

Establishing the Conditions for Student Learning Growth

A significant corpus of research consistently confirms that, of the in-school variables, teaching has the largest impact on student learning (Hattie, 2009; Hallinger, Heck & Murphy, 2014; Hanushek & Rivkin, 2012). The skills, knowledge and attributes (non-cognitive) of the teacher are essential ingredients in the development of effective pedagogical and learning strategies.

Highly effective teachers have been shown to improve the progression of students by three times that of low-performing teachers (McKinsey, 2007) and, in particular subject domains, students placed with highly effective teachers have been shown to progress up to two years further than those with low quality teachers (Louden, 2009; Sutton Trust, 2011). And the opposite is also true: students placed with low quality teachers stagnate or fall behind in their learning progression. Hammond (2000) warns that ‘the effect of poor quality teaching is debilitating and cumulative...The effects of quality teaching on educational outcomes are greater than those that arise from students’ backgrounds’.

Learning is complex. Globally, researchers and policy makers have attempted to define and articulate what highly effective teachers do and know. ‘Knowing the student’ is a core and fundamental knowledge expectation, but this knowledge needs to be underpinned by an understanding of the epistemological and epiphenomenal aspects of learning and the learner, and thus inform pedagogical strategies.

While learning is seen as the *sine qua non* of schooling, recent research has sought to move the discussion of student learning away from attainment to progression: that is, how can teachers maximize their impact so as to improve the learning growth of students beyond the normal developmental curve. This shift in paradigm has meant that there is an increased focus on the development of the attributes of the learner: the ability to solve complex problems, perseverance and engagement, motivation and a positive mindset. These attributes are acknowledged as being fundamental to lifelong learning success as opposed to content knowledge and short-term success often measured in high-stakes examinations.

This paper, then, provides an overview of some of the research which underscores effective pedagogical strategies most likely to accelerate student learning. There is no silver bullet which can be universally applied to all students: teachers must be equipped with a toolbox of appropriate strategies and techniques for a range of contexts.

Developmental models and concepts

Ostensibly, teaching strategies are predicated on a knowledge of how students learn. In recent decades considerable emphasis has been placed on the learning theory that students actively construct knowledge, building and adapting their own individual mental models of concepts based on incoming and previously acquired information. Emerging from the work of Dewey, Piaget, Vygotsky and Bruner, constructivism signaled a shift from the behaviourist theories that had previously dominated educational research, with a new focus on learner characteristics and processes. Constructivists believe that learning is not the passive reception of knowledge, but an ongoing process of experiencing, thinking, accommodating and reflecting on new information. To acquire knowledge, the student must process and reconstruct knowledge to fit their existing understanding.

Social constructivists extended the constructivist theory to argue that learning is a social activity and it is in interacting with others and the environment that a learner comes to test hypotheses and construct a personal understanding of the world. The role of the teacher, in this situation, is to scaffold learning activities to take the student beyond their current constructs so as to challenge and deepen understandings.

Several interlinked concepts related to the development and progression of students are introduced below.

Student learning continuum

An influential educational psychologist whose early ideas align with a constructivist philosophy was David Ausubel. The most important factor influencing learning, according to Ausubel (1968), is the learner's current level of knowledge; if a teacher can assess the student's current knowledge, and begin teaching from that point, the interaction is likely to be successful. His dictum to know where the learner is at, and then take her forward, acknowledges the personalized nature of learning. Understanding what the student knows, and how to move through the stages of progression, are central to learning growth.

This idea has similarities to the modern pedagogical principle of formative assessment, where the teacher assesses each student's prior knowledge before starting a unit or lesson. When teachers make use of formative assessment to plan their teaching, student performance can be greatly improved (Odden, 2007). Assessment *for* learning is most effective when the teacher engages with the individual student to check for understanding, and is thus well placed to identify misunderstandings or gaps in conceptual constructs,

thereby intervening in a timely fashion. Just-in-time learning and the ability to solve problems at the time of need are fundamental, not just to student progression, but to building the confidence and resilience of the learner to solve learning challenges.

Zone of proximal development and scaffolding

While formative assessment allows the teacher to determine a starting point from which to plan educational interventions, it must be followed with a robust framework for progressing the student past their current level of achievement. A highly influential concept in this space is the zone of proximal development (ZPD), attributed to Vygotsky (1978). The ZPD is defined as the space between what a learner can already do, and what the learner cannot do; a fundamental assumption of the model is that the student has access to a 'more knowledgeable other' (MKO; Vygotsky, 1978), typically a teacher or tutor who can provide assistance to the student to perform what they otherwise could not. As the student progresses, they are incrementally able to do what they could not previously do without assistance.

