

Social, emotional and cognitive development and its relationship to learning in school Prep to Year 10

A discussion paper prepared in August 2004 for the
Victorian Curriculum and Assessment Authority
as theoretical background for development of the
Victorian Essential Learning Standards



Acknowledgments

The VCAA acknowledges Inyahead Press and the following writers that helped shape the Victorian Essential Learning Standards:

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Introduction

A revolution in the study of the mind has occurred over the last three to four decades. The world is in the midst of incredible advances in our understanding ‘of the mind and brain, on the processes of thinking and learning, on the neural processes that occur during thought and learning, and on the development of competence’ (Bransford et al., 2000). Not that long ago, it was believed that the brain had all of its neurons at birth. The brain was unchanged by life’s experiences. We now know that the brain is continually changing in response to experience.

Society is becoming increasingly global, with students entering communities that have greater diversity. No longer are communities guaranteed a uniform set of social values, with common religious and cultural norms. Eckersley (1995) argues that the ‘accelerating rate and nature of changes – economic, social, cultural and technological – have torn western societies from their past and from the cultural heritage that provided the moral framework to [their] lives.’ These changes not only create challenges for schools in terms of sensitivities and ethics; they also have profound implications in terms of learning. In order for learning to occur effectively and efficiently, students need to understand how their existing knowledge relates to new tasks. The greater the contrast between the cultural and social norms of school and community, the more problematic a student’s opportunities for learning and success.

At the beginning of the twentieth century, schools focused on language acquisition. One hundred years later the demands on schools have grown dramatically. Students are confronted by a world that is changing at an ever-increasing rate. The explosion in knowledge and information is so dramatic, students will never even know about most information, let alone remember it. As the Nobel Laureate Herbert Simon once stated, ‘the meaning of knowing has shifted from being able to remember and repeat information to being able to find and use it.’ Students are now required to comprehend, apply, analyse, evaluate and synthesise (Bloom, 1956). They are recognised as being intelligent linguistically, spatially, kinaesthetically, musically, inter- and intra-personally, and naturalistically (Gardiner, 2000).

Change has other implications. Since World War II many health indicators for young people in Western societies have been in decline, especially mental health indicators. Drug misuse, suicide, self-harm, eating disorders and stress have been on longer-term upward trajectories. Society is becoming increasingly pluralistic, with a growing minority of young people becoming marginalised from the main stream (PDAC, 1996). The development of more complex cognitive abilities at school is not enough to equip students for their roles in the global community of the 21st century. The development of emotional and behavioural skills is also fundamental to effective functioning.

The purpose of this paper is to identify those generic skills that are essential for students to acquire at each stage of development Prep – Year 10. These are discussed in three broad stages; early, middle and 9–10 years, and refer to emotional, behavioural and cognitive skills.

The developing mind and brain

Neurons (nerve cells) receive information from other neurons or sensory organs, which they integrate to determine output. They then send their messages to other neurons or sensory organs. Information passes from one neuron to another along

synapses. In this sense, synapses are like the brain's wiring, along which messages pass. Two-thirds of the brain's synapses are produced after birth. At first they are over-produced, then selectively lost. The nervous system initially sets up a large number of connections. Experience then interacts with this network, selecting the useful ones to keep, and shedding those that are not useful. A basic structure of the brain is thereby created for future development. Depending on the part of the brain, this process is occurring up to 2–3 years of age in the case of the visual cortex, and 8–10 years of age in some parts of the frontal cortex. After this time, the brain alters in response to life experiences through the generation of fresh connections (synapses), and even in some instances, through the creation of new neurons. This is called 'neural plasticity.' For instance, students who study the violin each day for many years, develop larger parts of the brain where finger movement is controlled (Davison, R. in Goleman, 2003).

The link between emotions and cognition

Our thinking brain evolved by building on parts that are involved in emotion and feelings, causing them to be intricately linked. Feelings, then, are both created and perceived by the brain. They directly influence our behaviours and attitudes. (Zull, (undated). For instance, stress may lead to impaired cognition and fear may result in the physical deterioration of memory systems. (Sylwester, 1998).

Novelty and positive stimulation may lead to a heightened level of alertness and motivation. Our several specific emotional subsystems alert us to dangers and opportunities that shift our attention from its current focus to that of the emerging problem – and these actions then activate our various response systems. Our emotions establish and help to maintain the focus and intensity of our attention and solution systems (Sylwester, 1998).

