ESTABLISHING AN INFUSED THINKING ORIENTED CURRICULUM

Catherine Milvain
T.P.T.C.; DipEd; BEd(Melb); GradDip SpecEd(Melb);
GradDipEdAdmin(Melb); MEd(Melb).

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DECLARATION OF ORIGINALITY

This is to certify that this thesis does not contain material which has been previously accepted for any other degree in any university. To the best of my knowledge and belief, this thesis contains no material previously published or written by any other person, except where due reference is given in the text.

Catherine Milvain
GLOSSARY

ad libitum: a sampling technique for the recording of instances which the observer sees as interesting, revealing or significant. It is non-systematic and relies on impressions and, while informative of the general setting, it is open to bias and as the only method of data collection, is not viewed as a reliable source of information.

assessment: The process of gathering and organizing information about students’ performance to guide instruction, evaluate and report on the progress of students.

authentic tasks: An holistic approach to the design of a classroom activity so that there are not fragmented foci, but multiple perspectives that encompass several curriculum areas and encourage students to make their own connections. This makes the task more meaningful and personal for students.

case study: collection of information about a particular group, including data from the participants themselves.

collaborative learning: working in small interactive and independent groups to present students with the opportunity to practice social skills as they go about completing a task with the support of peers.

construct validity: requires the researcher to use the correct measures for the concepts being studied (Soy, 1998: 2)

constructivism: building of previous experiences by refining and to lead to the acquisition of new knowledge. There is an inbuilt opportunity for reflection on the content learned and the learning process.

credibility: the researcher’s ability to show accuracy in the manner in which the study was conducted.

critical thinking: A systematic approach to examining and reflection upon ideas, concepts and information, in order to reasonably assess their worth; the approach involves probing
and questioning, examining different points of view, gathering, analyzing and interpreting information, and evaluation.

**empirical research**: Research that is based on first-hand experience and designed to test or generate a theory. This research aims to gather data from people who are actively involved in the performance of the behaviour being studied.

**external validity**: reflects whether or not findings can be generalized beyond the immediate case to other situations.

**extrapolate**: based on an assumption that an occurring course of action or events will continue in the same manner and that what is learned in one situation can be generalised to another situation where conditions are identical.

**field notes**: written or taped detailed description of what the observer witnesses.

**holistic perspective (research)**: taking heed of the action and communication of the all the community involved in the study of the phenomenon. The whole phenomenon is more than the sum of parts.

**human-as-instrument**: relying on the researcher (human) as the main instrument for data collection.

**inductive research**: a form of reasoning in which a generalized conclusion is formed from analysis of observations of particular instances.

**in-dwelling**: time the researcher spends in the natural setting, before beginning explicit research procedures, to understands how elements exist and interact in that environment and to build trust between researcher and those being observed.

**internal validity**: the rigour with which the research was conducted – rich description of the decisions of what was to be measured, and the care taken to collect reliable information.

**intrinsic**: based on uniqueness.
methodology: the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcome (Graue, 1999).

KLA: Key Learning Areas – the breaking down of various disciplines of the curriculum.

mind tool: These tools can be internal (e.g. self-talk, memory devices, strategies) or external (e.g. computer hardware and software) to the learner as they lead the user to construct or refine knowledge.

naturalistic inquirer: the role of the naturalistic inquirer is to capture what people say and do as indicators to allow for interpretation of their world (Taylor and Bogden, 1975).

naturalistic inquiry: a study of a group operating in its natural setting and where there is lack of predetermined constraints on outcomes.

observation: simple observation is the watching and listening by a detached onlooker.

passive participant: the researcher is present but does not participate or interact with the participants of the action being observed and disturbs, as little as possible, the interaction and communication occurring within the natural setting being observed.

phenomenology: A qualitative research approach concerned with understanding certain group behaviours from that group’s point of view (Palmquist, 2004).

PLTs: Professional Learning Teams of teachers operating within schools.

qualitative research: Qualitative research can be used to gain more ‘in-depth’ information than can be given quantitatively, and is broadly defined by Hoepfl (1997: 2) as “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification”.

reliable: that the study can be reproduced and, if used by others in similar conditions to the original research, results will be the same or highly similar.
rigour: degree to which research methods are scrupulously and meticulously carried out in order to recognize important influences occurring in a [sic] experiment (Palmquist, 2004).

scaffolding: building on known tasks and presenting a task which moves the student into a new area of assisted learning to solve the task.

thinking skills: thinking – the process of cognition, knowing, remembering, perceiving and attending; skills – the acts of collecting and sorting information, analyzing, drawing conclusions, brainstorming, problem-solving, evaluating options, planning, monitoring, decision making and reflecting. This understanding is based on the definitions of each word offered by Wilson, 2000.

TOC: reference used to denote a Thinking Oriented Curriculum.

triangulation (methodological): the combination of multiple data collection sources to establish reliability and validity of the analysis of the data.

validity: is the precision or confidence one has that the method measures what it claims to measure. Validity begins with the convergence of researcher and the subject’s ideas about the subject’s view of the world.
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ABSTRACT

This thesis critically examines the early stages of introducing higher order thinking skills to the students of Years 7 in a Melbourne Secondary College. These skills were part of a Thinking Oriented Curriculum initiative aimed at better meeting the present and future needs of students.

The College’s new direction was in response to increased pressure being placed on educational institutions to equip students for a future purportedly determined and dominated by technological and societal changes (Papert, 1996; McKenzie, 2000; Tapscott, 1998). One method available for educators to address this challenge is to ensure that thinking skills are deliberately taught within classrooms (Costa, 2000; McGuinness, 1999; Perkins, 2000). In this thesis, the term thinking skills implies the ability to use, apply or practice those attributes of the cognitive process of thinking (Wilson, 2000). Recognising the benefit of raising the cognitive level of students as part of a school curriculum is not a new addition to pedagogy (Dewey, 1933; Bloom, 1956, Piaget, 1950). However, in the past, activities to strengthen thinking skills were seen as most appropriate to use only with ‘gifted’ students, or as incidental addenda to a classroom task.

Effective thinking procedures can no longer be seen as the sole domain of able students. Strategies should be available for all students to affect how they construct and apply knowledge within their environment. These are the skills required to take them into the next stage of their lives, their workplace, as more sophisticated thinking is needed in employment than was required by previous generations (McTighe & Schollenberger, 1991). Appropriate higher order thinking skills thus become invaluable life management skills for all students.
INTRODUCTION

While maintenance learning has been, and will continue to be, indispensable, it will not be enough; innovative learning is required if we are to cope with the problem of anticipating and dealing effectively with turbulence and change (Nickerson, Perkins & Smith, 1985: 5).

MOVING TOWARDS THE FUTURE

The driving force of society’s progress has placed new demands on people operating in today’s world. Our educational system must be in accordance with these new directions and focused on ensuring that each student is introduced to the skills necessary for tasks as they now stand now and are envisioned for the future. At the same time pedagogical planning must nurture within these students an attitude, and aptitude, to confront and accept that life long learning will be necessary.

While the rest of the world has undergone great changes, Papert (1996) argues that education has not. Intervention is needed. Presenting skills and strategies integral to a thinking oriented curriculum is a method chosen by some schools as they respond to the call for educational reform (McGuinness, 1999). A Melbourne Secondary College has tried to meet this need for ‘educational reform’ by introducing a Thinking Oriented Curriculum (TOC) to help students as they grapple with the demands of present educational needs and the perceived needs of their future.

There is now less controversy about whether the primary purpose of education is to impart knowledge (content) or to develop thinking skills. Both are needed, but content can be delivered in a more effective manner than merely teaching to the test. This is the aim of a thinking curriculum. Set outcomes become the vehicle for introducing specific higher order thinking skills so that students may then apply them in classroom situations but, more importantly, take them into the rest of their lives. Content must be ‘rich’ and selected for its ability to contribute to the use of thinking skills and strategies. Tishman, Perkins and Jay (1995: 62) view this co-dependence of knowledge and thinking ability as “the warp and weft of intellectual competence” for one holds and supports the direction of the other.

Students need skills to make personal adjustments to successfully exist in tomorrow’s world. They will operate in what futurists term the “The Information Age”, where knowledge becomes a tradable commodity and a driving force of global life. This form
of knowledge does not mean the regurgitation of facts, but rather the ability to control knowledge – how to access, organise, analyse, evaluate and effectively use information. Knowledge will need to be applied in too many ways for all to be anticipated. Emphasis will be moved from recall and retrieval, to developing the ability to use information to construct new understandings. While Marzano (2000: 32) cited Goal 3 of the American education system as recognizing the need to incorporate thinking and reasoning as part of student education, the same goal is relevant for Australian education systems.

Every school will ensure that all students learn to use their minds, so that they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.

As working conditions and lifestyles continue to change, students need skills and dispositions to adapt what they already know and to confidently seek out what they do not know. To competently make this transition into tomorrow’s world, students need to begin to make some changes today. Acquiring thinking skills is an educational intervention which prepares students for life-long learning. The explicit teaching of thinking skills is not a new direction for education. Theorists such as Dewey (1933), Vygotsky (1962), and Piaget (1950) were, in earlier years, advocating such direction in pedagogy. However, more and more, this belief in the need for the teaching of thinking has been recognised, and accepted, as an essential aspect of education by theorists (Marzano 1991; Perkins 1995; Costa 2000; Lipman 1991; McGuinness 1999). Nisbet (1993) states that no curriculum will be regarded as acceptable unless it can be shown to make a contribution to the teaching of thinking. Marzano, Brandt, Hughes, Jones, Presseisen, Rankin, Suhor (1988: 5) identified this ‘dual agenda’ of content and thinking urging teachers “to develop in all students a rich knowledge base” as well as “a repertoire of cognitive and metacognitive skills and strategies”.

**Changing employment and learning mores**

While traditional vocational learning focused on presenting students with options for employment in their adult years, current philosophies see the necessity for a more holistic approach in preparing them for the future. There is a need to equip tomorrow’s workforce with management of information, collaborative problem solving, and critical, creative and reflective thinking skills. Preparing to be part of the workforce does not imply that the student is being trained as a commodity to be used for competing on global markets or to contribute to the wealth of the nation (Sinclair Taylor {2000} citing the attitude of former British Prime Minister James Callaghan). Rather, it is
empowering a person to retain a sense of individuality and take increased control in
their employment.

Research (Tapscott, 1998; McGuinness, 1999; McKenzie, 2000; Hassig, 2001; World
Future Society, ###) suggests the employment a student enters after secondary or
tertiary education will rarely be the only career for that student. Jones (2001) states
students of the future have a greater likelihood of being employed in casual and part-
time work. Initial employment will not remain static but evolve either into different
aspects of the initial position or, more often, undergo a complete change. It is predicted
that the necessity of accepting and coping with varying employment circumstances will
become more wide-spread and changes in vocation will be more likely to occur earlier,
with more frequency, and often be a forced rather than an elected change. There is also
the often-proposed idea (Papert, 1996; Tapscott, 1998; Cowling, 1998; McKenzie, 2000)
that many jobs of the future have not even been envisaged and, therefore, are not yet
known or created. While some people in previous generations managed promotion and
career change, a changing workforce environment will now need to be met by the
majority of the workforce (Curriculum Corporation, 2003).

This societal change was mentioned by Fisher (1990: vii) and is supported by current
studies into the phenomenon of younger generations overtaking older generations.
Hassig (2001) suggested that each generation prepares the oncoming generation for what
the future holds, but because of the rapid changes to life-style and employment, this
societal convention is no longer viable (Codrington, 2000). Just as the Industrial
Revolution caused major changes to the structure of society, there is evidence that
current students are part of a: “wave of social transformation” (Tapscott, 1998: 22).
These students are technologically fluent from an early age, and Langrehr (1996) stated
that while instant access to technological data retrieval processes has not replaced the
need for content, the acquiring of content has become a less important objective. The
profile of today’s generation of students (Codrington, 2000; Tapscott, 1998; McKenzie,
2000) must persuade educators to query the implications for classroom learning and
teaching and reinforce the tenet that all students will need life-long learning skills to
students, as citizens of the future, will need to make well-balanced decisions and
judgements and these decisions will become increasingly more complex. Current
technology demands that thinking skills need to become part of the wider environment
and encompass oral, written, imaged and electronic interaction (Collins, 1994).

Establishing An Infused Thinking Oriented Curriculum
Inculcating higher order thinking skills – an answer to the need for change

As the need to learn new skills will continue past their initial schooling, it is essential that today’s students are equipped to manage their future self-education. While some students show an instinctive knowledge and understanding of this requirement, teachers are beginning to accept that all students must be exposed to opportunities to apply thinking strategies by working on realistic and practical activities to gain practice in managing their lives – now and for the future. All students need to become competent thinkers for, as Wilson (2000) states, while we may not all have the same tools [thinking ability] in our kit, we can certainly improve how we use them. This is an aim of a thinking curriculum – to encourage all students to prepare their tools for continuing use so that this ‘equipment’ becomes part and parcel of that individual and is in readiness for the future. The need for all students to benefit from thinking skills is borne out in the reported changes in education in Malta when schools implemented thinking skills based on de Bono’s thinking tools: “children from the whole ability spectrum acquired confidence to think, to contribute to a discussion and to feel that their contribution is valid” (Atie, Dimech & Vella, 2001: v).

The ability to make choices based on sound reasoning, coupled with a thorough and accurate knowledge of self-learning, should become essential factors of today’s education. Perkins (1992: 5) terms this knowledge “generative”, implying that it empowers learners to build even further upon their knowledge as they understand and deal with the world. To encourage and enable this style of learning to occur, schools are placing greater emphasis on exposing students to ‘rich’ tasks i.e. activities that stimulate thinking proficiency while providing some realistic understanding of the commercial and social environment into which they will soon move. Thinking may well be the best and most constant resource for the changing world of their future. De Bono (2000) sees students of the future as the ultimate human resource as they become contractors of their work. Tapscott (1998: 128) echoes this belief in the value of controlling knowledge, stating the assets of companies will not only be judged on their realty “but by the intellect and knowledge of management and workers”. Bowell, Isaacs and Merlich (2002: 8) cite the work of Ashworth and Hickling (2002) in identifying skills required by knowledge workers: “metacognition strategies, complex problem solving strategies, social competencies (co-operation, teamwork, citizenship) and affective strategies (self-esteem, social worth feelings)".
For many years, teachers have had access to formal analysis of the nature of thinking and cognitive processes generally termed thinking skills e.g. Bloom’s Taxonomy (1956), Gardner’s Multiple Intelligences (1993), de Bono’s Six Thinking Hats (1992) and Vygotsky’s scaffolding (1962). The term ‘skill’ when used in this study encompasses both understanding and application of knowledge. Traditionally skills are obtained through observation, modelling, and practice to accomplish the transfer of learning. This aspect of practising and honing thinking is an integral part of the design of classroom tasks to establish thinking procedures. Scientific studies have increased knowledge of how the brain works (Herrmann 1989; Sternberg, 1984; Groves & Rebec, 1992; Fogarty, 1997; Atkin I999; Sylwester, 1991; Peachey, 2002) and how knowledge can be built upon and extended – constructivism (Duffy, 1992; Merrill, 1992; Perkins, 1992; Strommen, 1992; Cobb, 1994; Ackerman, 1995; Steffe, 1995; Brooks & Brooks, 1993, 1999; Fosnot, 1996 a&b; von Glasersfeld, 1996; Richardson, 1997). Perkins (2000) and Feuerstein, Rand, Hoffman, Miller (1980) maintain that with appropriate intervention, thinking processes are modifiable.

Teachers are endeavouring to keep the twin perspectives of thinking skills and topic content simultaneously in view (together with the other aspects of classroom management and practice). This sets in place the powerful learning environment which De Corte (1990: 12) suggests as providing: “a good balance between discovery learning and personal exploration on one hand, and systematic instruction and guidance on the other”. This explicit assistance of guiding the learning of students to better equip them with personal skills for their perceived future is the basis for Enterprise Education programs operating within secondary schools.

**Enterprise Education**

There is an emergence of theories of cognition as the prevailing theoretical framework of current educational practice (Pohl, 1997, 2000; McGuinness, 1999; Costa, 2000; Perkins, 1995). Teachers have developed curriculum and classroom tasks around such theories but are often looking for reliable affirmation that these practices positively affect students’ learning. They are endeavouring to ensure that rehearsal and training will encourage students to become competent thinkers. Educators are seeking confirmation that new directions in pedagogy are supporting students to develop the skills and competencies to face life and employment as part of the knowledge generation. The core value of Enterprise Education (a Victorian Department of Education, Science and Training incentive) is for curriculum, and the delivery of that
curriculum, to prepare student for an uncertain future and to equip them to create the future in which they will want to live. This Enterprise Education program is a Victorian Education response to wider-world recognition that education must address the needs of the future (Fisher, 1990; Tapscott, 1998; McGuiness, 1999). There is focus on developing an education system and a learning climate that supports the student as a learner and exposes them to skills which will allow them to be ‘entrepreneurial’ - taking advantage of what could be, rather than accepting what is.

Enterprise Education aims to assist teachers to construct curriculum that prepares students for a knowledge world where they are equipped with ideas, attitudes and values of coping with a way of life moving to one of shrinking labour requirements. Jones (2001: 76-77) predicts that “Australian workers will have between five and ten different employers during their working lives, along with three to five periods of unemployment”. Such shifting and changing parameters are forcing a major departure from previous career education beliefs and values. Current values of Enterprise Education merge with higher order thinking skills which are detailed in later chapters of this thesis.

**Developing a thinking curriculum**

The College in this study has set in place an infused Thinking Skills Program\(^1\) which targets general cognitive processes rather than develop skills which are solely subject specific. The aim of such an infused thinking curriculum is to develop a thinking curriculum and thinking classrooms that will become integral parts of a learning community and contribute to a sense of thinking culture within the school. Introducing students to the strategies of higher order thinking is seen as an essential part of classroom learning. The belief is that learning ‘how to think’ will transfer to ‘thinking how to learn’ (McGuinness, 1999). The ideal of transference of learning is stated in The *Smart School* project (Project Zero, 2003) which is based on two guiding principles:

1. Learning is a consequence of thinking, and good thinking is learnable by all students.
2. Learning should include deep understanding, and this involves the flexible, active use of knowledge.

