check for student understanding, it is essential that students are provided with timely feedback following any formative assessment task to help them correct misconceptions or improve. Feedback is one of the most powerful tools to support student learning. Feedback enables students to understand where they are at in their learning and then progress that learning by providing steps to move forward. Research strongly supports the use of immediate, timely and specific feedback that is honest, constructive, and clear to improve student learning (Archer and Hughes 2011; Roediger and Butler 2011; Son and Simon 2012; Wisniewski et al. 2020).

This feedback should be tailored and detailed enough that students can take actionable steps to improve. Where possible in both formative and summative assessments, teachers should use developmental rubrics with criteria tailored to the specific task and/or work samples so that students understand what is expected. These resources have been shown to help students become better at self-assessment (Lane et al. 2019).

Effective practices in subject areas

The most effective pedagogical practices outlined above been shown to work irrespective of stage of learning or subject area and as such should be learnt by all pre-service teachers. While the Australian Curriculum provides the detail of what should be taught in each content area, a foundational understanding of the explicit, systematic, and structured teaching methods above supports teachers to apply these practices to specific curriculum content. Alongside the practices listed above it is also essential that all pre-service teachers (irrespective of stage of learning or subject area) have a foundational understanding of literacy and numeracy teaching strategies and their application.

Literacy

Specific attention should be given to reading and writing instruction as literacy is fundamental to success in all subjects and at all stages. A rigorous body of evidence identifies the key elements of high-quality reading instruction, which should be included in all ITE programs. It outlines that explicit and systematic teaching addresses the five key elements: phonemic awareness, phonics, fluency, vocabulary, and

comprehension. The importance of this approach is recognised by the mandate for ITE providers to prepare teachers to deliver phonics instruction as discussed in the call-out box below. However, the time allocation and depth of this content is not currently detailed, leaving room for inconsistent delivery across providers.

All pre-service teachers, primary and secondary, should be taught and understand how to explicitly teach reading and writing, not only through the English curriculum but across all subjects. The explicit teaching of reading and writing tailored to specific content and discipline can improve students' understanding and engagement with the material, as well as their overall academic performance. Explicit writing and comprehension instruction across KLAs has been shown to effectively enhance both literacy and subject specific learning outcomes (Graham et al. 2020; Graham and Hebert 2011). AERO has produced a comprehensive review of the literature on writing instruction, which provides more detail on 'what works' in writing instruction.

Consideration of current ITE content mandate for phonics

In 2019, it was mandated in Schedule 1 of the Accreditation of Initial Teacher Education Programs in Australia: Standards and Procedures (Standards and Procedures) 4.2 that all primary undergraduate and primary graduate entry programs include content for *English/literacy - discipline-specific curriculum and pedagogical studies including at least one-eighth of a year EFTSL for early reading instruction* (Australian Institute for Teaching and School Leadership (AITSL) 2015). Footnote 14 is included on page 16 and states "Early reading instruction should address evidence-based practice across the following elements: phonemic awareness, phonics, fluency, vocabulary, comprehension, and oral language" (p16). Providers should deliver content that adequately prepares pre-service teachers to effectively and explicitly teach the content outlined by the existing Standards and Procedures.

Numeracy

For numeracy and mathematics, ITE programs should emphasise the most efficient and effective instructional approaches that respond to how the brain learns. Structured and teacher-led approaches have been shown to be particularly effective in mathematics, and have been shown to raise mathematics attainment by a significant amount (Hodgen et al. 2018). Pre-service teachers should learn to apply practices which support the attainment of mathematical automaticity in students. Automaticity (or math fact fluency) is the mastery of the basic facts for addition, subtraction, multiplication, and division to a point in which these 'facts' are moved to long-term memory, freeing up working memory for more complex mathematical problem solving. Pre-service teachers should understand that if a student has not attained automaticity, they are more likely to experience cognitive overload when attempting more challenging mathematical tasks. To support the attainment of mathematical automaticity, pre-service teachers should learn to complement explicit teaching and modelling with formative assessment, spacing and retrieval practices to support students most efficiently and effectively in their learning.