Importantly, each student's ZPD is likely to be at a different stage along a developmental continuum. An effective teacher will be able to diagnose a student's current level of knowledge and plan an appropriate series of interventions within their ZPD to move them forward along the continuum. Although never explicitly mentioned by Vygotsky, scaffolding (Wood, Bruner, & Ross, 1976) is closely related to the concept of the ZPD. Scaffolding refers to the process of the MKO (teacher or tutor) supporting the learner as they navigate challenging learning that was previously not possible without assistance. As the student gains confidence and competence with the learning, the 'scaffolds' provided by the MKO are removed, and the student becomes able to complete tasks without assistance. This process is then repeated at the next stage of learning, with progressively more difficult ZPD.

Effective Pedagogical Strategies

High-impact strategies for learning

A recent trend in educational research has been a move towards selecting teaching strategies based on the evidence of their effectiveness rather than personal preference or convenience (Hattie, 2009; Marzano, 2001). Researchers collect and synthesise evidence of effectiveness from existing studies, drawing conclusions based on hundreds of thousands of student data points. Robert Marzano (2001) has identified nine 'high yield instructional strategies', which are general pedagogical strategies that can be used across a range of

subjects and developmental stages. They include identifying similarities and differences between concepts, writing summaries and identifying key information, setting goals, and creating graphic representations of knowledge. John Hattie (2009) collected over 800 meta-analyses related to student achievement, identifying key themes and strategies that are associated with advancing achievement beyond what is expected in a year of schooling. He encourages teachers to 'know thy impact' and monitor their own performance through the evidence provided by students. A key message emerging from this research area is that teachers who select high-impact strategies, and consider the impact of such strategies in their classrooms, give their students the best chance of success.

Metacognitive skills

While many see the role of a tutor as providing students with solutions to immediate problems, current best practice in education involves providing solutions while also incorporating the teaching of strategies that have longer-term influences on achievement. Metacognitive strategies are a collection of skills and approaches to learning that involve selecting and monitoring learning strategies, or 'thinking about thinking' (Newell, 1990). They include planning skills, evaluation and monitoring of progress, self-questioning, selection of learning strategies, and reflection on the success of chosen strategies. When tutors develop metacognitive strategies with their students, they help students to become independent, autonomous learners. Students not only have a range of tools at their disposal, but the ability to select the appropriate strategy for a range of varied learning contexts. Research suggests that metacognitive skills training can improve educational achievement, particularly when taught to students as individuals or in small groups (Chiu, 1998).

Evidence from cognitive psychology

Several pedagogical principles can be borrowed from the related field of cognitive psychology to inform evidence-based teaching practices. When students revisit material a number of times, outcomes such as retention and skill development can be improved. Distributed practice refers to the spacing of learning episodes across multiple days, so that students have many exposures to material; this is contrasted with blocked practice, in which students are introduced to material and practice it all within a single session. When sessions are spread over several days, students' recall and retention of material is greatly improved (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006). Ebbinghaus' forgetting curve (1880; reproduced by Murre & Dros, 2015) is another cognitive psychology principle explaining the benefits of revisiting content over multiple sessions. Ebbinghaus' empirically supported

theory states that each additional exposure to material decreases the proportion of material that is forgotten over time. The implication of these findings for student learning is that, often, exposure to a topic once in a classroom environment is not enough for students to effectively retain information. Students must revisit material across multiple sessions or days for maximum retention.

Deliberate practice

A concept associated with large effects on achievement across a range of domains (including academic, sporting, music, and vocational) is deliberate practice (Ericsson, Krampe and Tesch-Römer, 1993). Deliberate practice involves a process of repetition with challenging but achievable goals set regularly, the opportunity to experience and fix errors, and receiving regular feedback on performance (Van Gog, Ericsson, Rikers, & Paas, 2005). Teachers who can provide students with many opportunities for deliberate practice when acquiring skills or knowledge are likely to lead students towards success, particularly at the early stages of acquisition. Given the time constraints in a typical classroom, tutors can assist students individually by guiding their deliberate practice outside of the classroom and assisting with error detection, error correction and the provision of timely and specific feedback to move students towards a goal.

Feedback

Feedback is a particularly powerful educational tool, with many studies suggesting that providing students with feedback on their work has a large positive effect on learning outcomes. However, the evidence for feedback is also highly variable, with some studies finding a negative impact of some types of feedback on learning (Kluger & DeNisi, 1996). It is therefore important to ensure not only that students receive feedback, but that teachers have a sound working knowledge of the differing effects of feedback on achievement and on individual students.