In general, complex learning is enhanced by challenge and inhibited by threat. The brain learns optimally when appropriately challenged in an environment that encourages taking risks, but where it is not subjected to high levels of stress, or negative emotional excitation (Caine & Caine, 1994). Unpleasant feelings, such as fear, anger and helplessness, impair thinking, while more pleasant feelings, such as calm, safety and self-determination, tend to enhance thinking. Emotional regulation is a key skill.

Emotional intelligence

Daniel Goleman is credited with popularising the theory of emotional intelligence, which has its origins in the work of Salovey and Mayer who expanded Gardner's 'personal intelligences': inter- (social) and intra- (individual) personal intelligence. Students who are emotionally competent recognise and manage their own feelings, recognise and respond appropriately to the feelings of others, tolerate frustration, are less impulsive and more focused, and concentrate better.

Goleman (1996) argued that emotionally intelligent students manage their impulses and tend to find rational solutions to problems. Emotional intelligence is a determinant of lifelong success. Conversely, a lack of emotional intelligence tends to lead to emotional, academic, social and behavioural difficulties.

Brain research and implications for learning

A meaningful discussion of brain research, especially of the last thirty to forty years, and the implications for learning are beyond the scope of this paper.

However, a key theme in the literature is that knowledge is constructed. We build our brains through experience, both real and perceived:

Knowledge grows as our neurons make new connections, and as they increase or decrease the strength of existing networks in the brain... It is these existing networks, this prior knowledge that is the substrate for constructing new understanding. We learn by attaching the new to the old. This modifies the old, sometimes beyond recognition, but we are always building on what has gone before. Sometimes these old networks are so powerful that they become a barrier to new knowledge. Thus, we often carry childhood beliefs with us for a lifetime, even when we know that they are technically incorrect (Zull, undated).

Consequently, one of the first skills children must develop when entering school is how to reflect on learning, to link new knowledge to existing knowledge, to establish what is true and accurate, and to challenge what is untrue and inaccurate.

How children learn to do this is discussed in the context of how children learn, the mind and brain, and how experts differ from novices in a recent book by the National Research Council, USA (Bransford et al., 2000).

The authors acknowledge that learning is cumulative, and consequently, that the ability to transfer learning is a key skill. They further argue that children are actively engaged in making sense of their world. This process is aided by their capacity to speculate, explore, and draw on existing knowledge to expand their understanding of a task. They are innate problem solvers who have the ability to reason with the knowledge they understand. They develop meta-cognition very early by possessing the ability to plan and monitor their success. This is a skill competent learners transfer to the school setting when they monitor and regulate their information processing, making changes and adapting strategies as required.

Giving children opportunities to be reflective improves the quality of learning, since learning with understanding is more likely to promote transfer than memory. Knowledge needs to be relevant to a child's knowledge base and how it relates to new tasks. Knowledge that is delivered in a variety of contexts is more likely to be applied or transferred broadly. Children develop flexible understanding by extracting themes or concepts from knowledge.

Well-organised knowledge structures help children to store and apply their knowledge. As children specialise, they need to have an in-depth grasp of the organising structures or thinking patterns of a discipline, as well as factual knowledge. Children need to develop strategies that help them to understand a problem or task, for example, by making connections between a task and previous tasks they have solved successfully.

Children often fail to discriminate between the quality of information. Children require assistance with learning, by teachers directing their attention, structuring their experiences, supporting their efforts, and regulating the complexity and

difficulty of levels of information. Children need time to learn complex subject matter, and to know how and when to apply knowledge.

Early years

Children enter school with the major part of their brain's hard wiring already formed. They commence schooling with a vast amount of knowledge and skills. Much of this will be true and accurate, but some of it will not, even though it is believed to be true.

Some of these inaccuracies will be the basis for future learning. Some children hang on to inaccuracies and untruths with remarkable persistence and determination, indicating the importance of teaching students about how to reflect on their learning, and to focus on what is important, what is true and what is useful.

Piaget (1947a) described this process as: assimilation, where new information is integrated with prior knowledge; and accommodation, where new information causes an alteration to prior knowledge.

For children, beginning school is a major upheaval in their lives, especially those who have spent the majority of their life at home. The first challenge of schooling is to help children manage this change and to become engaged in schooling – behaviourally, emotionally and cognitively. Engagement is a state that remains critical to success throughout schooling.

