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adolescent success

Editorial

HINT

Pam Moran (2018) poses the question "What does #Future Ready mean really?" One might assume that students have always attended school with the purpose, in part, of gaining the knowledge, skills and dispositions that will see them well prepared to embark on their adult lives…wherever those lives might take them. However, in recent times we hear a lot about 21st century skills and being 'future ready' which seems to indicate that perhaps we live in an age where preparing students for the future may be a different proposition to previous times. This then begs the question 'why?' Given the pace of technological change, and the attendant changes to the type of jobs that are available, it is apropos for teachers to question the type of skills that students might need to navigate a different world to the one they entered upon leaving school. The term 21st century skills is one that is frequently encountered today and discussion continues about what these skills might be. The notion of trying to predict the skills that our current year one students might need in 20, 30 or 40 year's time is indeed mind boggling.

Nevertheless, it is incumbent upon teachers to ensure that the curriculum remains authentic and is delivered in teaching and learning contexts that are engaging and contemporary. This is certainly the case for educators who work with early adolescents. The theme for the 11th Conference for Adolescent Success is "Future Ready Students". The conference will provide a wonderful opportunity for participants to hear from a range of presenters who will explore the conference theme from a variety of perspectives. Conferences always provide an important opportunity for connection and the sharing of ideas.

The range of articles in this edition of the journal showcases the breadth of research and innovation with the area of early adolescence. The many and varied topics that touch on the lives of early adolescents indeed exemplifies the complexity of the job of working with this age group of students. In the refereed section Quinnell provides some insights into the connection between mathematical language and mathematical understanding. Ellerton's article on critical thinking and collaborative inquiry is thought provoking, yet provides so much clarity for the reader. Other articles in the journal focus on the range of initiatives at a school level. Topics include a book week program that runs at Highlands Christian College and the basics of peer feedback. McKenna explores the topic of resilience through a description of the Unleashing Personal Potential program. Opie provides some very important information about the role of comprehensive sexuality and relationships education in curbing rates of sexual violence. Finally, Cavanagh shares two 'blog posts' that explore the role of relationships in the classroom. This breadth of topics certainly underscores the many imperatives that exist for educators of early adolescents.

I would really encourage readers of the journal to consider sharing examples of different initiatives that are occurring at their own schools. It is really obvious, despite what we might hear through the media, that schools are really vibrant entities with a very strong focus on what is best for their students. Such a focus goes a long way to ensuring that we are indeed helping our students prepare for the future with the requisite skills, knowledge and dispositions that they require.

Dr Anne Coffey
Journal Editor
Adolescent Success

Moran, P.
"What does #FutureReady mean really?"
Future Ready Schools Preparing Students for Success,
24 September, 2018.
https://futureready.org/what-does-futureready-mean-really

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CONTENTS

HINT

Placing an Emphasis on Mathematical Language as a Key to Unlocking Mathematical Understanding

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Abstract

Understanding is one of the four proficiencies or key ideas in the Australian Mathematics Curriculum and arguably the pivot on which mathematics depends. With reference to a selection of mathematical language, this review discusses language strategies that can be used in mathematics classrooms to enhance students' understanding of mathematical concepts. The activities were carried out with preservice teachers with the aim of revising and scaffolding their knowledge of mathematical language and introducing them to language strategies that can be used in school classrooms.

The paper argues that enhancing understanding through a focus on language is crucial to aiding students to build a solid foundation of mathematical ideas.

Keywords: *Understanding, Mathematics, Language Strategies*

Introduction

Understanding is emphasised as one of four proficiencies or key ideas in the Australian Mathematics Curriculum (Australian Curriculum, Assessment and Reporting Authority, 2018). This applies to all levels including middle school levels. One element of understanding in mathematics is understanding of the language of the subject, acknowledged as a key component of reading, understanding, and learning of mathematics (see Dunston & Tyminski, 2013; Martiniello, 2008). It is important for instance, that middle school teachers foster students' ability to understand mathematical language, as a way of scaffolding their learning about the subject and their understanding of the requirements of assessment questions (e.g,, NAPLAN questions).

Scaffolding students' understanding of mathematical language relies on teachers' acknowledgement of the difficulties posed by key language, followed by a focus on this area of mathematics. Teachers' require deep understanding of the content of a subject in addition to an ability to convey the content effectively to the students (Australian Institute for Teaching and School Leadership Limited, 2018). Thus, aiding students to develop a deep understanding of mathematical vocabulary and language relies on teachers' understanding of the language and knowledge of strategies that can be used to enhance the learning and understanding of language.

Many strategies have been proposed by educators for scaffolding the learning of mathematical language. Much of the related work was carried out prior to the past decade (e.g., Friedland, McMillen, & del Prado Hill, 2011). The strategies often had their origins in language teaching, with details published in peer-reviewed journals for use in mathematics teaching. They frequently made use of visuals, some making links between different semiotic systems (e.g., Dunston & Tyminski, 2013). These complement the range of vocabulary introduction ideas that are categorised and discussed in an informative article by Rubenstein (2007), designed to address various challenges posed by mathematical language.

Although many of the strategies discussed below were originally aimed at middle school levels (e.g., Dunston & Tyminski, 2013; Gay & White, 2002; Rubenstein, 2007), with minor modifications such as careful choice of subject words and categories, they are likely to be more widely applicable. The activities described in this article were carried out with preservice teachers with the aim of revising and scaffolding their knowledge of mathematical language and introducing them to language strategies that can be used in school classrooms.

Strategies for introducing mathematical terminology

Formulation of definitions has been recommended by educators for the introduction of mathematical vocabulary in many school levels (e.g., Boulet, 2007; Pierce & Fontaine, 2009; Shield, 2004). However, this strategy presents benefits and difficulties. Composing descriptions or definitions can be used to facilitate language use, advance understanding and reasoning, expose imperfect constructions, and stimulate verbal discourse and thinking about mathematical ideas. The benefits of talking about mathematical concepts is evident in Boulet (2007), who provided examples of the use of dialogue as a key to encouraging active learning, communication, and thought.

Formulation of definitions can follow formal or less formal approaches. A formal approach in which objects are defined according to the item, class, and properties can be used (e.g., Shield, 2004). For instance, a *right-angled triangle* (item) is a triangle (class) which is a closed, plane shape with three straight sides, in which one angle is a right angle (properties).

Comprehensive definitions are an example of the precision, brevity and density of mathematical language. However, formulating formal definitions can present difficulties to learners, as is evident in Boulet's (2007) discussion of the difficulties that teachers experienced whilst collaboratively creating a definition of a *polygon* (pp. 1-2). Definitions often do not give enough information about the complexities of the meaning of a word (Ewing Monroe & Orme, 2002), and in the process of defining some concepts the richness of a concept is lost (Leung, 2005). Comprehensive definitions of many mathematical concepts are complicated and may rely on learners' prior knowledge, or be above the level of the learner, or use other unfamiliar terms (Leung, 2005; Shield, 2004). The definition for a *regular hexagon*, for instance, relies on a reference to many ideas, including a closed planar shape, with six straight sides, and equal sides and angles. Mathematical definitions are not necessarily unique (Boulet, 2007; Shield, 2004), for instance two very different definitions may be possible for the same shape. Many mathematical concepts are impossible to define concisely and unambiguously, even relatively simple terms such as *one dimension* or *square* (Leung, 2005, pp. 128-130). As stated by a student, "there's no such thing as a one dimensional shape coz a line is kind of like a rectangle filled in" (Leung, 2005, pp. 128-129). Often words can be used and understood without use of concise and unambiguous definitions (Leung, 2005).

Importantly, composing definitions depends on deep understanding of concepts, an understanding that needs to be developed before definitions can be considered. The difficulties of composing comprehensive mathematical definitions suggest that alternative strategies need to be considered. In line with the focus on understanding in the curriculum, such methods require a primary focus on the development of conceptual understanding, rather than on procedural knowledge. As an example, it is crucial that students develop deep understanding of the attributes area and perimeter before considering definitions or using formulae to calculate them. Without a focus in understanding, definitions may be meaningless and formulae may be misused. Fostering conceptual understanding can be achieved through use of manipulatives and diagrams, and reference to dictionaries and use of prefixes. Use of concrete manipulatives, for instance, aids students' understanding by allowing them to visualise and describe something tangible rather than describing otherwise abstract concepts. Involvement in written activities and dialogue about attributes such as area and perimeter, which may include informal approaches to vocabulary introduction are also advocated by educators (e.g., Pierce & Fontaine, 2009). The final step in the process is the development of formal definitions.

Informal definitions, which are gradually perfected by providing students opportunities to focus on examples, are useful in mathematics, encouraging learners to utilise and apply mathematical vocabulary. Knowledge construction through the process can be complemented by the inclusion of carefully labelled diagrams, and further questions, which encourage a deeper understanding by encouraging learners to think beyond the meaning of separate words. This corresponds to the idea of utilising user-friendly definitions and of including activities that make use of mathematical discourse to gradually enhance conceptual understanding (e.g., Dunston & Tyminski, 2013; Renne, 2004). In Renne's (2004) study, the described activities reinforced understanding of concepts and gradually honed in on increasingly well-defined concepts. Similarly, the set steps proposed by Pierce and Fontaine (2009) for primary levels can be used for vocabulary introduction. The steps comprise the use of user-friendly definitions, followed by discussion of the different meanings of a word and finally activities that promote deep processing of the new terminology. "Language acquisition takes time and occurs from connecting words to experiences" (Burns, 2007, p. 374); students' understanding of a word, including multiple meanings of a word, evolves in parallel with the understanding of the concept.

The process of constructing gradually more perfect definitions can be enhanced through following the steps: formulating of individual descriptions, rethinking and modifications after collaboration with peers and use of dictionaries, following think-pair-share ideas (e.g., Chamberlin, 2009). The process of communicating with others whilst formulating definitions can be used to highlight the necessary precision and reproducibility required when talking about mathematical concepts. For instance, development of comprehensive descriptions of acute-angled, right-angled and obtuse-angled triangles reveals that acute-angled triangles have three acute angles, whereas right-angled and obtuse-angled triangles have one right angle and one obtuse angle respectively. Formulating a description of *regular polygons* exposes the importance of stating that both sides and angles are equal. A star with ten equal sides for instance, is not a regular shape because the angles are not equal. An understanding of the term *regular polygon* can be reinforced for regular hexagons for example, through a discussion of hexagons, equiangular hexagons, equilateral hexagons, and regular hexagons, including examples and non-examples of regular hexagons (Rubenstein, 2007).

The process of formulating user-friendly definitions and descriptions means that a fuller picture of students' misconceptions are exposed in their descriptions, diagrams, and examples, meaning that it is possible to address the misconceptions. For example, two preservice teachers' descriptions of the attributes radius/diameter/circumference/area in Table 1 below, draws attention to Silvia's difficulties. They provide a

good contrast to Cynthia's more comprehensive descriptions, which show a deeper level of understanding, (except for her description of area, in which she appears to confuse the words diameter and circumference or perimeter). The descriptions offer an entry point to conversations about these attributes. Notably, describing an attribute in terms of the formula used to calculate it does not enhance or show understanding. An example can be seen in Silvia's description of area, a description that does not show her understanding of the concept and applies only to rectangles.

See Table 1 below

Descriptions and definitions can be used in both inductive and deductive teaching (Brahier, 2009). In an example, Brahier (2009) demonstrated how students can be asked to establish definitions for a diverse range of polygons. This is an example of inductive thinking, in which investigation of individual cases leads to generalisations and a definitions. Inductive thinking can be compared to deductive thinking, where generalisation precedes investigation of individual cases. In an example, students are provided with definitions of various polygons upfront and asked to use the definitions to identify a selection of polygons in a collection of shapes.

Inductive thinking links to the idea of constructivist learning in which the learners are actively involved in the learning process, encouraging them to do the thinking, thus fostering understanding. Because they have created the definition or generalisation, it is more likely that it will be remembered (Brahier, 2009). However, although inductive activities offer advantages compared to deductive activities, they may be more difficult for teachers to design; relying on a teachers' deep understanding and creativity.

Some educators have advocated the introduction of vocabulary through multiple, meaningful learning experiences and varying contexts, followed by focused teaching and use of definitions (Ewing Monroe & Orme, 2002; Shield, 2004). This follows the notion that new vocabulary is only useful once a concept is understood, indicating the logic of introducing concepts before definitions (Burns, 2007). For example, as a foundation for understanding, children may be encouraged to explore and describe different trapeziums before the word *parallel* is introduced. In another example, the difference between volume and capacity may be illustrated effectively with manipulatives or visuals, before defining these concepts. A key idea in many vocabulary learning strategies is that learners need to use and explore the multiple meanings of mathematical vocabulary in order to become familiar with their use, since "knowing a word means knowing more than its core meaning" (Leung, 2005, p. 130).

Recommended too for mathematics teaching in middle school levels (but also arguably appropriate for other levels), are discussions of prefixes and, partly because of the number of mathematics words with Latin and Greek origins, roots and origins of words including reference to English words with the same roots (Rubenstein, 2007). Important prefixes include *peri-* and *circ-* meaning around, *tetra-* and *quadr-* meaning four, *equi-* and *equa-* meaning equal, *iso-* meaning equal, and poly- meaning many (e.g., Anderson et al., 2008). Knowledge of prefixes has the potential to aid understanding of words such as *polygon, hexagon,* and *isosceles triangle*. A teacher may draw attention to the meaning of *poly-* meaning many when introducing multi-sided 2D shapes. Other prefixes such as *hex-* meaning six can be used to unlock the meaning of *hexagon*, which is a 2D shape with six sides. Further understanding of polygons and the many important prefixes used in mathematics can be achieved by reference to concept maps such as those in Anderson et al. (2008).

Table 1
Two Preservice Teachers' Descriptions of Radius, Diameter, and Circumference

Student	Radius	Diameter	Circumference	Area
Silvia	Distance of a segment	She depicted a diameter on a diagram of a circle but did not clearly show that it passed through the centre	All the way around a circle	Area = 2d usually length multiplied by height A = l × h (It later became clear that 2d meant two dimensional)
Cynthia	Distance between centre of a circle and any point on its circumference	Diametre [sic] distance of a straight line from one side of a circle to another that passes through the centre (2 × r)	The length of the outside of a circle	Space within the diametre [sic] of a shape

The concept maps for instance illustrate the pattern of prefixes used in the naming of shapes.

As a way of extending understanding, discussion may be used to form links between words that share the same prefix, for instance mathematical words and everyday words or technical English words from other disciplines. When discussing the word *circumference*, reference to the meaning of *circum-* (around) found in the word *circumnavigate* may be useful (Rubenstein, 2007). The prefix trans- from Latin, meaning through or across (Anderson et al., 2008), is found in words such as *translation, transatlantic, transit,* and *transparent* in English and Social Sciences. Through studying these words and their meanings in one (or more) other context, the mathematical words of translation, translate, transformation, transform and transversal can then be studied and their meanings explored.

Often two prefixes relate to the same concept, one from Greek origins and one from Latin. In an example, teachers need to recognise that both prefixes *tetra-* from Greek and *quad-* from Latin mean four, and are used in mathematical words such as *tetrahedron* (a 3D shape with four faces) and quadrilateral (a 2D shape with four sides) respectively. Prefixes that represent *one*, include *mono-* from Greek and *uni-* from Latin (Anderson et al., 2008). They are found in the words unit and union in mathematics and monologue, monorail, monotone, unique, unit, unicycle, universe, uniform, unify, union, in other curriculum areas or in everyday language. Discussion may be used to form links between the meanings of these words, based on the fact that each one includes a prefix meaning one. Notably, at times the same word is used in multiple contexts with different meanings. The meanings of words *unit* and *union* in mathematics are different from their meanings in everyday language although they all relate to the meaning of the prefix *uni-* meaning one.

Some vocabulary instruction strategies, previously used by reading teachers, have been recommended in mathematics for middle and senior level students. One example is the four-square model diagram (e.g., Figure 1), a useful means of organising a combination of word descriptions, diagrams, symbolic representations, and examples. The four-square model (verbal and visual word association diagram) consists of a rectangle divided into four sections, the first giving the word, the second a definition, the third a diagram, and the fourth, an association (Dunston & Tyminski, 2013; Gay & White, 2002). In Figure 1, the preservice teacher who constructed the diagram demonstrated a broad understanding of the word *hypotenuse*, and the ability to articulate the concept in multiple ways. She illustrated the word on differently orientated triangles and extended her diagram to include multiple associations such as linking it with the Theorem of Pythagoras. In this way, construction of graphic organisers, which include definitions and other representations, have the potential to enhance knowledge construction (e.g., Dunston & Tyminski, 2013). Four-square model diagrams can be used to depict a broad range of vocabulary from all strands, examples being *multiple, percentage, hypotenuse, perpendicular, kite, regular polygon, tessellation, square-based pyramid,* and *bar graph*. Once teachers are familiar with such diagrams, they can model their use for their students.