Multi-tiered systems of support (MTSS)

Teachers need to know how to provide early and proactive support for students to improve their academic performance and prevent the formation of a performance gap. The evidence shows that the way to do this effectively is by using a multi-tiered system of support (MTSS) approach.

This approach has three 'levels' of support, which provide additional instruction in smaller, more targeted settings depending on the student's need. The first tier, Tier 1, is typically general classroom instruction, while Tiers 2 and 3 involve more targeted interventions and higher-intensity support for students who are struggling.

Tier 1 refers to the instruction that the whole class receives. If students have already mastered foundational literacy and numeracy skills, most, not all, will respond well to evidence-based Tier-1 instruction in all subjects. This instruction consists of the effective pedagogical practices detailed above. In an MTSS model, all students are screened to determine their capability in reading, writing and mathematics. The resulting data is used to inform whether students require intervention.

Tier 2 intervention involves intensifying support for the skills a student needs support in. using evidence-based instructional practices and empirically validated interventions in a small group setting. Students who do not respond to Tier 2 intervention will require Tier 3 intervention, which intensifies support further by increasing frequency or lowering the ratio of students to staff in small-group instruction (1:1 instruction also being an option). Tier 3 intervention should be delivered by a staff member trained in relevant evidence-based practices e.g., in reading, writing or mathematics intervention.

Pre-service teachers should be taught and have the opportunity to practice implementing a multi-tiered framework during ITE programs. This should not be taught as a standalone approach but as a coherent integration with quality instruction, recognising and emphasising that Tier 1 is the most important tier of support as it plays the greatest role in students' success at school and preventing learning gaps (Berkeley et al. 2009, 2020).

What should teachers demonstrate?

1. A clear understanding of how to plan and sequence content and tasks so that they become increasingly challenging and incorporate spacing and retrieval practice.
2. Knowledge and application of explicit teaching, modelling and scaffolding practices that support how a student's brain learns.
3. An ability to effectively select a range of evidence-based assessment practices to evaluate progress, adjust instruction, provide targeted feedback, and support learning.
4. Appropriate subject matter expertise in the effective teaching of literacy, including the explicit teaching of phonics in early reading and the explicit teaching of reading and writing in subjects other than English.

5. Appropriate subject matter expertise in the effective teaching of numeracy including the explicit teaching of mathematics and building of automaticity through structured spacing and retrieval practices.
6. An understanding of theory and use of a multi-tiered system of support (MTSS) framework, the direct relationship to evidence-based teaching practices and how to practically implement in the classroom.

Graduate teacher standards

This content aligns with multiple Graduate descriptors within the Professional Knowledge and Professional Practice domains. Specific links to standard elaborations are shown below.

PROFESSIONAL KNOWLEDGE				PROFESSIONAL PRACTICE						PROFESSIONAL ENGAGEMENT			
1 Know students and how they learn		2 Know the content and how to teach it		3 Plan for and implement effective teaching and learning		4 Create and maintain supportive and safe learning environments		5 Assess, provide feedback and report on student learning		6 Engage in professional learning		7 Engage professionally with colleagues, parents/carers and the community	
1.1	1.2	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**	**5.1**	**5.2**	6.1	6.2	7.1	7.2
1.3	1.4	**2.3**	2.4	**3.3**	**3.4**	4.3	4.4	**5.3**	**5.4**	6.3	6.4	7.3	7.4
1.5	**1.6**	**2.5**	2.6	**3.5**	**3.6**	4.5		5.5					
				3.7									

Classroom management

Why is this important?

Effective classroom management involves establishing routines to actively engage students in their learning, consistently applying rules and explicitly modelling appropriate behaviour so students know what is expected of them and establishing high expectations for student learning. Understanding these practices allows for there to be an emphasis on fostering environments where students spend the most amount of time on learning.