Behavioural engagement involves:

- positive conduct, where children are cooperative and considerate of others. This is a minimal level of behaviour that allows the individual, other students and the school to function effectively.
- attitudes to learning where children persist, concentrate and interact. This is an intrinsic level of behaviour that helps students to achieve and develop. It is a natural inclination in most young children, and tends to decline in adolescence.
- commitment to school, where children participate in extra-curricula activities. This is a form of behaviour that indicates children are more than just engaged in their learning; they are participating fully in the opportunities provided by a school experience. It also indicates that children have a positive and confident attitude to the school experience (Fredricks et al., 2004).

Most behaviour is habitual. Developing habits early in a student's school experience provide the navigation systems to guide them as they progress. Developing habits of pro-social conduct, pro-learning attitudes and participation in extra-curricula activities indicate behavioural engagement.

The three levels of behavioural engagement described, move from a minimal level of engagement where children conform, motivated by extrinsic demands, to a higher level where their motivation is more intrinsic. The latter includes resilience, that is, the capacity to overcome stress and adversity. Resilient children achieve more highly at school and better manage the ups and downs in life. Schools play a significant role in helping children to develop resilience (Resnick et al., 1993).

A resilient child develops the habits of confidence and optimism. In school, resilience is nurtured as children are encouraged to persist with difficult tasks, and to take risks in order to achieve. Teachers provide an environment that facilitates reflective and positive attitudes toward mistakes, from which children learn and develop. Children are supported to develop a repertoire of positive coping strategies for solving social problems and managing stress. They have

opportunities to develop a sense of belonging at school and to enjoy participating in opportunities where they give and receive recognition for their efforts. They are assisted to maintain supportive relationships with a diverse range of family, peers, teachers and significant other adults. They are encouraged to differentiate between what is more and less important, to identify what they value and how they feel in pursuit of a sense of purpose. They are encouraged to set goals and plan to achieve them. Their parents are valued in their schooling and intervene when necessary.

While behaviour is significantly determined by habits, it is also sometimes reactive, being influenced by emotional states and cognitive processes.

Emotional engagement may be defined in terms of general well-being at school – for example, happiness, safety, calmness and empowerment, as opposed to sadness, worry, helplessness and stress. Or it may be defined in terms of identification with the school, where a student experiences a sense of belonging and value from school activities (Finn, 1989 quoted in Fredricks et al., 2004).

An important fundamental emotional skill that should be developed early and maintained throughout schooling is impulse control. Impulse control is a skill many children appear to develop naturally around the age of four. Professor Michel of Stamford University conducted a famous experiment in the 1960s in which the impulse control of four-year-olds was tested with marshmallows. Children who lasted for 20 minutes without eating their marshmallows were rewarded with another marshmallow. Approximately one-third of children lasted for 20 minutes, one-third lasted for some time but ate their marshmallow before 20 minutes, and the other third ate their marshmallows immediately. Those children who managed to control their impulses and delayed gratification for 20 minutes to receive another marshmallow have been shown in longitudinal studies to score more highly in positive life outcomes. In fact, the marshmallow test was a more accurate predictor of lifetime success, including academic performance, than other forms of intelligence testing (Goleman, 1996). Teachers can help children to develop impulse control by teaching them to recognise the feelings in themselves and others, by implementing behaviour management approaches that encourage children to regulate emotions, and by helping children to reflect on their behaviours.

Teachers encourage **cognitive engagement** by assisting students to be strategic and self-regulating learners, planning, monitoring and evaluating their progress. Intrinsic motivation is another aspect where students value learning and strive for mastery by developing strategies to persist and avoid distraction. They are driven to manage their level of effort, and to take steps to improve their performance by implementing a range of strategies that may include rehearsing, organising, summarising, remembering and understanding. The psychology literature includes flexible problem solving, preference for challenging tasks, and the acquisition of positive coping styles in definitions of cognitive engagement. (Fredricks et al., 2004)

While the first step in cognitive development is to *engage* children, this is only the beginning. The challenge then becomes to *challenge* children.

Around the age of six, there is a second surge in brain development as the child starts to use language in increasingly complex ways. This is a window of opportunity to develop reading and writing skills. Habits that form during this period reinforce brain development.

Around this time most children learn basic reading, writing and number. These essential skills provide a pathway to independent learning, and the development of increasingly complex thinking strategies.

Learning involves both construction and deconstruction of ideas. This occurs when students generate their own questions and apply a variety of strategies to develop a thinking process when considering an idea.