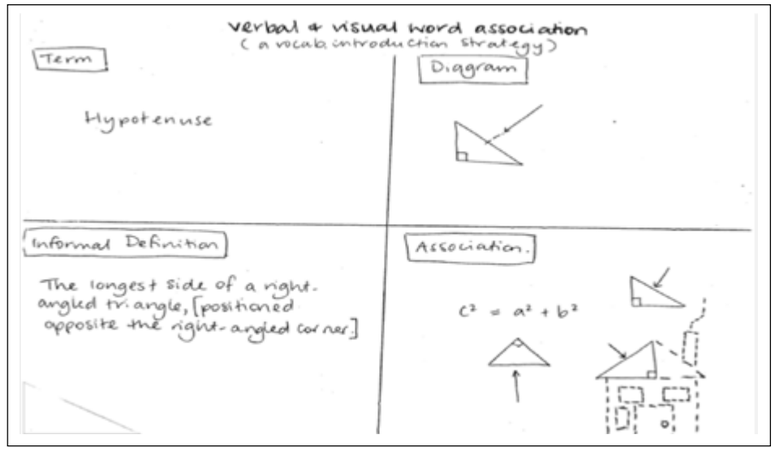

Figure 1 - *Example of a four-square model diagram depicting the word hypotenuse.*

The *association* category in four-square model diagrams at times presents difficulties for students. For kites and square-based pyramids, associations may be tessellating patterns of kites and Egyptian pyramids respectively. Use of the four-square model, including the association category, is a way of aiding learners to construct understanding of terminology, guiding them towards construction of clear descriptions, and aiding them to link ideas with prior knowledge and understanding of multiple applications. The diagrams can also help to expose gaps in understanding (Gay & White, 2002). The four-square model is perhaps particularly useful in terms of enhancing understanding of potentially confusing words and terms in mathematics, such as words used exclusively or differently in mathematics classrooms compared to their everyday use (e.g., hypotenuse, mean). Importantly, the four-square model builds understanding in a visual way (Dunston & Tyminski, 2013) and forms links between different semiotic systems such as words, symbolism, and visual images (see O'Halloran, 2005).

Other graphic organisers are more complex but bear some similarities to four-square model diagrams. They incorporate definitions, examples and non-examples, attributes or characteristics (Ewing Monroe & Orme, 2002), varied representations, and reference to varied notation (Gough, 2007). Construction of four-square model diagrams and other graphic organisers (e.g., Dunston & Tyminski, 2013; Ewing Monroe & Orme, 2002) offer many benefits to students. They present "effective ways to help students assimilate the unique concepts and terms that they will encounter in mathematics" (Dunston & Tyminski, 2013, p. 44). Construction of such graphic organisers helps learners to structure information with reference to prior knowledge and encourages them to think about relationships (Dunston & Tyminski, 2013; Ewing Monroe & Orme, 2002). As do four-square model diagrams, construction of other graphic organisers aid understanding of the meaning of concepts, and may aid teachers to identify student misconceptions (Gay & White, 2002). Graphic organisers can be adapted for students at different levels, with careful thought given to the subject word and categories.

Other vocabulary introduction strategies have been advocated to aid students' understanding of mathematical concepts. They include concept maps, concept circles, word walls, and semantic feature analysis. Concept maps have been widely advocated for use in the space strand offering a means of depicting a diverse range of space concepts in an organised way (e.g., Anderson et al., 2008; Shield, 2004). Concept maps can be used in combination with written definitions to describe concepts (Shield, 2004).

Mathematical reference books and dictionaries are valuable tools when combined with other strategies to enhance conceptual understanding of mathematics vocabulary. For instance they can be used to improve on four-square model diagrams (e.g., Figure 1). Examples of mathematical reference books and dictionaries include handbooks such as the comprehensive *The Origo Handbook* (Anderson et al., 2008), or the *Primary maths handbook* (O'Brien and Purcell, 2013), and the online mathematics dictionary for children (Eather, 2011). Written by mathematics educators not mathematicians, *The Origo Handbook* is suitable for teachers, presenting mathematics terminology in accessible ways without the use of unnecessarily complex explanations. It includes diagrams, examples, and lists of mathematical symbols, abbreviations, formulae, and prefixes. *The Primary maths handbook* and the online Eather dictionary are attractive, colourful, and easy to read and navigate, hence are useful for primary and middle schooling. They contain definitions, and aid understanding through extensive use of illustrations, colour, examples, and exercises. The inclusion of diagrams and examples builds links between different ideas and representations, thereby providing more effective scaffolding of understanding than formal definitions. The fact that Eather (2011) is online makes it readily accessible to those who have access to the internet. Mathematical dictionaries are a better option than searching for mathematics words on the internet, since words are often used very differently in mathematics than in everyday language (Pierce & Fontaine, 2009). Important for Australian classrooms, Eather (2011), O'Brien and Purcell (2013), and Anderson et al. (2008) are Australian, following Australian use of mathematics terminology and spelling. Since understanding of language evolves, becoming more precise with use (Kotsopoulos, 2007), and since academic definitions can be unhelpful (Leung, 2005), Eather (2011) presents an option for introducing students to mathematical language, bearing in mind that such a resource needs to be viewed with a critical eye. This can be followed by use of more comprehensive

references such as *The Origo Handbook* (Anderson et al., 2008).

A combination of dialogue and use of four-square model diagrams and dictionaries can be used to scaffold understanding, as evident in the conversations followed by further activities about the concept *prime number* between a facilitator and preservice teacher below (see Quinnell, 2016).

Student
I can't think what a prime number is. Um, 1, 3, 5, 7, 9 ...? Odd numbers?

Facilitator
Is nine a prime?

Student
No, it can be divided by three.

Facilitator
Yep, so what's a prime?

Student
Numbers that can only be divided by themselves.

Facilitator
And one. Can be divided by one and themselves. So write down examples of primes.

Student
1, 2, 3, 5, 7, ... [written]

Facilitator
What do you see with the even numbers, how many are there?

Student
Only one, is there only one? Is there only one altogether?

Facilitator
Yes every other even number is divided [sic] by two as well as one and themselves. [The word divisible should have been used.] Is nine a prime?

Student
No

Facilitator
Eleven? … OK, put dot, dot, dot
[an indication that the list is infinite].

The student was then asked to give an informal definition for prime numbers:

Student
Numbers that can be divided by one and themselves [written].

As in the conversations in Zazkis, Liljedahl, and Sinclair (2009), through the communication process the student gradually constructed an expanded understanding of *prime number*, the dialogue aiding the student to formulate ideas, which were then internalised as internal thinking. The facilitator missed some opportunities to aid the student to expand her understanding and overlooked the student's inclusion of one in her list of primes. As advocated in Renne (2004), decisions need to be taken about what difficulties to address and when. The student's inclusion of 1 as a prime number would later be addressed when she referred to a mathematics dictionary. Notably, although verbal discourse about mathematical ideas can scaffold learning, the sudden turns in dialogue are difficult to script (Renne, 2004). Such conversations are reliant on deep conceptual understanding, on teachers' and students' ability to effectively articulate mathematical ideas, and on the adaptability of the teacher.

In a similar conversation, another student stated that a prime is "a number that can be divided by itself or one" and gave examples: "1, 3, 5, 7, 9 um …, 11 …". Notably, the number two was omitted, one was included, and the student was unsure whether nine was prime or not. Moreover the word or was used in her definition rather than and, an example of the need for precision in mathematical language. In mathematics, minor words such as or may change the meaning of a statement, an issue described by Zevenbergen (2004). Further questions would have been appropriate here to ascertain whether, the student's difficulties in describing the concept corresponded to an imperfect understanding of the concept.

Together with discussions, the use of representations, four-square model diagrams, and dictionaries have the potential to stimulate construction of understanding of terms such as *prime number*, clarifying that prime numbers exclude one and nine but include two. Descriptions in dictionaries or in peers' work may draw students' attention to the differences between their definitions and examples, and those given in the dictionary or in others' work. For instance, Eather (2011) stated that a prime is a number that has two factors, divisible by only itself and 1. Included are examples of prime numbers: 2, 3, 5, 7, 11... Such descriptions provide a means of identifying and correcting student misconceptions. Notably, the definition of prime should perhaps state that a prime number has exactly two factors, one and itself.

Educators advocate that concrete manipulatives then diagrams are employed to enhance understanding of concepts, prior to abstractions of a concept (e.g., Heath, 2010; Van de Walle, Karp, & Bay-Williams, 2010). Understanding of a term such as *prime number* can be scaffolded with counters. Prime numbers can only be represented by a straight line of counters, and not by a rectangle of counters (see Figure 2 below). The number 7, a prime number, can only be represented in a straight line having factors 1 and 7. On the other hand 12, a composite number, can be represented by a number of arrays and has factors 1, 2, 3, 4, 6, 12. This is an example of the power

of a representation to enhance understanding of mathematical concepts.

Alternatively, primes can be represented by starting with a mixture of prime and composite numbers and listing all the factors for each. This reveals the prime numbers, which have exactly two factors, and shows that one, which has only one factor, and nine, which has three factors, are not prime (see Table 2 below).

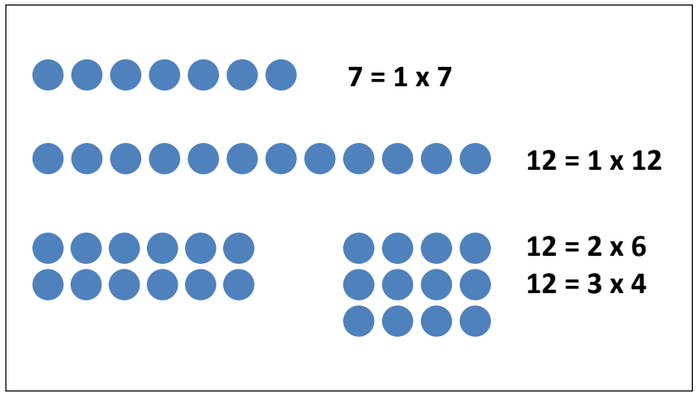

Figure 2 - *Representation of a prime number 7 and a composite number 12 with arrays of counters.*

Table 2
Identifying Prime and Composite Numbers by their Number of Factors

Number	Factors	Prime or Composite
1	1	Neither prime nor composite
2	1, 2	Prime
3	1, 3	Prime
4	1, 2, 4	Composite
5	1, 5	Prime
6	1, 2, 3, 6	Composite
7	1, 7	Prime
8	1, 2, 4, 8	Composite
9	1, 3, 9	Composite

Other strategies that can be used to deepen understanding of mathematical concepts include giving learners opportunities to read, write, and communicate in mathematics in order to aid learners to gradually move towards competently using, with a deep understanding, increasingly formal mathematical language. Unlocking understanding is a way of moving away from student difficulties such as learners misusing or forgetting formulas and procedures; for instance, multiplying the dimensions of a rectangle to calculate the perimeter, locating a median without first ordering the data values, or misinterpreting everyday text that refers to averages (see Brahier, 2009).

When carefully chosen, language strategies such as those discussed provide opportunities to stimulate mathematically oriented debate and discussion and to enhance learners' competencies to describe mathematical concepts concisely and accurately. Relevant activities and dialogue depend on a deep engagement with the subtle and precise meanings of mathematical language. With the use of varied representations, incorporation of written and verbal activities, and scaffolding from other students and teachers, students can be encouraged to collaboratively deepen their understanding of important mathematical language. Promoting such understanding is dependent on exposure to diverse learning experiences and contexts.

Conclusion

Enhancing understanding through a focus on language is crucial to aiding students to build a solid foundation of mathematical ideas. Students require opportunities to engage with written and verbal activities, to aid them to efficiently communicate about mathematical ideas. Such opportunities need to be provided by teachers who have a clear understanding of the literacy demands of mathematics.

Knowledge of strategies that can be used to subtly scaffold students' immature conceptual understanding of mathematical ideas is crucial for teachers, to enable them to scaffold understanding in the subject. Strategies such as those described incorporate verbal and written discourse, with an emphasis on the use of concrete materials, diagrams, descriptions, examples, and symbolic representations. Mathematical handbooks and dictionaries are useful resources in such activities.

Learners gradually develop an understanding of concepts by using and exploring the meanings and multiple meanings of words and symbols in many circumstances, enabling them to move towards more precise use and understanding of vocabulary and abstract concepts (Kotsopoulos, 2007; Zazkis et al., 2009). This aligns with the focus on understanding in the Australian Curriculum (Australian Curriculum, Assessment and Reporting Authority, 2018).

References

Anderson, J., Briner, A., Irons, C., Shield, M., Sparrow, L., & Steinle, V. (2008). *The Origo handbook of mathematics education*. QLD, Australia: Origo Education.

Australian Curriculum, Assessment and Reporting Authority. (2018). Australian Curriculum: Mathematics. Retrieved from https://www.australiancurriculum.edu.au/f-10-curriculum/mathematics/key-ideas/

Australian Institute for Teaching and School Leadership Limited. (2018). Australian Professional Standards for Teachers. Retrieved from https://www.aitsl.edu.au/teach/standards

Boulet, G. (2007). How does language impact the learning of mathematics? Let me count the ways. *Journal of Teaching and Learning, 5*(1), 1-12.

Brahier, D. J. (2009). *Teaching secondary and middle school mathematics* (3rd ed.). Boston, MA: Pearson Education.

Burns, M. (2007). *About teaching mathematics: A K–8 resource* (3rd ed.). Sausalito, CA: Math Solutions.

Chamberlin, M. (2009). Teachers' reflections on their mathematical learning experiences in a professional development course. *Mathematics Teacher Education and Development, 11*, 22-35.

Dunston, P. J., & Tyminski, A. M. (2013). What's the big deal about vocabulary? *Mathematics Teaching in the Middle School, 19*(1), 38-45.

Eather, J. (2018). A maths dictionary for kids. Retrieved from http://www.amathsdictionaryforkids.com/qr/qr.html

Ewing Monroe, E., & Orme, M. P. (2002). Developing mathematical vocabulary. *Preventing School Failure, 46*(3), 139-142.

Friedland, E. S., McMillen, S. E., & del Prado Hill, P. (2011). Collaborating to cross the mathematics-literacy divide: An annotated bibliography of literacy strategies for mathematics classrooms. *Journal of Adolescent & Adult Literacy, 55*(1), 57-66.

Gay, A. S. & White, S. H. (2002). Teaching vocabulary to communicate mathematically. *Middle School Journal, 34*(2), 33-38.

Gough, J. (2007). Conceptual complexity and apparent contradictions in mathematics language. *Australian Mathematics Teacher, 63*(2), 8-15.

Heath, B. (2010). What do the signs say? Learning to teach mathematics notation. *Australian Primary Mathematics Classroom, 15*(1), 29-32.

Kotsopoulos, D. (2007). Mathematics discourse: "It's like hearing a foreign language". *Mathematics Teacher Education and Development, 101*(4), 301-305.

Leung, C. (2005). Mathematical vocabulary: Fixers of knowledge or points of exploration? *Language and Education, 19*(2), 127-135. doi:10.1080/09500780508668668

Martiniello, M. (2008). Language and the performance of English-language learners in math word problems. *Harvard Educational Review, 72*(2), 332-367.

O'Brien, H., & Purcell, G. (2013). *Primary maths handbook* (4th ed.). Melbourne, VIC: Oxford University Press.

O'Halloran, K. L. (2005). Mathematical discourse: Language, symbolism and visual images. London, UK: Continuum.

Pierce, M. E., & Fontaine, L. M. (2009). Designing vocabulary instruction in mathematics. *Reading Teacher, 63*(3), 239-243. doi:10.1598/RT.63.3.7

Quinnell, L. (2016). *Literacy in mathematics in preservice education* (Doctoral dissertation, Queensland University of Technology, Brisbane). Available at https://eprints.qut.edu.au/view/types/qut=5Fthesis/2016.html#A _Q

Renne, C. G. (2004). Is a rectangle a square? Developing mathematical vocabulary and conceptual understanding. *Teaching Children Mathematics, 10*(5), 258-263.

Rubenstein, R. N. (2007). Focused strategies for middle-grades mathematics vocabulary development. *Mathematics Teaching in the Middle School, 13*(4), 200-207.

Shield, M. (2004). Formal definitions in mathematics. *Australian Mathematics Teacher, 60*(4), 25-28.

Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2010). *Elementary and middle school mathematics* (7th ed.). Boston, MA: Pearson Education.

Zazkis, R., Liljedahl, P., & Sinclair, N. (2009). Lesson plays: Planning teaching versus teaching planning. *For the Learning of Mathematics, 29*(1), 40-47. Retrieved from

Zevenbergen, R. (2004). Study groups as a tool for enhancing preservice students' content knowledge. *Mathematics Teacher Education and Development, 6*, 4-22.

Addressing Sexual Assault through Comprehensive Sexuality and Relationships Education

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Abstract

One in five women experience some form of sexual violence in their lifetime, while almost a quarter of sexually active high school students in Australia report at least one experience of unwanted sex. The evidence base suggests that more work needs to be done to reduce the rates of sexual violence, especially amongst young people, with recommendations proposing that the development of healthy, respectful and egalitarian gender relationships and identities during adolescence is likely to reduce the risk of sexual violence in the short term, and increase the likelihood of respectful relationships into adulthood as well.