What is the evidence?

Evidence shows that the presented classroom management practices are highly effective at maximising students' on-task learning time by minimising disruptive behaviour and disengagement. While these practices have been deemed relevant for both primary and secondary contexts, some of the illustrative examples of the practices offered may not apply to all contexts. ITE providers should use their subject matter expertise to appropriately contextualise these practices to meet the needs of their pre-service teacher cohorts. Similarly, reasonable adjustments must be made where necessary to ensure full access and participation for students with disability, the consideration of which is discussed here.

An annotated overview of the underpinning research evidence can be found here. This overview is further supported by the findings in the following:

- 2020 literature review from The Centre for Education Statistics and Evaluation, NSW Department of Education, 'Classroom management - creating and maintaining positive learning environments' (CESE (Centre for Education Statistics and Evaluation) 2020)
- 2019 evidence review from the Education Endowment Foundation, 'Improving Behaviour in Schools' (Darren Moore et al. 2019)
- 2018 systematic review from the Campbell Collaboration 'School-based interventions for reducing disciplinary school exclusion' (Valdebenito et al. 2018)

What should teachers learn?

Classroom management content should provide pre-service teachers with a foundational knowledge and understanding of successful preventative and responsive classroom management practices. Pre-service teachers should develop an understanding of, and opportunity to practice, establishing rules and routines, implementing proactive practices such as having high expectations and implementing responsive behaviour management.

This content has been structured into three key areas that teachers need to know:

1. Rules and routines
2. Proactive practices
3. Managing behaviour

Rules and routines

Establishing rules and routines in the classroom has been shown to be an effective practice in maximising student learning and minimising disruptive behaviours. Creating rules promotes a sense of structure and predictability for students, which leads to a safe and supportive environment, focused on learning (Alter and Haydon 2017). The evidence shows that use of routines or cues reduces wasted learning time by creating habits of learning that encourage students to respond quickly to instructions (Simonsen et al. 2008).

Pre-service teachers should learn the importance of developing and reinforcing clear and well-defined rules and routines and pre-service teachers should understand that these rules and routines need to be explicitly taught to students to be effective (Chaffee et al. 2017). Furthermore, ITE content should include practical examples of rules and routines that are shown by the research to be effective and how to use them in a lesson. This could include what can be used at the beginning and end of lessons (e.g., 'do-nows' and lesson reflections), for different types of learning activities (e.g., protocols for small group discussions) and for transitions (e.g., moving quickly from one activity to the next). ITE providers should consider when and how pre-service teachers can practice developing and using rules and routines in a professional experience setting so that they are best supported to transition to the classroom.

Proactive practices

Proactive practices can reduce the likelihood of misbehaviour before it occurs. By setting clear and high expectations, building positive relationships, and providing structured and engaging lessons, teachers can create a classroom environment that is less conducive to misbehaviour. The effectiveness of proactive and preventative classroom management measures is strongly supported by the evidence and as such should be prioritised in ITE core content (Alter and Haydon 2017) .

When students are held to a high standard, they are more likely to meet or exceed those standards. Having high expectations motivates students to learn, take responsibility for their actions and understand the consequences of their behaviour. The evidence shows that setting ambitious and achievable goals in collaboration with students, followed by a strong emphasis that these goals can be realised, is an effective, proactive approach to classroom management (Rubie-Davies et al. 2014).

High-quality instruction and active student engagement have also been shown to promote effective learning and positive behaviour. The evidence supports practices that provide frequent opportunities for students to actively engage through practices such

as questioning (Simonsen et al. 2008), clear and explicit instruction so that students know where they are at in their learning and what they need to learn (Rubie-Davies et al. 2014), and reducing cognitive load by presenting students with only one task or direction at a time (Pashler 1994). The evidence also supports engaging students through the provision of specific, positive feedback that acknowledges student effort and its contribution to learning progress (Rubie-Davies et al. 2014).