While there are thinking traditions, there is no set path or right way to think. Essential to thinking is the realisation that you do not always get the right answer the first time, that there is often more than one way to arrive at an answer and, often, more than one answer. Thinking may be explorative, adventurous, novel and fun; it may involve taking risks and making mistakes; it may involve constructing, reconsidering, reconstructing and often changing ideas. Deep thinking also allows children time to experience both conscious and unconscious learning, to recognise patterns and to create new ones.

In late childhood, Years 3–4, children begin to shift their focus from their inner to their social world. Friends and morality become central to their behavioural, emotional and cognitive states.

Friendship provides opportunities for social growth. Through their relationships children expand their social world. Children experience joy and satisfaction, as well as conflict and disappointment. They learn how to play in groups, and become more aware of diverse rules and customs. They form attachments, make emotional investments and form bonds outside the family. They become aware of common interests and understandings, values such as loyalty and trust, and how to construct joy and fun. Friendship also helps children to develop social skills such as negotiation, conflict management, group decision making, tolerance and social problem solving. Late childhood is also a time when many children experience bullying. Social skill programs are particularly important in Years 3 and 4.

With this switch in focus, children also become more aware of their own value systems and the value systems of others. Kohlberg (in Muuss, 1975) explains moral development as beginning when children begin moving from an elementary stage – pre-occupied with their own needs – towards some level of recognition of the needs of others and a degree of reciprocity. The latter is done on the basis of an exchange of favours, rather than on the basis of a set of values. In late childhood, they begin to perceive goodness and focus on pleasing others, especially authority figures. They maintain and judge relationships on the basis of values such as trust and loyalty, and they consider the motivations for the behaviour of others. They tend to see rules as inflexible and feel a duty to obey them. Values education that informs social skills development is important at this stage of schooling.

Middle years

A key concept in the literature is that of a ‘developmental transition’ which is a period in life when there is a period of change both within the individual and within the social environment. Adolescence occurs when children begin puberty. They are developing an independent social, emotional and sexual identity. Maria Montessori described adolescence as:

an age of great social development, an age of critical thinking and re-evaluation, and a period of self-concern and self-assessment. It is a transition from childhood to adulthood with the corresponding physical, mental and sexual maturation. In

early puberty the adolescent finds it hard to concentrate on academic and structured learning. Above all, adolescence is like an odyssey – an arduous yet exciting adventure – where the adolescent tries to find his or her place in the world.

Accompanying the shift from childhood to adolescence is the shift from primary to secondary schooling. Students are often subjected to more competitive standards and institutionalised forms of emotional and behavioural management. A shift in support-seeking behaviour, from adults to peers, also occurs in adolescence. Developing the skills to connect with pro-social peer groups is fundamental to functioning well during this phase of development.

Transition to secondary school requires students to accept many social challenges. Students need to be assisted to communicate, participate and work cooperatively, to have self-control, and to be able to resolve conflicts thoughtfully without resorting to avoidance or aggression. In other words, students need to be emotionally intelligent. Self-efficacy and communication skills (in the context of social skills) are critical.

During adolescence, students become more complex thinkers. They begin to apply logical reasoning processes and apply these to both abstract ideas and concrete objects. They become more flexible and begin to regulate their own learning. They begin to expand their thinking in subjects such as mathematics and use scientific method. They also begin to organise their thinking in more complex ways by understanding processes like cause and effect. Consequently, they become capable of distinguishing between the processes and thinking tools specific to particular subjects. Learning how to reflect on and evaluate these processes is an important skill to develop in the Middle years.

Piaget (1947b) described this as a shift from the concrete operational stage, when a child was able to reason on the basis of objects, to the formal operations stage, when the student:

begins to reason on the basis of verbal propositions. He can make hypothetical deductions and entertain the idea of relativity. ‘Formal thought reaches its fruition during adolescence. An adolescent, unlike the child, is an individual who thinks beyond the present and forms theories about everything, delighting especially in consideration of that which is not’ (Piaget, 1947, p.148, as cited in Muuss, 1975, p. 192). The adolescent can not only think beyond the present, but can analytically reflect about their own thinking.