Schools are uniquely placed to support and/or facilitate sexual assault prevention efforts which (among other strategies) should involve robust and pragmatic discussions about pornography, gender and power, consent and coercion, and safe and respectful relationships.

This paper explores an innovative and evidence-based approach to sexual assault prevention amongst middle school students, which is informed by current best practice guidelines for comprehensive sexuality and relationships education.

One in five women experience some form of sexual violence in their lifetime (Australian Bureau of Statistics, 2014), with girls aged between 15 and 19 most at risk (Webster et al., 2014). Indeed, a quarter of sexually active high school students in Australia, across years 10 to 12, report at least one experience of unwanted sex (Mitchell et al., 2014). Similarly, research reveals that 1 in 7 teenage girls have experienced at least one incident of attempted forced sexual intercourse at the hands of a boyfriend (National Crime Prevention and Partnerships Against Domestic Violence, 2001).

Perpetration of Sexual Violence among Young People

Young age is a risk factor for both male perpetration and female victimisation of sexual assault, with research identifying that sexually violent behaviour is commonly initiated in adolescence (Abbey & McAuslan, 2004; Fulu et al., 2013). More than 40% of sexual assault survivors will experience their first completed rape before the age of 17 (Black et al., 2011). Perpetration of sexual violence in adolescence may also be indicative of perpetration in adulthood as well (Greathouse et al., 2015; Haberland & Rogow, 2015; Lundgren & Amin, 2015). Furthermore, results from the most recent National Survey of Community Attitudes towards Violence Against Women revealed young people are more inclined that older Australians to hold gender based violence-tolerant views, with young men demonstrating the highest level of attitudinal support for violence against women (Webster et al., 2014). Specifically, young men aged between 16 and 24 years were the most likely cohort to excuse, justify, minimise, or trivialise violence perpetrated against a woman, and/or hold a woman (partly) responsible for violence perpetrated against her (Webster et al., 2014).

The evidence base suggests that in order to reduce the rates of sexual coercion, more education is needed targeting young people aged 10 to 14 years (Chandra-Mouli et al., 2015). Recommendations further propose that the development of healthy, respectful and egalitarian gender relationships and identities during adolescence is likely to reduce the risk of sexual violence in the short term, and increase the likelihood of respectful relationships throughout adulthood as well (Brannon, 2011; Chandra-Mouli et al., 2015; Lundgren & Amin, 2015). One Australian report shows that teens want sex education to include information about consent and coercion (Johnson et al., 2016). Additional research reveals that quality sexuality education at the secondary level has several demonstrable positive outcomes, including reduced rates of coerced sexual activity and sexual assault amongst young people (Bachus et al., 2010; Kirby, 2011; UNESCO, 2018; Walsh, 2015).

Schools can play a fundamental role in sexual assault prevention efforts (Crabbe & Corlett, 2013; Department of Education and Training, 2014; Our Watch, 2015). This simply requires the appropriate personnel to confidently and competently facilitate conversations about pornography, gender and power, consent and coercion, and safe and respectful relationships. Such stipulations are consistent with current best practice guidelines for the delivery of school-based comprehensive sexuality and relationships education (Australian Association of Adolescent Health, 2018; Pound et al., 2017; UNESCO, 2015), as well as findings from a systematic review of primary prevention strategies for sexual violence perpetration (DuGue et al., 2014).

Comprehensive Sexuality and Relationships Education

Contemporary notions of sexual health are less concerned with sex-related 'dysfunction' and/or the mere presence or absence of sexually transmissible infections (STIs). Instead, contemporary notions of sexual health concentrate more on sexual wellbeing, including "…pleasurable and safe sexual experiences, free of coercion, discrimination and violence" (World Health Organization, 2006). Accordingly, there is increasing pressure on schools to incorporate the teaching of 'respectful relationships' within school-based curricula (Australian Association of Adolescent Health, 2018; Crabbe & Corlett, 2013; Johnson et al., 2016; Our Watch, 2015; UNESCO, 2018).

Comprehensive sexuality and relationships education (SRE) is considered an "age-appropriate, culturally relevant approach to teaching … by providing scientifically accurate, realistic, non-judgmental information" (UNESCO, 2015). The fundamental objective of comprehensive SRE is to provide young people with opportunities to broaden their life skills and to develop the necessary knowledge to make conscious, healthy, and respectful choices about relationships and sexuality. Comprehensive SRE has the capacity to significantly improve the sexual health outcomes of young people, including delayed onset of first sexual experience, reduced rates of STIs, and reduced rates of unplanned pregnancies (Kirby, 2011; Pound et al., 2017; UNESCO, 2018). However, what is seemingly less recognised is that comprehensive SRE can contribute to other sexual health outcomes for young people including reduced rates of coerced sexual activity and increased capacity to actively negotiate consensual sexual interactions (Bachus et al., 2010; Foshee et al., 2012; Our Watch, 2015; Pound et al., 2017; UNESCO, 2015).

In a recent review of systematic

reviews and meta-analyses of school-based sexual health interventions, Pound and her colleagues (2017) noted that the development and implementation of SRE benefits from the involvement of a spectrum of stakeholders, including schools, students, parents, sexual health/support agencies, researchers, and external experts in human sexuality. Furthermore, current best practice guidelines for school-based SRE stipulate that programs of this nature be age-appropriate, commencing in primary school and continuing throughout the period of compulsory schooling. They should also be delivered from a non-judgmental and sex positive approach (Pound et al., 2017; UNESCO, 2015). Information should be scientifically and factually accurate, with discussion of topics such as sexual and gender diversity, pornography, sexting and social media, pleasure, gender stereotypes and gender inequalities, emotions and relationships, sexual and reproductive health, sexual health literacy, and safe and respectful relationships (AAAH, 2018; Allen, 2007; Baker, 2016; Dobson & Ringrose, 2016; Gegenfurtner & Gebhardt, 2017; Johnson et al., 2016; Ollis & Harrison, 2016; Ullman, 2017). Importantly, the evidence base further stipulates that comprehensive SRE includes teaching on consent, coercion, and sexual violence (Family Planning Alliance Australia, 2016; Kerney et al., 2016; Our Watch, 2015; Pound et al., 2017; UNESCO, 2015).

Sexual Assault Prevention Strategies

In relation to sexual violence prevention, DuGue and her colleagues (2014) conducted a systematic review of primary prevention strategies for sexual violence perpetration programs, with many of the findings supported by earlier evidence (Small, Cooney & O'Connor, 2009). Specifically, ten (10) of these studies were conducted in Middle School settings. Results revealed mixed findings, with many of the studies reviewed providing insufficient evidence to adequately assess the effectiveness of the intervention for preventing sexual violence. Some studies demonstrated no effect on sexual violence perpetration, while other studies (within the Middle School context) revealed decreases in sexual dating violence perpetration, as well as decreases in perpetration of sexual harassment and peer sexual violence (Foshee et al., 2012; Taylor et al., 2010a; Taylor et al., 2010b; Taylor et al., 2013). Accordingly, DeGue and her colleagues (2014) identified the following characteristics for best practice sexual violence prevention programs:

- Comprehensive: Prevention strategies should include multiple intervention components in addition to individual attitudes and knowledge, including peer attitudes, social norms, organisational climate and policies, community interventions, educational or skills-building curricula, and awareness campaigns.
- Appropriately-timed: Most programs have focused on university-aged young people which may, arguably, be too late for the prevention of many incidents of sexual violence. DeGue and her colleagues (2014) argue that prevention initiatives should be implemented before many incidents of youth sexual violence occur, i.e. within the school setting. A recent review of intimate partner violence prevention strategies (Whitaker et al., 2013) also suggests that adolescence may represent the most critical window for intervention strategies.
- Varied teaching methods: Prevention programs appear most effective when they include interactive instruction and opportunities for active, skills-based learning, including role playing, skills practice and other group activities.
- Sufficient dosage: Longer programs may be more likely to achieve enduring results. Behaviours as complex as sexual violence will likely require a higher program dosage to change behaviour, in both the immediate and longer terms.
- Fosters positive relationships: Include additional relationship-based program elements, including peer support programs and active bystander empowerment.
- Socio-cultural relevance: Programs that are sensitive to, and reflective of, community norms and cultural beliefs achieve better results in relation to participant recruitment and retention, and are more likely to achieve desired program outcomes.
- Well-trained staff: Further training and implementation research is needed to determine characteristics of program staff that may enhance the preventative effects of sexual assault prevention programs, however, it has been demonstrated that facilitators who are competent in their knowledge and delivery are better able to connect effectively with participants.
- Theory-driven: Cognitive factors, including misogyny or hostility toward women, adherence to traditional gender roles, and hyper- or toxic-masculinity, have shown consistent links to sexual violence perpetration (Tharp et al., 2013) but are rarely addressed directly in prevention programs, the authors argue (DuGue et al., 2014). More research is needed to ascertain confidently whether these components are effective pieces of the sexual violence prevention puzzle.

Conclusion

With the onset of sexual violence commonly occurring in adolescence, schools are supremely placed to be actively involved in the development and implementation of sexual assault prevention initiatives. Such initiatives should be informed by the principles of comprehensive sexuality and relationships education, with a prominent focus on the characteristics for best practice prevention of sexual violence. Much practical and empirical work has already been done. Schools can no longer ignore their duty of care in the context of sexual assault prevention.

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References

Abbey, A., & McAuslan, P. (2004). A longitudinal examination of male college students' perpetration of sexual assault. *Journal of Consulting and Clinical Psychology, 72*(5):747.

Allen, L. (2007). 'Pleasurable pedagogy': Young people's ideas about teaching 'pleasure' in sexuality education. *Twenty-First Century Society, 2*(3), 249-264.

Australian Association for Adolescent Health Ltd. (2018). Comprehensive Sexuality Education in Schools: Position Paper. Australian Association for Adolescent Health, Australia.

Australian Bureau of Statistics. (2014). Sexual Assault. Viewed August 2017. Available at: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4510.0~2014~Main%20Features~Sexual%20Assault~10

Bachus, L., Martens, M., & van der Sluis, M. (2010). *An impact and process evaluation of two Dutch sexuality education programmes for 10 – 12 year olds in primary school. "Relationships and Sexuality" and Comfortable in your skin"*. Amsterdam, Rescon.

Baker, K.E. (2016). Online pornography - Should schools be teaching young people about the risks? An exploration of the views of young people and teaching professionals. *Sex Education, 16*(2), 213-228.

Black, M.C., Basile, K.C., Breiding, M.J., Smith, S.G., Walters, M.L., Merrick, M.T., et al. (2011). *National intimate partner and sexual violence survey*. Atlanta, GA: CDC. Centers for Disease Control and Prevention.

Brannon, L. (2011). *Gender: Psychological Perspectives*, (6th ed.), Boston, MA: Pearson.

Chandra-Mouli, V., Svanemyr, J., Amin, A., Fogstad, H., Say, L., Girard, F., & Temmerman, M. (2015). Twenty Years after International Conference on Population and Development: Where are we with Adolescent Sexual and Reproductive Health Rights? *Journal of Adolescent Health, 56*, S1 – 6.

Crabbe, M., & Corlett, D. (Directors). (2013). *Love and sex in an age of pornography*. Australia: Rendered Visible and Looking Glass Pictures.

DeGue, S., Valle, L.A., Holt, M.K., Massetti, G.M., Matjasko, J.L., & Tharp, A.T. (2014). A systematic review of primary prevention strategies for sexual violence perpetration. *Aggression and Violent Behaviour, 19*, 346 – 362.

Department of Education and Training. (2014). *Building Respectful Relationships: Stepping out against Gender Based Violence*. Melbourne, Department of Education and Training.

Dobson, A.S. and Ringrose, J. (2016). Sext Education: Pedagogies of Sex, Gender and Shame in the Schoolyards of "Tagged" and "Exposed". Sex Education: *Sexuality, Society and Learning, 16*(1), 8-21.

Foshee, V.A., McNaughton Reyes, H.L., Ennett, S.T., Cance, J.D., Bauman, K.E., & Bowling, J.M. (2012). Assessing the effects of families for safe dates, a family-based teen dating abuse prevention program. *Journal of Adolescent Health, 51*(4), 349–356.

Fulu, E., Warner, X., Miedeme, S., Jewkes, R., Roselli, T., & Lang, J. (2013). *'Why Do Some Men Use Violence Against Women and How Can we Prevent It? Quantitative findings from the United Nations Multi-country study on men and violence in the Asia-Pacific'*. Partners for Prevention. A UNDP, UNFPA, UN Women and UNV regional joint programme for gender-based violence prevention in Asia and the Pacific. Bangkok.

Gegenfurtner, A. & Gebhardt, M. (2017). Sexuality education including lesbian, gay, bisexual, and transgender (LGBT) issues in schools. *Educational Research Review, 22*, 215-222.

Family Planning Alliance Australia (2016). *Relationships and Sexuality Education in Schools: Position Statement*. Family Planning Alliance Australia, Australia.

References *(cont'd)*

Greathouse, S., Saunders, J., Matthews, M., Keller, K., & Miller, M. (2015). *A review of the literature on sexual assault perpetrator characteristics and behaviors*. Research report, the RAND Corporation, Santa Monica, Calif.

Haberland, N. & Rogow, D. (2015). Sexuality education: Emerging trends in evidence and practice. *Journal of Adolescent Health, 56*, S15 – 21.

Johnson, B., Harrison, L., Ollis, D., Flentje, J., Arnold, P., & Bartholomaeus, C. (2016). *'It's not all about sex': Young people's views about sexuality and relationships education*. Report of Stage 1 of the Engaging Young People in Sexuality Education Research Project. Adelaide: University of South Australia.

Kearney, S., Leung, L., Joyce, A., Ollis, D. & Green, C. (2016). Applying systems theory to the evaluation of a whole school approach to violence prevention. *Health Promotion Journal of Australia, 27*, 230-235.

Kirby, D. (2011). *The impact of sex education on the sexual behaviour of young people*. Population Diversion Expert Paper, Np. 2011/12, United Nations Department of Economic and Social Affairs, New York, NY.

Lundgren, R & Amin, A. (2015). Addressing intimate partner violence and sexual violence among adolescents: Emerging evidence of effectiveness. *Journal of Adolescent Health, 56*, S42 – 50.

Mitchell, A., Patrick, K., Heywood, W., Blackman, P., & Pitts, M. (2014). *National Survey of Australian Secondary School Students and Sexual Health*. Australian Research Centre in Sex, Health and Society, La Trobe University, Melbourne, Australia.

National Crime Prevention. & Partnerships Against Domestic Violence. (2001). *Young people and domestic violence: national research on young people's attitudes to and experiences of domestic violence*. Barton, ACT: Attorney-General's Department. Available at: http://www.crimeprevention.gov.au

Ollis, D. & Harrison, L. (2016). Lessons in building capacity in sexuality education using the health promoting school framework: from planning to implementation. *Health Education, 116*(2), 138-153.

Pound, P., Denford, S., Shucksmith, J., Tanton, C., Johnson, A., Owen, J., Hutton, R., Mohan, L., Bonell, C., Abraham, C., & Campbell, R. (2017). What is best practice in sex and relationship education? A synthesis of evidence, including stakeholders' views. *BMJ Open 2017; 7:e014791*. doi: 10.136/bmjopen-2016-014791.

Powell A (2010). *Sex, power, and consent: Youth culture and the unwritten rules*. Cambridge University Press, New York, NY.

Small, S.A., Cooney, S.M., & O'Connor, C. (2009). Evidence-informed program improvement: using principles of effectiveness to enhance the quality and impact of family-based prevention programs. *Family Relations, 58*(1), 1–13.

Taylor, B., Stein, N. & Burden, F. (2010a). The effects of gender violence/harassment prevention programming in middle schools: a randomized experimental evaluation. *Violence and Victims, 25*(2), 202– 223.

Taylor, B.G., Stein, N. & Burden, F.F. (2010b). Exploring gender differences in dating violence/harassment prevention programming in middle schools: results from a randomized experiment. *Journal of Experimental Criminology, 6*(4), 419–445.

Taylor, B.G., Stein, N.D., Mumford, E.A. & Woods, D. (2013). Shifting boundaries: an experimental evaluation of a dating violence prevention program in middle schools. *Prevention Science, 14*(1), 64–76.

Tharp, A.T., DeGue, S., Valle, L.A., Brookmeyer, K.A., Massetti, G.M. & Matjasko, J.L. (2013). A systematic qualitative review of risk and protective factors for sexual violence perpetration. *Trauma, Violence & Abuse, 14*(2):133–167

The United Nations Educational, Scientific, and Cultural Organization (UNESCO). (2015). *Emerging Evidence, Lessons and Practice in Comprehensive Sexuality Education. A Global Review*. Paris, France. Available at: https://www.unfpa.org/sites/default/files/pub-pdf/CSE_Global_Review_2015.pdf

Ullman, J. (2017). Teacher positivity towards gender diversity: Exploring relationships and school outcomes for transgender and gender-diverse students. *Sex Education, 17*(3), 276-289.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2018). *International Technical Guidance on Sexuality Education: An evidence-informed approach*, revised edition. Paris, France: UNESCO. Available at: http://unesdoc.unesco.org/images/0026/002607/260770e.pdf

Our Watch. (2015). *Evidence Paper: Respectful Relationships Education in Schools*. Our Watch. Melbourne, Australia.