\(^1\) The scope of an infused thinking curriculum is more fully detailed on pp.13, 14 and 52.
This ‘learnable thinking’ has become a goal for The College in its efforts to meet the students’ needs as they confront the demands of the 21st Century, and to fulfill the objectives of the Enterprise Education model. This thesis examines whether the first steps taken by The College in integrating higher order thinking skills as part of the curriculum for all students have an effect on the students’ own views of their thinking and on their learning.

The importance of this study

As Victorian secondary colleges move towards establishing thinking curricula, many are ensuring that teachers receive professional development in adopting teaching strategies that will hopefully ensure thinking skills become infused into all areas of the curriculum. But, as with any change, teachers asked to implement new ideas are seeking confirmation that these changes are producing a discernable difference in the learning behaviour and attitude of their students. Teachers want to know that as the wheel turns yet again, it is not just spinning but rather that ground is being covered and progress is being made.

McGuinness (1999) cites the work of Berliner and Calfee (1996) in pointing out two features which characterise contemporary educational research – the renewed engagement with issues of practice, and the emergence of cognition as the prevailing theoretical framework. However, she notes that in research conducted into approaches for developing pupils’ thinking, there were only a few well documented examples where thinking classrooms have been evaluated. McGuinness states that considerable evaluative work needs to be done in order to link features of a framework such as thinking skills and learning outcomes. Teaching experiments have been undertaken to try to assess the value of the intervention of teaching thinking skills, but “robustness [researched based evaluation] in terms of how they transfer to ordinary classrooms have not yet been tested” (McGuinness, 1999: 8). As the research base in this area is in its infancy, this study which examines the efficacy of The College’s intervention in establishing a thinking culture will contribute information to this area.

The College wished to evaluate the effectiveness of introducing a thinking skills intervention as an integral part of classroom practice. The aim was for the teaching of thinking skills to be overt, teacher-directed, and occurring as part of regular classroom instruction in all curriculum areas. This study was undertaken to ascertain if, after
training of staff to incorporate thinking skills as an explicit part of their teaching practice, there was observable application of these skills by the students. The research occurred during the first semester of the implementation and sought evidence that students were using (practising) the skills being ‘taught’ as part of the curriculum i.e. some level of application of this learning is occurring. The researcher believed that this should be an achievable outcome of a semester of regular, rigorous and systematic classroom observation and the analysis of other qualitative data. This research moved beyond teacher assumptions and opinions to a more penetrating analysis of the thinking skills being used in the classroom. After a rigorous, independent study, outcomes of this research will enhance professional knowledge in an area of education which is becoming increasingly important as schools look towards thinking skills as better contributing to long range goals of education i.e. life-long learning skills for their students.

An overview of the content of this study

Within Chapter One, thinking skills literature is examined to critically consider the identification of thinking skills and the tenets of a thinking culture for an educational institution. Three methods of presenting thinking skills within an educational setting, as suggested by McGuinness, are explained. The work of Perkins, Marzano and Costa is examined as these thinking skills theorists have made a substantial contribution to our current knowledge of developing cognitive skills for students. The underlying theories of De Bono’s Six Thinking Hats, Gardner’s Multiple Intelligences, Bloom’s Taxonomy and Ryan’s Thinker’s Keys for Kids, as supporting the development of thinking skills, are investigated as these programs were essential elements in the TOC.

In Chapter Two the rationale for the introduction of a thinking oriented curriculum and the background of The College where this study took place are examined. The steps preceding the introduction of the TOC, determining the Professional Development for the staff and how the initiative was organized within the structure of The College are also investigated.

Chapter Three details how the research design and methodology of the study meet the criteria of a case study as the project studies a phenomenon in a natural setting. Following the recommendation of Farrell; Peguero; Lindsey; White, (1988) that a report should be organised around the people important to the study, this work focuses on the perspectives of the school leadership team, staff implementing the initiative, and the students.
A full description of, and rationale for, all data collection procedures is explained in Chapter Four. In some instances, tasks were ‘purpose-designed’ to best extricate the information needed for this particular study. The theory upon which each was based and the structure behind the design of such tasks is provided within the data collection to ensure a valid and reliable data trail has been established.

The relevance of the results of this data collection and the implications of all major findings are examined in Chapter Five. The discussion of results from the multiple sources of data increases validity and places emphasis on the perspective of leadership, staff and students.

In Chapter Six the recommendations of this study are fully explained. The narrative report interprets and relates the qualitative data collected to fully inform in the reality of the context of the classroom – the naturalistic setting. This chapter will also draw attention to the contribution this project has made to the body of knowledge of implementing an infused thinking oriented curriculum, and raise possibilities for future research.
CHAPTER ONE
LITERATURE REVIEW

Current attempts to teach thinking are part of a more general thrust in educational reform which emphasises the quality of the thinking processes and thinking skills as a means of raising educational standards and of preparing children and young people for lifelong learning. Raising standards requires that attention is directed not only on what is to be learned but on how teachers intervene to achieve this (McGuinness, 1999: 1).

BACKGROUND TO IMPLEMENTING A THINKING CURRICULUM

The work of McGuinness (1999) in the field of thinking curricula has helped clarify alternatives for educators as they plan how to implement thinking skills into their school program. Because the work of McGuinness is fundamental to this current study, a condensed list of features she believed were critical in developing thinking skills within a school curriculum (1999: 5-7) are paraphrased below.

1. By focusing on thinking skills, cognitive processing is supported.
2. Teachers must make explicit what they mean by better forms of thinking and directly teach for thinking.
3. Thinking skills programs and taxonomies are specifically directed to take thinking into a 'higher gear'.
4. Sufficient time must be given to allow students to reflect on, and to discuss, their thinking hence the need for metacognition.
5. A constructivist approach to classroom tasks allows learning to be nurtured by building on self-reliance and social interaction with peers.
6. Cognitive competence is multi-dimensional and needs to be supported by collaborative learning.
7. It is important to encourage and nurture positive dispositions and habits of good thinking within the classroom;
8. The narrow focus of thinking as a skill expands to the idea of a thinking curriculum and learning communities.

The overarching aim of a thinking curriculum is that students are exposed to thinking skills and encouraged to use them in current studies so that these skills become habits they take into their future lives. When appraising any approach to the teaching of thinking skills, it must be acknowledged that there are students who already know these techniques and intrinsically apply them. The aim of current direction in the teaching of thinking skills is to ensure such techniques are introduced into the repertoire of all students. For some students, there must be explicit teacher intervention to encourage the transfer of skill, or the disparity between students will widen. De Bono (1991) states that all students benefit from such formalised teaching - even those who tend to display a working knowledge of such skills.
Research by Nisbet (1993), McGuinness (1999) and Wilson (2000) stated that educators have three approaches from which to choose when introducing thinking skills in a school curriculum: generic, subject specific and infused. Generic thinking skills are usually introduced through separate stand alone subjects and are targeted to general cognitive processes. Subject specific skills are skills which are applicable to a specific subject such as geography or mathematics and are often not seen as transferable to other curriculum domains. Infusing thinking skills into all curriculum areas involves recognising there are general skills which are applicable to all subjects and not limited to any particular curriculum area.

Selecting an appropriate Thinking Oriented Curriculum

Researchers in the field of education (Papert, 1996; Perkins, 1995; Costa & Kallick, 2000; Marzano, 2000) recognised that the teaching of thinking and reasoning skills in isolation is not always an effective methodology. If taught in isolation, these skills lack relevance and consequently students lack the understanding of how these skills fit together to reach desired outcomes. Peachey (2002: 16) saw this stand alone method as “bolted on” and not central to the needs of student. This was a view supported by Resnick (1987: 48) who stated that: “Isolated instruction in thinking skills, no matter how elegant the training provided, is unlikely to produce broadly used thinking ability”.

Introducing thinking skills into the curriculum, but linked to the content of a subject, is a technique Resnick (1987) advocated and she offered three considerations for adopting such methodology. The first of these was that a natural knowledge base was the best environment in which to practice and develop pertinent higher order thinking skills. Secondly, embedding such skills within the relevant discipline provided the criteria for what constitutes good thinking and reasoning within that discipline. Her third suggestion was that teaching higher order skills relevant to a specific discipline ensures that “something worthwhile will have been learned even if wide transfer proves unattainable” (1987: 36). Peachey (2002:16) also mentioned this doubt of transfer across curriculum areas and stated “reasoning and problem solving in one subject do not necessarily show similar high quality thinking in other subjects”. But while promoting the discipline-embedded approach to the teaching of thinking skills, Resnick strongly holds that there is value in the teaching of these skills- regardless of methodology.

Prudent educational practice should seek to embed efforts to teach cognitive skills into one or another - preferably all - of the traditional...
school disciplines, and it should do this regardless of special courses in thinking or learning skills (Resnick, 1987: 35).

Within her work, McGuinness (1999) explained the benefit of specific programs designed to increase and develop the thinking skills of participating students. Some of these programs are de Bono's CoRT Thinking skills (1986), Philosophy for Children (Lipman, Sharp, & Oscanyan, 1980) and the work of Feuerstein et al. (1980). Such programs are context free and usually operate with material designed specifically for the program and do not require specialized knowledge of content. McGuinness (1999) cited evidence to prove these programs have noticeable positive effect on the skills of participating students. However, often these programs are additional to the curriculum, are not always school-wide, and are often only taken on board by individual teachers with knowledge of the program. Unless all teachers are aware of the programs and the direction in which the associated activities steer students' analysis, creativity and application, then the skills attained by those students are rarely used beyond the classroom in which the specific programs are taught. There is a danger that the skills taught in stand-alone sessions will remain locked into these sessions and not 'transported' into other general classroom activities. Students need the opportunity to apply these skills in meaningful ways as a direct lack of application can mean these skills lie forgotten. Ong (2000: 3) stated that "if thinking is taught in only one or two courses, it will not take root".

There are many subject areas where specific skills have been successfully introduced and are effective in increasing the students' understanding and application of subject knowledge. However, as these skills are often subject related, this could mean that teachers outside of the discipline would not know of the skills or how they could be employed in another discipline. Marzano et al. (1988) state there is also danger that learning the skill may be seen as an end in itself.

Perkins (2002) speaks about differing methods of increasing students' thinking skills. Special courses focused on the art of thinking he agrees are worthwhile interventions, but not likely to find a place in an already crowded curriculum. He speaks of the necessity to use specific strategies and thinking tools that are linked with specific subject areas: "any discipline has its distinctive ways of explaining and justifying ideas" (Perkins, 2002: 4). He cites the need for deductive proof in mathematics, describes how science emphasises empirical proof, and reminds us that history is reliant on the use of primary sources. However, while promoting the use of these strategies within disciplines, he suggests these skills can be used in areas across the curriculum. He is
more concerned there is an injection of thoughtfulness into the subject matter so that the content and the technique for examining the topic are welded together as one, and that one is not taught without the other. Costa and Garmston (2002:3) state that curriculum needs to be generative - a “vehicle for experiencing, practicing and applying creative and critical thinking”. This is not an add-on to the curriculum but enrichment which Perkins (2002: 5) terms metacurriculum - where the tool becomes an integral part of the content: “I am an advocate of what is often called infusion – integrating the teaching of new concepts in a deep and far-reaching way with subject matter instruction.

An infused thinking curriculum

McGuinness (1999) sees an infusion method as ‘a middle way’ which recognises the need to teach specific thinking skills. She acknowledges this is best done when linked to context. She cites the Webster dictionary meaning of ‘infuse’ i.e. “to introduce one thing into a second thing which gives extra life, vigour and a new significance”. Within the context of the agenda of a thinking curriculum, thinking skills are introduced into the ‘normal’ classroom curriculum so that this curriculum becomes the medium for the explanation and application of thinking skills. Thinking skill and content are tucked into each other so that they become part of each other’s technique. McGuinness states the benefits of an infused thinking skills program are that: thinking skills are matched directly with topics in the curriculum; content instruction is invigorated thus leading to deeper understanding; classroom time is used optimally; teaching for thoughtfulness is directly supported across the curriculum; and transfer of learning can be more easily promoted and reinforced at other stages. Perkins (1992: 8) believes that this transfer of learning “is a consequence of thinking” engendered by experiences which invite students to think about, and think along with, what they are learning.

An infused method of teaching thinking is also supported by Swartz and Perkins (1989), Swartz and Parks (1994); Nisbet (1993) and, within Australia, Melville Jones and Haynes (1999). The early work of Swartz and Perkins (1989) identified three ways in which they interpreted infused thinking: 1) the active structured use of thinking skills; 2) creating an awareness of the thinking that students are doing; and 3) varied reflective practice in applying the skill. McGuinness refers to the work of Swartz and Parks (1994) to identify three key principles of an infused approach to the teaching of thinking skills: the more explicit the teaching of thinking is, the greater the impact it will have on students; the more classroom instruction incorporates an atmosphere of thoughtfulness,
the more open students will be to valuing good thinking; and the more the teaching of thinking is integrated into current instruction, the more students will think about what they are learning.

An infusion program relies on identifying specific thinking skills and designing delivery of content so that skills become part of tuition and are given practical application. This method is closely linked to the subject specific model but moves beyond the limitations of this methodology by not restricting the skill to a particular subject. Rather, the student is shown how the skill can be applied in other areas. For such a methodology to be effective, it relies heavily on the commitment of teaching staff, because all staff must be aware of the targeted skills and deliberately make opportunities for these skills to be practised by the student in all areas of the curriculum. While skills are introduced in one area, the students must be made aware of the ‘portability’ of the skill into other disciplines. The ultimate goal is that the thinking skills will become part of the psyche of each student and move with them into all parts of their lives – school life and beyond school.

Swartz (1991) states the linking of thinking skills to curriculum is a natural and relevant way to introduce students to these skills. He cites the work of researchers in the field of teaching of thinking skills (Perkins & Salomon, 1988; Salomon & Perkins, 1989), to add support for his belief for the effectiveness of infusing thinking as part of the regular classroom activities, rather than a separate skill taught in isolation from curriculum content or contextual application.

There are indications, however, that when a separate program is used as the sole vehicle for instruction in thinking, however effective it may be otherwise, the transfer of what is learned into other academic work and into everyday thinking is far less automatic than we would like (Swartz, 1991: 177).

Swartz and Parks (1994), Marzano (2000), Costa (1991) and McGuinness (1999) see an infusion method – curriculum becoming the framework for developing thinking skills - as having the best opportunity for transference of such skills into all subjects. It is important to heed the words of McGuinness (1999) who cautions that whatever model of cognition is used, maximising the transfer of learning beyond the context in which it was learned is at the heart of the matter. To effectively introduce an infused method of implementing thinking skills into a school program requires commitment by school leaders and all staff members, as well as entailing an effectively supported PD program for all teaching staff.
Implications of research into the educational needs of students in the middle years

The need for school planning and organization to better address the needs of students, particularly those in the Middle Years (Years 5-9), has recently received much attention from educators. Australian research has been conducted since the early 1990s and Leckey (2001) states that there is now an accumulation of research driving current educational policies. Victorian educational reform has recently been influenced by the convincing data presented by the MYRAD project which identified many middle year students as being disinterested and unengaged in an education they saw as unproductive and unrewarding. The results of this project have influenced the way educators are now responding, in a more informed manner, to the needs of these students. Many Victorian schools are keen to implement directions recommended by the report and are creating “a more supportive learning environment and one in which students are engaged and experience success” (Hill, Mackay & Russell, 1999: 1).

During the middle years of schooling, many students are experiencing significant changes to their lives. They must grapple with changes such as rapid body growth, cognition, their interests, their emotions and their place in a rapidly changing society (Leckey, 2001). Unless the concerns of these students are adequately ‘handled’, they quickly become disinterested in their education and disengaged with what is happening at school. Hill et al. (1999: 3) cite research which creates a list of disturbing social behaviour which these students can display.

- Early leaving; truancy; habitual lateness; dislike of teachers; anger and resentment toward school; disruptive behaviour in class; delinquent behaviour; suspension and expulsion; passivity and withdrawal; failure to complete work or do homework; low self-esteem; social isolation, peer conflict or gang behaviour; substance abuse; unsafe sexual practices and self injury.

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2 The Middle Years Research and Development (MYRAD) Project was commissioned by DE&I and was undertaken by the Centre for Applied Educational Research at the University of Melbourne during 1998/9, 2000 and 2001. Initial work was undertaken in 12 secondary schools during 1998-1999 and expanded to over 250 secondary and primary schools in 2000-2001. The project involved in-depth research into 61 clusters (62 clusters in 2001) of secondary schools and their associated primary schools. These clusters developed, evaluated and refined a research and evidence driven whole-schools approach to improve student learning outcomes in the middle years (Years 5-9). Fourteen clusters undertook specific research focussing on the areas of literacy, student engagement and well-being and a thinking-oriented curriculum (Hamilton, 2002).
Hill et al. (1999) suggest the rapidly changing society is a factor influencing current middle years’ students’ behaviour and acknowledge that difficulties within the middle years of education are common across Western society. The need for society, schools in particular, to respond to the changing times is a point also made by Tapscott (1998), as he talks of the N-Gen and its response to the influences of the rapidly changing technology of current times. These are the students he sees as active users of digital technology who “inquire, discuss, argue, play, shop, critique, investigate, ridicule, fantasize, seek, and inform” (p.26). Such skills Tapscott sees as potentially embarking students on a new path to learning which places an onus on educational institutions to examine how they are addressing, and meeting, the needs of these students. Unless this changing attitude of students is addressed by teachers, student reaction will further fit with the disengagement and disinterest mentioned in the MYRAD report. Tapscott (1998: 128) sees students of this digital age as those who “expect things to happen fast, because in their world things do happen fast”. However, perhaps as a balance, students need to be aware that the ability to make quick decisions and to then critically examine the ramifications of these decisions, will become an essential element of a person’s interaction with society. Metacognition, and use of this self knowledge, will be an indispensable part of all decision making process - thus supporting the ethos of a thinking curriculum.

**MAJOR THEORISTS IN THE FIELD OF THINKING SKILLS**

It is important for any study of how thinking is nurtured in classrooms, to examine the work of theorists whose models are currently influencing thinking skills as they apply to classroom teaching and learning and the development of a thinking oriented curriculum.