A common misconception about feedback is that it is done to the student as part of a one-way flow of information from teacher to student (Boud & Molloy, 2013). Instead, effective teachers are also able to seek feedback on their own performance from the performance of their students, and adjust their teaching accordingly to improve outcomes (Hattie, 2009). Effective teachers must also consider the content of the feedback; instead of simply providing a correction or judgement about past performance, including information about the student's next steps along a developmental continuum ('where to next?' feedback;

Hattie & Timperley, 2007) can assist the student to understand the actions required to improve performance.

Many feedback effects depend upon the characteristics and dispositions of students (Kluger & Denisi, 1998). Some students may be motivated by praise and seek feedback to improve their self-image, while others seek feedback that confirms their own self-view whether positive or negative (Swann & Brooks, 2012). At an overall level, students are typically motivated by feedback information regarding how they can improve on weaker areas of their work (Wiliam, 2012), so it is important that students are afforded the opportunity to receive timely and specific feedback on these areas.

Goal setting

In order to move students forward, effective teachers are able to work with the student to set challenging goals and provide the student with opportunities to work incrementally towards achieving each goal. Goal setting is an effective intervention across a range of settings, but can be particularly powerful in an academic context because they provide the student with a clear and specific outcome to work towards. Clear but challenging goals also contain an element of motivation; if students perceive that goals are within their reach, they are more likely to engage with tasks that are related to their attainment (van Yperen, Blaga, & Postmes, 2014). When combined with appropriate feedback and the guidance of a teacher or tutor, goals allow the student to evaluate their progress against a standard and adjust their direction and strategies in order to achieve success (Locke & Latham, 1990). The effect of goal-setting is also dependent on the individual characteristics of the learner (Schunk & Zimmerman, 2008). Students with a mastery orientation believe that effort can result in success, and are intrinsically motivated to achieve outcomes. These students are typically motivated by goals related to self-improvement and gaining new knowledge. Students oriented towards performance tend to be extrinsically motivated by the desire to achieve more than others, or avoid an outcome less successful than others. Encouraging a mastery orientation in students is closely related to the notion of growth mindset, explored in greater depth below.

Other developmental approaches

A number of existing pedagogical frameworks are available for teachers to implement in designing activities and assessments with a developmental approach in mind. These include the Bloom's and SOLO taxonomies.

Originally published in 1956 by Benjamin Bloom and colleagues, Bloom's taxonomy has been updated for a modern learning context (Anderson et al., 2001). The taxonomy sets out a number of incrementally complex stages for classifying educational tasks or goals. At the lower end of the taxonomy are verbs such as Remember and Understand, where the aim of the educational experience is to retain factual or conceptual knowledge about the content being taught. At the more complex end of the taxonomy are verbs such as analyse, evaluate and create. These stages require the student to perform higher-level tasks that may involve an element of metacognitive knowledge. A common assumption is that students require lower-level knowledge before being able to complete higher-level tasks, so the taxonomy could be considered a developmental framework.

Similarly, the Structure of the Observed Learning Outcome taxonomy (SOLO; Biggs & Collis, 1982) sets out a number of stages of increasing complexity to guide the thinking of teachers responsible for planning lessons, curriculum or assessments. Stages move from unistructural (where the student can identify or name single elements of a concept) to extended abstract (where students formulate or hypothesise about concepts based on current knowledge). Like Bloom's taxonomy, the SOLO taxonomy can be used by teachers to guide students through a process of acquiring surface and deep knowledge.

Individual tutoring

With an average Australian class size of 24.7 students (OECD, 2013), teachers are responsible for diagnosing current levels of achievement and planning interventions for many students across a wide range of developmental stages; in an average year 9 classroom, the difference between the highest and lowest achieving students can be up to seven years (Goss & Sonneman, 2016). Teachers must be able to differentiate their practice across this large range, and act as a 'more knowledgeable other' (MKO; Vygotsky, 1978) to each student in order to move them forward.

A common response to this issue is to campaign for a reduction in class sizes, so that teachers can spend more time individualizing their instruction to each student's specific needs. However, research suggests that smaller class sizes do not have a large impact on achievement, because teachers do not typically change their practice whether teaching to 5 or 25 students (Hattie, 2009). However, extensive evidence suggests that individual tuition, typically undertaken outside of classroom hours, can have a significant effect on enhancing achievement (Evidence for Learning, 2016). One reason for this effect is that the student is able to work more closely with a teacher who can tailor educational interventions to

specifically target the student's current ZPD. While individual tutoring is often used remedially to improve the performance of students who show deficiencies in specific areas of the curriculum, several studies suggest that all students can benefit from individual tutoring; students who are tutored achieve higher scores than students who do not receive tutoring on a range of academic outcomes (Ritter, Barnett, Genny, & Albin, 2009).