Walsh, J., (2015). *Talk soon. Talk Often. A guide for parents talking to their kids about sex*. Government of Western Australia, Department of Health. ISBN 978-1-921841-01-9. Available at: http://www.healthywa.wa.gov.au/~/media/Files/HealthyWA/Original/Sexual-health/TSTO_V2.ashx

Webster, K., Pennay, P., Bricknall, R., Diermer, K., Flood, M., Powell, A., Politoff, V. & Ward, A. (2014). *Australians' attitudes to violence against women: Findings from the 2013 National Community Attitudes towards Violence Against Women Survey (NCAS)*. Victorian Health Promotion Foundation, Melbourne, Australia.

Whitaker, D.J., Murphy, C.M., Eckhardt, C.I., Hodges, A.E., Cowart, M. (2013). Effectiveness of primary prevention efforts for intimate partner violence. *Partner Abuse, 4*(2):175–195.

World Health Organization (WHO). (2006). *Defining sexual health. Report of a technical consultation on sexual health*. Geneva: WHO.

Taking it a step further... Resilience Plus (+)

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Resilience

Resilience is our ability to respond to disruptive life events and stressors. It is an essential skill for adolescents, and is useful throughout our entire lives. Our resilience is largely determined by personal skills such as emotional self-regulation and our social connections (MindMatters, n.d.). It can be defined as: "The capacity to recover quickly from difficulties; toughness; the ability of a substance or object to spring back into shape; elasticity" (Oxford Dictionary, 2018). Functioning well in our lives involves the ability to overcome difficulties, to take risks and to connect to other people.

Psychological resilience is the ability to successfully cope with a crisis and to return to pre-crisis status quickly (de Terte & Stephens, 2014). Resilience exists when the person uses "mental processes and behaviours in protecting themself from the potential negative effects of stressors" (Robertson et. al., 2015, p534). It allows us to remain calm during crises/chaos and to move on from the incident without long-term negative consequences. As humans, we utilise this evolutionary advantage to manage normal stressors in our lives. Those who possess resilience are likely to develop faster and be happier than those who bounce back from adversity more slowly.

Resilience allows us to cope with and adapt to new situations. Having a sense of resilience and positive wellbeing enables a person to approach other people and situations with confidence and optimism, which is especially important for young people given the enormous changes that occur with the transition into adolescence and adulthood (ReachOut, 2018).

However, is it possible to do more than just spring back into shape? Is it possible to positively adapt through certain disruptions in our lives?

Taking it a step further- Resilience Plus (+)

Resilience Plus recognises that there are times when we rebound from adversity as a strengthened and more resourceful person. The difficulty actually strengthens us.

Resilience is a process of positive adaptation that is developed as we "experience small exposures to adversity or some sort of age appropriate challenges" (Yates, Egeland & Sroufe 2003, p244). I call this process of adaptive change and growth in our lives "resilience plus"- reminding us that in some situations, rather than simply bounce back (to where we were), it may be possible to bounce forward, as we learn, adapt and become better.

A similar thing happens when we go to the gym. Our muscles fibres actually break a little. Then, when we recover, our muscles are able to adapt and become stronger than they were before. Vaccinations use the same logic- injecting a person with a mild strain of a disease in order to become immune from the disease. There may be some merit in the saying- "what doesn't kill us makes us stronger".

Researchers use the term "post traumatic growth", to describe the transformation that can occur in people's lives after traumatic events. These events can lead to positive adjustments in our perspective, attitude and behaviours (Tedeshi & Calhoun, 2004).

Resilience plus is different to post traumatic growth, in that resilience plus refers to bouncing back from small to medium difficulties that

are inevitable in our lives, rather than life altering circumstances. However, I suggest that a similar process of positive adaptation can occur through the moderately difficult times of our lives.

So it may be quite helpful for our children to lose at pass the parcel or musical chairs – not everyone wins a prize in all aspects of life. Michael Jordan famously said "I've failed over and over again in my life - and that is why I've succeeded." It's not that he succeeded despite lots of failure- he succeeded because of it- because of what he learned from it, because he changed as a result. He didn't just put it behind him and forget about it. He stood on top of it. That's resilience plus.

How can we help to cultivate resilience plus in the lives of our students?

The good old days and the modern world

Dr Tim Elmore shares some brilliant thoughts on this, in an article entitled "How adults reduce grit in kids".

He notices that, when our parents grew up:

- Life was slower, with less technology and on-demand conveniences.
- Life was harder, with more manual labour jobs and do-it-yourself lifestyles.
- Life was more boring, with fewer screens and activities to entertain you.
- Life was quieter, without social media pinging at you night and day.

While these realities may sound depressing, they actually nourished grit in people's lives. With less glitz, glamour, noise and clutter, people stuck with something longer, even when the novelty wore off. There wasn't an expectation to be entertained; that everything would be fun or fast; or that that someone else would do the work we had been assigned.

Today's culture of speed and convenience frequently has led to a "Google Reflex", where we assume we can click and find answers in seconds. We don't have to memorise as much. We don't have to wait as much. We don't have to work as hard as we once did. We don't have to search as long.

But I'd like to focus here on the considerations for educators with big hearts who do want to help students be prepared for the inevitable challenges in their lives.

Considerations for educators

1. The more we do for children, the less they learn to do for themselves.
2. The easier life is for children, the less able they are to cope when challenges arise.
3. The faster solutions come, the less time children tend to take time searching for answers.
4. The more resources we give children, the less resourceful they become.

Helping by not helping

Resilience is not a trait that some people simply possess and others do not. There is no such thing as an 'invulnerable child' who can overcome any setback that they encounter in life. However, resilience is quite common. Masten (2001, p227) refers to the "ordinariness of resilience," explaining that resilience is made of ordinary, rather than extraordinary, processes. This offers a more positive outlook on human development and adaptation. In particular, it overturns assumptions that children growing up with adversity will be worse off. That's not necessarily the case.

I think it helps if children don't have to learn these lessons later in life with the bigger things. (If they think everyone wins a prize in pass the parcel, how will they cope when they don't pass the test? How will they cope when they don't get the job? When they get dumped? When they miss out on their driver's licence?)

Parents and teachers are helpers – we want to help our children and students. But sometimes that gets in the way of our children being able to experience the "small exposures to adversity" that they need. The ideas of lawn mower parenting and helicopter parenting are well known. I think even as teachers, we should reflect on our willingness to "swoop in" to help and should instead consider allowing small mistakes, adversity and setbacks for children. Resilience is, after all a dynamic two-way process between a person and their environment. We should consider "helping by not helping."

I have a confession to make – I, like many of you, admit to being both a parent and a teacher, so I am as guilty as anyone in this regard – I love to help. Although I have noticed that when I am able to sit back and watch a student (or our own children) struggle to find the path (and then work it out), it is quite rewarding. Furthermore, this has been found to give children a sense of personal pride and self-worth (Steven & Wolin, 2010).

Keep in mind that the adversity should be developmentally appropriate, as children do better when not exposed to high levels of risk or adversity. So if they can struggle and meet the challenge, great – help by not helping. But it is recommended that we don't stand back while children struggle with no pathway forward.

The point is that because many young people seem fragile and ready to give up at the first sign of setback, we tend to rescue them. As well as helping those in their time of greatest need, I suggest we focus on proactively equipping all students with tools to ride out challenges and manage their wellbeing. We need to build resilience before the stressful events- like building immunity to a disease with a vaccination. That's why wellbeing practices are so important. So what skills do they need?

The ingredients of resilience

The American Psychological Association (2014) suggests '10 Ways to Build Resilience', which are:

1. to maintain good relationships with close family members, friends and others
2. to avoid seeing crises or stressful events as unbearable problems
3. to accept circumstances that cannot be changed
4. to develop realistic goals and move towards them
5. to take decisive actions in adverse situations
6. to look for opportunities of self-discovery after a struggle with loss
7. to develop self-confidence
8. to keep a long-term perspective and consider the stressful event in a broader context
9. to maintain a hopeful outlook, expecting good things and visualising what is wished
10. to take care of one's mind and body, exercising regularly, paying attention to one's own needs and feelings

Contrary to what we might think, resilient people don't go it alone when bad things happen – they talk to the people who care about them and ask for help. While some individuals may be more inclined to have more of the list of resilient behaviours and attitudes, everything on the list can be increased.

These elements are targeted through the toolkit we provide through our incursions for students. For more ways to build resilience and wellbeing with staff and students at your school, **access our Personal Wellbeing Practices here**

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References

American Psychological Association (2014.) Ten Ways to Build Resilience https://www.apa.org/helpcenter/road-resilience.aspx

de Terte, I., Stephens, C. (2014). Psychological resilience of workers in high-risk occupations. *Stress and Health. 30* (5): 353–355. doi:10.1002/smi.2627.

Masten, A. S. (2014). Ordinary magic: Resilience in development. New York, NY: Guilford Press.

MindMmatters (n.d.) – Module 1.3 p6 – https://www.mindmatters.edu.au/docs/default- source/learning – module-documents/mm_module1_3-protectiveriskfactors.pdf?sfvrsn=2

Oxford Dictionary (2018). https://www.oxforddictionaries.com/

ReachOut (2018). Wellbeing and Resilience https://au.reachout.com/articles/wellbeing – and-resilience

Robertson, I.T., Cooper, C.L., Sarkar, M. & Curran, T. (2015). Resilience training in the workplace from 2003 to 2014: A systematic review. *Journal of Occupational and Organizational Psychology. 88* (3): 533–562. doi:10.1111/joop.12120.

Tedeshi, R.G., & Calhoun, L.G. (2004). Posttraumatic growth: Conceptual foundation and empirical evidence. Philadelphia, PA: Lawrence Erlbaum Associates.

Yates, T.M., Egeland, B., & Sroufe, L.A. (2003). Rethinking resilience: A developmental process perspective. pp. 234–256 in S. S. Luthar (Ed.), Resilience and vulnerability: *Adaptation in the context of childhood adversities*. New York: Cambridge University Press.

PEER FEEDBACK: THE BASICS

Strategies and Practices to Develop Peer Feedback in Your Classroom

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Abstract

Students today need to develop self-reliance and efficacy. Peer Feedback allows students to gain ownership over the development of their work, while also fostering a collaborative climate within classrooms. This article outlines simple strategies teachers can employ to develop this feedback technique into their classrooms.

Peer Feedback: The Beginnings

Overview and Introduction

Peer Feedback builds on the ideal that *"every student has the potential to be an expert"* (Sackstein, 2017, p. 11).

Essentially, *"by giving students the responsibility to share their expertise with one another, we are engaging them in the highest level of learning: asking them to teach"* (Sackstein, 2017, p. 11).

This article aims to help teachers foster a culture of peer feedback within their classrooms, using the work of Starr Sackstein (2017), Robert Marzano (2007; 2017) and John Hattie (2007). The strategies will allow teachers to adjust their current practices so that students are empowered to be independent and self-efficient, while also cultivating a collaborative classroom. *"This shift isn't necessarily easy or instantaneous"* (Sackstein, 2017, p. 12), but will give time back to teachers so that they are able to work with students to progress their learning and enhance student growth. As in the development of all skills, teachers need to model, scaffold and explicitly teach students how to provide feedback and be critical analysts of information.

"To create a classroom of experts, you'll need to instil qualities of independence and self-advocacy in your students, a cumulative process that takes time to yield results" (Sackstein, 2017p. 12), highlighting the beginning of the year as the optimal time to develop this classroom practice. These strategies are easily incorporated into any subject discipline and adaptable to age and ability.

> *"...empowering students as experts means that they gain some control of their learning..."*
>
> *(Sackstein, 2017;12).*

The Steps...

Step 1: Building Rapport and Respect

From the beginning, make it a priority to develop a rapport with and among students. *"Developing a respectful classroom culture isn't about warm and fuzzy experiences"* (Sackstein, 2017, p. 19), it is about cultivating a culture where students are able to provide constructive criticisms to enhance peer learning while also developing resilience to have their work judged by peers. *"Teachers need to safeguard student pride and ensure that the classroom is as free of negative judgement as possible"* (Sackstein, 2017, p. 19).

An approach is to see the feedback process through Sackstein's (2017) idea of *'Failing Forward'*. This approach sees mistakes as opportunities for growth rather than as close-ended failures. Through this, there is an increase in students' engagement and awareness of their strengths and challenges. *'Failing Forward'* Sackstein (2017, p. 12) believes, *"opens endless opportunities for students and teachers alike to grow"*.

Step 2: Celebrating Success and Failure

"For real learning to happen, failure must not be feared but embraced – reframe failure as opportunity, students feel free to take the big risks that can accelerate progress and growth" (Sackstein, 2017, p. 24).

Teachers should establish class routines and practices that allow this celebration and build towards students being efficient at providing peer feedback. Feedback is most important after students engage in new material. Timely feedback means that there is still time for the student to act upon the feedback and improve. Hattie and Timperley (2007) go further highlighting that novice students need immediate feedback, which acts to:

- Highlight what is *right and wrong*, or *good and bad* about **their work**
- Helps students to see **how they can improve**

(Killan, 2015).

To provide immediate feedback, that also celebrates success and failure as students engage with new content, is using *I Noticed… and I Wondered statements*. Here, students engage with a peer's work and provide two statements of focused feedback to their peer.

> ***I noticed statements =*** A Positive/Strength about the peer's learning.
>
> ***I wondered statements =*** A suggestion for enhancement.

Through these statements, each student can celebrate a success, regardless of how small, while also receiving a strategy for improvement. It is important that students did not simply point out a weakness or error in the work, instead they should provide a suggestion for how this error or weakness can be overcome.

These feedback statements can be written directly into the peer's book, worksheet or onto a post-it note, but need to have a specific skill (or learning goal) to focus their feedback. Students can move around looking at a range of peer work, providing multiple feedback statements. This extends the scope of the feedback a student receives and exposure to different levels of responses.

Other Routine Strategies Include:

- **Encourage students to give the wrong answer** (Sackstein, 2017, p. 25). If discussion is stifled or students are reluctant to voluntarily provide answers in class, ask them to tell you the wrong answer. While this does have the possibility to quickly escalate out of control, if you have created respectful classroom spaces students know their boundaries and you can work within these easily. From this, students are able to show some understanding by providing the wrong answers and can build on to provide the correct ones.
- **Fist to Five** (Jones, 2018) This is the simplest way to receive feedback about student perception of understanding and the easiest to implement. The only equipment required is the student's hand. Fist is equivalent to no understanding of the concepts through to five fingers symbolising that the student is confident with their understanding of the concepts.
- **Traffic Lights** (Education Services Australia) Students would highlight in **green to represent success** in relation to the skill, task requirement or focus learning goal. The **amber represents where improvement is needed**. This strategy is most effective through the drafting or learning process, so that students can act on the feedback immediately. This can also be completed using coloured Post-it notes.

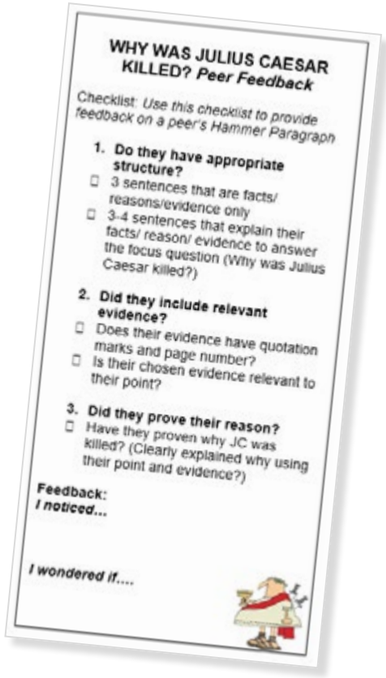
Step 3: Ingredients to Success - Checklists

Many of us already use Checklists to help guide student learning and build student responses. These are a very effective means for students to provide clear feedback to their peers. The use of checklists in aiding and directing peer feedback allows students at all levels to engage in the process and provide meaningful feedback.

Checklists have additional advantages:

- ✓ Clear description scaffolding the requirements of a response or of learning
- ✓ Quickly direct and focus student feedback
- ✓ Enable students at all levels to provide meaningful feedback
- ✓ Allow lower level students to see the *Ingredients to Success*
- ✓ Instantly provide students with the information they need to enhance and improve their work – a major component in meaningful feedback

When using checklists for feedback, students should also provide the i noticed and i wondered statements. This brings meaning and extends the feedback to show not just errors but strategies to improvement.



Step 4: Success Criteria

"The learning intention of a lesson or series of lessons tells students what they should know, understand and be able to do, and ***the success criteria help teachers to decide whether their students have in fact achieved the learning intention****"* (Marzano Research, 2019).

Success Criteria can be teacher-created initially and gradually become student created. This gives students ownership over their learning and demonstrates their understanding of the task, its requirements and their response.