In order to avoid formulation of lists concerning skills with no theoretical base, we had to choose a proper theoretical framework that will guide our efforts and consolidate our findings (Hassig, 2001: 4).

When addressing the topic of *Setting a Thinking Climate*, Fogarty (2004) spoke of a set of ‘Architects of the Intellect’. Table 1 lists these thinking theorists, the particular aspect of thinking linked with each, and a brief explanation of the understanding of intelligence attributed to each of these theorists. There is no lack of models and theories about thinking with Sale (2001) stating there is even the possibility that varied perspectives and terminology could confuse educational planning rather than assist.

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Chapter One

Literature Review

<table>
<thead>
<tr>
<th>THEORIST</th>
<th>ASPECT OF THINKING</th>
<th>UNDERSTANDING OF INTELLIGENCE</th>
</tr>
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<tbody>
<tr>
<td>PIAGET</td>
<td>Constructivism</td>
<td>Intelligence is developmental and constructed in the mind of the learner.</td>
</tr>
<tr>
<td>VYGOTSKY</td>
<td>Socialism</td>
<td>Intelligence is a function of experience and can be modified through material, tools and other human beings. He advocated that children learn best in a social setting.</td>
</tr>
<tr>
<td>FEUERSTEIN</td>
<td>Mediation</td>
<td>Intelligence is a function of experience and can be modified through mediation with another human being guiding the thinking.</td>
</tr>
<tr>
<td>GARDNER</td>
<td>Differentiation</td>
<td>Intelligence is not a single entity, but involves at least eight other realms of knowing.</td>
</tr>
<tr>
<td>GOLEMAN</td>
<td>Emotional</td>
<td>Intelligence is both cognitive and emotional (self-awareness, self-regulation, sympathy, motivation, social skills) with emotional ruling over the cognitive – EQ is more important than IQ.</td>
</tr>
<tr>
<td>COLES</td>
<td>Character Development</td>
<td>Intelligence is composed of cognitive, psychological and moral realms.</td>
</tr>
<tr>
<td>PERKINS</td>
<td>Metacognition</td>
<td>Intelligence is composed of acquired habits of mind.</td>
</tr>
<tr>
<td>COSTA</td>
<td>Intelligent Behaviour</td>
<td>Intelligence is composed of acquired habits of mind.</td>
</tr>
<tr>
<td>STERNBERG</td>
<td>Practical Application</td>
<td>Intelligence is triarchic with analytical, creative and practical components.</td>
</tr>
</tbody>
</table>

Table 1: Major theorists in the field of thinking skills and their approach to understanding intelligence.

In *Developing Minds*, Costa (2000a-d) considers programs from more than thirty contributing authors. Whose model would a teacher follow; whose ideas fit a classroom approach? When making such decisions, educators must look at theories to confirm whether they: a) are founded on reliable research, b) enlighten understanding of how learning occurs and c) offer dependable methods for ‘turning’ these ideals into classroom practice. If contemporary educational philosophy promotes the benefit of introducing thinking skills as part of a school curriculum, then it is time for teachers to focus their teaching around learning processes as well as content and place increased emphasis on understanding how students learn. Current educational theories are directing teachers towards investigating the underlying process of cognition to better inform and guide classroom management and learning practices. The theories of Perkins (1992), Marzano (1992) and Costa (1981) are seen as instrumental in guiding the educational practice of implementing higher order thinking skills into the curriculum and form the basis of this literature review. The importance of students’ mental attitudes upon the way they approach learning thinking skills is also considered in this literature review.

**Historical identification of thinking skills**

Thinking skills theorists (Marzano, 2000; Perkins, 1992; Costa, 1991a; McGuinness, 1999) refer to early research in the teaching of thinking skills by Lauren Resnick (1987)
which promotes the benefit of directly teaching thinking skills across the curriculum. Resnick makes the point that the lack of cultivating thinking could be a source of major learning difficulties in early schooling. Within the same work she promotes the idea that such skills are closely aligned with the domain to which they apply, and consistently stresses cognitive research demonstrates that reasoning and thinking skills must be based around knowledge of the specific content area in which they are to be applied. Resnick queries the belief that thinking skills can actually be separated from the context to which they relate to be taught as an all-purpose aptitude applied across other subject areas as:

[this] raises questions about the wisdom of attempting to develop thinking skills outside the context of specific knowledge domains. It suggests that a more promising route may be to teach thinking skills within specific disciplines and perhaps hope for some transfer to other disciplines as relevant knowledge is acquired (Resnick, 1987: 18).

As stated, Resnick advocates the importance and necessity of teaching thinking skills when these skills are firmly tied to the context of a particular discipline, but mentions the need for more empirical data in assessing this transference of skills. Resnick (1987: 19) states that this hope of transfer: “from learning in one area to improvements across the board has never been well supported empirically” and qualifies this statement by stating that learning outcomes are often evaluated solely on the knowledge gained rather than on whether “skills for acquiring knowledge in that discipline have been enhanced”, and that “the issue of transferability of thinking and learning skills, then, is still open”. There is a need to examine theories which examine the effectiveness of intervention to increase this transferal of thinking skills.

**Perkins**

Intelligence is a complex function and there is conjecture about whether it is genetic, whether it is measureable, whether it is fixed, whether it is modifiable and whether it can be enhanced. Perkins' belief that intelligence can be modified forms the foundation of this literature review and leads to investigating how the theories of Marzano and Costa support this intervention. Perkins (2002: 2) holds there is not “one true intelligence” but that it has “multiple principal causes” which he identifies as: neural, experiential and reflective, stating these characteristics are not ‘rivals’, but “contrasting causal factors that all contribute substantially to intelligent behavior”. Perkins (2002) examines these three dimensions of intelligence to suggest the best approach to modifying intelligence.
Perkins’ theory of intelligence

The neural aspect of understanding intelligence is linked to functions of the nervous system. This biological dimension is probably a traditional view of intelligence and one which Perkins states does not change very much with “directed instruction and practice”. There is adequate research to inform us that certain behaviour of pregnant mothers (taking drugs, smoking) can affect the neural dimension of an unborn child’s intelligence. There are also environmental hazards (lead-based paint etc.) which can adversely affect this dimension of intelligence. The experiential understanding aspect of intelligence, Perkins states, is linked to a specialty or a particular area of endeavour and speaks of the experts in various fields where experience and continual practice has a cumulative effect upon this talent. Students growing up in an enriched environment have experience upon which to draw, but this exposure does not mean that they will automatically take on these skills as their own expertise. The third component of intelligence Perkins believes is built by the management of self reflection – knowing what to ask one’s self as difficult scenarios or problem solving tasks are considered and undertaken. This monitoring, controlling and improvement of self thinking is referred to as metacognition.

Perkins (2002: 2) suggests educational intervention should target reflective intelligence because “reflective thinking is the most learnable of the three” and, like de Bono, he believes this reflective aspect of intelligence applies to all students. Perkins states intelligence is enhanced by effectively accessing and using ‘tools’ to support this behaviour. He collectively labels such tools ‘mindware’ and, in using this term, makes the analogy of kitchenware and software as examples of equipment to expedite the work being undertaken. Mindware (Perkins, 2000: 3) helps the student to establish organized methods to a task (patterns), assists in relearning procedures that were incorrect or unproductive (re patterning), and helps to open up the mind to new methodology and avoid the “ruts and habits of prejudice” (depatterning).

Making thinking visible

Because it is heavily reliant on mental techniques, thinking is hard to observe, copy or imitate. Often students are unaware of how the thinking process occurs, and this is the invisibility of thinking to which Perkins (2003) refers. He further suggests lack of knowledge of the processes others follow when solving dilemmas, rather than poor
skills, can be responsible for inadequate understanding of how to deal with difficult situations or problems that occur stating rather than poor skills. To encourage thinking to become more visible Perkins suggests the use of three strategies.

The first of these is the constant and deliberate use of the language of thinking and Perkins’ work (1992: 108) refers to the work of Costa to support this theory. Costa terms this thinking vocabulary ‘cognitaire’ and challenges teachers to examine whether they are using this style of language. He cites the example of a teaching asking students to “compare” rather than “look” at two pictures, and how this subtle change of language can foster thinking and contribute towards making the classroom a more ‘thoughtful’ place. Costa and Kallick (2000: 8) link thinking and language as being “closely intertwined: like either side of a coin they are inseparable” while it is Costa’s belief that “as children do in any language environment, they will pick up and internalize the idiom”. Tishman, Perkins and Jay (1995) are united in recommending teachers to turn everyday classroom activities into opportunities to use, cultivate and nurture a language of thinking. These authors also stress the importance of exposing students to thinking vocabulary to stimulate their thinking responses and to cue specific patterns of thinking. The second of Perkins’ strategies is for teachers to model reflective thinking. This can be done by explaining the steps in reaching a decision, factors which should be considered, and the implications upon others which the anticipated consequences of actions may cause. His third strategy is to enhance all curricula by looking for opportunities to “surface” thinking skills. This enriched learning experiences he terms ‘metacurriculum’. Such a strategy supports the ethos of an infused thinking program where “thinking routines … are folded easily into learning in the subject area” (Perkins, 2003: 2).

**Metacurriculum to enhance thinking skills**

While educators are familiar with the term metacognition as meaning thinking about thinking and implying moving beyond a mono-level of thinking, Perkins (1992: 102) suggests moving away from the delivery of just the content matter, to incorporate “content that addresses the learner and the subject matter from a higher-order perspective”. He calls this approach metacurriculum and uses this term to include a combination of: retention of facts, an understanding of the subject matter, and the active use of knowledge. Metacurriculum is not a stand-alone subject, but rather “infused into the usual teaching of the subject matters, enriching and amplifying them” (Perkins, 1992: 103). Teaching of curriculum can be done without ‘metacurriculum’ but,
according to Perkins, it is not as effective because the thoughtfulness associated with the study of content matter has been removed. In her analysis of Perkins' work, Mueller (2001) states Perkin's belief in deep probing of selected matter, even if this means less subject matter is covered, will result in better learning which will lead to more effective teaching and learning. This interlocking support of simultaneously teaching curriculum and thinking skills is supported by van Tassel Baska (1993: 204) who states: "There is no teaching of thinking skills in isolation from a knowledge base, nor is a knowledge base developed without a dynamic, thinking type of interaction with the content". Perkins (1992) lists six elements of metacurriculum, and the details of these components are included because the MYRAD report (Hill et al., 1999) emphasized their importance in setting the best learning environment for students in the middle years of their education.

1. **Levels of understanding** - content matter includes reasoning and exploring the teaching process.
2. **Language of thinking** - using the language of thinking: believe, hypothesize, compare, predict etc. in interaction with students.
3. **Intellectual passions** - the need of open-mindedness, wholeheartedness and responsibility.
4. **Integrative mental images** - linking to other subject matter by mental images: metaphors, analogies, concept maps, graphic organizers etc.
5. **Learning to learn** - consistently moving control of the learning process onto the students.
6. **Learning for transfer** - setting up learning situations that allow knowledge and skills to be transportable learning experiences.

Perkins believes employing the ideals of metacurriculum contributes to creating learners who are not satisfied with facts but want to understand concepts. Perkins (2003) states that for a number of years educators have been aware of a dispositional view which recognises the value of peoples' traits or attitudes to engage behaviour which nurtures thinking processes. Perkins, Jay and Tishman (1993) suggest that acquiring a disposition of good thinking is an essential part of higher order thinking as there is a need to develop a will as well as a skill. Tishman, Perkins and Jay (1995: 38) speak of human performance as an amalgam of abilities plus dispositions. They state student thinking skills should be characterized by specific dispositions. Students should be curious and questioning with the urge to look beyond what is given. They need to think broadly and adventurously and be constantly trying new ideas and exploring alternative
points of view. Students also need to reason clearly and carefully, seeking clarity and understanding but remaining alert to possible errors. There is a need to be organized in one's thinking and approach things in a methodical method. It is important that students are encouraged to give time and effort to reflect on their thinking.

It is the person's dispositional mind-set which becomes a motivational factor driving the person to 'think' and plan reactions to problems and build productive relationships with others. Perkins and Tishman (2003) recognise that 'good thinkers' have thinking skills. They have appropriate passion, attitudes, values and habits of mind, all of which help determine how they use their thinking skills. The authors speak of three components of this dispositional behaviour: ability: capacity to carry out the behaviour, motivation: (intrinsic and extrinsic) desire to engage, and sensitivity: awareness of occasions to engage in the behaviour. Sensitivity, they state, has a larger impact than had been assumed and appears to be the "bottleneck" in effective performance. This has implications for educators in that cognitive sensitivity may require a different style of instructional challenge than that of directly teaching for cognitive ability. Such a challenge could be addressed in an infused thinking curriculum where scenarios and situational problems assist students in the appropriate use of thinking skills.

Procedures can be set in place to ensure that such intervention is of a high standard and targeted to essential elements of higher order thinking. If thinking dispositions play a major role in the successful adoption of strategies, then the work of Marzano and Costa present essential theories to explore for setting environments to encourage positive attitudes to higher order thinking skills. The second aspect is that specific thinking programs allow a repertoire of the components of higher order thinking to be 'taught' and 'practised' in readiness for application.

Marzano

While Resnick (1987) advocated that thinking skills are best taught as techniques based on requirements within specific subject areas to which they directly result, Marzano et al. (1988:69) offer a different viewpoint. They used criteria to select skills "teachable, established through research studies, field testing, or widespread use in the classroom". They identified twenty-one thinking skills which fell across eight categories as shown in Table 2.
Core Thinking Skills

<table>
<thead>
<tr>
<th>Focusing Skills</th>
<th>Analyzing Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Defining problems</td>
<td>11. Identifying attributes and components</td>
</tr>
<tr>
<td>2. Setting goals</td>
<td>12. Identifying relationships and patterns</td>
</tr>
<tr>
<td>13. Identifying main ideas</td>
<td></td>
</tr>
<tr>
<td>14. Identifying errors</td>
<td></td>
</tr>
<tr>
<td>Information Gathering Skills</td>
<td>Generating Skills</td>
</tr>
<tr>
<td>3. Observing</td>
<td>15. Inferring</td>
</tr>
<tr>
<td>4. Formulating questions</td>
<td>16. Predicting</td>
</tr>
<tr>
<td>17. Elaborating</td>
<td></td>
</tr>
<tr>
<td>Remembering Skills</td>
<td>Integrating Skills</td>
</tr>
<tr>
<td>5. Encoding</td>
<td>18. Summarizing</td>
</tr>
<tr>
<td>6. Recalling</td>
<td>19. Restructuring</td>
</tr>
<tr>
<td>Organizing Skills</td>
<td>Evaluating Skills</td>
</tr>
<tr>
<td>9. Ordering</td>
<td></td>
</tr>
<tr>
<td>10. Representing</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Core Thinking Skills as identified by Marzano et al. 1988: 69.

In later research results, Marzano (2000) offers empirical evidence to support his claim that there are generalized thinking skills which can be taught across the curriculum. Marzano analysed national documents of twelve subject areas to identify thinking and reasoning skills which were either implicitly or explicitly stated in these documents. These twelve subject areas could correlate with KLAs (Key Learning Areas) within the Victorian Education system. The study, carried out by the McREL Institute (Marzano, 2000), revealed commonality of skills across the subject areas. While some subject areas reflect a focus on a particular skill e.g. experimental inquiry, or logic, or problem solving, similarities of skills across the subject areas were able to be identified. These general skills were then grouped and according to Marzano (2000:33), became “the first ever list ever devised empirically by analyzing national standards documents ... across the subject areas”. This list of generalized skills is shown in Table 3.

<table>
<thead>
<tr>
<th>GENERAL INFORMATION SKILLS</th>
<th>KNOWLEDGE UTILIZATION SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying similarities, dissimilarities and patterns</td>
<td>7. Experimental Inquiry</td>
</tr>
<tr>
<td>1. Comparing and contrasting</td>
<td>8. Investigation</td>
</tr>
<tr>
<td>3. Classifying</td>
<td>10. Decision Making</td>
</tr>
<tr>
<td>Logic</td>
<td></td>
</tr>
<tr>
<td>4. Argumentation</td>
<td></td>
</tr>
<tr>
<td>5. Making Inductions</td>
<td></td>
</tr>
<tr>
<td>6. Making decisions</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Marzano’s List of Generalized Thinking Skills (2000: 36).
Chapter One

Marzano (2000: 33) states this research “asserts” thinking and reasoning skills are not always “domain specific”, but “generic” to all content and can be applied across multiple areas of the curriculum. This viewpoint would support the practice of programs and practices that teach and reinforce thinking skills across all subject areas. Such a position strongly indicates a belief of engaging thinking skills as part of the normal content of a curriculum and supports the ethos of an infused thinking curriculum.

From their early writing, (Marzano et al. 1988), through to more recent research (Marzano, 2000; Marzano & Kendall, 1996), Marzano has advocated that thinking skills are best ‘taught’ in the context of other learning with students using “skills, processes and metacognitive strategies in connection with regular classroom content” (Marzano et al., 1988: 5). They states that while current direction in education shows agreement about the benefit of including the teaching of thinking skills within a school curriculum, there is not always agreement about the manner in which they are presented. Marzano et al. (1988: 23) advocates a student’s attitude can either promote or inhibit learning and this principle is a foundational factor to be considered in educational reform. From positions explained earlier in this chapter, Resnick (1987) and Marzano (2000) may seem at odds with each other when considering how best to integrate thinking into the students’ way of life; but both agree that higher order thinking skills are enhanced by a positive disposition to thinking and these dispositions are learnable habits of the mind.

**Marzano’s dispositions of thinking**

Marzano et al. (1988) identify five dimensions of thinking to be addressed when trying to incorporate thinking to both curriculum and instruction: metacognition, critical and creative thinking, thinking processes, core thinking skills and content knowledge.