The adolescent thinker can leave the real objective world behind and enter the world of ideas. They are able to control events in their mind through logical deductions of possibilities and consequences. Even the direction of his thought processes change. The preadolescent begins by thinking about reality and attempts to extend thoughts toward possibility. The adolescent, who has mastered formal operations, begins by thinking of all logical possibilities and then considers them in a systematic fashion; reality is secondary to possibility. “The most distinctive property of formal thought is this reversal of direction between reality and possibility ... formal thought begins with a theoretical synthesis implying that certain relations are necessary and thus proceeds in the opposite direction ... This type of thinking proceeds from what is

possible to what is empirically real” (Inhelder & Piaget, 1958, p. 251). This reversal of the direction of thought between reality and possibility constitutes a turning point in the development of the structure of intelligence, since it leads to an equilibrium that is both stable and fixed. (Muuss, 1975, p. 192).

...Formal operations allow the adolescent to combine propositions and to isolate variables in order to confirm or disprove his hypothesis. He no longer needs to think in terms of objects or concrete events, but can carry out operations of symbols in his mind (Muuss, 1975, p.193).

However, while the adolescent becomes capable of thinking abstractly, their brain is still not fully mature. While the parietal and temporal areas mediating spatial, sensory, auditory and language functions appeared largely mature in the teen brain, the frontal lobes are still maturing and there is evidence to suggest myelination is still occurring.

Researchers at UCLA, Harvard Medical School and the National Institute of Mental Health have traced the development of a child’s brain to adulthood.

Through neuro-imaging technology, researchers have discovered that in a process called myelination a normal healthy adolescent brain develops during adolescence. Myelination helps the brain to communicate more quickly and efficiently. One of the benefits is the enhancement of fine motor skills; the use of the smaller muscle groups that require hand–eye coordination. This leads to the capacity for improvement in areas that combine visual and thinking skills, for example, art and design. Displaying information visually in the form of concept maps, cause–effect diagrams, and flow charts are skills that will help develop metacognition.

The brain has a period of specialisation that lasts from around 12 to 18 years of age. Heavily used parts of the brains develop, and unused parts of the brain are pruned. This process is most predominant in the pre-frontal cortex, an area critical to controlling planning, working memory, organising, anticipating consequences, controlling impulses and modulating mood. These are skills fundamental to optimum academic achievement. Students require specific training to help develop these skills.

To compensate for the underdevelopment of the prefrontal cortex, the adolescent brain relies heavily on another area of the brain called the amygdala, which creates a tendency to react on instincts. Biologically, adolescents do not have the same abilities as adults to control their actions and make sound decisions.

Wilson & Horch (2002) report:

Neuro-psychologists agree that the way to hold attention in young adolescents is through sensorimotor experience (Davis, 2001; Kolb, 2000; Wilson, 2001). Music, smell, touch, and emotion can focus students’ attention when learning. Another approach combined with sensorimotor engagement is that of inquiry or problem-based learning (Kwon & Lawson, 2000; Montgomery & Whiting, 2000), which teachers can use by encouraging students to ask questions that interest them after initially engaging them in the problem of a unit. Using essential questions to frame the unit, incorporating the senses and emotions to focus the learning, and then facilitating students to find multiple ways of solving problems can focus adolescent

learning while building complex neuron connections within the brain.

At the time when the brains of students are becoming more specialised, schools will serve students best when they provide a diverse range of learning experiences. Incorporating the multiple intelligences into school programs will help students to develop a set of broadly based skills.

Stress may impede the development of the adolescent brain. There is also evidence to indicate that stress has a more negative effect on the brain development of females compared to males, especially for periods of prolonged stress (Wood & Shors, 1998). At the onset of adolescence, young people who remain connected to adults, school and family are more likely to develop resilience, which includes the ability to manage stress positively. Catalano (1997) argues that students are more likely to develop a sense of belonging when they have diverse opportunities to participate and succeed at school. Resnick (et al., 1993) found that feelings of safety and security are also critical to developing resilience skills.

Developing a sense of purpose also facilitates resilience. A sense of purpose may evolve from a moral and/or spiritual mission, or may be more practical, where students develop planning and goal-setting skills.

Mood modulation is a challenge during adolescence. Learning to manage emotions, predict consequences, develop optimistic thinking habits, and set goals are all skills that students need to acquire if they are going to achieve their potential regardless of the subjects they are studying.