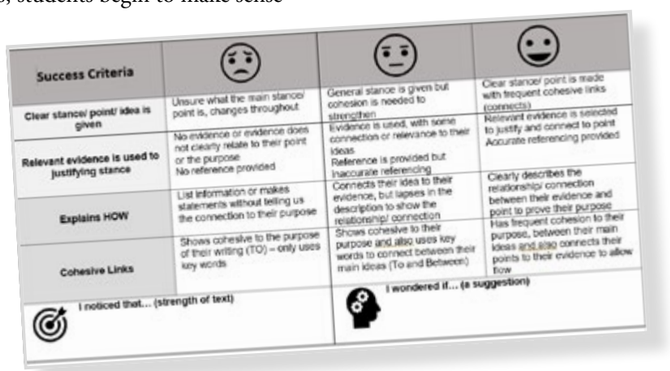
Furthermore, the success criteria should draw from the core skills and understandings within your lessons and units. The language used in success criteria should mimic the language within your criteria and rubrics, to help build student vocabulary and assist in their understanding of how they will be judged and assessed. From this, students begin to make sense of their marking criteria and learn how to have greater self-efficacy in judging their own work against the task criteria.

Success criteria, like proficiency scales, allow students to clearly and easily track their progress along their learning journey. Students can physically see their growth across the different criteria, while also clearly seeing how to move forward. The criteria must move the students towards achieving the learning goal by providing the how and where to next.

Building success criteria from checklists allow for deeper feedback to be provided. Use these to have students analyse and evaluate an example/ modelled response.

When the teacher is providing drafting or feedback on specific responses, use the same success criteria as the students. Multiple exposure will allow students to become more familiar with the process, creating deeper engagement and meaning for them.

Students should gain peer feedback on their response, especially during drafting phases, throughout the entire process before submitting a response to the teacher. Asking students to include the peer feedback success criteria will allow students and the teachers to see the development, progression and enhancement of the student work.



Teacher Strategies in the Classroom During Assessment Phases:

Response Boards (Marzano Research, 2019)
Students write their responses to a posed question (relevant to learning goal and/ or assessment focus) on a small whiteboard or piece of paper they can hold in the air. The teacher can then scan the class to quickly see student understanding. By obtaining data of the proportion of students who understand the concepts, teachers can gain immediate feedback of any misunderstandings or errors.

Quizzes
Quizzes as a starter activity or as a Microsoft Form, allows teachers to assess student understanding and gain data on the class understanding. Microsoft Forms can be used for short response or multi-choice questions. The results are graphed so teachers can clearly see where weaknesses in class understandings exist, while providing visual feedback for the class.

Entry and/ or Exit Cards
(Marzano, 2007)
Entry or Exit Cards/ Slips are an effective method to gain insight into student understanding. These can be used to assess student understanding of specific concepts or skills, while also useful as reflective tools for the students.

1. Assessment of Understanding: Posing an inquiry-based question onto the cards allows students to demonstrate their knowledge and understanding of a specific skill. The inquiry question should relate to the relevant learning goal for the lesson. This can be posed as an Entry card to ascertain student's prior knowledge and/ or used as an Exit card to gain insight into knowledge and understanding of the class after the lesson
2. Reflective Tool: Pose questions that ask students to rate their effectiveness in the lesson or how effectively they are working towards their goals. You may also ask them to provide strategies to improve their understanding. By pausing to have students reflect on their own learning, students are developing self-efficacy and beginning to take ownership over their learning.

NB: *Entry and Exit Cards can be together to assess student understanding as you begin exploring a new concept and to show the immediate impact of your teaching. Recognition of Prior Learning helps students see the transference of their learning across subjects and year levels. Asking students to redefine their responses at the end of the lesson using an Exit card, provides instant feedback on the effectiveness of the lesson on student learning and understanding, both for the teacher and the student.*

Simple Cards Ideas:

- ✓ An inquiry question *eg. What important do volcanoes have to life on Earth?* (Inquiry questions are an effective way to assess student learning when using Flipped Learning)
- ✓ Use of a source *eg. Use the source to explain what the Feudal System reveals about Shogun Japan's societal values OR Read the scripture and explain how this reflects our Catholic Social Teachings*
- ✓ The 1-2-3 = 1 sentence to define the concept + 2 components + 3 reasons/ points/ examples
- ✓ Apply to their lives *eg. How do you think the Australian Government should respond to the needs of refugees? OR How do the Catholic Social Teachings show us how to act towards all?*

Small Groups and Work Stations

"Smaller groups are ideal for feedback because the teacher has more time to go to every expert group or pair in each class sitting" (Sackstein, 2017; 72).

"Breaking larger classes into smaller, more manageable groups" (Sackstein, 2017; 72) allows teachers to make productive use of class time while also being able to provide meaningful feedback to each student. Furthermore, *"changing the way the room looks when students are engaging in peer feedback activities"* (Sackstein, 2017; 72) allows students to physical engage with the process. Move tables so that students can work in groups or circles, enhancing opportunities for discussion and collaboration.

Additionally, allow students the freedom to move around the room as needed to confer and collaborate with their peers. While some teachers are hesitant to allow students to move around the classroom, establishing clear expectations and routines sees students rise to these by using the peer feedback opportunities to remain on-task without teacher prompting. You do not have to relinquish all control, instead build students towards independence and self-efficacy by slowly moving towards structured group work and purposeful movement in the room.

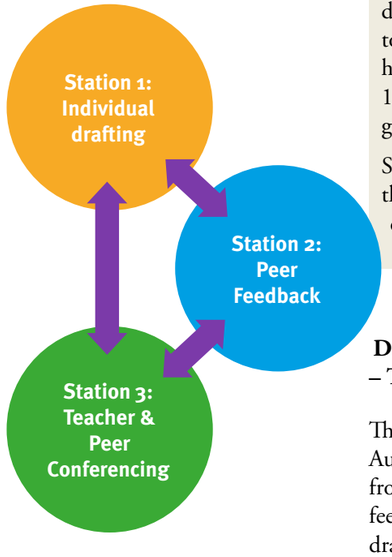
Example Exit Cards

An Easy Strategy to Use During Assessment Time:

The use of stations in the classroom will help gain you time in conferencing with student, developing their independence, while also actively rectifying the simple errors that teachers spend most drafting time identifying and fixing.

Break the room into 3 stations:

1. Station 1 is *Individual research/ drafting with a clear learning goal* – students should arrive with a specific goal achieved, while also using the class time to progress towards their next goal. Effective use of learning goals is essential during the assessment phase. Assessment as learning.
2. Station 2 is *Peer Feedback* – students at this station use the provided checklist and/ or success criteria to engage with a peer's response and provide meaningful feedback using the provided worksheets.
3. Station 3 is *Teacher Conferencing*. Here students in groups can conference with the teacher to build on their responses. The discussion would focus on the learning goal, where students come to this station with their response to show their goal attainment. From this, teachers can unpack the requirements and understandings, while also allowing other students to provide feedback and assistance. In this, the focus is away from the teacher as the expert, and rather sees all as experts who can provide help and assistance.



NOTE: Set a clear learning goal for each lesson. This should be a specific skill or part of an assessment that students have completed (e.g. A particular paragraph/ research focus question).

Students can move between Station 1 and 2 as they complete specific activities. They can finish drafting at Station 1 then move to Station 2 for feedback. From here they can return to Station 1 to edit based on the feedback given.

Students move to Station 3 in their allocated group and when called by the teacher.

Drafting Strategies For Teachers – The New System Requirements

The new system of education across Australia sees teachers step back from providing formal and explicit feedback to students during the drafting and assessment phases. Consequently, new strategies are needed so that students develop self-reliance and efficacy in the development of their work. Students need to be guided how to look beyond the teacher as the expert.

Peer Feedback and The New System

Peer Feedback is going to become a fundamental strategy for teachers and students to use to enhance student work. The strategies and steps outlined in this article will help to develop students as markers, rather than the teacher. Through this, students are still receiving vital information about the development of their responses.

The Teacher Conferencing Station becomes an essential time within assessment lessons. Teachers can conference with students about their work, gaining critical feedback on the strengths and weaknesses of the class as a whole. Teachers are also able to verbally help students develop their ideas, extend their reasoning and reconsider their expression – the same feedback teachers would provide on formal drafts.

This method also ensures that students receive a minimum of two methods of feedback: teacher conferencing and peer feedback.

Symbols In Drafting

To decrease the time spent drafting, develop specific symbols that represent specific core skills required. From this, you are no longer writing phrases or identifying the errors explicitly for students. Instead placing the appropriate symbol at the area means that the student gains independence and ownership over their work. The student must identify the error and correct this. Rather than providing students with the questions for consideration, the student takes themselves through this process.

Mini-Tutorials

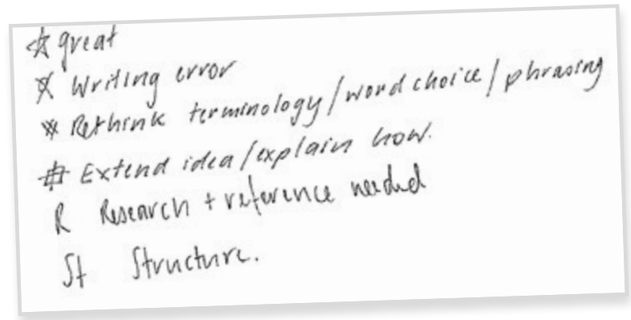
When there are identified areas of weakness across the class, develop mini-tutorials for students to use to improve in this area. This self-directed learning provides students with steps in the process about how they can act on feedback to improve their learning. Students will have greater ownership over their learning, rather than relying on the teacher. These mini-tutorials can be created by you using a platform like *Screencastomatic* which records your voice and computer screen. Use the resources from class and narrate over these to provide students with information. The same as in the Flipped Learning process. You can also include specific activities, links to websites or other resources that will help the students.

"Learners need endless feedback more than they need endless teaching"

- Grant Wiggins (2012)

Trouble Shooting

- Students need to be assigned into specific groups, so that they can be called to their Conferencing sessions. Students would move between Station 1 and 2 as needed, while a specific group is at Station 3. This requires teachers to have established expectations and protocol for these types of lessons. Breaking the lesson into 10-15min chunks helps maintain classroom management.
- When students are ready to move to Station 2, they can write their name on the board to show that they require a peer.
- All the required checklists and success criteria's need to be photocopied and ready for student use at Station 2.
- If students have questions during these type of lesson, have them write their question onto a post-it note that can be put with Station 2. Peers should be able to provide answers to most questions – any questions left at the end will signal that there is a shared misunderstanding. This then tells you where gaps in student understanding are.
- At times it is appropriate to have explicit teaching for the first 10mins before breaking into this style of lesson. In this 10mins, focus the class on the learning goal (specific skill or part of the assessment) they should be working towards in this lesson. You can then have the teaching on the board for Station 1. This helps minimise the amount of questions and interruptions to Teacher Conferencing.



THE QUICK GUIDE

STEP 1: BUILDING RAPPORT AND RESPECT

- ✓ Cultivate a classroom climate of respect
- ✓ Spend time getting to know and forming a respectful relationship with and amongst your students

STEP 2: CELEBRATING SUCCESS AND FAILURE

- ✓ Establish a classroom that celebrates success as well as failure
- ✓ Reframe the notion of failure as an opportunity
- ✓ "Failing Forward" philosophy

STEP 3: INGREDIENTS TO SUCCESS – CHECKLIST

- ✓ Use checklists to guide and focus peer feedback
- ✓ Students need to have a clear understanding of the requirements of a skill or of a concept before they can judge a response
- ✓ A checklist also allows students to see where to next

STEP 4: SUCCESS CRITERIA

- ✓ From the checklists, you can create criteria
- ✓ These are also known as proficiency scales – allow a student to track their progress in their learning or in the development of their responses
- ✓ Clearly outlines to students where to next and how to move forward in their learning
- ✓ Use the same Success Criteria from Peer Feedback when you as the teacher are providing feedback

STRATEGIES INCLUDED IN THIS ARTICLE:

- ***I noticed...I wondered*** feedback statements
- ***Encourage students to give the wrong answer***
- ***Fist to Five***
- ***Traffic Lights***
- ***Response Boards***
- ***Quizzes***
- ***Entry/ Exit Cards***
- ***Small group collaborations***
- ***Three Stations***
- ***Use symbols in drafting feedback***
- ***Mini-Tutorials***

References

Education Services Australia (nd) *Strategies to Enhance Peer Feedback*. Retrieved from https://www.assessmentforlearning.edu.au/professional_learning/peer_feedback/peer_strategies_enhance.html#1

Hattie, J., & Timperley, H. (2007) 'The power of feedback', *Review of Education Research* (77; 81).

Jones, L. (February 8, 2018). *Five strategies to assess young students learning* [Blog]. Retrieved from https://www.teachingchannel.org/blog/2018/02/08/tch-tips-assess-young-students

Killian, S (2015) *8 Strategies Marzano & Hattie Agree On* Retrieved on 5/1/2019 from http://www.evidencebasedteaching.org.au/robert-marzano-vs-john-hattie/

Marzano, R. (2007). *The art and science of teaching*. Hawker Brownlow Education: Victoria, Australia.

Marzano Research (2019). *Providing Scales and Rubrics*. Retrieved from https://www.marzanoresearch.com/online-compendium/providing-scales-and-rubrics

Sackstein, S. (2017) *Peer feedback in the classroom: Empowering students to be the experts*, Hawker Brownlow Education: Victoria, Australia.

Wiggins, G. (27 August, 2012). *Less Teaching and More Feedback?* [Blog]. Retrieved from http://inservice.ascd.org/less-teaching-and-more-feedback/

On critical thinking and collaborative inquiry

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Across the globe in recent years, calls have been growing for education to renew its focus on higher-order skills and capabilities – often referred to as '21st century skills' – in order to better prepare young people for an increasingly complex world. While there is no agreement on exactly what 21st century skills should comprise, there are some commonalities, including the ability to think critically and work with others to approach complex problems in novel ways. Though these skills are by no means new, many believe that they are becoming ever more important for all young people to acquire in order to thrive in a world that is becoming increasingly globalised and augmented by technology. Many are calling for students to have stronger capacities in critical and analytical thinking so that they might identify biases in news, data and in their own interpretations, develop deeper understanding of complex ideas and empathy for different perspectives. But what do we mean by critical thinking and how do we teach for thinking, not just for learning?

Critical thinking has become ubiquitous among lists of educational outcomes at all levels. Primary, secondary and tertiary educational institutions, as well as many of the courses and subjects they offer, explicitly state the desirability of developing critical thinking skills. Employers, too, strongly value critical thinking as an attribute in prospective employees. It is hardly surprising therefore that critical thinking is well-recognised as a key 21st century skill.

What is surprising, however, is the lack of clarity behind what we mean by 'critical thinking'. Do we mean a list of skills, a set of dispositions, a familiarity with logical thinking, a willingness to engage, expertise in inquiry, well-honed inferential thinking, an understanding of thinking norms or all the above? Even if critical thinking can be clearly articulated along these lines, the pedagogical imperatives that can lead us to these outcomes are not always obvious. Nor are the kinds of professional development that can build critical thinking capabilities in employees easily envisaged or implemented.

In this paper, I intend to articulate some of the assumptions that often underlie calls for critical thinking in education, as well as some assumptions that do not but perhaps should. These assumptions concern the nature of critical thinking, its position with respect to discipline knowledge, the contexts in which it is best taught, what can be said about critical thinkers as well as critical thinking, and what teachers need to know and do to effectively teach critical thinking—including some implications for assessment. In considering these issues, I will also consider how we might go about integrating much of what we know about critical thinking and about effective teaching for thinking in general.

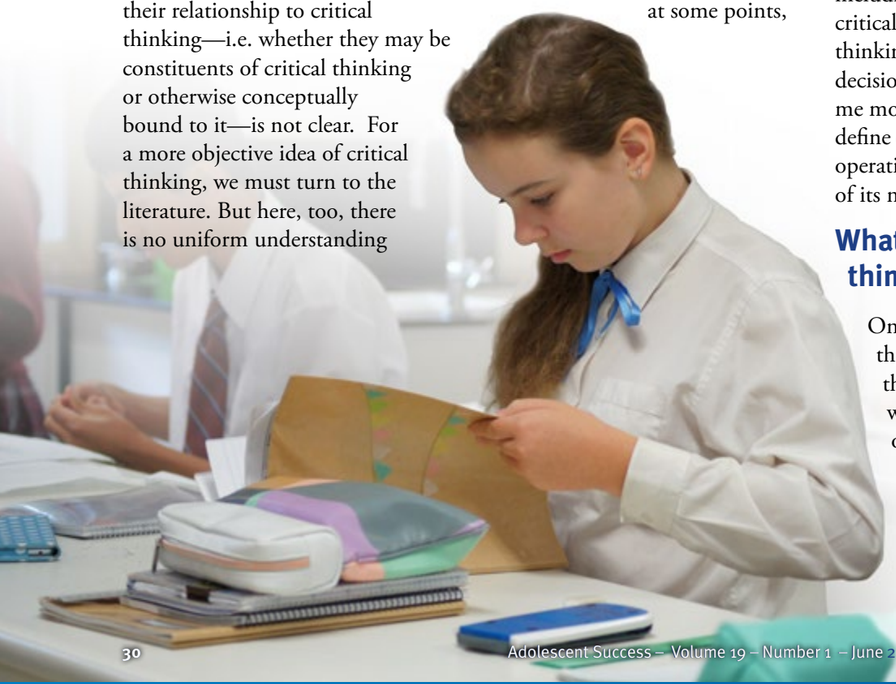
What do we *mean* by critical thinking?