The term metacognition implies the ability to be aware of one’s own thinking and to use this awareness to bring about change perceived, through reflection, to be better for the outcomes of the task. Metacognition consists of two main characteristics: knowledge and control of self, and knowledge and control of task. Critical thinking is often interpreted as ability to reason logically, evaluate evidence and to reach decisions based on this analysis while creative thinking is frequently seen as reframing ideas, or generating new ideas and ways of approaching a task to produce an original or unpredicted outcome. The two characteristics of thinking are complementary rather than opposite ends of a process - “all good thinking requires both quality assessment and the production of novelty” (p.17). Marzano et al. (1988) identify eight macro level aspects
of a thinking process: concept formation, principle formation and comprehension which are directed towards knowledge acquisition, while problem solving, decision making, research and composition relate to the application of knowledge. The final skill, oral discourse, the researchers state is the combination of "both acquiring and producing knowledge" (p.33). Core thinking skills (see Table 2) the researchers see as the micro level of the thinking process and are used to achieve an outcome. The previously discussed dimensions of thinking are not separate or isolated or forming a taxonomy or hierarchy, but rather interlinked in a complex system of interaction within the content of curriculum. Content or subject matter is, therefore, used as a base to instigate the thinking processes.

Marzano (1991b) arranged thinking strategies (tactics for thinking) into three broad categories: learning to learn, content thinking, and reasoning. He advocated implementing these thinking skills by teaching each of the strategies as part of normal classroom procedure and then implementing the techniques across all areas of the curriculum with the aim that these skills can eventually be used by students without any need of cueing from the teacher. This theory supports the idea of an infused thinking curriculum.

**Marzano’s dimensions of learning**

Marzano (1992: 2) further identified five dimensions of learning which he stated are "direct descendants" of his five dimension of thinking framework. The dimensions of thinking Marzano saw as influencing "theory" and the dimensions of learning as influencing "practice" (Marzano, 1992: 2). These dimensions of learning he listed as positive attitudes and perceptions about learning; thinking which is involved in acquiring and integrating knowledge; thinking involved in extending and refining knowledge; thinking involved in using knowledge meaningfully and productive habits of mind.

If students perceive themselves as poor problem solvers, that perception overrides most other factors including natural ability and previous learning and can impede their learning process. Students need to work in an environment in which they felt accepted, secure and free from confusion and tension. Teachers work at establishing a positive relationship with their students by understanding this rapport is an essential part of the learning process. Such a relationship is a major factor in the way in which boys, in particular, learn (Hampshire, 2001; Keddie, 2000; Rowe, 2001; Hawkes, 2001).
Chapter One

Marzano drew on the theory of constructivism where students take information (acquiring) and relate it to previous experiences (integrating): “Linking our prior knowledge to what we are about to learn is always the first type of thinking we use when acquiring new knowledge” (p.7). Much has been written on the practice of constructivism (Cobb, 1994; Fosnot, 1996a & b; von Glasersfeld, 1996; Brooks & Brooks, 1999); but the main principles of this practice are:

a) Learning is constructed (as against the idea of absorbed).

b) Learning draws on past experiences and links to the new information.

Constructivism does not reject the need for content knowledge, but moves from placing emphasis on knowing isolated facts to understanding how this new knowledge fits into what is already known, and can be appropriately used to re-fresh old information.

In constructing new knowledge, analysis of new data establishes what is unimportant, if there are anomalies, or if there are errors. Knowledge does not remain ‘static’ but is refined and becomes an extension of previous knowledge which, in turn, has been reconstructed. Previous understanding may change as students alter perspectives. Cognitive analysis which is an essential element of this dimension has a major influence on why thinking skills are an important skill for students as it is this ability to critically examine and evaluate new information, experiment with other applications of the information, and then move it into the knowledge base of an individual that controls the manner in which students react with their learning – for now and for the future.

Using knowledge in a meaningful way is closely linked to working on authentic tasks. Practice at such tasks helps the student understand that this learning has real life application, rather than just working at school work. Using knowledge meaningfully to accomplish a goal encourages the learner to understand there is a need to examine the problem, consider what may be required to solve the problem, and weigh up possible ramification of decisions. Within this dimension of learning, Marzano states that it is important students have some control of their learning. This ideal of student input into learning was supported by findings expressed in the MYRAD report (Hill et al., 1999).

Although they may not lack the ability to complete a task, there are students who ‘give up’ because they do not know how to cope with a new and unfamiliar situation or when solutions are not readily apparent. They have not developed mental habits that will assist them to learn whatever they want to know in unfamiliar territory. Marzano identified 15 habits of mind (Moulds, 2003) which he divided into three categories.
These habits (Tarlinton, 2003) are listed as they are integral to the aspect of intervention to the reflective dimension of intelligence to which Perkins (2002) refers in his descriptions of three aspects of intelligence.

- **Self Regulating**
  - Being aware of your own thinking
  - Planning
  - Being aware of necessary resources
  - Being sensitive to feedback
  - Evaluating the effectiveness of your actions

- **Creative Thinking.**
  - Engaging intensely in tasks even when answers are not apparent
  - Pushing the limits of your knowledge and ability
  - Generating, trusting, and maintaining your own standards of evaluation.
  - Generating new ways of viewing situations outside the boundaries of standard convention.

- **Critical Thinking.**
  - Being accurate and seeking accuracy
  - Being clear and seeking clarity
  - Being open minded
  - Resisting impulsivity
  - Taking and defending a position
  - Being sensitive to others.

Marzano (1992) stated that students do not always readily see productive habits of mind being used and, therefore, there is a need to bring these to the notice of students and to overtly teach them to students. This would link to the previously discussed invisibility of thinking to which Perkins refers. Marzano (1992) maintains effective ‘real life’ examples of such habits are observable in the lives of many world leaders (Gandhi, Martin Luther King etc.). Similar habits of mind are also an important part of the way Costa and Kallick (2000a-d) recommend students should approach all learning activities.

**Costa**

Costa (2004: 1), mentioned his interest in another author’s description of attributes of successful people from across many walks of life and became convinced “that unless dispositions of thinking are also present, then all of the thinking skills are of little use” Analysis of intellectual characteristics of effective people developed into a theory structured by Costa and Kallick in their developmental *Habits of Mind* (2000 a-d). In promoting their habits of mind, Costa and Kallick were interested in establishing workable mental attitudes to support students as they engage in classroom tasks. Tishman and Andrade (2004: 2) believe dispositions are “tendencies toward particular patterns of intellectual behavior”, and Resnick (1987) sees dispositions as ‘habits’ and ways in which tasks are approached. In the preface of their series (2000a-d: xii), the co-
authors (Costa & Kallick) use the term ‘habits of mind’ to indicate the mental discipline “that is practiced so that it becomes a habitual way of working toward more thoughtful, intelligent action”.

Habits of mind

Using the previous explanations, a link can be made with mental attitudes becoming a factor influencing the intellectual behaviour of students as they work at classroom activities, thus dispositions leading to habits. The more positive the disposition and the more practiced the behaviour (habits), the more likely it will be that students will engage productive thinking strategies. In order to think skillfully Costa (2002) sees habits of mind as providing the disposition necessary to do this type of thinking. Although stating this may not be a finite number (Costa 2002), Costa and Kallick identify sixteen habits of the mind as shown in Table 4.

<table>
<thead>
<tr>
<th>HABITS OF MIND</th>
<th>CLASSROOM IMPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persisting</td>
<td>Keep trying, don’t give up, hang in there.</td>
</tr>
<tr>
<td>Managing impulsivity</td>
<td>Think before you say or do something.</td>
</tr>
<tr>
<td>Listening to others with understanding and empathy</td>
<td>Listen well and try to imagine you are the other person.</td>
</tr>
<tr>
<td>Thinking flexibly</td>
<td>Try hard to think of several ideas or answers.</td>
</tr>
<tr>
<td>Metacognition</td>
<td>Think about how you learn and think.</td>
</tr>
<tr>
<td>Striving for accuracy and precision</td>
<td>Always go back and check your work – make sure it is correct.</td>
</tr>
<tr>
<td>Questioning and posing problems</td>
<td>Ask questions to help you learn more.</td>
</tr>
<tr>
<td>Applying past knowledge to new situations</td>
<td>Think about what you already know and how it can help you learn something new.</td>
</tr>
<tr>
<td>Thinking and communicating with clarity and precision</td>
<td>Try to find the best word, not the first word you think of ... be clear.</td>
</tr>
<tr>
<td>Gathering data through all senses</td>
<td>Be aware of the things around you and use your eyes and ears, as well as your brain.</td>
</tr>
<tr>
<td>Creating, imagining and innovation</td>
<td>Try to think of a question or answer that no one else thought of.</td>
</tr>
<tr>
<td>Responding with wonderment and awe</td>
<td>Always be ready to learn something new; make learning an adventure.</td>
</tr>
<tr>
<td>Taking responsible risks</td>
<td>Try new things that are hard, always keeping safety in mind.</td>
</tr>
<tr>
<td>Finding humor</td>
<td>Have fun learning, see the humor in things, laugh at situations not at other people.</td>
</tr>
<tr>
<td>Thinking interdependently</td>
<td>Work well with others, share ideas and materials.</td>
</tr>
<tr>
<td>Learning continuously</td>
<td>Always keep an open mind, you can learn something from each person in the class.</td>
</tr>
</tbody>
</table>

Table 4: Costa and Kallick’s Habits of Mind and how they could be introduced to students⁴.

Costa repeatedly states that these habits are not acquired immediately and will need constant practice in a learning environment which is rich in learning activities that are

⁴ Retrieved on 17.03.04 from [http://www.fcps.k12.va.us/WolfrapES/costa.html](http://www.fcps.k12.va.us/WolfrapES/costa.html) (no author shown).
structured to develop thinking skills along with studying content matter. While recognizing it may be an unrealistic goal, Costa and Kallick (2000e) state that there must also be a whole school approach to the use of these habits of mind so that they become a practiced and retrievable process for approaching any activity. In the context of this study which has a focus on understanding students practicing thinking skills as part of a thinking curriculum, it is important to understand the impact of these habits upon the classroom behaviour of students.

These habits of mind try to establish ‘ability on demand’ where there are strategies to draw upon as a situation is confronted. In moving these habits into the repertoire of students, Costa and Kallick are working at Perkins’ level of reflective intelligence, but there is need for teachers to give attention to using the techniques of modeling, coaching, scaffolding, articulating, reflecting and exploring to increase the effectiveness of this intervention. The authors describe modeling as talking through and explaining why certain strategies are being considered or withdrawn to assist the students understand how to formulate their own approach to a new situation. Coaching allows students the opportunity to practice strategies under the watchful eye of a person skilled in that area for a coach is able to ask the trainee to self examine and find specific points to enlighten the problem, and to draw on the effectiveness or ineffectiveness of previous experiences. Scaffolding is a technique which implies supporting the student while new learning is occurring. This scaffolding is gradually withdrawn as the student is able to independently manage the task. By talking through the action being considered, the teacher is able to articulate the thinking process as it occurs, thus helping to reduce the invisibility of thinking to which Perkins (2003) refers. This articulation can also be used to reflect on outcomes and how effective the thinking was, or how it could be improved. Lastly, the teacher is in a position to demonstrate in undertaking a new task, what possibilities he/she is prepared to safely risk.

Heeding the proposals of Perkins, Marzano, Costa, Resnick, McGuinness, another aspect could be added to this list – that of ‘universality’ where intervention practices become a whole school agenda as the long term effect may be lost, or certainly minimized, if students are not aware of the portability of these practices beyond the lessons where they are encouraged by the teacher. Many students will not be life-long learners unless they are exposed to school wide learning of thinking dispositions, habits and strategies so that these becomes an intrinsic part of their approach to all tasks. In advocating intervention

5 A term created by this researcher to denote school wide implementation of thinking skills.

Establishing An Infused Thinking Oriented Curriculum
as a means of modifying reflective intelligence, Perkins (2002:3) mentions the use of “mindware” which he states is: “anything a person can learn – a strategy, an attitude, a habit – that extends the person’s general powers to think critically and creatively”. Such a definition summarises the ideals of an infused thinking curriculum, and encompasses the ideas of Marzano that a disposition towards learning encourages the acquisition of learning coupled with Costa’s belief that control of learning can be encouraged by helping students establish positive habits of mind.

For this reason, educators need to shape a classroom where there is “an educational atmosphere where talking about thinking – questioning, predicting, contradicting, doubting – is not only tolerated but actively pursued” (McGuinness, 1999: 6). She further states that this teaching must be explicit and unequivocally declares that acquisition of thinking skills will not come by osmosis, but needs to be supported by tasks that open possibilities for teaching and practicing such skills. The work of Bloom, Gardner, de Bono and Ryan is examined as their programs became the explicit tools of intervention used by The College in setting up their thinking oriented curriculum.

THINKING SKILLS PROGRAMS WITHIN THE CLASSROOM

As this project focuses on the implementation of four specific thinking skills programs at The College, there is need to specifically examine the underlying theory of these programs and their implementation within a classroom context. Thinking skills are seen as components of the process of thinking (Marzano et al., 1988) and the following examination of four programs details how teachers can transfer the theories of specific thinking skills programs into practice and enable students to improve their thinking ability. These four programs are Bloom’s Taxonomy, Gardner’s Theory of Multiple Intelligence, de Bono’s Six thinking Hats and Ryan’s Thinker’s Keys.

Bloom’s Taxonomy

Benjamin Bloom, with a group of educational psychologists (Bloom, Engleheart, Furst, Hill and Krathwohl, 1956), developed a classification of intellectual behaviour which has become commonly known as Bloom’s Taxonomy. The taxonomy is based on the belief that there is a hierarchy of cognitive skills from the lower level of simple recall

6As Bloom’s name was the first listed in the publication of their research, the taxonomy has commonly become known as Bloom’s Taxonomy.
through to the ability to understand, analyse and use data. The developmental categories of the original Bloom taxonomy were: knowledge, comprehension, application, analysis, synthesis, and evaluation, and it is understood that ability to work at the higher levels of this taxonomy indicates that earlier categories are subsets of higher categories (O’Brien & White, 2001).

The range of vocabulary to motivate a particular level of the taxonomy is vast and, while the words given in the following table are based on the work of Bloom et al. (1956), it is not meant to imply that only those words can be used – rather they are an indication of how words can activate the thinking and action required by the student. This careful use of specific vocabulary as a stimulus to guide thinking is also advocated by Costa (1997). Table 5 below, lists the levels of Bloom’s taxonomy, expected outcomes and an indication of suitable vocabulary to guide the framing of questions to meet the cognitive goals of each level.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>EXPECTED OUTCOME</th>
<th>SUGGESTED VOCABULARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNOWLEDGE</td>
<td>Remembering or recall of previously learned, or discussed, material.</td>
<td>list; name; record; select; state; recall; tell; show; quote; describe; find; record.</td>
</tr>
<tr>
<td>COMPREHENSION</td>
<td>Understanding the meaning of information which has been presented. Interpreting this information.</td>
<td>explain; describe; summarise; interpret; estimate; discuss;</td>
</tr>
<tr>
<td>APPLICATION</td>
<td>Ability to use information from material studied to solve problems.</td>
<td>construct; predict; use; demonstrate; apply; examine; classify; complete; solve; prepare;</td>
</tr>
<tr>
<td>ANALYSIS</td>
<td>Breaking down information which has been presented, into component parts to increase knowledge of the topic.</td>
<td>distinguish; outline; prioritise; illustrate; outline; order; select; subdivide.</td>
</tr>
<tr>
<td>SYNTHESIS</td>
<td>Gathering, and applying, past knowledge and skills to produce an original view of a topic.</td>
<td>compile; compose; initiate; model; reconstruct; modify; rearrange; rewrite; create; plan; reorganise;</td>
</tr>
<tr>
<td>EVALUATION</td>
<td>Judging the value on information by comparing and discriminating, Making choices based on reasoned judgements.</td>
<td>Judge; assess; compare and contrast; justify; rank; conclude; recommend; convince; support; validate; critique;</td>
</tr>
</tbody>
</table>

Table 5: Bloom’s Taxonomy of Cognitive Skills.

Bloom’s taxonomy has become an instrument for diversifying classroom tasks to offer cognitive challenges for all students and supporting productive ways of engaging students in learning processes as recommended by the MYRAD report. Smythe and Halonen (2004: 1) state such engagement “requires mechanisms that increase class participation and facilitate higher-order learning”. Bloom’s taxonomy is a means of introducing students to higher order thinking essential for the Information Age because,
by undertaking critical assessment of information presented to them, guided by Bloom’s questioning techniques, students are practising skills useful for their own future control of information. Bloom’s taxonomy (and revised taxonomies discussed later) is applicable to all subject areas and has the potential to be used by all teachers as they design classroom activities and projects. It is this wide application and the potential to engage students at all levels of cognitive thinking which makes the taxonomy an effective tool for developing thinking skills for all students.

Perhaps Bloom’s greatest input into pedagogy has been to encourage teachers to ask higher order questions encouraging students to take on the thinking of how information might be used, or re-created to form another concept, rather that the more simplistic recall of facts. Figure 1, presented below, shows how the categories target levels of cognition.

![Figure 1: The two levels of thinking skills of Bloom's Taxonomy.](image)

**Bloom’s Revised Taxonomy**

In later years, Bloom’s original taxonomy was refined by one of his colleagues/students, Lorin Anderson, and this revised taxonomy was part of the thinking tools presented in PD sessions at The College. Bloom’s Taxonomy operates from the lower level of retrieving information found directly within the work being investigated, through to the higher cognitive skills of understanding and using information, and interpreting and restructuring new knowledge to form judgements about the ideas being investigated. Changes introduced by Anderson (RITE, 2003) are both minor and major, but the idea of cognitive progression was retained. The differences between the two taxonomies are shown in Table 6:
Smythe and Halonen (2004:1) state changing all category names from nouns to a verb is better suited to today’s educational need for “outcome-oriented language”. While retaining the cognitive skill required for operating at a level, this use of verbs better demonstrates that thinking is an active process. Pohl (2000a: 3) states major changes are evident in the re-ordering of some categories within the original taxonomy and by Anderson changing titles to better reflect the philosophy of the thinking process involved at that level of the taxonomy. The first of the changes occurs with the renaming of ‘knowledge’ to ‘remembering’ for, as Pohl (2000a: 3) reasons, knowledge is “an outcome or product of thinking not a form of thinking per se”. Comprehension and synthesis were also altered to “better reflect the nature of the thinking defined in each category” (Pohl, 2000a: 3).