Finally, the research points to providing a consistent and predictable physical environment to complement other proactive approaches to classroom management. Where possible, teachers should consider the arrangement of the classroom and consistent use of space/location to maximise on-task behaviour and support routines. For example, consider configurations or spaces that promote the type of task like rows or horseshoes for explicit instruction or clusters for group or practical work (Pashler et al. 2013; Wannarak and Ruhl 2008). Objects within the regular classroom setting should consistently appear in the same place, reducing cognitive load and supporting a consistent and predictable environment focused on learning (Summerfield and Egner 2009).

Managing behaviour

Managing behaviour is daunting for pre-service and early career teachers and it is essential that ITE programs move beyond theoretical, assignment-based assessment of these skills and support pre-service teachers to act and reflect on their practices in a safe and supported environment.

Effective practices for managing behaviour require calm, consistent, expected, and proportional use and should be on a sliding scale that increases in intensity. In the first instance, teachers should learn to model the behaviours expected of students. For example using a calm tone, active listening, respectful interactions and being organised and on time shows students the expectation and gives them concrete examples of the behaviours they should replicate (Alter and Haydon 2017).

The evidence supports the practice of pre-planning and rehearsing responses to behaviours to help teachers to be more consistent and implement responses on the spot to reinforce high expectations for learners (Alter and Haydon 2017). The responses shown to be highly effective are those that are positive and proactive. Teachers should learn to use early intervention using simple prompts or ‘pre-corrections’ and referring to those prompts throughout a lesson for example Q “When we get to the library, what are the three things we need to remember to be responsible?”; A: “Walk on the left, be responsible for your books and surroundings, and talk in a quiet voice.” (Ennis et al. 2017).

Response to more intense behaviours should be addressed by giving verbal feedback that draws attention to expected behaviours, rather than focusing on undesired behaviours, for example on-the-spot praise or specific and actionable verbal feedback, have been shown to be highly effective (Simonsen et al. 2008). A key and recurring theme in the research is the essentiality of consistent, predictable, and proportional

responses so that students know the expectations but also feel safe in the knowledge that if their behaviour does not meet expectations, the response will be measured.

Consideration of whole-school behaviour frameworks

ITE content related to classroom management should consider common whole-school frameworks and models that pre-service teachers may encounter in schools. The practices outlined above lift and prioritise what the evidence shows works during an individual teacher's classroom practice, but it is important for ITE providers to acknowledge broader school processes and frameworks such as the Positive Behaviour for Learning (PBL) framework used by the NSW Department of Education. Understanding the place these evidence-based practices have in a broader framework will support pre-service teachers in being classroom and school ready.

What should teachers demonstrate?

1. A strong understanding of the role of rules and routines in establishing a structured, safe and positive classroom environment (i.e., entry and exit routines, explicit teaching and reinforcement of rules, protocols for common activities).
2. A clear understanding of the efficacy of proactive practices in preventing misbehaviour and/or disengagement, including the role of high-quality instruction as a proactive practice.
3. An ability to practice and apply proactive practices, including setting high expectations, building positive relationships, providing structure and setting ambitious, achievable and personalised goals.
4. An ability to practice and apply techniques that positively and effectively manage behaviour in classroom contexts, including the use of calm, consistent and proportional responses, behaviour modelling and feedback that gives attention to the desired behaviour rather than the undesired behaviour.

Graduate teacher standards

This content aligns best with the Graduate standards 1,3 and 4. Specific links to standard elaborations are shown below.