It is generally true that no-one laments their own lack of thinking skills. While it is easy for people to admit to a lack of proficiency in mathematics, languages or technology, say, or to readily acknowledge a poor memory, no-one says 'please don't try and

reason with me, I'm just too irrational'. What's more, most of us like to think we are the exemplar of the rational person—with the implication that if only more people could think like us and see the world as we do we'd all be better off. This means that our conception of what critical thinking is can be biased towards the way we already think. This nearly universal phenomenon of promoting the efficacy of our own cognitive performance helps to explain why everyone seems to value critical thinking and perceives a deficit of it around them.

Identifying what we mean by critical thinking, in other words how we use the term, would seem to give us our best shot at understanding its nature. Unfortunately, many of those who claim to value critical thinking are hard pressed to explain exactly what they mean by it beyond typically diffuse references to 'higher-order thinking' or general reasoning characteristics. Other phrases, such as 'analytical thinking' and 'scientific reasoning' are well enough defined, but their relationship to critical thinking—i.e. whether they may be constituents of critical thinking or otherwise conceptually bound to it—is not clear. For a more objective idea of critical thinking, we must turn to the literature. But here, too, there is no uniform understanding or acceptance. Definitions vary from the ability to correctly assess statements (Ennis, 1964), examine and evaluate our own thinking with regard to criteria and standards (Elder and Paul, 2013), or to be 'appropriately moved by reasons' (Siegel, 1998, p. 23).

Even so, we might discern resemblances between definitions. One thing they have in common is a commitment to processes of evaluation and justification grounded in some kind of attempt at rational objectivity. The use of the words 'correctly', 'criteria' and 'appropriately' in the definitions suggest an appeal to normativity, however that normativity might be arrived at. Note also that these definitions move from the clinical 'correctly assess' to the clearly passionate 'moved'. This reflects a common blurring of the line between critical thinking and critical thinkers. Such a merging between the act and the actor is not unexpected as it must be a person doing the thinking. However, it might pay a dividend in terms of our pedagogical focus if we can meaningfully talk separately, at least at some points, about thinking skills and thinking virtues (i.e. the characteristics of people who think) as we progress.



Others have attempted to deliver a higher resolution in terms of what it means to think critically. The American Philosophical Association's Delphi Report (1990) produced a consensus view on critical thinking that outlined a set of definitive skills and dispositions around critical thinking, including detailed descriptions of subskills, definitions, examples and educational imperatives (if not pedagogical direction).

In less depth, but with more attention to skill development, the Australian Curriculum's Critical and Creative Thinking General Capability also teases apart 'key ideas' of critical thinking (noting, quite properly, the essential relationship with creative thinking). More recently, the Queensland Curriculum and Assessment Authority (2015) synthesised a range of Australian and international reports on the skills needed by individuals for success in the 21st century including the 'associated skills' of critical thinking such as analytical thinking, problem-solving and decision-making (p. 11). But let me move away from attempts to define critical thinking with such operational precision and talk more of its nature.

What makes a critical thinker?

One aspect of critical thinking that is often not explicit in the literature is that it begins with understanding our own thinking. It is hard to reconcile a paradigmatic critical thinker characterised by having insight into the minds of others with someone being blind to a lack of rigour in their own reasoning. This experiential aspect of critical thinking, that it is first and foremost about our own thinking, means that certain elements of knowing how to think are non-propositional knowledge (Ellerton, 2015). Non-propositional knowledge is knowledge which cannot be transmitted by language alone. More specifically, it is not contained in propositions. For example, I cannot teach someone how to surf by simply speaking to them. At some stage, they must get on the board and find out for themselves what it's like.

Gilbert Ryle (1970) captured the difference between these two types of knowledge, knowledge that can be transmitted through language alone and knowledge that cannot, as the difference between knowing that and knowing how. I know that gravity, my sense of balance and the force I exert on a bicycle pedal are factors at play when it comes to making a bicycle go forwards while I remain upright, but that does not mean I know how to ride a bike. In the same way, knowing how to think is more than a consequence of being told what to think, or even how to think (to whatever extent that is possible). The fact that thinking has this experiential flavour carries with it the pedagogical implications common to all experiential, non-propositional, knowledge: what can we get people to do that improves their practice?

Thinking as inquiry

Before we can address what we might do to improve our capacity to think critically, we need to be a little more specific about what we mean by 'thinking'. Following the American pragmatists Charles Sanders Peirce and John Dewey, we can make a meaningful equivalence between thinking and inquiry. Peirce understood inquiry as axiomatic for progressing reason (and progressing through reason). What he calls the corollary to his rule of reason—'that in order to learn you must desire to learn, and in so desiring not be satisfied with what you are already inclined to think'—is: 'Do not block the way of inquiry' (cited in Haack, 2014, p.319). But what can we understand by 'inquiry' that would show it to be as important as Peirce suggests? Peirce saw that thinking could 'never be made to direct itself toward anything but the production of belief' and that beliefs themselves were things achieved to soothe 'the irritation of doubt' and become in fullness 'a rule of action' and 'a new starting-place for thought' (Peirce, 1878).

In the pragmatic tradition established by Peirce and carried through by Dewey, William James, Matthew Lipman and others, inquiry is the process of moving from doubt to belief. But simply moving from doubt to belief need not involve thinking of the sort we see as educationally valuable. The missing element that moves us from thinking as simple reaction or association into the kind of thinking marked by improvement through education is what Dewey calls reflective thinking, an 'active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends' (Dewey, 1910, eBook: Chapter One). Lipman makes a link between inquiry and such reflective practice in an understanding of inquiry that goes beyond the broad sense Dewey gives us:

> *By 'inquiry' I mean self-correcting practice. I do not call a behavior inquiry if it is merely customary, conventional, or traditional—that is, simply practice. But if the supervening practice of self-correction is added to that practice, the result is inquiry. (Lipman, 2003, p.178).*

The 'practice of self-correction' is a reflective practice. We might call reflective thinking a necessary condition for 'critical' thinking on the assumption that reflection alone is insufficient without some necessary recourse to standards and criteria that determine how improvement in practice might occur. If we accept this, then we see the logic of Dewey's comment that: 'The essence of critical thinking is suspended judgment [as we experience doubt and look to fix beliefs]; and the essence of this suspense is inquiry to determine the nature of the problem before proceeding to attempts at its solution' (Dewey, 1910, eBook: Chapter Six).

The type of inquiry we engage in with students to improve their thinking, therefore, is that inquiry which requires reflective thinking. But more than this, thinking for inquiry must take us into the 'self-correction' of Lipman's account and so to the means by which this correction is guided. On this understanding of the relationship between thinking and inquiry we can also accept quite specific definitions of inquiry, such as requiring 'comparative evaluation of competing arguments with the goal of making reasoned judgments' (Bailin and Battersby, 2015, p.123), as derived from the general conditions of inquiry outlined above.

But if we are to value inquiry, we must value doubt, for doubt

is the beginning of inquiry. This has certain implications for our classrooms, as Lipman points out:

> *If, then, thinking in the classroom is considered desirable, the curriculum cannot present itself as clear and settled, for this paralyses thought. (Lipman, 2003, p. 21)*

Lipman means that, for a thinking education, the classroom cannot simply be seen as a medium for the smooth transmission of knowledge from teacher to student. Classrooms in which things are 'settled and clear' imply an absence of doubt, hence an absence of inquiry, hence an absence of opportunities to engage in reflective thinking, and hence an absence of opportunities to improve thinking.

That all classrooms are not inquiry focussed is not surprising, given an understanding of how modern schools developed. Modern educational systems, beginning in the early 19th century, were subject to pressures of numbers and an increasing recognition that classical methods and topics of education were slow and unproductive. Jeremy Bentham's Chrestomathia school, developed for the growing middle classes and designed to address the need for faster and more immediately useful educational outcomes, is paradigmatic of the view that education is for utility, and a largely scientific utility at that (Bentham, 1816). Both critics and supporters of Bentham acknowledged that schools were to be modelled on factory processes, and this was something of a selling point for many; but not for all. Elissa Itzkin (1978) notes correspondence from a school of the time expressing concerns that the roles of students and masters are too rigorously defined within this model.

> *Indeed, the duties of each must be made perfectly mechanical. There must be no doubt or hesitation on the part of the master or pupil; for doubt would produce delay and dispute, and consequently throw the whole machine into disorder. Hence there can be no appeal to the reasoning powers; for reasoning, never can be reduced to mechanism . . . every boy must conform to the average motion of the School.*

and

> *It is our object to produce voluntary mental exertion; and we therefore cannot think it judicious to subject our pupils to continual restraint. We wish to teach them to educate themselves, while we direct their operations. We must teach them to think as well as act; while all that is attempted in favour of the others is to teach them the latter power. (Itzkin, 1978, pp.313–314).*

This seems to me an exquisite articulation of the conflict between the need for teaching for thinking and the constraints of a manufactory model of education, showing how the diminishing of inquiry equates to a lack of thinking focus.

The skills of critical thinking, however they may be articulated in detail, can therefore be thought of as the thinking skills that support effective inquiry. This framing still leaves much work to be done, but at least it provides a link between thinking and classroom practice (that thinking begins with inquiry) that can act as a starting point.

Critical thinking and discipline knowledge

It's often said of critical thinking that you have to be thinking about something. Some authors (e.g. Willingham, 2008) point out that the more you understand the knowledge of your domain, the more sophisticated your thinking can be, and that without such complexity, learning to think well is problematic. While this may be true, it does not imply that the skills we bring to bear on complex problems cannot be talked about, practised at some level, and become themselves objects of study with a view to improving them as we move through to a deeper understanding of our domain knowledge.

The critical thinking skills of which we can speak are legion and include the already mentioned problem-solving and decision-making, but also the ability to see patterns, discern meaning, detect inferential errors and other fallacious reasoning, generate and test ideas, apply criteria effectively, imagine alternatives, justify preferencing one course of action of another and so on. Lipman knew how daunting a task capturing these thinking skills would be, noting that 'the list is endless, because it consists of nothing less than an inventory of the intellectual powers of humankind' (Lipman, 2003, p.8). While all of this, and much more, might be representative of the skills of thinking well, simply generating a list of desirable characteristics does not provide pedagogical direction. The educational focus is not sharp enough to show us how to achieve these ends. To move towards a practical understanding of what we can do, and get students to do, to improve thinking, let me now consider in more detail the relationship between content and thinking.

The most basic thing we can ask students to do with knowledge is to recall it. (We might argue that we first wish them to remember it, but let me group these two skills for simplicity's sake). This is a necessary, but low-level requirement of learning—we might, more aspirationally, want students to also understand that which they can recall. So how do we ourselves understand what 'understand' means?

One way to explain 'understanding' concerns how knowledge is organised and structured in our minds. If I ask you to remember a list of phone numbers, it would not seem sensible to ask if you understood the list. It is a list of numbers, granted, but beyond that minimal understanding it seems a shallow task. Each element of that list has very little connection with the other elements. Contrast this with asking you to commit to memory a food web in which predator and prey species were intimately involved with each other's business of survival. What I would be looking for is an indication that you have not only recalled the elements of the web, but also the nature of their relationships and interactions. In other words, I would ask that you understood what it was that you reproduced. More than this, I would expect that knowing the relationships between the elements makes learning each one of the elements easier than it would be if they were in isolation from the others. Therefore, 'information that needs to be "understood", rather than merely learned, consists of material that has a high degree of element interactivity' (Sweller, 1994, p.311). The logical implication of this understanding is that learning experiences intended to improve student understanding are those that make the nature and relationship between elements of the concept, object, construct or system to be understood clear.

Knowledge organised into coherent frameworks in which elements and their relationships are contained in mental models is called schematic knowledge, and the structures themselves are called schemata. In teaching for understanding, therefore, our business is the development of organised schematic knowledge in students' minds. While this endeavour is clearly one associated with content knowledge, how is it related to thinking?

There are two important considerations here, the understanding of which deliver pedagogical insights. The first is that the more effectively our knowledge of our domain is organised, the better we can make use of it to solve problems. So, to improve students' abilities to make decisions and solve problems within a domain, we must improve their schematic knowledge of that domain (a necessary but not sufficient condition).

The second consideration is that schematic knowledge, once properly formed, does not require the use of working memory to access and use it. Individual

elements not organised into a schema each need a slot in working memory, and each has a life measured in seconds unless actively renewed. Schematic knowledge is not only free of the constraint of working memory, but the sum of that knowledge within the schema is also available. These two considerations mean that thinking with schematic knowledge is fast, effective and effortless in comparison with thinking using large amounts of unorganised knowledge[1]. Expert diagnosticians thinking schematically can reach diagnoses much quicker than novices and with error rates up to five times less (Harasym et al., 2008). Indeed, it is characteristic of expert behaviour that their knowledge is so structured and used (Glaser et al., 1988).

Cognitive skills can support the process of developing deeper understanding and mastery of content knowledge

Understanding is a thing to be attained, or perhaps extended or used to build further understanding. It is not of itself a skill. But there are skills that do directly relate to thinking and can themselves contribute to the broader skills such as problem solving and decision making, as well as to developing understanding. These are known as cognitive skills and they already populate our syllabuses, work programs and assessment tasks. They are skills such as analyse, evaluate, justify, synthesise, organise, identify, infer, categorise, hypothesise and so on. They are also known as cognitive verbs (Marzano, 2006) and hence describe things that we do. As to what we do them *with*, the answer is our brains (or, more appropriately, our minds). As to what we do them *to*, one useful answer is content knowledge, including knowledge of situations, circumstances, contexts and requirements.

The cognitive skills constitute, in large part, what we do when we are thinking, at least at a descriptive if not neurological level. While they might not be constituted by matching cognitive processes (e.g. there might not be a part of our brain or a particular process generally associated with 'analysing') they provide a shorthand way to talk about what we mean by thinking in an educational context, as well as providing a mechanism for delivering a measurable output. The results of a text analysis can be written down. The justification for a claim can be articulated. The criteria for evaluation can be discussed. The organisation of knowledge can be displayed.

In these ways thinking, or at least the outputs of it, can be made clear. To make the thinking clear, the process by which the student uses these skills to progress through the task can be talked about, critiqued and fed back upon. It is easy to see that the quality of an analysis, the strength of a justification, the confidence of an evaluation or the sophistication of a synthesis can be improved by a deeper understanding of domain knowledge. But, as I pointed out earlier, this does not negate discussing the skills with a view to understanding their nature and purpose. Let me provide an example.

The skill of analysis might be broadly understood as looking at some object or construct to discern its function or purpose. It might include identifying the elements that make up the construct or object, how they are related to one another, whether they may exist in certain categories, and how they contribute to the purpose or function of the whole, including investigating which elements are more relevant or significant than others and why this may or may not be the case, and perhaps also to seek for patterns or hidden structures.

[1]It is the freedom from reliance on working memory that distinguishes between what has been called System One and System Two thinking (see Kahneman, 2011).

Whether this is an agreeable definition or not is not so important, the point is rather what we might do with such a definition to help students understand analysis. Having developed a satisfactory shared understanding of what analysis is, students can recognise what is being asked of them when a task sheet requires them to analyse something. Students know to look for function, to identify elements, to categorise if possible, to seek relevance and significance, to look for patterns and so on. How well they do these things is, partly, a function of domain knowledge, but critically it is also the very skill we are seeking to develop through practice, feedback and reflection on the level of success reached. Framing and explaining analysis in this way is not a magic bullet to achieve high level analysis, it is rather a means of providing clear learning experiences designed explicitly to improve analysis by providing opportunities for students to use those skills and to receive feedback on them. In other words, to improve their thinking.

While these questions of analysis are generic and broadly describe what we ask students to do in applying the skill, the answers to them are context and hence discipline-specific. One way to address the issue of the relationship between critical thinking and discipline knowledge, therefore, is to claim independence for the understanding of thinking skills but dependence for their development to high levels. This is because such high-level thinking requires a full and complex understanding which presumably is more attainable within a discipline context than through general knowledge.

Critical thinking, education, philosophy and collaborative inquiry

In looking at initial definitions of critical thinking, I noted their appeal to some kinds of normative standards of thinking. That there are norms of thinking is not hard to accept—after all, thinking is not an 'anything goes' affair. What those norms are and how they are—or ought to be—derived are questions with complex answers. And they are important answers since thinking, like a language, cannot be learned in isolation and the way in which these norms are understood and put into practice determines in large part the kind of thinker a person will become. When learning a language, our skills develop fastest and most fully when we have a chance to speak to another person who also has some understanding of that language. It is only by getting feedback from them that we can determine the success or otherwise of our efforts to communicate with them through that language. If we mispronounce a word so that its meaning is lost to the listener, or if our grammar is so distorted that either meaning is lost or an incorrect interpretation of what we are saying is made, then we have opportunities to correct what we are doing in the full knowledge of what has gone wrong and how we can best correct it. Without such interaction, growth in our competency is difficult.