Bloom’s original taxonomy indicated that a user takes information, understands and applies the idea behind the information, analyses the data, reforms this new knowledge and then makes judgements about the original information. Anderson holds that the creation of new ideas and concepts cannot proceed unless the user has passed through the stages of understanding the information, pulling the data apart, making judgement about this information and then using this interpretation and evaluation to construct new knowledge. Anderson believes the stage of evaluation should precede the formation and use of more meaningful knowledge, and as Pohl (2000a) reasons “if one considers the taxonomy to be hierarchal reflecting increasing complexity, then creative thinking (i.e. creating level of the revised taxonomy) is a more complex form of thinking than critical thinking (i.e. evaluating of the new taxonomy).” Pohl (2000a) further explains that critical thinking implies judging and making choices, but creative thinking is a more complex process as it involves accepting or rejecting choices and then using this evaluation to create new ideas, products or perspectives. This view is supported by Smythe and Halonan (2004:1) who state that in Anderson’s taxonomy “the highest level of development is create rather than evaluate”. Bloom’s taxonomy has also been

<table>
<thead>
<tr>
<th>Bloom’s Original Taxonomy</th>
<th>Bloom’s Revised Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Remembering</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Understanding</td>
</tr>
<tr>
<td>Application</td>
<td>Applying</td>
</tr>
<tr>
<td>Analysis</td>
<td>Analysing</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Evaluating</td>
</tr>
<tr>
<td>Evaluating</td>
<td>Creating</td>
</tr>
</tbody>
</table>

Table 6: Comparison of Bloom’s original taxonomy and Bloom’s revised taxonomy.
(Pohl, 2000a: 2)
revised by Williams to cater for the aspect of learning behaviour, and Marzano has also adapted Bloom’s taxonomy and added further categories.

Marzano’s Taxonomy

Marzano’s model (in Houghton 2002: 1) contains eight categories. He removed the category Bloom named application, introduced other categories and, as with Anderson and Williams, used verbs instead of nouns to identify the categories. The categories are focusing, information gathering, remembering, organizing, analyzing, generating, integrating and evaluating. These categories were a source of reference when this researcher was determining data collection tasks for this project.

Williams’ Taxonomy

Where Bloom’s taxonomy focused on cognitive skills for critical thinking, Robert Williams based his taxonomy on creative skills and this taxonomy was included in the PD sessions with the staff at The College. Table 7 shows how his eight categories could be divided into two domains – cognitive skills which relate to the four basic skills of creativity and four affective skills (Curriculum Integration Services, accessed 2004). These categories were also used as a reference when this researcher was designing data collection tasks.

<table>
<thead>
<tr>
<th>COGNITIVE SKILLS</th>
<th>AFFECTIVE SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLUENCY</strong></td>
<td>Experimenting, exploring, trying new challenges.</td>
</tr>
<tr>
<td><strong>FLEXIBILITY</strong></td>
<td>The ability to create structure/order out of chaos to bring logical order to a given situation and/or see the missing parts.</td>
</tr>
<tr>
<td><strong>ORIGINALITY</strong></td>
<td>The ability to wonder, ponder, contemplate or puzzle.</td>
</tr>
<tr>
<td><strong>ELABORATION</strong></td>
<td>The ability to build mental pictures, visualise possibilities and new things or reach beyond practical limits.</td>
</tr>
</tbody>
</table>

Table 7: The categories of Williams’ Taxonomy (Curriculum Integration Resources, 2004).
These taxonomies are presented to show that the original format of Bloom’s taxonomy may have been changed, but the theory of cognitive development is retained. It is this aspect of the taxonomy that is important and why it is included in a range of thinking skills included in the ‘mindware’ used by The College when introducing the TOC to students.

Gardner’s Theory of Multiple Intelligences

The ability to think effectively and efficiently has often been linked to a person’s intelligence. Two traditional assumptions about intelligence have been dispelled by recent research. One assumption was that intelligence was a fixed entity i.e. what a person was born with, stayed that way, and could not be altered (apart from major injuries or illness). This assumption is refuted by the work of Perkins (2002) and of Feuerstein et al. (1980) which show that the use of planned intervention could alter a person’s ability to engage in ‘better’ thinking. Increased knowledge about the construction of the brain (Hermmann, 1989) and how the brain operates (Sperry, 1983) and the differing types of intelligence (Sternberg, 1984; Perkins, 2002) have also added to the general understanding that the complexity of brain structure and function extends beyond the initial restricted belief proposed by Binet’s assessment. For many years IQ was determined by using testing procedure established by Binet. This testing was often based on the person’s ability to handle tasks which involved understanding language and mathematical reasoning. From the work of Howard Gardner (1983), it is now more readily recognised and accepted that there is not a single entity to intelligence giving rise to the adage cited by Chapman (1993) “It is not how smart we are, but how we are smart”. In educational settings, this is referred to as Gardner’s Theory of Multiple Intelligences.

The website of Project Zero (1999) cites Gardner as stating that information processing operations can be broken down to show essential components which are most relevant in designing students’ activities. Core operations, as shown in Table 8, are particularly pertinent for educators as they a) endeavour to recognize the dominant intelligences of each student, b) understand how this intelligence may influence the manner in which students approach classroom tasks, and c) guide them as they design student activities to cater for the diversity of multiple intelligence within the classroom.

Information available at http://allpsych.com/biographies/binet.html
Establishing An Infused Thinking Oriented Curriculum
parallel thinking as everyone wearing the same hat was concentrating on the same theme. These two types of thinking are a focus of this section of this project.

The Six Thinking Hats program uses many metaphors. In western culture, the word "hat" has been linked with the word "thinking" e.g. put on your thinking hat. A hat is also something that is easy to take off and put down, and simplicity in the ease of switching 'roles' is a principle guiding the operation of the thinking program. De Bono explains that a hat can also be a symbol of a specific role e.g. a fireman’s hat, construction worker etc. and this allows for the metaphorical link of different thinking hats being suited to different thinking roles. The Six Thinking Hats program is a technique aimed at ensuring all possible avenues for considering mitigating factors are used to reach a considered decision rather than a rash judgement or becoming locked into a defensive position which blocks heeding the opinion of peers. The hats cover seeking clarifying information, looking at safety and inhibiting factors, the creation of new ideas, appreciating that concepts may need adjustments or changes, recognizing that emotional factors influence decisions, and reflection on the thinking that has taken place or that may need further consideration. Table 9 shows a synopsis of each style of thinking expected by each hat, and the expected direction for this thinking.

<table>
<thead>
<tr>
<th>COLOUR OF HAT</th>
<th>MODE OF THINKING</th>
<th>DIRECTION OF THINKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Hat</td>
<td>Information. Questions.</td>
<td>What information do we have? What information do we need to get? Is this information reliable?</td>
</tr>
<tr>
<td>Yellow Hat</td>
<td>Positive points.</td>
<td>Why is this worth doing? How will it help? Why can it be done? Why will it work?</td>
</tr>
<tr>
<td>Black Hat</td>
<td>Assessment. Judgement. Caution.</td>
<td>Is it true? Will it work? What are the weaknesses? What are some other ways to solve the problem?</td>
</tr>
<tr>
<td>Red Hat</td>
<td>Emotions, intuition, feelings and hunches.</td>
<td>No need to justify the feelings. How do I feel about this right now.</td>
</tr>
<tr>
<td>Green Hat</td>
<td>Creativity. Different ideas. New ideas.</td>
<td>Suggestions and proposals. What are some possible ways to work this out? What are some other ways to solve this problem?</td>
</tr>
<tr>
<td>Blue Hat</td>
<td>Reflection and organization of thinking. Thinking about thinking.</td>
<td>What have we done so far? What do we need to do next? What thinking do we need to revisit?</td>
</tr>
</tbody>
</table>

Table 9: Style of thinking promoted by the Six Thinking Hats Program.

The concepts listed within this table are elements of higher order thinking processes. Each hat represents a different mode of thinking and the colours simply serve as an easy reference. The six hats, with their control of the pathway of the thinking, are instrumental in opening up an individual’s appreciation of the ability to be engaged in other styles of thinking. Using the six hats means there are six different ways of approaching thinking about a topic.
Parallel thinking

As each person is wearing the same hat at the same time, all are thinking from the same viewpoint – they are thinking in parallel and producing similar ideas. While there is concentration of thinking on one aspect, there is also the opportunity to offer different interpretation of the same “hat” and there is enrichment from the experience and knowledge from all participants in the parallel thinking. This is a different style of thinking from argumentative thinking where often each person is stating the correctness of their own viewpoint without knowledge of the viewpoint of others. Figure 2 shows the direction of application of these two contrasting methods of thinking.

![Figure 2: Comparison of the direction of parallel and argumentative thinking.](image)

Lateral thinking

De Bono states that he used the term lateral thinking in the late 1960s to denote the style of thinking that is needed to change concept and perceptions. Such thinking is not always sequential, is often unpredictable and is not restrained by standard practice. He further defines lateral thinking programs as “teaching individuals creativity and the skill of generating ideas while using their knowledge and experience” (de Bono Group, 1999: 1). Lateral thinking is casting aside the conventional in order to better discover what other elements could be used or – colloquially termed thinking outside the square, or depatterning (p.19). Perry (2004: 1) states that people have the ability to think deductively and creatively. Deductive thinking is often understood to encompass linear thinking and that “it is the lateral thinking process that we use to generate and produce new ideas” and he further states that these skills can be acquired through practice. The aim would be for these techniques to then become a ‘habit of mind’ not just a pre-set series of steps or routines to be slavishly followed. Parallel thinking can then be used to examine new concepts discovered by lateral thinking.

The Six Hats Program focuses students so that all are contributing equally to the same aspect, and individual opinions are broadened by the viewpoints that other students have about this topic. The program can, therefore, be used to encourage the ‘wealth’ of diversity and the ‘richness’ of correlation of ideas as it builds expertise in both lateral
and parallel thinking. It is productive thinking as parallel thinking is used to support thinking across a broad spectrum of ideas which is shown in Figure 3.

![Figure 3: The Six Hats Thinking Program uses parallel thinking to support wider understanding of a problematic scenario.](image)

Heeding the opinion of others, looking for alternative solutions, and being able to work as part of a co-operative team, are skills listed in the aims of Enterprise Education and this would indicate the value of this style of thinking as engendered by the Six thinking Hats when used as part of a TOC.

**Ryan’s Thinker’s Keys for Kids**

Tony Ryan is an Australian educator who has designed teaching material to assist teachers to develop effective thinking and learning as part of classroom programs. Part of this has been to develop PD and workshops to assist teachers in practical pedagogy as they introduce thinking skills to the routine of classroom tasks. But it is his work with *Thinker’s Keys for Kids* (1990) that is important to this study as it is a thinking tool being incorporated into many schools’ thinking skills’ programs IBMYP⁸, Tarlinton (2003).

In handouts prepared for in-service work with The College, the expert consultant Pohl (2002) looks at models and strategies for teaching and learning and separates these into four areas: 1) instructional approaches to develop a broad range of thinking and feeling processes; 2) instructional approaches with a specific thinking focus; 3) integrated

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⁸ This a site describing a middle years’ program developed by a school as part of their International Baccalaureate curriculum. [http://www.kidmanpkps.sa.edu.au/ibship/ibship.htm](http://www.kidmanpkps.sa.edu.au/ibship/ibship.htm)
instructional approaches; and 4) instructional approaches to tap into ways of knowing and understanding the world. He then places Thinker’s Keys in this first listed group of strategies, and later describes this program as a tool that is able to be used to encourage the development of problem solving skills for students. Ryan’s text book presents twenty keys, states how they can be used, the justification for their use, and gives examples of tasks which could be set for the use of each key. The keys and a brief outline of the targeted thinking skill for each key are shown as Table 10.

<table>
<thead>
<tr>
<th>KEY</th>
<th>JUSTIFICATION FOR USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Reverse Key</td>
<td>Changing direction of thinking to encourage different use of information.</td>
</tr>
<tr>
<td>2. The What If Key</td>
<td>Encouraging brainstorming.</td>
</tr>
<tr>
<td>3. The Disadvantages Key</td>
<td>Looking at disadvantages with the purpose of eliminating, or improving, them. It is challenging the 'status quo'.</td>
</tr>
<tr>
<td>4. The Combination</td>
<td>Matching attributes of unrelated objects.</td>
</tr>
<tr>
<td>5. The BAR Key</td>
<td>Improving the design of everyday objects by using the acronym: Bigger. Add. Remove/Replace.</td>
</tr>
<tr>
<td>6. The Alphabet</td>
<td>Using each letter of the alphabet to focus on a distinguishing feature.</td>
</tr>
<tr>
<td>7. The Variation</td>
<td>Expanding thinking – how many different ways can a task be completed.</td>
</tr>
<tr>
<td>8. The Picture Key</td>
<td>Developing a visual conception.</td>
</tr>
<tr>
<td>9. The Prediction⁹</td>
<td>Predicting possible outcomes of a particular scenario.</td>
</tr>
<tr>
<td>10. Different Uses Key</td>
<td>Recycling and finding other uses for everyday (disposable) objects.</td>
</tr>
<tr>
<td>11. The Ridiculous</td>
<td>Making a ridiculous statement and trying to substantiate it – breaking barriers set by holding steadfast to convention.</td>
</tr>
<tr>
<td>12. The Commonality Key</td>
<td>Comparing two dissimilar objects and looking for commonalities in them.</td>
</tr>
<tr>
<td>13. The Question Key</td>
<td>Finding a question for a given answer.</td>
</tr>
<tr>
<td>14. Brainstorming Key</td>
<td>Encouraging diversity of responses without the need for justification.</td>
</tr>
<tr>
<td>15. The Inventions Key</td>
<td>Encouraging the idea of creativity and of invention.</td>
</tr>
<tr>
<td>16. The Brick Wall</td>
<td>Developing persistence by thinking around impediments and drawing on alternative strategies.</td>
</tr>
<tr>
<td>17. The Construction Key</td>
<td>Problem solving of construction with access to restricted materials.</td>
</tr>
<tr>
<td>18. The Forced Relationship Key</td>
<td>Developing a solution to a problem by considering the attributes of dissimilar objects.</td>
</tr>
<tr>
<td>19. The Alternative Key</td>
<td>Moving away from accepted paths to consider alternatives.</td>
</tr>
<tr>
<td>20. The Interpretation Key</td>
<td>Finding a different explanation for the existence of a situation with thought to consequences of decisions.</td>
</tr>
</tbody>
</table>

Table 10: Using Ryan’s Thinker’s Keys for Kids in the classroom.

Ryan (1990) states the majority of keys are directed toward developing innovation and creative thinking for three specific reasons: 1) participation is designed to be enjoyable and non-threatening to encourages a positive attitude to learning; 2) the stimulation of an emotional link also heightens this positive attitude to learning; and 3) by encouraging

⁹ This key was used as part of the data collection for this study.
open-endedness and the acceptance of new ideas, creativity assists in the management of change – an important factor for coping with the demands of a changing future. The Thinker’s Keys open up opportunities for students to develop, and practice, their analytical and creative thinking skills. Students draw on known information, and also extend their knowledge of the situation presented to them. In this way, the keys are a productive strategy for approaching problem solving as they encourage looking at the activity from multiple perspectives. Tarlinton (2003) in her presentation to teachers shows examples of Thinker’s Keys combined with Bloom’s Taxonomy e.g. the invention key being used to stimulate the aspect of application, or the ridiculous key asking students to justify why a course of action has been chosen – evaluation level. The Thinker’s Keys (as with Bloom’s Taxonomy) can be adapted to fit the cognitive level of the students and The College was using the Thinker’s Keys strategy at the Year 7 & 8 level. By adjusting the vocabulary, (Costa & Kallick, 2000; Dockrell, Lewis, & Lindsay, 2000) and the criteria of scenarios presented to the students, the task can be designed to fit the range of targeted cognitive ability.

Giving attention to the dimensions of learning and thinking (Marzano), helping to establish ‘good’ habits of mind (Costa), understanding intelligence, examining the invisible skills of thinking and the creation of a metacurriculum which incorporates core thinking skills and content matter (Perkins) will help educators create a thinking community within their classrooms (McGuinness). The College deliberately included Bloom’s Taxonomy, Gardner’s Multiple Intelligences, de Bono’s Six Thinking Hats and Ryan’s Thinker’s Keys as thinking tools in a direct positive response to initiating the establishment of a TOC. The diversity of thinking skills which these programs can encourage is a process recognized by Russell (2000: 3): “Advocates of thinking-oriented learning do not follow a single path, they vary greatly in theoretical orientation and approach”. The focus of each of these thinking skills programs will help ensure a wide exposure to the components and structure of thinking processes. Bloom’s Taxonomy introduces the student to the development of complexity of cognition; Gardner’s Multiple Intelligences helps students to reflect on self-learning and focus on personal strengths and weaknesses; de Bono’s Six Thinking Hats exposes students to specific structure to assist problem solving techniques; and Ryan’s Thinker’s Keys widens students’ perceptions of differing approaches. Such a multiplicity of strategies has the potential to provide the scaffolding and framework to be used by thinking communities so that students benefit from these clear and overt experiences and can make such processes part of their own lives.
CHAPTER TWO
IMPLEMENTING A THINKING ORIENTED CURRICULUM

Although thinking is a normal ability that certainly occurs without instruction, we can improve students' ability to perform the various processes by increasing their awareness of the component skills and by increasing their skill proficiency through conscious practice (Marzano et al., 1988: 65).

This chapter considers the special needs of students in Years 7 and 8 and examines a thinking oriented curriculum as an appropriate intervention strategy as suggested by Perkins (2000) and McGuinness (1999). Information about The College sets the background for describing procedures implemented by leadership and staff as they began to overtly introduce thinking skills as an integral part of the school curriculum.

CONSIDERING THE MIDDLE YEARS OF EDUCATION

The MYRAD report identified elements of a conceptual framework for schools considering how to adjust programs to meet the needs of middle years' students. The elements, which need to be addressed to affect school reform, and which contribute to the beliefs and understandings of a school, are shown in the Figure 4 (Crevola & Hill, 1998). Because these elements are interconnected and interdependent, a change in any of the elements can be expected to bring change to the others.