Later years

By the time students reach Year 9 they are well into adolescence. They are, according to Robert Havighurst:

- accepting their physique and a masculine or feminine role
- developing more supportive relationships with their peers
- gaining independence from their parents and teachers
- seeking economic independence
- selecting an occupation
- developing intellectual skills and concepts necessary for civic competence
- desiring and achieving socially responsible behaviour
- preparing for marriage and family life
- building conscious values in harmony with an adequate scientific world-picture.

(Havighurst [adapted], in Muuss, 1975, p.142)

Parents and teachers have, by now, declined as important models, especially with regard to issues that are of immediate concern. (Muuss, 1975, p. 235). Peers become more important as models, along with designer labels, adolescent 'dialects', fashion, style, and multi-media idols. Programs that encourage positive peer influence, and link youths with adults will have positive outcomes in terms of resilience and coping styles.

Theorists like Erikson (1959), and Friedenberg (1959), consider adolescence as a time of re-examination and re-orientation, a time for developing the ‘mature ego’ (Muuss, 1975, p. 267).

Piaget (1947a) explained this stage as a time ‘at which the individual rejects, or at least revises his estimate of everything that has been inculcated in him, and acquires a personal point of view and a personal place in life.’ Child-like fantasy disappears and obligations, responsibility, and social expectations become more prominent (Muuss, 1975, p. 267). During this period, Kohlberg believed some young people could reach an awareness of universal values and ethical principles.

Added responsibilities and expectations can be part of this time of adventure, learning and growth, which can also be a time of fear, loss of confidence and insecurity. It has been noted (Quinn et al., 1985) that the rites of passage from childhood to adulthood are becoming more poorly defined, as adolescents mature physically at younger ages and enter the adult world of work and family at older ages; this has led to less clear roles for both parents and adolescents.

The post-compulsory years of schooling are a key developmental point to improve coping skills. Frydenberg (1997) suggests a need to intervene in the education of adolescents at about Year 9 level (at 14 and 15 years) to capture the student’s attention. The greatest shift in coping occurs between 14 and 16 years, which make it the optimum time to contemplate their coping behaviour and discuss particular strategies, especially for girls, ‘who exhibit a greater shift in coping between these years, but whose ability to cope decreases significantly during this period.’ (Rayner & Montague, 1999)

Coping skills are often discussed in the context of a broader set of skills, attitudes and beliefs, within the domain of resilience. Rayner and Montague (1999) assert that resilient young people demonstrate the following:

- They participate in activities, such as education, training, and work, that are indicative of a probable steady transition to adult work.
- They participate in decision making and are involved in citizenship responsibilities and the community.
- Their achievements in sport, education, employment, cultural or artistic activity are acknowledged.
- They have stable domestic or living arrangements.’

It is the pattern of full recovery from setbacks, or resistance to the negative effects of risks, that distinguish a resilient from a vulnerable young person. A resilient young person is a competent young person with effective coping skills.

Another development issue in the post-compulsory years of schooling is that concerning ‘second-chance events’ or ‘turning points’ where young people have windows of opportunity to change and improve their prospects. Werner (in Rayner et al., 1993) explains how these events are most likely to occur in times of change, as, for example, when major transitions are occurring.

These decisions will be influenced by the capacities of young people to remain positively connected to institutions, the circumstances and opportunities provided by institutions, and the recognition or level of importance placed on those institutions. As Rayner (et al., 1993) explain:

The evidence presented could be interpreted to mean that children and young people also need to participate in family,

school and community life, voluntarily that is. These are sources of positive experiences that teach them self-respect, self-esteem, give them an internal locus of control, and establish trusting relationships with others.'

Inter- and intra-personal skills are outcomes of these dispositions.

Career focus in the Later years

In Years 9 and 10, a future career comes more into focus for young people. A number of public and industry-sponsored investigations into the skills that prepare young people for work have occurred in the last 15 years, including the Mayer Committee (1992), Australian Industry Group (1999), Australian Chamber of Commerce and Business Council of Australia (2002) and the Australian National Training Authority (2002).

The Mayer Committee (1992) identified seven key competencies: communicating ideas and information, using mathematical ideas and techniques, working with others in teams, solving problems, planning and organising activities, collecting, analysing and organising information, and using technology. The Mayer Committee believed that three performance levels were relevant to each of the key competencies:

- Level 1: efficiency and self management
- Level 2: managing activities and making judgments about the quality of processes and outcomes
- Level 3: evaluating, planning and making improvements to existing and/or new processes.

The Australian Chamber of Commerce and the Business Council of Australia (2002) built on Mayer's recommendations by adding initiative and enterprise skills, learning skills and personal attributes such as values, attitudes and motivation.