Affective factors

While researchers have developed strong conceptualizations of the underlying pedagogical and developmental principles that are associated with educational progression, these principles must be paired with an understanding of the attitudes, beliefs and predispositions of learners. Affective factors are powerful in establishing the conditions for effective learning. While some affective domains are related to personality, others are malleable and can be improved with highly effective teaching strategies.

Mindset

One of the most prevalent affective theories in education over the last decade has been Carol Dweck's mindset theory (Dweck, 2006). The theory proposes that students hold either a fixed or a growth mindset with regard to their levels of intelligence and talent. Those with a fixed mindset believe that their intelligence is fixed; an innate trait that is not able to be modified. These students believe that they either 'have it' or don't. In contrast, students holding a growth mindset believe that hard work leads to success regardless of intelligence, and that determination and perseverance can help to develop abilities.

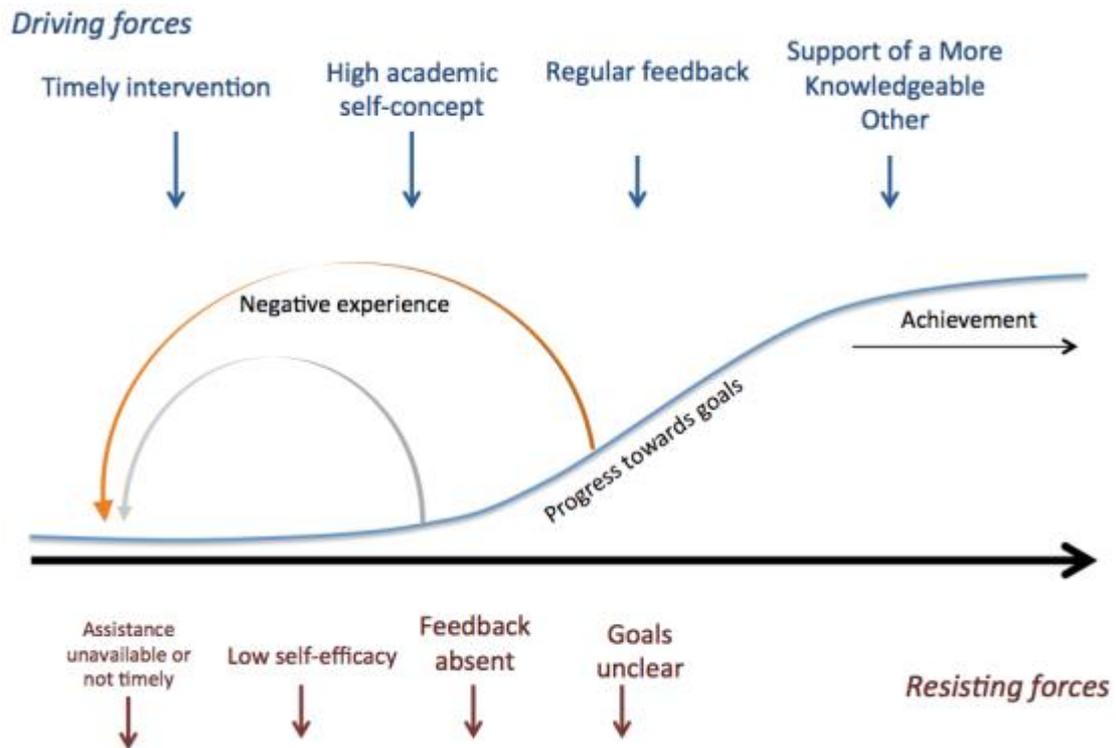
Teachers can help to influence which mindset students adopt through their use of praise and feedback. Dweck proposes that when students are told that they are 'talented' or 'just get it', a fixed mindset is fostered whereby students attribute their success to an innate gift rather than hard work. Teachers are instead encouraged to praise effort when a student is successful, in order to reinforce the notion that hard work is the main factor leading to success. While the evidence on mindset has not shown major effects on educational achievement (De Meuse, Guangrong, & Hallenbeck, 2010) further evidence is required, such that many educators currently consider fostering a growth mindset to be a 'no harm done' approach with the potential for positive effects.