![Whole-school design model for improvement in student learning as part of the MYRAD project.](image)

While each of these elements should be considered by schools as they initiate changes to their organization and school programs, there are particular aspects identified in the MYRAD report which impacted upon this project.
**Classroom teaching strategies:** Students make best progress in classrooms where there is quality teaching with teachers displaying a repertoire of strategies to cater for the diverse learning styles in each group of students. Hill et al. (1999: 11) include "higher order and critical thinking activity" in their list of positive characteristics and this is a factor behind many schools' implementation of a TOC.

**Professional learning teams:** Teachers as a professional, multidisciplinary and collegial group examine outcomes of programs to identify successes, areas of concern and how the learning and teaching can be improved. The professional learning teams at The College were part of the structure implemented at The College for the support of the TOC (see Figure 6, page 49).

**Home/school/community links:** The MYRAD report calls for close links between secondary schools and their feeder primary schools. This 'link' has been acted upon at The College where the Innovation and Excellence Educator has established a cluster group of schools using The College as the base for collaboration with four local primary schools. When framing a proposal to establish this cluster group focused on thinking skills, the document states leadership commitment was "based on an understanding of the research findings of the MYRAD Project" (Rivett, 2003: 3).

**Leadership and co-ordination:** Leaders have the authority to implement design changes but also have the responsibility of providing the professional, financial and emotional support required as staff implement changes to pedagogy. They need to ensure that all staff members have access to quality PD and are adequately supported as they seek to carry through these changes to school programs on 'a day-to-day basis'. This supported chain of implementation of change has begun at The College.

Intensive work by Hill et al. (1999: 5) into the educational needs of the middle years of schooling has identified the need for adolescents to "think in ways that become progressively more abstract, critical and reflective". By introducing thinking skills such as those later outlined in this study, The College in this study took steps to implement this stated need of middle years' pedagogy to deal with the real needs of students.

**A THINKING CURRICULUM INTERVENTION**

A thinking curriculum incorporates thinking skills as an explicit part of a school program where classroom activities are designed so that thinking skills and content
matter are interwoven and concurrently taught. The move to explicitly include thinking skills has been recommended by theorists for many years, for example Nisbett (1991: 179) spoke of the need “to focus attention on the processes of thinking, to rescue thinking from the neglect it suffers in much of our educational practice”, and de Bono (1991: 5) “there is a pressing need to teach thinking directly and explicitly in schools”. Many schools and teachers in the early 21st Century are more readily acknowledging the benefit of thinking skills and including such skills as an essential, obligatory and responsible aspect of their teaching programs. McGuinness (1999) maintains that thinking skills are not acquired ‘by osmosis’, and that students must be explicitly taught these skills and given opportunities to practice them as a fundamental part of classroom activities. Some schools are, therefore, planning and adopting thinking curricula to ensure these skills become an integral part of their program and, by so doing, are endeavouring to develop a thinking culture.

Accepting Perkins belief that the reflective dimension of intelligence can be modified by appropriate intervention, Figure 5 represents this researcher’s interpretation of a possible pathway for such mediation.

![Figure 5: A possible intervention path for promoting thinking skills.](image)

Of the many programs available (McGuinness, 1999), The College develop an infused thinking oriented curriculum where students would be introduced to thinking skills by the use of specific programs – Bloom’s Taxonomy, Gardner’s Multiple Intelligences, de Bono’s Six Thinking Hats and Ryan’s Thinker’s Keys. These thinking skills were to be introduced across all curriculum areas and, ideally, woven into all content.
Chapter Two Implementing A Thinking Oriented Curriculum

Using the thinking programs productively

The four thinking programs became thinking tools or mindware (Perkins, 2002) to allow students to understand the steps of the thinking process and how thinking strategies can be helpful in dealing with problematic situations. Working within these programs provides the practice essential for ensuring the skills are understood, able to be used, and then utilized with practical application. However, it is this researcher’s belief that teachers using such programs must be aware of two important factors.

The first is that these programs are indeed programs – they are not, by themselves, thinking skills but rather the vehicle to demonstrate specific ways of approaching a task or a problem. They open the students’ minds to procedures that can be implemented. Alongside the teaching and use of these programs, students must be aware of the underpinning cognitive processes and how these are employed in other situations. The second factor is based of Perkins’ (2000) view of practice. It is an accepted theory that practice helps establish confidence in a procedure and allows the user to gradually use these steps without conscious recall of ‘how do I do it’. However, there is danger in believing that practice makes perfect. Practising an incorrect procedure will create imperfect practice and ‘unlearning’ an established pattern of response is, in itself, a difficult process. Practice, even when correct procedures are used, can also be detrimental in that one procedure becomes too engrained to the stage where no ‘new’ or divergent thinking occurs. In repetitive practice, the student is completing the task, but may be simply applying procedures and not engaged in the cognitive process of thinking. To counter this effect, students must be shown and encouraged to use the reflective thinking aspect of Perkins’s theory of intelligence - metacognition. Critically thinking about the thinking being used and analytically evaluating the process will help students ensure they are developing their thinking.

PROFILE OF THE COLLEGE

The College, where this study of the early stages of introducing an infused thinking oriented curriculum was undertaken, was established in 1964. It is a large state coeducational school situated in a Melbourne residential municipality, The College has two campuses in close proximity – a junior site for Years 7 and 8, and a senior site for Years 9 to 12. While some teachers move between campuses at the start of the school year, most staff members teach solely at one site, and some specialist teachers move
between both campuses. There are thirteen classes of approximately 26 students in the Year 7 classes involved in this project.

Among these students there is a wide ethnic population with over seventy ethnic groups represented among the school community. A February census (2003) showed almost half the students are classified as LBOTE (Language Background Other Than English). Approximately 400 students have parents/guardians who receive either EMA (Education Maintenance Allowance) or Youth Allowance. There are several severely physically handicapped students at the school, and other students with learning problems. The College is a ‘typical secondary school’ facing the usual difficulties of most educational institutions. This information is presented to suggest that if a thinking skills curriculum could successfully function within the environment such as operates at The College, and following similar intensive Professional Development sessions, correlation and extrapolation could be made that such a program could operate within similar secondary schools.

The College consists of three sub schools – junior, middle and senior. There are three assistant principals at The College and each of the sub schools is under the leadership of one of these assistant principals. Each sub school has two managers, with one manager responsible for student welfare and discipline and the other for the programs operating within the sub school. This project was undertaken in conjunction with the heads of the Junior and Middle schools.

**Supporting the concept of a thinking culture**

By early 2001, the leadership at The College considered current direction of educational outcomes and was keen to address the difficulties faced by students trying to adapt to new demands as they entered employment. There was a perceived commonality of thinking skills outcomes and those attributes identified in Enterprise Education studies at The College. The Victorian Curriculum Corporation website states workers of the future will need: “to work autonomously, to take responsibility and decisions; to work in small teams and units; to be flexible and creative and to update their skills continually”.

Kerka (1992: 1) states that vocational education needs to be involved in developing thinking skills because of two major indicators: occupations are becoming more reliant on cognitive capacities, and the work environment requires flexibility and adaptability to manage changing conditions. A thinking curriculum works towards developing in
students those ideals of autonomous ‘good’ thinking and the responsibility of being in
charge of their own learning - life-long learning. To be able to exist in a future
workforce, students need to become self-reliant and in control of their changing work
environment. The goals of Enterprise Education (Conning, 2002b: 3), personal
attributes (Conning: 2002a: 4), and Key Competencies identified in the Mayer Report
(Conning: 2002a: 4) are shown in Table 11. These principles are incorporated in the
vocational educational program at The College and cover aspects of how a work
environment could operate and personal attributes and perspectives.

<table>
<thead>
<tr>
<th>ENTERPRISE EDUCATION</th>
<th>PERSONAL ATTRIBUTES</th>
<th>KEY COMPETENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creativity, self-reliance, a capacity to respond to change, and an ability to generate, recognise and seize opportunities;</td>
<td>• Generating and using creative ideas and processes</td>
<td>• Collecting, analyzing and organising information</td>
</tr>
<tr>
<td>• A greater understanding of how the workplace operates;</td>
<td>• Identifying, creating, assessing and taking advantage of opportunities</td>
<td>• Communicating ideas and information</td>
</tr>
<tr>
<td>• The ability to demonstrate initiative and look for new opportunities in the work environment;</td>
<td>• Using initiative</td>
<td>• Planning and organising activities</td>
</tr>
<tr>
<td>• A wider appreciation and understanding of the complexity of community, business and industry enterprises;</td>
<td>• Identifying, assessing and managing risks</td>
<td>• Working with others and in teams</td>
</tr>
<tr>
<td>• The ability to take a greater degree of responsibility for the quality of their work.</td>
<td>• Gathering and managing resources</td>
<td>• Using mathematical ideas and techniques</td>
</tr>
<tr>
<td></td>
<td>• Matching personal strengths and weaknesses to undertakings</td>
<td>• Solving problems</td>
</tr>
<tr>
<td></td>
<td>• Being flexible and dealing with change</td>
<td>• Using technologies.</td>
</tr>
<tr>
<td></td>
<td>• Monitoring and evaluating personal and others' performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interpersonal communication and influencing skills.</td>
<td></td>
</tr>
</tbody>
</table>

Table 11: Expected outcomes of vocational education.

When examining the above expectations, it is evident there is a link to higher order
thinking skills (Tables 2 & 3, pages 23) promoted as part of a TOC. The common goals
of the responsibilities of employment and citizenship, together with the recognised
personal benefits of a repertoire of thinking skills, lay behind the initiative of an infused
thinking curriculum at The College.

Anticipated outcomes are more likely to occur if there is a firmly structured foundation.
A well supported thinking curriculum, used by teachers implementing specific
techniques and pedagogy, can establish conditions which lead to the desired outcome of
students acquiring life-long attitudes to learning and confidently entering the world
Chapter Two

Implementing A Thinking Oriented Curriculum

beyond their school life. The ultimate goal of The College is to establish a thinking culture so the ideals shown in Table 12 (planned by the researcher) create a thinking culture so that all students exiting their secondary education and taking on the role of responsible citizenship will have: a) been exposed to skills helpful to their future and b) have practice in the use of thinking tools. A thinking curriculum relies on teachers drawing on techniques which provide planned educational experiences which, in turn, expose students to situations where they are able to practise, in a secure environment, those strategies seen as essential for attaining the educational goals stated above - a responsible citizen confronting an unknown future.

<table>
<thead>
<tr>
<th>A THINKING CURRICULUM supported by</th>
<th>TEACHERS Implementing</th>
<th>STUDENTS Demonstrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Leadership</td>
<td>Thinking Oriented Curriculum</td>
<td>Life-long Learning Attitudes</td>
</tr>
<tr>
<td>School Ethos</td>
<td>Social Competencies</td>
<td>Civic Responsibility</td>
</tr>
<tr>
<td>All School Professional Development</td>
<td>Engaged Learning</td>
<td>Key Competencies</td>
</tr>
<tr>
<td>External Curriculum Consultant</td>
<td>Authentic Tasks</td>
<td>Enterprise Education Attributes</td>
</tr>
<tr>
<td>Innovation and Excellence Educator</td>
<td>Collaborative Group Work</td>
<td></td>
</tr>
<tr>
<td>Professional Learning Teams</td>
<td>Differentiated Core Curriculum</td>
<td></td>
</tr>
<tr>
<td>Coordinators of KLAs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12: Infrastructure for a planned thinking culture within a school.

Such a change of direction in pedagogy may be a dramatic change for some educators and they must be supported by many diverse elements of school organisation. Primarily, all staff members need to feel that leadership is willing to support each person with initial quality PD and continuing guidance as changes begin to impact on daily classroom teaching. Ong (2000: 6) cites “strong leadership” and “staff development and support” as critical factors for a successful thinking initiative. Promotional material from The College explicitly recognises reliance upon staff for such a commitment to be successful.

A supportive, dedicated and passionate staff have led and supported the implementation of the program both in staffrooms and, most importantly, in classrooms.

Establishing An Infused Thinking Oriented Curriculum
Many teachers may need emotional support as they endeavour to change teaching techniques of a craft in which they previously felt capable, competent and proficient. This support was set in place within The College as initial PD was complemented by the opportunity to access individual assistance (and reassurance), from an externally appointed educational consultant who took on the role of a teaching and learning specialist. There was also collegial support as KLA leaders worked towards ensuring all staff in their discipline understood what was required in the transition to a thinking curriculum and how those skills, to be explicitly introduced in the subject areas where they teach, could become part of both teaching techniques and design of classroom tasks. Professional Learning Teams would also act as an evaluative tool, allowing for discussion of techniques, examining failures and successes, and a professional sharing of ideas across KLAs. Using such teams for this purpose is part of reforms suggested by Hill et al. (1999) as they have the potential to initiate mini action research studies within the school. In addition, they believed a study of the early stages of the thinking initiative carried out by a doctoral student external to the school would ensure that this evaluative research had the rigour and validity to enrich knowledge of how thinking skills were observed/not observed in the classrooms.

This provision for the anticipated needs of the staff is shown as a combination of elements of support from within the school, the use of internal and external staff with particular expertise in the area of teaching and learning, and the process for monitoring and evaluating how the TOC was moving into the organization of school programs. These three elements of support arose in discussion between the researcher, head of the junior school and the external Teaching and Learning consultant. The researcher refined aspects arising in the discussion and incorporated them into the following model as shown in Figure 6.

![Figure 6: Support network for the Thinking Oriented Curriculum at The College.](image-url)
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IMPORTING THE THEORY INTO PRACTICE

The practising of thinking skills needs to be carried out in well-planned classroom activities which recognise the need to ensure activities are structured around authentic tasks, and encourage the use of collaborative group interaction. Authentic tasks closely resemble life in the 'real world' and reflect, and are aligned to, the personal interests of the students. They are designed to encourage students to find out as much as they can about a topic, rather than simply finding answers to questions. Authentic tasks encourage a wide range of thinking skills and allow for multi-disciplinary transfer of skills. This style of learning has a value beyond school life for, in carrying out authentic tasks, students will be utilising skills that have relevance to real life situations and are likely to be needed in future employment. Working with peers in interactive and interdependent groups, allows students to practise social interaction skills and is a worthwhile introduction to conditions in the work setting of the future. The building of team responsibility and interaction between team members increases the range of experiences for all members of the group. As nations and people become increasingly more interconnected, there is need for students to experience elements of collaboration in their learning tasks. The variety of composition of such working groups (gender, culture, academic ability etc.) allows all participants to better understand how differing perspectives can influence decision making. The aspect of group interdependence is discussed in the description of Costa’s Habits of Mind (p.28) of this study.

When the above elements are incorporated into an activity, there is increased likelihood that students will be interested in their accomplishments, prepared to interact with peers and other adults (mentors), and become energised about their performance and their learning. This involvement leads to the engaged learning which, Tapscott (1998) and McKenzie (2000) see as essential for students of this generation – particularly when those students are in the middle years of their schooling (Hill et al., 1999; Russell, 2000).

Steps in developing a thinking curriculum

Bowell, Isaacs, Merlick (2002) acknowledge the difficulty in sustaining changes in teaching style as teachers try to adapt their skills and perceptions to the new directions (for some staff) of a thinking curriculum. The staged introduction of the thinking curriculum at The College recognised that stress and tension can be associated with
change and ensured that teachers were supported as the TOC was implemented. Introducing a TOC was not a hasty decision or a ‘knee jerk’ response to current trends and policies. Rather, it was a planned and proactive response to improving the educational outcomes for all students\(^{10}\). The actual implementation of the TOC was carried out over four years, with The College ensuring supporting structure was solidly set in place before changes to curriculum and pedagogy were introduced on a school wide basis\(^{11}\). Thinking skills were certainly being taught by some staff in some subject areas, but current research (Pohl 2000; Russell, 2000; Hill et al., 1999) presented to the staff advocated that the teaching of these skills must move from an ad hoc basis and be ‘infused’ into teaching across all areas of the curriculum. Like many schools interested in improving the teaching and learning occurring in their classrooms, The College had dabbled\(^{12}\) with the idea of a thinking curriculum since 1955. More solid steps were laid in 2000 when forty staff of The College undertook PD called *Engaging Classrooms* run by Deakin University. This was a series of after school sessions and introduced participating staff to examining pedagogy as a means of engaging students and involving them in the learning processes. 2001 saw 35 staff taking on further after school sessions to better understand the special needs of students in the middle years. This PD established a core of teachers at The College who were aware of recent research in curriculum reform and development, were open to these initiatives, and keen to implement these new directions in educational issues. When further PD was deemed necessary, sessions on a whole school basis ensured all staff at the school participated in the setting The College’s new goals of introducing a TOC. In Early 2002, Michael Pohl\(^{13}\) was contracted by The College to speak to the staff about such a TOC and how this could be achieved. After this initial session, teachers were offered four alternatives about thinking curriculum methodology to guide the introduction of the TOC within The College. The survey choices were:

The College should develop a curriculum at Years 7 and 8 that has:

A. Thinking as a separate subject – a time allotted to thinking skills.

B. Thinking infused in a subject – a subject has the responsibility for teaching thinking skills.

\(^{10}\) Information about how The College set about developing a thinking culture has been taken from school documents and is used with permission.

\(^{11}\) The time table of implementation of the TOC is presented as Appendix 1.

\(^{12}\) This description is used in promotional material by the school and implies that the school later adopted a more structured approach as early experimentation showed the benefit of such pedagogy.

\(^{13}\) Michael Pohl was engaged by the school to conduct PD sessions with all staff at each campus.
C. Thinking infused in across the curriculum – all subjects have the responsibility for teaching thinking skills.

D. None of the above.

Placing these options to all staff ensured that all teachers were aware each had responsibility in determining the path this initiative could follow, and the survey gave each a share in the decision making process. Teachers who might be wary about the changes such an initiative could bring to their classroom teaching could see that it was not just an edict being imposed from above but, in fact, a majority of staff had selected how the initiative was to be implemented. Teaching staff, informed by quality PD sessions, were keen to introduce the perceived benefits of a thinking curriculum to the entire student body. 80% of the staff chose option C and The College began, in earnest, to implement an infused thinking oriented curriculum. So, while Bellanca and Fogarty (1993) warn against ‘mandating’ changes in the curriculum as they feel teachers feel their professionalism is encouraged when they chose how and what they learn, opening the direction of the initiative to the staff provided teachers with this element of choice about the method of inclusion to their classroom teaching.