There are parallels here with learning how to reason well. If our arguments are unclear, if we do not express all the assumptions we hold that lead us to a conclusion, or if our conclusions are the result of webs of beliefs that are not shared by others, we might fail to be persuasive to others. More than this, we know that the bar for convincing ourselves that something we wish to be true is in fact much lower than the bar for other people who are not so motivated (see, for example, Strickland et al., 2012). We must learn that the sincerity of our beliefs, or the volume or frequency with which we express them, are not necessarily effective as persuasive techniques. The respect and care we develop for epistemic rigour and rational engagement is born from our experiences with others, not from the introspections of our own minds alone in a *priori* fashion.

Thinking well is, in part, a result of our experiences of what others find persuasive and why, as well as reflection upon our own thinking to produce such persuasive effects. But thinking well is also about learning how to think with others, to in effect become part of a broader social cognition that can achieve more collectively than is possible individually. Furthermore, an education in thinking must also move to the normative question of how we ought to think, and this takes us to philosophy.

> *The notions of 'reason' and 'rationality' […] are philosophically problematic. Just what is a reason? How do we know that some consideration constitutes a reason for believing or doing something? How do we evaluate the strength or merit of reasons? What is it for a belief or action to be justified? What is the relationship between justification and truth? Why is rationality to be valued? (Siegel, 1989, p.127)*

Because these issues are at the core of how we understand what makes for good reasons and for good reasoning, 'it is central to critical thinking education that students be given some understanding of the

epistemology underlying critical thinking' (p. 127).

An exemplar of collaborative inquiry with a view to establishing norms of effective thinking is the Philosophy for Children (P4C) program, developed initially by Matthew Lipman and Anne Sharp, which has established itself as a successful program for the teaching of thinking skills (Lipman, 2010, 2003, 1998; Lipman and Sharp, 1978; Splitter and Sharp, 1995). Bearing the legacy of Peirce and Dewey in terms of epistemological assumptions and educational applications, and incorporating the pedagogical imperatives of Vygotsky, P4C has developed as an established educational practice in many countries, including Australia (Burgh and Thornton, 2016). The efficacy of this approach in terms of cognitive gain for students is backed by research over a number of years (see, for example, Gorard et al., 2015; Millett and Tapper, 2011; Topping and Trickey, 2007).

Splitter and Sharp (1995) recognised that in identifying thinking that is educationally worthwhile we are talking about more than simple cognition, we are also concerned about the norms of thinking.

> *It is this normative dimension that marks our inquiry as philosophical rather than empirical; as being concerned with how young people ought to think rather than merely with how they think. (Splitter and Sharp, 1995, p.7)*

Considering 'how young people ought to think' could be misinterpreted as a call for uniformity of thought, but it is rather a call for an integrated and systematic understanding of thinking in terms of standards, criteria and its effectiveness in inquiry. This indeed was Lipman's educational goal, to 'build a system of thought' for students (Lipman, 2003, p.103). Lipman focused on several aspects of thinking and also recognised that when we talk about thinking we are talking about both thinking and thinkers; hence he was concerned with both thinking skills and the development of dispositions. Most importantly, he considered that this was best achieved through a pedagogical approach based on the community of inquiry, in which norms of thinking could be collaboratively developed and reflectively refined and in which key concepts such as justification and reasoning could be located in discourse rather than in individuals. Thus, for Lipman, the 'normative' aspect of thinking was one derived from engagement in collaborative inquiry.

Philosophy was not the content of the classroom, but the methodology of teaching based on inquiry, argumentation, and collaborative development of the norms of rational thinking.

The community of inquiry is also the source of inquiry values, identifying what is valuable in the act of inquiry and therefore in the act of thinking (Ellerton, 2016). Understanding what we value in thinking gives us a means to evaluate thinking. These values and their application are a significant aspect of the norms of thinking, and include clarity, precision, plausibility, significance, breadth, depth and simplicity. They have been recognised as values by Thomas Kuhn (1970), by Lipman himself (2003) and a subset of them structured more formally by Elder and Paul as Intellectual Standards (2013).

In the environment of collaborative inquiry, speaking of cognitive skills and giving feedback using what we value in thinking gives us a language in which to practise and promote metacognition and in which to help students understand how the values should be applied in the practice of inquiry.

Critical thinking, logical reasoning and argumentation

The fashioning and evaluation of arguments is fundamental to our idea of reasoning and of critical thought, in as much as the critical aspect is analytical and evaluative. Argumentation is in a sense the framework in which critical thinking can effectively occur. Argumentation is a large part of the methodology of philosophy, but also of rational inquiry in general. Not only does it have a formal beginning in the logic of Aristotle, but Dan Sperber and Hugo Mercier even suggest that our capacity to reason has evolved 'to produce arguments in order to convince others and to evaluate arguments others use in order to convince us' (2012, p.2). It would therefore be remiss in the context of this paper to discuss critical thinking without considering how it is related to argumentation, or how argumentation can be used to develop students' critical thinking capabilities.

In considering argumentation, it is necessary to first define what an 'argument' is. To argue is to engage in an intellectual process. While there are many ways to talk about it, there seems no great need to move beyond the definition offered by Monty Python[2] as 'a connected series of statements intended to establish a proposition' (2014). More formally, an argument is made up of premises, those things we take to be true for the purposes of the argument, and

Arguments

Arguments are formal structures that outline how new beliefs (conclusions) are justified on the basis of existing beliefs (premises).

The process of drawing a conclusion from a series of established premises is technically known as "inferring". When we infer, we either attempt to reach a conclusion that is necessarily true given the truth of a set of premises (deduction) or, at the least, to reach a conclusion that is coherent with a set of premises (induction).

Arguments help us to contextualise our reasoning and hence apply it in real-world situations. The construction, analysis and evaluation of arguments requires that a broad range of thinking skills is brought to bear in a framework that provides a focus for cognition and a direction for progress. Argumentation, therefore, is an essential component of teaching for thinking.

a conclusion, the point at which we arrive after duly considering the premises and inferring to our final proposition. Arguments allow us to contextualise reasoning (Battersby and Bailin, 2011) and provide a structured platform for engaging with issues in a rational way. Arguments demand of us the direct application of a range of cognitive skills. They can be identified, interpreted, constructed, and, crucially, evaluated. When we justify a decision or preference, we construct an argument to defend our claim.

Arguments can be evaluated by testing them for two key attributes: validity and soundness. A valid argument is one in which the conclusion is logically and necessarily entailed by the premises. A sound argument is a valid argument with true premises. We understand someone's claims as an argument which can be assessed on the likelihood of the premises being true and on the strength of the logical pathway from the premises to the conclusion.

Constructing arguments, therefore, provides a mechanism for discussion, analysis and evaluation of claims that allows for a high inferential resolution and hence increased potential for rational rejection or acceptance of claims. Moreover, it is in the acts of arguing, or explicitly evaluating arguments or justifying positions through constructing arguments, that cognitive and other social interactions between students can occur that deliver the opportunities for testing ideas and establishing norms. In other words, through argumentation students can learn how to think philosophically and be self-reflective about their own thinking and assumptions.

Assessing thinking

Attempts to assess students' thinking are usually focused on one of two broad approaches or a combination of them. The first approach is to determine whether or not students are successful in inferring what statements logically follow from others (and identifying those that do not). This approach requires students to demonstrate an understanding of logical structures, including formal arguments, and to properly navigate through problems with detailed logical and causal connections. Examples of this sort include the well-established California Critical Thinking Skills Test and other tests typically used in pre-post testing to determine the efficacy of critical thinking courses or programs.

The second approach is broader and includes looking at students' work to see if it reflects what they ought to be able do at certain developmental stages, typically focusing on categories of tasks such as 'posing questions', 'generating ideas', 'identifying key concepts', 'metacognition' and so on. This latter approach is that taken in the Australian Curriculum's Critical and Creative Thinking 'Learning Continuum' which considers student growth in thinking abilities over year levels. Let me label these two approaches as the 'structural' and the 'developmental' approaches respectively.

One might also expect students' results in structural tests to improve in the very short term following explicit instruction in, and repeated examples of, structural thinking. One might also expect students' results in structural tests to improve over the longer term even without explicit training in logical structures. As students age and as they engage with increasingly complex subject matter they develop better cognitive resources and more experiences that encourage sophisticated thinking.

Structural approaches run the risk of simply reflecting good teaching rather than deep learning. For example, imagine giving a student a pre-test in their knowledge of chemistry, teaching them some chemistry, and then giving them a post-test. Presumably, some improvement would be noticed, but that does not mean the knowledge gained is transferable or sustainable. Developmental approaches run the risk of being descriptive rather than prescriptive,

[2] See also the Argument Clinic sketch www.youtube.com/watch?v=0rTEzYbMiNM

stating merely what the student should be capable of at a particular stage rather than what we wish for them as a result of targeted improvement. They also run the risk of catering to a 'lowest common factor' paradigm, as they typically deal with age-level groupings.

Cognitive verbs can also act as a focus for the assessment of thinking, with the advantage of being discipline-centred as required. The ability of a student to perform in questions of analysis, evaluation or justification, for example, can be measured and used to assess thinking. Of course, this approach runs the risk of ignoring issues of depth and breadth of content knowledge that can impact these results, but it is not difficult to craft questions that emphasise cognition using elementary subject matter and so exercise some control over this variable.

Whatever method or combination of methods might be used to test student thinking, and whatever their disadvantages might be, we are not left without options.

Concluding thoughts

Powell and Snellman speak of the 'knowledge economy', in which 'the key component […] is a greater reliance on intellectual capabilities than on physical inputs or natural resources' (2004, p.199). Economies are not defined by what they disseminate, distribute or consume alone, however; these are simply derivative of what the economy produces. A 'knowledge economy' therefore not only disseminates, distributes and consumes knowledge, it produces it. We have a word that describes the production of knowledge: it is 'thinking'. Thinking, or inquiring, produces new knowledge, and teaching thinking, or teaching inquiry, helps develop the knowledge producers of the future.

Understanding what is effective about inquiry tells us what is effective in thinking, and this is something that each area of inquiry, or discipline, can understand and frame for itself considering the nature of its domain knowledge and methodology of inquiry. But there are general aspects of inquiry that speak to the cognitive behaviour of inquirers.

One general aspect is the use of cognitive skills, which, while used to build understanding and to use that understanding to solve problems within discipline areas, have an architecture that can be spoken of independently of those areas. A knowledge of cognitive skills and their development can give us guidance in designing and constructing learning experiences and assessment items to ensure their practice and improvement. Those learning experiences will only improve the cognitive skills of students, however, if students are provided with timely and effective feedback that identifies and promotes what it is we value in the act of thinking and inquiry. What we value in thinking, and how we apply those values, is best learned and constructed collaboratively to allow students an opportunity to internalise individually what has been learned socially. Social cognition not only allows for this formative phase of learning the norms of effective thinking, but also enhances our ability to overcome limitations in individual thinking such as cognitive biases and framing problems (Mercier and Sperber, 2011).

The task of identifying the norms of thinking, and understanding how are they developed, is a philosophical one. The nature of reasoning, what makes for good reasons and why ought we to be moved by reasons, lie at the heart of the project of teaching critical thinking. Philosophy programs in schools such as P4C are often representative of critical thinking in education (without being exhaustive)[3]. It is the (self-reflecting) methodology of philosophy, not necessarily its content, that provides the pedagogical focus on inquiry that emphasises thinking skills and the nature of reasoning.

As teachers of thinking, we wish for students to not only think about philosophical (and particularly epistemological) issues, but also to think philosophically. Part of this methodology is argumentation, which both contextualises thinking and provides a structure for the analysis and evaluation of our thinking. Argumentation is not so much the point of critical thinking as it is the framework in which it can most effectively occur. Useful knowledge about thinking that is often present in 'critical thinking' programs—for example knowledge of the fallacies of reasoning, cognitive biases, belief formation and motivated thinking—are less the substance of thinking as they are functional decorations to be placed on the tree of argumentation.

The educational imperatives that emerge from this picture of critical thinking are still being shaped, but they must logically include a focus on inquiry (understood as reflective thinking), a commitment to plan and speak in the language of student cognition to enable metacognitive strategies to be enacted and to provide feedback on thinking and a plan to work collaboratively to establish and refine the norms of effective thinking as well as increase the effectiveness of it through social cognition.

For these things to occur, we need to focus closely on how teaching for thinking, not just for learning, aligns with the resources, processes and educational values of our schools and larger organisational structures (including those directed to teacher training). Just as some technologies are seen as disruptive because they do not fit existing business models (Christensen, 1997), the pedagogy of teaching for thinking may also be disruptive in that it is ill-suited to simple didactic models, not well assessed by standard tests, highly collaborative rather than teacher-focussed and concerned with inquiry as much as with content. All these characteristics are anathema to Bentham's factory model of schooling and so, to the extent we have not been able to evolve sufficiently far from that, to current models of schooling.

The utility of teaching for thinking may well be economic, but it is also a social good. Learning to think well is a path to individual resilience, not just intellectual but emotional. It can empower students to deepen their understanding of the world around them and deal with contradictions and uncertainty. Understanding the motivations of those around us and the effect our actions have on each other is a virtue born not only of empathy but of the ability to imagine and engage with the minds of others in a purposeful and rational way. Writ large, this is also a function of good citizenship. Critical thinking is not just the chrome and steel of effective cognition, it is deeply embedded in the circumstances of our humanity. It is a part of our cultural heritage. For all these reasons, we are obliged to make it a priority for our students.

Philosophy for Children

Philosophy for Children (P4C) has been a significant presence in educating for thinking for several decades. Developed in the US by Matthew Lipman and Ann Sharp as a means of focusing on student thinking, it has grown into a world-wide movement deeply embedding the theory and practice of philosophy as a methodology of teaching (rather than philosophy as subject matter).

The community of collaborative philosophical inquiry is at the heart of the P4C pedagogical approach, in which issues relating to the nature of knowledge, meaning and rationality are engaged with and developed through deliberative discourse and reflective thinking.

The success of P4C in developing students' thinking skills is well established, showing cognitive gains that persist beyond engagement in the classroom.

About the author

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[3] Other examples of philosophy in schools include the Queensland senior subject Philosophy and Reason and The Western Australia subject Philosophy and Ethics.

P-12 Book Week – A Treasure Worth Hunting

Shez Morris,
Library Manager,
Highlands Christian College Toowoomba

Why should Primary schools have all the fun?

After all, if a TV show about scientist geeks can become the world's most popular sit-com, and Comicon can make cosplay cool, then why shouldn't teenagers and teachers embrace the nerdy-geeky-bookish regalement of Book Week?

While pop culture may have recently created a petri dish from which any school may cultivate a germ of bookish enthusiasm, it was an unexpected and divine appointment to Highlands Christian College, a P-12, single campus, independent college, which propagated this Teacher Librarian's dream for Book Week engagement amongst Secondary students.

Although the Secondary staff and students had never previously engaged with Book Week, and many of the common sceptical attitudes were initially encountered, the 2016 P-12 Book Week efforts produced enough encouraging feedback to build on the following year. This second attempt in 2017, according to the principal, was the best Book Week he had ever experienced at any school. In particular, the interest and participation by Year 7 students was exciting.

The Year 7's propensity for exploration, imagination and fun may have been the sparks that ignited their enthusiasm. However, our wonderful middle years' teachers likely contributed fuel to their fires, by encouraging students to embrace Book Week, and developing the College's reading culture throughout the year through regular "reading for enjoyment" English lessons and promotion of library borrowing.

These efforts had been initiated in an attempt to combat the significant decline in library and reading engagement detected in 2015 College borrowing data and 2016 student survey results. Thankfully, due to initiatives like whole College Book Week celebrations, current borrowing statistics indicate significant improvement in library engagement, especially in Years 5, 6, 7, and 8, which have increased the average number of books borrowed annually per student by 203%, 304%, 594%, and 560% respectively.

This is improvement in a vital direction, given Sullivan and Brown's (2013) findings that "reading is actually linked to increased cognitive progress over time," and their call "to support and encourage children's reading in their leisure time in light of the decline in leisure reading between the ages of 10 and 16" (Sullivan, & Brown,. 2013, p. 37) The Programme for International Student Assessment (PISA) has also promoted the need to encourage reading for enjoyment, stating that, "On average, students who read daily for enjoyment score the equivalent of one-and-a-half years of schooling better than those who do not" (OECD, 2011, p. 11).

Given the need to promote reading for enjoyment to teenagers, and expectations produced by 2017's success, the challenge was set for Book Week 2018 in our P-12 College. With the Children's Book Council of Australia (CBCA)'s brilliant national theme, "Find Your Treasure," the hunt was on for Book Week memories to be treasured; and as they say, third time's a charm!