Self-efficacy

A major factor influencing the academic success of students is self-efficacy, or the student's beliefs and expectations about their own learning and ability to achieve (Pintrich & Schunk, 1996). Students with higher levels of self-efficacy are more likely to strive towards and achieve goals (Hattie, 2009) because of a belief in their own abilities. Teachers must take into account a student's level of self-efficacy when planning goals; those with higher self-efficacy are more likely to perceive that success is possible when faced with challenging goals, while those with lower self-efficacy may need smaller sub-goals in order to believe that success is attainable. It follows that an important task for teachers is nurturing a sense of self-efficacy in their students, so that students feel confident to engage with and achieve progressively more challenging learning goals.

Another aspect of self-efficacy to be taken into account by teachers is the timeliness of educational intervention when students require additional help with content. Academic self-concept refers to a student's sense of self-efficacy or competency in specific subject areas (Bornholt, 2000). Without necessary support, students may develop a sense that they are 'not a Maths person' or 'bad at English', because of their low self-efficacy related to each subject. To prevent students from developing a fixed mindset (Dweck, 2006) about their ability in certain subjects, teachers need to facilitate the development of positive self-concept by providing assistance with misconceptions or difficulties to steer the student towards success. Supporting students along a trajectory towards high self-efficacy involves providing opportunities for each student to achieve success and develop academic self-concept. Importantly, this process also relies on timely intervention when difficulties arise, as students can develop a sense of helplessness associated with extremely low self-efficacy if they are unable to work past difficulties.

Students with low self-efficacy may also be less likely to engage in class activities and discussion, because of a fear of being perceived as less competent than their peers (Linnenbrink & Pintrich, 2010). Without this avenue for intervention and support, the role of a tutor can be important as it allows the student to seek help in a more private setting without fear of negative perceptions by peers.



The life course model above demonstrates the forces which are positive and those which have the potential to act as barriers to effective learning progression. The model affirms the continuous growth students make with the support of appropriate teacher support for both content knowledge and building affective domains. The risk, the model demonstrates, is that the intervention of negative forces may not only delay progression, but may have the effect of causing the student to retreat to an earlier stage of development. This has a long-term harmful effect on the learner's progression.

Motivation, engagement and grit

A major piece of the puzzle for enhancing student achievement is the student's level of motivation to achieve. There are several teacher-controlled factors that can lead to improved student motivation. These include setting challenging goals that are perceived to be achievable by the student, giving frequent feedback on progress, giving timely help with difficulties, and affirming the student with positive feedback (Dornyei, 2001). Another major factor influencing motivation is the nature of assistance provided by the teacher when a student encounters difficulties. Research suggests that simply offering a solution is not as powerful for motivation or achievement outcomes than offering hints or strategies that can assist the student to complete the task themselves (Narciss, 2004). Students can also benefit from a degree of control or self-direction over the learning process (Patall, Cooper, & Robinson, 2008). Factors reducing motivation include interpersonal conflicts with teachers

or peers, and the chance of embarrassment if peers perceive the student to be incompetent (Dornyei, 2001). It is therefore important that students are supported both in and out of the classroom to engage and persist with the learning process; Hattie (2009) proposes that motivational factors can have a sizable effect on achievement, because they enhance a student's level of engagement with effective learning strategies.

Related to motivation is the concept of grit, defined as passion and the ability to persevere with long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). Grit is positively associated with successful outcomes in a range of fields, including educational attainment measures. Students who are able to persist through challenges, become comfortable with working hard, and spend extended periods working on a single task are likely able to improve their educational outcomes regardless of other measures such as IQ. The teacher's role in encouraging grit involves supporting students to persist through difficulties, and providing adequate support so that self-efficacy and feelings of competence are preserved.

Conclusion

There are many factors which impact on the progression and rate of progression of student learning. This paper has attempted to identify those factors which are malleable and therefore can be improved through purposeful and deliberate practice from an effective teacher or tutor.

Finally, there is now important evidence that teachers do not work in isolation and that, when teachers work together or collaborate and take collective responsibility for a student's learning, we are more likely to improve student learning outcomes (Verscio, Ross, & Adams 2008). While much recent research has focussed on building the capacity of individual teachers, it is important that the focus shift from helping individuals be more effective in their isolated classrooms to creating a collaborative culture of interdependence and shared responsibility (DuFour & Marzano, 2011). The capacity of teachers and tutors to add another 'lift' to student outcomes therefore provides an important opportunity for leveraging improvements in student learning outcomes.

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