**Introducing staff to an infused thinking oriented curriculum**

McGuinness (1999: 19) offers the ‘infusion’ method of teaching thinking as an alternative to specific programs or specific subject domains. As previously explained, an infused method embeds thinking skills into the delivery of the curriculum content of all subjects and targets general cognitive processes, rather than develop skills which were solely subject specific. Four programs were designated to be taught in particular areas of the curriculum and other subject domains were selected to support these programs. If we consider that thinking processes are skills and make an analogy to other skills (athletics etc.), then just as these skills are developed and extended by specifically planned skill-based activities, thinking skills may be improved by directed coaching, training and practice. However, there must be consideration given to the stages of development of the performer and the thinking skills regime must take into account the stages of the students' developmental progress. Tishman, Perkins, and Jay (1995: 61) make a comparison to the solving of ‘hard or easy’ jigsaw - the same visual search task is common, but these puzzles can “differ considerably with the respect to the intellectual demands they place on the problem solver”.
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The programs that were selected to be introduced at the junior campus of The College fitted well into the ‘normal’ range of student capability. They could be extended to challenge, or provide sufficient ‘concrete’ examples and structure to meet the needs of slower learners thus continuing to nurture the progress of all students. As stated previously, the four selected programs were Bloom’s Taxonomy, Gardner’s Multiple Intelligences, de Bono’s Six Thinking Hats and Ryan’s Thinker’s Keys. The philosophy underlying these programs, and how they can be used in the classroom, is discussed in Chapter Three of this work. Using this system, students were exposed to the four programs introduced to the staff by Pohl in different subject areas, and were given tasks which encouraged the use of these techniques in other key learning areas.

Although the establishment of a thinking curriculum was a new direction for The College and it was mandated to be implemented at all levels of the junior campus in all curriculum areas, staff was encouraged to feel that each had the teaching skills to be able to meet these demands. To facilitate this new direction and to support all teachers as some grappled with new ideas, new paradigms, and change of teaching style, The College made a commitment to provide the staff with thorough Professional Development and all teachers attended sessions with Pohl. The mandatory aspect of the TOC was not asked of staff until there had been sufficient PD and the appointment was made of a teaching and learning specialist to support the individual needs of the staff. This supported and effective PD is seen as an essential factor in a successful implementation of new direction in pedagogy associated with infusing thinking skills into the curriculum (Ong, 2000).

Staff members could feel less threatened as they saw other colleagues also coming to grips with new ideas; some gained satisfying encouragement that initiatives they were already trying had a basis in accepted theories of learning; while others gained impetus and support to venture down new pathways. The use of a whole staff PD brought cohesion to the adoption of a thinking curriculum and an understanding that all teachers were working towards the same objective with the support of colleagues and all levels of management within the college. At each session with the trainer, the professionalism of all staff was consistently acknowledged, and it was always stressed that, while this new direction was of benefit to the students, it could actually require a minimum of deviation from current classroom practice.

Teachers were encouraged to appreciate that a thinking curriculum was not just another thing to be added to the curriculum. Rather, it was a better way of ‘teaching’ the
curriculum and achieving the learning outcomes they wanted for students. Teachers were encouraged to understand that because of their practical experience, they already had some understanding of the reasoning behind the adoption of the new methodology. They were encouraged to grasp and appreciate the notion that adaptation of teaching style, a more thoughtful procedure in the setting of tasks, changing expectations for the students and collaborative group work would, in fact, stimulate learning and encourage student motivation and boost self-esteem as these students were shown the skills to help them gain greater control of their learning.

Meeting the expectations of teaching thinking skills

Marzano and Pickering (1991: 97), as part of their theory of incorporating thinking skills into educational systems, offered three suppositions that are relevant to educators basing classroom activities around the ideas of an infused thinking oriented curriculum. These were:

- teaching thinking is reinforced by overt teacher behaviours,
- for the teaching of thinking to be effective, it must be part of instructional planning, and
- for the teaching of thinking to be effective, it must be based on a comprehensive framework of human learning.

These suppositions fitted most comfortably with the initiative of The College as the infused thinking oriented curriculum began at the junior campus of Years 7 & 8. It was mandatory for all teachers to explicitly, and overtly, introduce thinking skills in any KLA in which they teach, and this directive meets the criteria of Marzano and Pickering’s first assumption.

Professional development sessions were run by a consultant who was an expert in the field of thinking skills as part of the curriculum. He explained to all staff the underlying reasoning of why specific thinking skills were to become part of all classroom teaching, and then provided teachers with practical examples and pathways for integrating these skills into the curriculum. The theories were explained in detail and the presenter based sessions around how the thinking skills modelled could become part of the normal curriculum. Emphasis was placed, not so much on a change of curriculum, but a change in how tasks are presented to the students, how thinking skills become part of the planned classroom activities and how to design these activities to encourage strategies which, in turn, could promote thinking skills.
This adaptation of pedagogy was supported by a consultant employed by the school to individually confer with staff and reinforce how the skills could be incorporated into specific curriculum content. An additional part of the consultant’s role was to assist each staff member to re-model and adapt prior classroom activities to incorporate a more direct emphasis on thinking skills play as part of the design of activities. Another consultant is shared with local primary schools in a cluster arrangement, as thinking skills becomes a curriculum priority for schools in the area. This pedagogical support meets the second of this assumptions and this is shown in the model presented as Figure 6 (page 49).

The third of these assumptions is that for the teaching of thinking skills to be effective, then it should be based on a ‘comprehensive framework of human learning’. As the skills introduced at the junior campus are based on the educationally accepted theories of Bloom, Gardner, de Bono and Ryan, then the teaching practices to be adopted by the staff would most adequately meet the criteria of the third of these suppositions given by Marzano and Pickering.

School organization of the infused thinking oriented curriculum

The aim of an infused thinking curriculum is that all skills are taught to all students and used in all curriculum areas. To ensure that all skills reached all students, it was decided that each of the selected thinking programs would be explicitly ‘taught’ in a particular KLA (Key Learning Area) and this skill would be supported within another KLA. In this work, the spread of skills across disciplines is referred to as teaching KLAs and support KLAs. The heads of each KLA were asked to nominate the skill they saw as best ‘fitting’ with their subject area. With the infused method of introduction thinking skills, there can be a perceived problem in trying to fit “general thinking skills into subject specific content knowledge” (Ong, 2000: 4). Selection of designated skills by KLA leaders, according to how they might best fit KLAs, was one means of addressing this distribution of skills and encouraged a flexible and integrated approach to the distribution of skills across all domains. Although the four skills were spread across the eight KLAs and one skill was ‘allotted’ to two curriculum areas, this did not mean that those skills were only for use in those areas – in fact, all skills were to be encouraged in all subjects. As all teachers had been exposed to all programs, the thinking skills could be used in all areas of the students’ work and, potentially, there would be no crack for a skill to escape from the students’ repertoire. The school organisation of this spread of programs is shown in Table 13.
Chapter Two Implementing A Thinking Oriented Curriculum

<table>
<thead>
<tr>
<th>THINKING SKILL</th>
<th>EXPLICIT TEACHING KLA</th>
<th>REINFORCING KLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIX THINKING HATS</td>
<td>ENGLISH</td>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>BLOOM'S TAXONOMY</td>
<td>MATHEMATICS</td>
<td>ARTS</td>
</tr>
<tr>
<td>THINKER'S KEYS</td>
<td>SCIENCE</td>
<td>PHYSICAL EDUCATION HEALTH</td>
</tr>
<tr>
<td>MULTIPLE INTELLIGENCES</td>
<td>SOSE</td>
<td>LOTE</td>
</tr>
</tbody>
</table>

Table 13: Dispersion of thinking skills programs across the eight KLAs.

Marzano (2003: 23) ranks “a guaranteed and viable curriculum” as first in a list of school factors having impact on student achievement. By a) making it mandatory for teachers to include the designated thinking skills in specific KLAs, b) ensuring teaching staff had access to quality PO, and c) staff were supported by an advisor as they moved into (for some) new aspects of teaching practice and as they refined ‘old’ activities into this new pedagogy, the school was intending there would be little discrepancy between the ‘intended curriculum into the implemented curriculum’.

Classroom organisation of the infused thinking oriented curriculum

Bayer (1991: 276) states that the teaching of thinking skills is improved “if we use techniques of direct instruction” and details specific steps to follow in promoting the learning of the skills. The introduction of the specific skills explicitly taught at the Year 7 and 8 level followed five steps recommended by Beyer (1991: 276). Although this methodology was not part an overt part of the PD sessions, it was the procedure observed in English classes which were part of the main focus of this study. Beyer’s (1991) steps are outlined below, but it must be remembered that each step does not necessarily represent one lesson. In fact, during the first step, the student may need to ‘overlearn’ the skill with multiple examples. There may be the need to repeat scenarios with guided practice (as in steps two and three) before the students participate in their own ‘dry run’ in step four.

The first steps involve the teacher:

1. *Introducing the skill.* This step may be as basic as naming the technique or defining it in terms of synonyms and examples as with de Bono’s Six Thinking Hats which could be linked to the phrase ‘put on your thinking hat’, or Ryan’s
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Thinker’s Keys with the analogy that a key can be used to open something blocking your access;

2. Explaining the procedure and rules of the skill. Here the characteristics of the skill are discussed with the students. With the Six Thinking Hats this could be detailing the style of thinking that each hat represents- creative, emotive, need for further information, safety concerns, new directions and reflective monitoring of the process;

3. Demonstrating how the skill is used. Scenarios are introduced to the students and the teacher talks the students through how the technique could be directly applied to the situation.

Then the students:

4. Apply the skill. Further situations are introduced to the students and they are given the opportunity to deliberately try out their new knowledge. The teacher’s assistance will gradually drop away and students will take control of the usage of the skill.

5. Reflect on what occurs as they execute the skill. This reflection will expose both difficulties and successes.

Purpose of this project

The College decided to introduce reliably researched and proven thinking skills strategies into classroom practice and then looked for evidence of the efficacy of such a program by critically examining pathways already taken, and refining any aspects of the program not meeting goals. In the implementation of any educational initiative there is a three-step procedure: the purpose, goals and outcomes of the process are identified; the delivery system is set in place – how it is to be introduced at a school level is decided; and collecting of evidence and evaluation of the how the process is meeting the identified goals needs to be undertaken.

The College identified the purpose of introducing a TOC as providing the rehearsal and training to encourage students to become competent thinkers preparing to face life and employment as part of the knowledge generation. School organization ensured the selected programs had been organized across the KLAs to both explicitly teach and provide practice for these programs. This study then formed the third part of this implementation procedure by monitoring whether the educational ideals of the infused TOC were becoming a reality for the students.
CHAPTER THREE
RESEARCH METHODOLOGY

Cognitive psychology and instructional research has witnessed some shift in methodology away from laboratory-driven studies toward studies which are more directly relevant to school learning and classroom instruction (McGuinness, 1999: 4).

This chapter examines the characteristics of qualitative research and justifies why a single case study was deemed the most appropriate research methodology for this project. Procedural steps in the case study are detailed to address the essential aspects of validity and reliability. Methods of data collection are explained to establish how these fit the qualitative research characteristics of a single case study paradigm. The perspective of all stakeholders in this naturalistic inquiry is explained as part of establishing a holistic perception of the phenomenon under scrutiny.

If understanding social situations through studying behaviour is a raison d'être for sociologists, then it is from this methodology of research tradition that classroom research has evolved. Documented works of many theorists (Piaget, 1950; Dewey, 1933; Vygotsky, 1962) exist as guides to understanding and establishing how students learn. Costa (1991d) suggests that when considering how to substantiate if students are achieving/not achieving desired learning outcomes, teachers often look to assessment to provide systematic evidence for their beliefs or 'gut feelings'. However, to move from the perception of an investigation being simply a scouting foray to 'check things out', there must be insight gained through a methodical and controlled observation of the learning process. Simply investigating a known procedure in a known environment could, in fact, condone blinkered and limited practices and reaffirm ineffective outcomes. How does the researcher move beyond the subjective and insular aspect of reflective practice? When does investigative work of classroom behaviour move from a self-monitoring inquiry of practice into the area of rigour and validity that the term 'research' implies, and when does personal judgement become informed belief?

Adopting the rigour and protocol of a case study research as part of a qualitative research format takes such educational research beyond subjective opinions as the researcher makes valid and reliable conclusions founded on the data collected. This work intends to addresses the relevant features of investigation needed for the study to achieve credibility.
CHARACTERISTICS OF QUALITATIVE RESEARCH

Qualitative research has become a widely accepted and legitimate methodology in areas concerning educational issues and the understanding of learning and cognition (Polyani, 1959; Bassey, 1981; Lincoln & Guba, 1985; Wolcott, 1990; Elliott, 1991; Barnes, 1992; Norman, 1992; Yin, 1993; Maykut & Morehouse, 1994; Kellehear, 1993; Denzin & Lincoln, 1994; Edwards, 1994; Gage, 1994; Stake, 1994, 1995; Scott, 1996; Hoepfl, 1997; Berg, 1998; Bell, 1999). Shank (1995: 6) identifies qualitative research as progressing through two stages (which he terms ‘crossroads’) in its development.

The field was formed at the first crossroad, when some educational researchers chose to move away from the standard experimental path. At the second crossroad, qualitative educational researchers chose to move away from the field-oriented path blazed earlier to pursue interpretive and foundational issues that still allowed qualitative inquiry in education to adhere to the principles of empirical research (Shank, 1995: 6).

The third current crossroad he states will be a divergent explosion into inquiry covering artistic, investigative, clinical, and many more directions” and will “determine its field for years to come” (Shank:1995: 7).

Qualitative research methodology was used for investigating the introduction of a TOC as it was believed this method for investigating classroom instruction has passed beyond the original distrust of unscientific measurement (Wiersma, 1985; Howe, 1985; Patton, 1990), to the scientific rigour and acceptance in the field of research paradigms. The proposed diversity in the collecting of data would reveal more in-depth understanding than could be gained quantitatively (Hoepfl, 1997; Strauss & Corbin, 1990). Maykut and Morehouse (1994: 43-7) have drawn on the findings of many other researchers in this field (Eisner, 1991; Lincoln & Guba, 1985; Patton, 1990; Yin 1993; 1994) and have identified vital qualities of qualitative research. They speak of eight characteristics important for successful qualitative research: an exploratory and descriptive focus; emergent design; a purposive sample; data collection in the natural setting; emphasis on human-as-instrument; qualitative methods of data collection; early and on-going inductive data analysis; and a case study approach in reporting research outcomes.

Qualitative research is designed to understand emerging facets of a social phenomenon and quite often this is relative to a learning institution such as schools. By studying the behaviour and perspectives of the people concerned in the study, the researcher endeavoured to broaden understanding about specific situations. This study aimed at
investigating the initial stages of introducing the TOC to Year 7 at a state secondary college, and obtaining understanding of this implementation from the perspectives of all participants in this curriculum initiative.

**Qualitative research in an educational setting**

In the planning stages of research, the researcher wished to make provision for the fact that, as the research begins, unanticipated points important to the research may present themselves and the researcher needs to flexible to follow these unplanned directions while they hold relevance to the focus of the investigation. Maykut and Morehouse (1994) speak of the unique opportunity a qualitative researcher has to withhold final judgement until the data specifically makes visible the path of interpretation. They see no difficulty in this open-ended aspect and hold that there is benefit in tolerating, and managing, both vagueness and ambiguity. Maykut and Morehouse explain the difference of these terms in regard to the interpretation of data. Vagueness is a condition that is lacking in precision and, therefore, requires specific steps to be undertaken by the researcher to achieve exact information. Ambiguity applies to a situation which can be understood in more than one way: “In naturalistic inquiry, the searcher must go back and forth between the observed situation and its meaning” (p.39). The authors see benefit in holding interpretations in abeyance and avoiding premature closure, while waiting to see which ‘backward glance’ of these observations allows for an undisputed explanation merited by the data being collected. In this study, although an initial pathway had been identified, decisions about what would be significant to study were deferred until the end of the indwelling sessions. The overall thrust of this study – to investigate the initial stages of introducing the TOC within The College – did not change, but what did emerge and develop with time, were the possibilities of how all facets of this question could be best investigated.

Rather than random sampling, a purposive study makes a specific choice of study area (e.g. a school) based on the premise that the participants will, of themselves, provide the variability for the sample and how it relates to the social phenomenon being studied. In this work, the selection of three unstreamed classes of students would provide a sufficient approximation of randomness in that the diversity of classes would reflect the diversity of the larger student population, represent the range of experience of the social phenomenon and meet the focus of the inquiry. Three classes became the main unit of analysis in this project, and as the investigation relied on studying a specific group of students with all the variables intrinsic to a class, there is a purposive sample.
In this case study the researcher wished to better understand a social phenomenon within the context of that phenomenon where personal meaning was essential to the investigation of people's experiences. Maykut and Morehouse (1994) place value on indwelling to better develop tacit and explicit knowledge of the subjects of the study. Indwelling is time spent by the researcher in familiarising herself with the environment where the main part of the observational research will be conducted. It was believed that indwelling could allow the students to become familiar with the presence of the researcher and the researcher becomes familiar with the students, their physical environment, the nature of the teaching sessions and how these factors will input on the project. The researcher becoming 'invisible' would allow the participants, as much as possible, to continue normal practice. This, in turn, would allow the researcher increased authenticity and objectiveness in interpretation of observed patterns of behaviour.

In collecting data the researcher played an integral part of the investigative study as she was the pivotal point of all aspects of the research and responsible for the collection and interpretation of data. While traditional methods of research (surveys, questionnaires etc.) may be used in qualitative research, it was the researcher who would cull information from the interpretation of the observation of participants' behaviour and listen to their perspectives that form the backbone of qualitative research methodology. This type of information is very difficult to obtain using traditional research techniques. By the use of indwelling and the interpretation of facts gathered from this understanding of the context behind all data, the researcher becomes the actual instrument used to gather data as well as interpret the information. This allows for a unique perspective of knowledge which can only be gleaned from understanding the context in which it was observed. It is the heavy reliance on the immersion of the researcher into the research situation that marks an important difference between qualitative and quantitative research. Lincoln and Guba (1985) argue that the human instrument is responsive, adaptable and holistic. A human investigator brings knowledge of past instances, can respond immediately to the situation and understand complexities in a way that a "one-dimensional instrument" (Maykut & Morehouse, 1994: 27) is not able.