PROFESSIONAL KNOWLEDGE				PROFESSIONAL PRACTICE						PROFESSIONAL ENGAGEMENT			
1 Know students and how they learn		2 Know the content and how to teach it		**3** Plan for and implement effective teaching and learning		**4** Create and maintain supportive and safe learning environments		5 Assess, provide feedback and report on student learning		6 Engage in professional learning		7 Engage professionally with colleagues, parents/carers and the community	
1.1	**1.2**	2.1	2.2	**3.1**	3.2	**4.1**	**4.2**	5.1	5.2	6.1	6.2	7.1	7.2
1.3	1.4	2.3	2.4	3.3	3.4	**4.3**	**4.4**	5.3	5.4	6.3	6.4	7.3	7.4
1.5	1.6	2.5	2.6	**3.5**	3.6	4.5		5.5					
				3.7									

Enabling factors for learning

There is a myriad of factors that impact the level to which a student can engage in learning effectively. As highlighted in the context statement, many of the factors that impact student learning are outside the control of a teacher or school. The enabling factors presented here are in response to three key areas identified in the Quality Initial Teacher Education (QITE) review as those that need particular attention to best support graduates to be classroom ready: cultural responsiveness, students with additional needs and family engagement. Although the content presented below may not necessarily be teaching practices in and of themselves, developing a foundational understanding of their critical role in successful learning should be a central part of ITE.

Each of the three enabling factors presented aims to provide high-level guidance on the approach ITE providers could take when addressing this content. There is no question that addressing these factors should form a core and mandatory part of all ITE programs, noting however that in some cases, the evidence for what works in practice may have limitations.

Culturally responsive teaching

Teachers should understand cultural self-reflection and reflexivity to be an ever-evolving career practice, acknowledging that this is the foundation of intercultural development. ITE programs should emphasise the importance of building knowledge of the cultural diversity within classrooms and communities to understand and value the perspectives and worldviews of diverse groups. This should be done with particular attention to First Nations people, their cultures, and perspectives as an essential part of our national goals in moving towards reconciliation.

There is broad acknowledgment in both research and policy that there is limited research-based evidence regarding what constitutes 'culturally responsive pedagogy' and the potential impact on student outcomes. This is largely the result of historical power structures and ingrained biases. Given this and the relative newness of this research base, ITE providers should seek subject matter experts when crafting this content.

ITE programs should address how biases and assumptions affect practices, behaviours and attitudes in ways that adversely impact specific groups. Pre-service teachers should build an understanding of positionality through engagement in critical self-inquiry with a focus on how their views impact their approach in the classroom (Anderson et al. 2021). This self-reflection will support pre-service teachers in engaging with culturally diverse students and their families. Engagement with the AITSL Intercultural Development toolkit could provide a consistent framework for ITE providers (AITSL 2022b).

ITE programs should provide opportunities to practice cultural responsiveness through assessments and professional experience to develop the ability to be responsive to the

knowledge, skills, and cultural identities of other groups, acknowledging that this is a lifelong process requiring active attention to be sustained.

Specific attention was given to addressing responsivity to First Nations students and cultures. To support this, a thematic synthesis of key themes and recommendations proposed through seminal reviews and reports was undertaken (Education Ministers 2019; Australian Institute for Teaching and School Leadership (AITSL) 2022b; Moreton-Robinson et al. 2012; Rhea et al. 2012; Department of Education, Skills and Employment 2022). All seminal works selected contained extensive consultation work with First Nations people across Australia. AERO presented the proposed the key themes to its First Nations Expert Reference Group (FNERG) for feedback, which was then incorporated. ITE content as it related to First Nations should take an Indigenist, rights-based approach, that highlights the importance of critical self-reflection, intercultural development and understanding of First Nations culture and perspective in order to be responsive (Anderson and Rhea 2018; AITSL 2022a).

Content as it relates to First Nations histories, cultures and perspectives should be explicitly taught in ITE programs with emphasis on the diversity of these nations. The cross-curriculum priority *Aboriginal and Torres Strait Islander Histories and Cultures* in the Australian Curriculum presents a framework, which includes elaborations for integration in learning areas. The content in this framework, along with AITSL's elaborations for course content recommendations, provides a good starting point for ITE providers. This is not only so that First Nations students can see themselves and their culture reflected in the classroom content, but also enabling all students to engage in reconciliation, respect, and recognition of the world's oldest continuous living culture.