The *Adelaide Declaration on National Goals for Schooling in the 21st Century* (1999) incorporated Mayer's key competencies as well as personal, inter-personal, ethical, civic and practical work knowledge. The latter involves participation in vocational education, and development of enterprise skills that encourage adaptability and flexibility.

The recommendations since and including Mayer (see National Centre for Vocational Educational Research, 2003), appear to fall into six categories:

- Basic fundamental skills (e.g., literacy, numeracy, technology)
- People skills (e.g., communication, team work, customer service)
- Thinking skills (e.g., organising, problem solving, creating, planning)
- Personal attributes (e.g., responsibility, flexibility, self-esteem)
- Business skills (e.g., innovation and enterprise)
- Community skills (e.g., civics).

Students with less of a workforce focus, and with more of an interest in their continuing success at school, will benefit from many of the above-mentioned skills. Competent learners will begin to use more sophisticated cognitive strategies than in earlier years. They will be flexible learners who apply a number of approaches to understanding information. They will explore widely, questioning assumptions and switching perspectives; they will use creativity and analysis; they will rehearse,

elaborate, organise, judge and apply. They will also prepare for the Senior years by acquiring efficient study habits. These will include note taking, study habits, planning, preparation for examinations, and motivation.

Conclusion

Brain research concurs with the predominant theories about learning. Knowledge is constructed and cumulative. Children build on previous experiences. That which is learned before schooling is the foundation for what is learned in the Early school years, and so on. In this sense, skills that are learned early in life remain useful throughout life. Rather than becoming obsolete, they form the basis for refinement and further development. Children will learn what is accurate and what is inaccurate. In order to correct inaccuracies, children must understand the learning process, and be helped by teachers, parents and peers to reflect on their learning.

The following table is a summary of the skills discussed (or implied) in this paper at each stage: Early years, Middle years, and Years 9 and 10. Those skills listed for the Early years remain essential learning in the Middle and Post-compulsory years. The skills listed for Middle years and Years 9 and 10 are added (or highlighted) because they can be most effectively taught at that stage of maturity, or because they are fundamental to a particular stage or transition period of development.

Summary of essential learning skills accumulating through stages of development

	Early years	Middle years	Years 9 and 10
Communication skills	<ul style="list-style-type: none"> • Reading, writing, speaking and listening • Recognising and responding to own and others' emotions • Asking and answering questions (as a basis for learning) 	<ul style="list-style-type: none"> • Self efficacy • Help seeking • Public speaking 	<ul style="list-style-type: none"> • Responsiveness • Reciprocity • Assertiveness • Fine motor skills • Technological skills
Thinking skills	<ul style="list-style-type: none"> • Internal locus of control • Focusing and concentrating • Self motivate • Monitor learning • Discriminate between information • Assimilate and accommodate • Problem solve • Multiple intelligences 	<ul style="list-style-type: none"> • Logical reasoning • Regulate own learning • Apply a variety of strategies • Construct and deconstruct concrete ideas • Organise information (e.g. cause and effect, concept map) • Reflect and evaluate. • Application 	<ul style="list-style-type: none"> • Plan and set goals • Construct and deconstruct conceptual ideas. • Employ a variety of perspectives • Question assumptions • Evaluate thinking processes, learning and ideas • Study skills
Social skills	<ul style="list-style-type: none"> • Supportive relationships • Friendly behaviour • Negotiation • Resilience 	<ul style="list-style-type: none"> • Cooperative learning • Conflict resolution • Emotional regulation • Assertiveness • Problem solving • Empathy • Group decision making 	<ul style="list-style-type: none"> • Predicting consequences • Considering motivations • Peer resistance • Universal values and ethical conduct • Coping skills
Employment and life skills	<ul style="list-style-type: none"> • School behaviour habits (e.g. organisation of materials) • Aggression management • Positive conduct • Participate in activities • Persistence 	<ul style="list-style-type: none"> • Team building • Outcome-focused habits and routines • Leadership 	<ul style="list-style-type: none"> • Personal attributes (responsibility, motivation) • Sense of purpose • Business skills (management, innovation, enterprise) • Personal skills • Civics

NB: Knowledge is cumulative. Skills for essential learning need to be monitored and improved at each stage of learning, consequently, early years skills need to be built on at subsequent stages of development, as do middle years skills.

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