Compared to previous years, the level of engagement by Secondary students and teachers in Book Week activities took everyone by surprise. Students of all ages loved reading books taken from the cardboard treasure chests, and playing in the makeshift sailing ship and bathtub row boat assembled in the library. However, at times it was a little too noisy to read, due to the crowds of Primary and Secondary students that filled the library Monday to Friday during every free moment to solve the treasure hunt clues, codes, riddles and ciphers staff had hidden in the CBCA shortlisted book displays. A team of four Year 12 boys finally won the treasure hunt prize, only 15 minutes ahead of a large group of determined middle years' girls, and then began helping the younger teams solve more clues. One of the year 8 treasure hunters reported,

> *"I was in a massive group with my friends and we were all just working together throughout each clue - some of the ways a few of them cracked each step still astounds me! From the rush of the first clue hanging up on the toilet block, to finding the last clue in a hollow book, it was truly more exhilarating and challenging than I ever thought."*

The Year 12 cohort displayed Book Week leadership for the first time, with Year 12 leaders promoting activities to both Secondary and Primary parades and "class carers" initiating their own plan to dress up according to their designated Primary class' themes. At final count, 54% of all Secondary students at the school voluntarily dressed up as book characters and

submitted entries to the "Photo Comp." Even the Secondary teachers decided to dress up as pirates from Treasure Island. The results of our Book Week feedback survey were very affirming:

> *"The highlight of my Book Week this year was the treasure hunt that Miss Morris set up for the school. It was a really clever way to encourage people to head to the library, pick up some of this year's CBCA award winning books and just have some fun! It was very well done and must have taken a lot of time and effort, but I think it was worth it! I also enjoyed the dress up day and the photo competition, all things designed to encourage a love of reading. All in all this is the best book week I've ever had!" – Year 8 student.*

> *"It was fun finding costumes and it felt really cool getting to dress up and entertain Primary kids." – Year 11 student.*

> *"It was really inclusive of everybody and advertised well so people got into it. Also, the library display was amazing!" – Year 11 student.*

> *"I loved how inclusive the library was all week." – Primary staff member.*

> *"It was well thought out and executed. It involved the kids well." – Secondary staff member.*

"I can't wait to see where Book Week goes in the next couple of years, and I look forward to being a part of it all over again!" – Year 8 student.

The journey so far has had its ups and downs, but watching 17 to 5 year olds share equal joy in books and book-related activities has been worth any disappointment and every extra hour's work. Books are back, and Book Week is bigger than ever. Furthermore, with a 2019 CBCA national Book Week theme of "Reading is My Secret Power", the ability to tap into the "geekdom" now attractive to teens just got supercharged!

If your Secondary school has a successful Book Week culture, please share this success to inspire others. The misnomer that Book Week only works for Primary students will be rejected if stories of Secondary enthusiasm circulate more widely.

If you are a School/Teacher Librarian, Head of English, Head of Secondary, Principal, or other potential Book Week leader in a P-12 or 7-12 school considering Secondary engagement, here are some specific tips learned from the last three years of at Highlands Christian College:

- For at least this one week a year, embrace the chaos! - If you are successful, the library will be overcrowded and noisy
- Creative play and inter-grade interaction is more valuable than library rules and organisation
- All hands on deck! – volunteers and staff will be needed more than you plan for
- Smile and laugh like you're having more fun than the kids (and mean it)
- Find your inner child, and encourage staff and teenagers to do the same
- Get student leaders on board to promote and plan
- Say yes to the ideas of others as often as possible
- Plan 12 months ahead
- Get feedback as quickly as you can – e.g. online survey the week following Book Week to all staff and students
- Collaborate closely with leadership and teachers – they need time to process and freedom to air ideas and concerns
- Food and group fun will draw in teenage participation
- Communicate to parents repeatedly, in various ways, weeks/months in advance
- Roll with the national theme, but tailor it to your own school
- Plan to build a school-wide culture of Book Week frivolity over a few years
- Build partnerships with keen people, and think outside the box – e.g. tuckshop ladies
- Give teachers specific and practical ideas on how to engage students throughout term 3 (give this to them before June/July holidays, so they can plan)
- Build on already established inter-grade relationships – e.g. peer mentoring, class carers
- Find ways to come together – e.g. dress-up day lunch in one area or whole school parade
- Take and share photos – Facebook, Instagram, yearbook, emails – this year's memories will help build the culture for next year
- Include fun activities that focus attention on the books – e.g. treasure hunt with clues in the books, or treasure chests full or previous CBCA shortlisted books
- Prepare as best you can for the cost – financially (both on the library budget and your own wallet), physically, emotionally and on your time
- Find your champions – the staff and students who will build you up, build you support, and build you creative things
- Keep any thank you notes and emails you receive – they are precious reminders that it is all worth it when you are knee deep in it next year!

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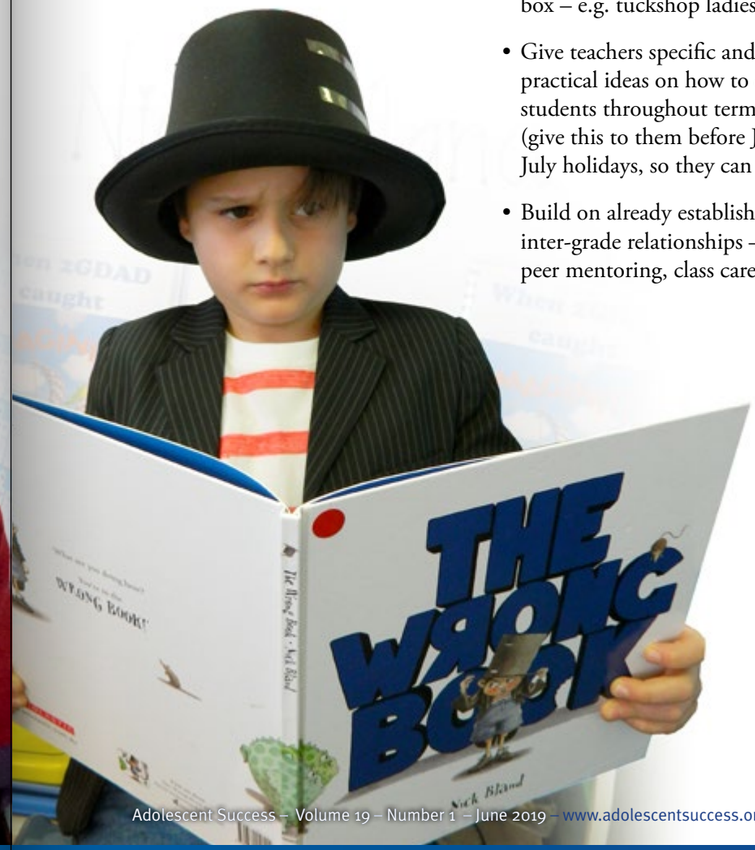

Blog Post

Taking account of personal relationships between students in teaching

Peter J. Cavanagh

How important are relationships in education? Rita Person, in her classic TED Talk, says "Kids don't learn from people they don't like." I thoroughly agree and I would like it mandated that every teacher watches her talk every year!

I want to expand her sentiment to include student to student relationships.

> *"Kids don't learn well in classes where they have bad relationships."*

This statement is proven at the worst end of the relational spectrum, where victimisation and bullying occur. A report by the Murdoch Children's Research Institute (MCRI) says "Students who are bullied for two or three years in mid primary school fall nearly 10 months behind their peers in numeracy by year 7."

The correlation between learning and the relational context holds true for positive relationships as well. The best learning environments happen for students not only when the instruction is excellent but when relationships are strong with teachers as well as with fellow students.

If you don't agree with how important relationships are to education I wish you well as you go on leading schools with teachers teaching subject matter to students they hardly know as A.I. slowly comes in and sweeps away any need for basic content delivery by pedagogues.

For the rest, who do believe that relationships matter greatly for learning, consider these questions.

1. What endeavours do you implement to increase relationship strength in all of your classes?
2. Is it possible to keep track of all the relationships of your students?
3. How do you establish which student relationships need intervention?
4. What systems do you have in place once you do identify their needs?

- Firstly, we must agree as a school that relationships matter and are worth our consideration and effort regularly. Give your teachers permission (nay, encouragement) to run at least some activities that are designed SOLELY to build successful relationships.
- Secondly, we need to consider how we holistically build relationship tools into our practice. What can be done when teaching English or mathematics which will mean that the classroom context will encourage healthy relationships rather than competitiveness or exclusion?
- Thirdly, we need to follow up broken relationships. Just as we have remediation processes for illiteracy, students who are struggling with relationships will need targeted help. Without going into too much details about mediation, restorative justice and reconciliation (which needs a blog post for itself), teachers need to know which students are distracted from learning because of conflict in their class and have a toolbox of tools for how to respond.
- Fourthly, we need processes to assess and track relationships just as we have processes for assessing and tracking numeracy and literacy.

What do you currently do to track relationships? Most would answer that they use subjective observation of quality teachers. Consider how you could increase effectiveness of these observations.

One simple idea is to encourage teachers to regularly meet with two students who they know like them

(there's always a couple in each class) and interview them about the relational dynamics in their class. They may find issues that are below the surface. This will help them to develop curriculum delivery to match the relational dynamics of each particular class. For instance asking certain students to speak publicly in front of their peers may be disastrous if they are being ostracised by a dominant member of the class. They could ask this student to do their presentation before your staff room instead.

For nine years I have been developing a tool for tracking relationships in schools (yr 3 to 11). For example at St. Paul's Anglican Grammar School we use this online tool I invented, in all four campuses, so that every term we ask every student about every student in their class. The data is processed automatically and trends are determined, revealing how relationships are developing and changing. Isolated students can have interventions tailored for them before negative experiences occur. Conflicts can be mediated. Students with potential for bullying can be coached and encouraged to build trust rather than abuse it.

You and your school are welcome to pilot Trustmapping at no cost with a class to see if it

brings benefit to your plan for building schools with wonderful relationships.

Peter Cavanagh is a teacher and "ideas man". He lives near Melbourne Australia, is married with two children and is passionate about seeing students become well connected and learning effectively. Pete came up with Trustmapping.com to help kids in schools. It gives teachers metrics on trust within cohorts to pre-empt bullying and to be proactive in taking care of students who are getting left out by their peers.

So far we are working on 5 continents, 28 campuses, 97 classes and regularly surveying 2887 students.

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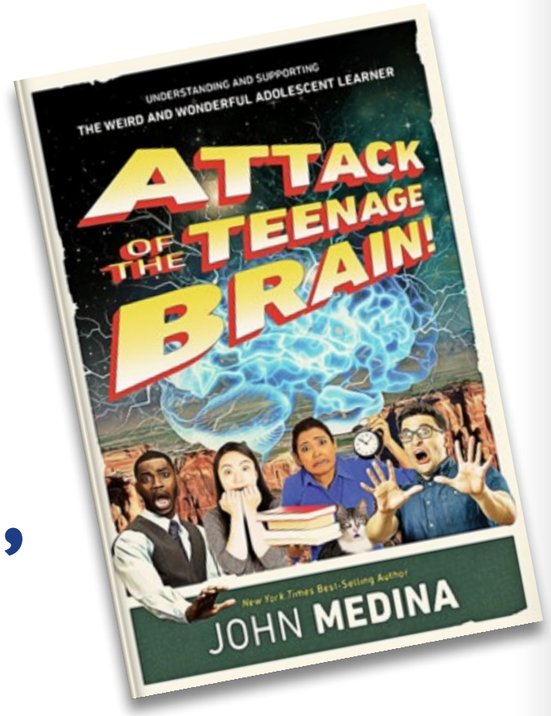
Book Reviews



John Medina

‘Attack of the Teenage Brain’

Reviewed by Adam Somes

“Attack of the Teenage Brain” by John Medina joins the growing list of books released in recent years, on the topic of adolescent neurobiology and adolescent development. Like its predecessors, *“Age of Opportunity”* by Dr Lawrence Steinberg and *“The Teenage Brain”* by Dr Frances E. Jensen with Amy Ellis Nutt, it too is founded in excellent research, provokes ongoing conversation about the trials of adolescence and provides insightful ideas about how parents and teachers can work collaboratively, to help adolescents survive these increasingly challenging years. Where Medina’s book stands apart from the texts that came before it, lies in its humour, accessibility and the comparisons he draws between adolescent development and popular culture of the past 2000 or more years. Any writer who can connect *Star Trek III: The Search for Spock*, the Greek demi-god Phaeton and Evel Knievel to the experiences of adolescence, is worthy of a read.

The title alone is probably more than enough to draw you in. When you start to move through its pages, what underlies John Medina’s book is a compelling argument about the need to put a stronger emphasis on Executive Function (EF), especially during childhood and the teenage years. Medina explores in great depth how EF can make a dramatic difference in the lives of adolescents, parents and educators. Medina is the first to admit that this concept is a controversial one. As an educator, the idea that there is this a panacea to treat adolescence, seems a little hard to swallow at first. The research that he draw on to support his argument is clear though; teens with higher EF do better. As Medina points out, “(EF)…separates rock stars from rock bottom….” (p. 23). His research is clear in showing that higher EF does not only have educational benefits, it also results in better physical and mental health, as well as personal and professional happiness.

Once his concept is established, Medina moves on to proving how parents and teachers who understand, develop and harness EF, can ensure the success of teenagers. He explores the science of brain structure and development in a personal and anecdotal style, which only further encourages you to support his underlying argument. Indeed, Medina describes the complexities of neurobiology in thoughtful, humorous and accessible ways. If you need these elements described to you in terms that sit outside the usual textbook fashion, this could be very well be your way in. It’s not only the brain that he is interested in exploring, but behaviour and emotions as well. Throughout the middle chapters of his book, it emerges that 14 years of age, might be the most important age in adolescent development. This is the peak age for neurological, health and academic development. Medina outlines to the reader that the battles of adolescence are either won or lost when a teenager reaches 14 years of age. Although this might seem a frightening idea, he explores this idea with his usual warmth, humour and insight.

It is in the concluding chapters of *“Attack of the Teenage Brain”*, that Medina offers some truly exciting and inspiring views on how education and schools can be optimised for the teenage brain. His arguments are grounded in excellent research and only further strengthen his overall idea. For Medina, the schools of the future will have Executive Function at the centre of all its practices, whilst also involving and educating parents about how they can best support their child throughout their teenage years. However, the best outcomes could be delivered by having every teenager involved in daily exercise, empathy building and through practising mindfulness; by doing this, he argues, education can be revolutionised. It is a bold vision well worth consideration.

If you are interested in knowing the types of answers we can find to the puzzle that is adolescent development, especially through references to popular culture, then this would be a great addition to your reading list. More importantly though, if you are after a book about adolescent development that is relevant, thought provoking and shows how great story-telling can connect and reinforce a deeper message, then John Medina’s *“Attack of the Teenage Brain”* should be on your must-buy list.

Information for Contributors

Adolescent Success welcomes submissions for journal inclusion that reflect the aims of the Association and address issues relevant to the middle years of schooling. Possible topics include: the developmental needs and interests of young adolescents; family and community partnerships; varied approaches to teaching and learning integrated curriculum; authentic assessment; school leadership and organisational structures in the middle years; information and communication technologies and resources in the middle years; research findings and future developments in the middle years.

Contributions may take the form of:

- academic and research papers that make an original contribution of an empirical or theoretical nature
- literature reviews
- papers of a practical or applied nature
- reports
- viewpoints
- book reviews

Contributions

- The journal has two levels of acceptance of papers for publication: refereed and non refereed. Refereed papers will have two referees selected from relevant fields of study by the editor. Papers must clearly indicate if they wish to be considered for refereed status. Refereed articles will be included in a specific section of the journal.
- Contributions shall be submitted electronically via email to the MYSA email address, or on CD, as a Microsoft Word document. Articles must be double-spaced, without the use of styles, 12 point font Times New Roman. The submitted article and CD become the property of MYSA.
- All contributors need to complete an Author's agreement form to be submitted with the article.
- Papers should be between 700 and 5000 words in length.
- Each article should have a separate title page that contains the title, the names of all authors, their contact addresses, email addresses, and telephone and facsimile numbers. The names of the authors should not appear on the rest of the paper.
- An abstract of no more than 200 words must accompany each refereed article.
- All references should be placed at the end of text using APA (6th edition). For example:

Journal article
Rumble, P., & Aspland, T. (2010). The four tributes model of the middle school teacher. *Australian Journal of Middle Schooling, 10*(1), 4–15.

Book
Bandura, A. (1986). *Social foundations of thought and action*. New Jersey: Prentice Hall.

Chapter in edited book
Ajsen, I. (1985). From intentions to actions: a theory of planned behaviour. In J. Kuhl & J. Beckman (Eds), *Action control. From cognition to behaviour* (pp. 11–40). Berlin: Springer-Verlag.

- Footnotes are not to be used.
- Figures and diagrams should be professionally prepared and submitted in a form suitable for reproduction, indicating preferred placement.
- Photographs should be submitted separately (not included within the text). All student photographs, art work, poetry etc must be accompanied by copyright release forms, which are available on the website or from the editor.
- If the material has been published elsewhere, details must be included on the author's agreement form.
- The Middle Years of Schooling Association Inc holds copyright for articles published in the Australian Journal of Middle Schooling, excluding those previously published elsewhere.
- It is the right of the editor to make minor editorial amendments without consultation.
- Upon acceptance of contributions for publication, the contributors will be advised of the likely issue and date of publication. A complimentary copy of the journal in which the article appears will be sent to contributors.

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