Family engagement for learning

There is a great deal of evidence that families play a critical role in their child's learning. Family engagement is important throughout all stages of schooling, but strategies may look different at different stages. ITE programs should include the evidence-based practices suited to their course cohort and focus on building an understanding of ways school teachers and leaders can engage with families to bring about improvements in students' learning outcomes.

AERO has produced practice guides on family engagement for learning that are tailored to different contexts. A rapid literature review was followed by consultation with accomplished practitioners from ECEC, primary school and secondary school nominated by the Australian Children's Education and Care Quality Authority (ACECQA) and the Australian Institute for Teaching and School Leadership (AITSL). Feedback and insights were also sought from ACECQA, AITSL, the Australian Research Alliance for Children and Youth (ARACY), 3 peak bodies (the Australian Council of State School Organisations, the Australian Parents Council, and Catholic School Parents Australia) and various state and territory jurisdictions. These guides have been designed to be clear, concise, relevant to a

range of ECEC and school contexts, and relevant to practitioners with different roles. They have been designed to be a starting point and provide a good basis for ITE program content.

An overview of the research evidence cited throughout the family engagement practice guides and the detailed methodology describing the process followed to synthesise the research evidence can be viewed on the AERO website through the links provided.

Research evidence shows the approaches detailed in the primary school and secondary school practice guides for engaging with families can have a measurable positive effect on student learning outcomes. While some promising approaches may seem obvious, the key is that they have been shown to improve student learning outcomes when they are implemented well.

Primary school practices	Secondary school practices
• Recognising and supporting family engagement in learning at home • Supporting two-way, positive communication and providing light touch updates about learning • Promoting a literacy-rich environment at home • Collaboratively planning and problem-solving with families	• Recognising and supporting family engagement in learning at home • Supporting two-way, positive communication and providing light touch updates about learning • Collaboratively planning and problem-solving with families

Diverse learning needs

The ITE foundational content recommendations are presented in the knowledge that the quality of teaching is the most important factor in improving outcomes for students – particularly those with additional needs or from disadvantaged backgrounds.

Careful and deliberate consideration has been given to the foundational core content presented here as it relates to diverse learners, including students with a disability and students from disadvantaged backgrounds. The foundational content intends to showcase the practices shown in the evidence to meet the needs of the vast majority students most effectively, including those with additional needs. It is designed to support pre-service teachers in taking their first steps towards becoming expert practitioners in the future.

An acceptance of diversity among students in mainstream schools is a values-based approach (Lindsay and Thompson 1997) underpinned by international agreements (e.g., the UN Convention on Children's Rights, 1989), is a legal entitlement (Commonwealth

Disability Discrimination Act 1992) and a core pillar of educational policy (Disability Standards for Education 2005).

AITSL and ACARA provide guidance and resources for teaching students with a disability in line with these requirements, acknowledging that high-quality general instruction meets the needs of the vast majority of students with additional needs. An evidence synthesis from the Education Endowment Foundation drawing from systematic reviews of literature states that there is a strong evidence base for the use of effective pedagogical practices with students with additional needs. It also strongly supports the use of targeted intervention such as multi-tiered system of support (MTSS) frameworks presented above (Cullen et al. 2020).

There is a wide range of specific needs and disabilities that a teacher may encounter during their career, all of which have unique approaches to the provision of access to education. For example, adjustments for a student with vision impairment will be vastly different from adjustments for a student with cognitive disability. The depth and breadth of specific approaches to the range of additional needs pre-service teachers will encounter in their careers is not detailed in this report, providing an opportunity for ITE providers to tailor their curricula using their subject matter expertise.

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