Data collected in qualitative research is particularly based on the analysis of the participants' behaviour – their words and actions - and requires methods which draw out such information. This can be by observation, completion of specific tasks, collection of relevant documentation and in-depth interviews (individual and group) which endeavour to elicit tacit knowledge so that it becomes actual and explicit information. In most
cases, observational field notes are taken and later transcribed and used for data analysis. Interviews can be audio-taped, transcribed and analysed. As Spindler (1982) advises, many instruments for gathering data for research can be designed as a result of observations that highlight what information is possible to obtain and how the information could best be drawn from the participants. Indeed, this was the situation as multiple sources of data collection in this study of the TOC were designed to elicit information specific to the participants as they were observed in their environment.

In the collection, transcribing and analysis of data mentioned previously, there is opportunity for the reflective thinking essential to qualitative research. While maintaining the initial focus of inquiry, and suspending as much as possible personal views of the situation, the qualitative researcher is able to open his/her mind to unexpected incidences which could add knowledge to the original framework of investigation. Initial leads can be followed and analysis of data begins when there is "a subset" of data and "the salient aspects of the phenomenon under study begin to emerge" (Maykut & Morehouse, 1994: 46). The inquiry can then be broadened or narrowed. It is important that the study builds from criteria inductively derived from the data collected and that all categories are not predetermined by the researcher as they could, in fact, become barriers to understanding the participants' true perspectives.

The narrative style of a case study supports qualitative research. The rich description which the case study format allows, should lead the reader to understand the participants' perspective within the detailed results of the study and then possibly apply these outcomes to other similar situations. In many instances, the actual words and behaviour become part of this text.

The above characteristics emphasise qualitative research as involving "reflective and meditative thinking rather than calculative thinking" (Maykut & Morehouse, 1994: 39). Similar criteria are advocated by Hoepfl (1997). In a comparison of qualitative and quantitative research, Merriam (1988) lists the characteristics of both methodologies. While not comparing the pros and cons of both research methodologies, there is benefit in examining the characteristics of qualitative research to ensure that these are met in this project. The characteristics listed in Table 14 were met in this research study as the researcher: a) focused on working with specific classes as they worked at familiar tasks in their natural setting; b) was the primary instrument responsible for interpretation of data; c) prepared to be guided by emerging data; d) designed a range of activities to solicit information from all concerned parties; e) was aware of the necessity to hold

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judgement in abeyance; f) had a strong understanding of the thinking skill programs being examined as well as understanding the criteria of qualitative research.

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>QUALITATIVE RESEARCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus of research</td>
<td>Quality (nature, essence).</td>
</tr>
<tr>
<td>Philosophical roots</td>
<td>Phenomenology, symbolic interaction.</td>
</tr>
<tr>
<td>Associated phrases</td>
<td>Fieldwork, ethnographic, naturalistic, grounded, subjective.</td>
</tr>
<tr>
<td>Goal of investigation</td>
<td>Understanding, description, discovery, hypothesis generating.</td>
</tr>
<tr>
<td>Design characteristics</td>
<td>Flexible, evolving, emergent.</td>
</tr>
<tr>
<td>Setting</td>
<td>Natural familiar.</td>
</tr>
<tr>
<td>Sample</td>
<td>Small, non-random, theoretical.</td>
</tr>
<tr>
<td>Data collection</td>
<td>Researcher as primary instrument, interviews, observations.</td>
</tr>
<tr>
<td>Mode of analysis</td>
<td>Inductive (by researcher).</td>
</tr>
<tr>
<td>Findings</td>
<td>Comprehensive, holistic, expansive.</td>
</tr>
</tbody>
</table>

Table 14: Characteristics of Qualitative Research (Merriam, 1988: 18)

While Patton (1990: 59) states criteria such as these shown above are not the “absolute characteristics of qualitative inquiry”, he sees them as “strategic ideals” providing direction and a framework for investigative study. The researcher wished to provide a strong theoretical basis for procedures taken and it was thus such a framework upon which the research element of this project was based.

**A CASE STUDY AS A RESEARCH METHODOLOGY**

When determining what methodology of research would be used, consideration was given to the many factors influencing this choice. As indicated by Stake (1994, 1995), the decision to use a case study is not always a methodological choice, but rather a choice driven by the topic being investigated and the context within which this information can be attained. Hathaway (1995) states the decision to use a case study method can also be based on the researcher’s own experience, preference and resources. For this investigation of the TOC, it was decided a case study would reveal qualities of student/staff experiences in a way that other research methodologies may not, and observations would provide context for the observed patterns of behaviour of people involved in the program. This decision followed Patton’s recommendation that “methodological appropriateness was the primary criterion for judging methodological quality” (1990:30). The researcher was experienced in the collection and analysis of data for classroom research.

Yin (1994: 6) puts forward the contention that if research is to follow a ‘how’ or ‘why’ question being asked about a contemporary set of events over which the investigator has little or no control, then the case study is a highly suitable and dependable methodology.
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for the research. There is often a desire to expand and generalize a theory and to generate a rich and complex description of a phenomenon, rather than to obtain statistical generalization or establish cause-effect relationships (Yin, 1994; Neuman & McCormick, 1995). In this research study, the situation being investigated was not linked to other studies and was concerned with understanding the behaviour of students in a specific situation, rather than gathering statistical data.

The case study is a research method suited to an educational setting as the researcher is in an ideal position to combine understanding of theory with observed behaviours, and to make informed judgements about these classroom occurrences. The interpretive approach of case study research procedures allows for the complexities of 'normal' classroom situations to be acknowledged and explored. Elbaz (1981) defines the understanding that an educator brings to the unique position of teacher-researcher as 'practical knowledge'. Such knowledge he sees as dynamic, driven by concrete experience and incorporating an understanding of subject matter, curriculum, instruction, self and the milieu of schooling. It becomes a valuable element of case studies conducted into educational processes or curriculum.

The case study associated with this study was an in-depth study of a particular case and included interviews, surveys and passive participant observation where the aim was to analyse a case from a sociological perspective. The case study method used in this work would be categorized as a descriptive single case study where the term descriptive implied "a complete description of a phenomenon within a context" (Yin, 1993: 5). The study fell within the definition of an explorative case study offered by Pentti (1999) as there was no earlier model and the goal of this study was to describe the exceptional character of the TOC at The College.

Although the prime purpose of this investigative work was to examine a specific case in a particular setting, Hamel, Dufour, Fortin (1993) see a study rich in detailed description as being representative of other situations and, therefore, having the capacity to establish transferal to other situations. A case study of classroom research based on objective collection of information and a collaborative critical analysis of this data has many benefits to offer. With the stipulation that due care was given to design and realization so that bias would not interfere with the analysis of data, a case study was the chosen methodology for this study.
Single case study

A rationale for the use of a single-case study can be to “confirm, challenge or extend a theory” in a particular situation (Yin, 1994: 38). Also supporting such a position, Berg (1998: 216) cites Stake (1994):

_Intrinsic case studies_ are undertaken when a researcher wants to better understand a particular case. It is not undertaken primarily because it represents other cases or because it illustrates some particular trait, characteristic, or problem. ... The researcher’s purpose is not to understand or test abstract theory or to develop new theoretical explanations; instead, is to better understand intrinsic aspects of the particular case.

Although the number of studies undertaken to investigate a process can be important, Hamel et al. (1993) argue that the worth of sociological investigation should not be judged solely on that basis. They contend that there is value in the use of a single case as long as the investigation proves adequate to meet the objective. In a single case study, the focus is on the particulars of a single situation and the complexities that are intrinsic to that circumstance, rather than the whole population of cases (Stake, 1994). The case study undertaken in this study has the clear objective of examining student behaviour to enrich, and extend, educational knowledge of students’ behaviour as they work at thinking skills introduced as part of an infused thinking skills program within a particular setting. However, this researcher is aware that such a study could be open to concern that: a) there is a lack of rigour, b) interpretation of observed behaviour could be linked to bias, and c) too many subjective decisions made by the investigator (Hamel et al., 1993: 19) may impede genuinely objective results. Continual attention was given to ensure that these possible detrimental aspects of a case study were addressed, and they became an essential consideration of all data analysis procedures.

Case Study protocol

Having selected a case study as the most appropriate method of gaining information about the specific questions posed in this work, the major aspects of quality research suggested by Yin (1994: 34-35) were considered. These features are as follows:

- **Construct validity**: procedures suited to the concept of the research are used in the research and in the collection of data
- **Internal validity**: proof of direct causal relationship without interference of other factors
- **External validity**: results must be able to be generalized, and
- **Reliability**: the research process should be able to be repeated with the same results.
Each of these features was incorporated into this study at the relevant stages of the project as indicated in the table set by Yin and shown as Table 15 of this work.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Case study tactic</th>
<th>Phase of research in which tactic occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>- use multiple sources of evidence</td>
<td>Data collection</td>
</tr>
<tr>
<td></td>
<td>- establish chain of evidence</td>
<td>Data collection</td>
</tr>
<tr>
<td></td>
<td>- have key informants review draft case study reports</td>
<td>Data collection</td>
</tr>
<tr>
<td>Internal validity</td>
<td>- do pattern-matching</td>
<td>Data analysis</td>
</tr>
<tr>
<td></td>
<td>- do explanation-building</td>
<td>Data analysis</td>
</tr>
<tr>
<td></td>
<td>- do time-series-analysis</td>
<td>Data analysis</td>
</tr>
<tr>
<td>External validity</td>
<td>- use replication logic to multiple-case studies</td>
<td>Research design</td>
</tr>
<tr>
<td>Reliability</td>
<td>- use case study protocol</td>
<td>Data collection</td>
</tr>
<tr>
<td></td>
<td>- develop case study data base</td>
<td>Data collection</td>
</tr>
</tbody>
</table>

Table 15: Case Study Tactics for achieving validity (Yin, 1994: 33)

To develop construct validity, three strategies were pursued - the use of multiple sources of evidence during data collection, establishing a chain of evidence, and having the draft case study report reviewed by a key informant. (An interim report was viewed by the leadership team and the researcher's supervisor). Literature (Yin 1993, 1994; Scott, 1996; Lewis & Lindsay, 2000) states that reliability is confirmed if a later investigator follows the same procedures and conducts the same case study over again and reaches the same findings and conclusions. Results should be able to be projected from the sample to the general population, across time and settings and tested by replication. Once this replication can be established, then results are more acceptable within a more general population. If the sample cannot be transferred into a larger population, then Guba and Lincoln (1985: 316) hold reliability can still be achieved if the researcher provides "the thick description necessary to enable someone interested in making a transfer to reach a conclusion about whether the transfer can be contemplated as a possibility". Bassey (1981: 85) concurs with this belief "that reliability of a case study is more important than its generality". Accurate and thorough documentation of the process should ensure that a repeated case study could be undertaken. It is anticipated that the methodology used to observe and analyse student behaviour in this singular case study, is richly descriptive and could be extrapolated to future cases.

In designing and implementing tasks as part of this study, and in the subsequent analysis of data, the researcher has included the following strategies that practitioners (Yin, 1994, 1995; Stake 1995; Berg, 1998) have suggested in order to achieve credibility.

1. procedures for data collection should be explained,
2. data collected should be displayed and ready for analysis,
3. negative instances should be reported, 
4. biases should be acknowledged, 
5. fieldwork analyses need to be documented, 
6. the relationship between assertion and evidence should be documented, 
7. diaries should track what was actually done during different stages of the study, and 
8. methods should be devised to check the quality of the data.

Care was taken to ensure Berg's (1998: 217) two particular aspects were addressed: a) that the procedure did not involve too many subjective decisions to offer genuinely objective results, and b) that the method could be seen as useful beyond the individual case.

If the previously listed criteria and Berg's points above are effectively addressed, then there is sufficient evidence (Elbaz, 1981; Wilson, 1981; Lincoln and Guba, 1985; Howe, 1985; Hamel et al., 1993; Stake, 1995; Yin, 1993, 1994; Gage, 1994; Scott, 1996; Hoepfl, 1997; Berg, 1998) to affirm there is ample scope within a well-conducted case study for theory to surpass perceived prejudice. In endeavouring to ensure a high quality investigation, this researcher intended to follow a structure defined by Yin (1994: 138) as 'linear-analytic'. The sequence of elements he states as stating the issue, reviewing relevant literature, selecting methodology, collecting and analysing data and reporting implications and conclusion from the findings.

Such a direction incorporates the previously listed requirements for conducting a credible case study. By setting a protocol for this case study, and making certain that any necessary deviations from this order are clearly and unambiguously documented, the investigator aims to ensure that the criteria of construct validity and reliability are satisfactorily met. A major aspect of this protocol will be to establish the 'chain of evidence' to which Yin (1994: 78) identifies as building explicit links between the questions asked in setting the case study, the data collected, and the conclusions drawn so that another observer could trace conclusions back to their source, or follow a response to the relevant conclusion.

**Steps in the procedure of the case study research**

In adhering to steps suggested by other researchers in the area of case studies (Soy, 1998; Yin, 1993, 1994; Scott, 1996; Guba & Lincoln, 1985), the intended research
procedure followed this format. The researcher needed to: establish the parameters of
this research, draw up a statement of the purpose of the investigation, decide appropriate
procedures for the collection of data, analyse this data, ensure there was authenticity of
outcomes, and construct a concluding report based on the findings from the research.
Each of these procedures is discussed below.

Towards the end of the year (2002) preceding the project, at the request of the leadership
team at The College, the researcher and her supervisor met to discuss how this study
could best be conducted. The tenets of a thinking oriented curriculum were discussed,
and the best method for collecting information about student thinking behaviour was
considered. Four particular strategies for teaching thinking skills (discussed in Chapter
Two) were to become an integral part of the curriculum in 2003, and it was decided that
the most relevant and reliable information would be produced if the researcher
concentrated on following the implementation of one of these skills. It was decided that
the researcher would follow the teaching of this skill across two separate teaching
classes and one of the support classes. The thinking skill program selected was the Six
Thinking Hats and three classes were chosen after the setting of the time table and
consultation with involved staff members. Broadening the number of classes and KLAs
beyond these three classes would generate too much data to draw reliable conclusions
(Wilson, 1981; Hoepfl, 1997). Originally this research was to include only interviews of
the leadership team and relevant teaching staff, and the observational sessions of the
three classes. But it soon became evident that deeper, richer information could be
obtained from the students. The original plan was amended to incorporate other
activities and this decision heeds the ‘emergent’ design principle referred to by Graue,
1999; Hoepfl, 1997; Maykut and Morehouse, 1994; Eisner; 1991; Patton, 1990; Lincoln

This study aims to investigate issues pertinent to the introduction of a mandated TOC at
a junior secondary college. The project was to determine the impact of this initiative on
the staff and the students and ascertain if there was any indication that the thinking skills
presented to the students were being applied as they worked at their classroom tasks and
in their communication with peers and teachers. Another important aspect of this study
would be to determine the students’ perception of themselves as ‘thinkers’. To ensure a
holistic understanding of the TOC impact within the school, data would be collected
from school leaders, teachers, students in the observed classrooms, and a selection of
students from across Year 7.
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Principal sources of data: were: observation of students' classroom behaviour, examination of students' written work, an open-ended task which questioned students' responses to scenarios based on real-life situations, and a metacognitive task which required students to examine how they saw themselves as 'thinkers'. Focus group interviews and individual interviews were also held with selected students. Interviews were conducted with The College leadership team and the three teachers whose classes were involved in the classroom observations. Questionnaires were also distributed to all teachers of Years 7 & 8. Material collected in this study was to be held in a logical manner to allow for easy retrieval if this was required by other researchers, and readily available for investigation with the proviso that adequate privacy was maintained in accordance with usual practice. A full description of each aspect of the data collection is presented in Chapter Four. Throughout the collection of data, a focus was maintained on the design of tasks to ensure there was construct validity, internal validity, external validity and reliability of outcomes.

Wiersma (1985: 133) warns that the many variables found in an education setting – intelligences, aptitude or socioeconomic background – introduce potential weaknesses or flaws when undertaking research in this field. However, as this work was not a comparative study and the aim was to analyse how all students of a classroom responded to a task that forms part of the normal routine of this class, then this aspect of variables did not need to be controlled or eliminated. Berg (1998: 233) advises that content analysis involves the interaction of two processes: basic content elements being examined, and the application of explicit rules for identifying and recording these characteristics. Data were examined, and responses evaluated against a specific set of criteria. A coding system allowed for the recording of this comparison of response against a consistent set of criteria. All steps in the collection of the data were specified, and the derivation of all conclusions adequately linked and referred to the source to allow for replication of this study. Another observer could trace conclusions back to their source, or follow a response to the relevant conclusion.

The multiple sources of collected information contribute to the required triangulation of data. Transcription of all recorded data was completed as soon as possible after the relevant sessions to minimize any difficulty with the recall and authenticity of observations. Field notes were examined alongside audio-taped dialogue to ensure recall was accurate and observed behaviour could add information to recorded dialogue. Data was coded so that corresponding references could be quickly identified to assist in the methodological triangulation of this data. All data were analysed to identify
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emerging findings and to firmly establish if there was collaboration of evidence. Collaboration would confirm that all avenues of data collection contributed to identifying repeating patterns to determine reliable outcomes rather than initial impressions, and identified outcomes would then form the basis of recommendation from the review process.

An interim report was presented to the leadership team to allow them to understand the supporting literature sources, the rationale for the chosen procedure and the anticipated pathway for data collection. At the same time, the design of specific data collection tools and how they were expected to be used by the researcher were explained to the leadership team. The final report was a rich description of the entire procedure of the study with specific concentration on the techniques used to obtain data, and analysis of this raw data. A determined approach was made to use language that was concise and void of ambiguity and that could not be interpreted in any other way than was intended (Hamel et al., 1993). Constant reference to the behaviour and dialogue of the students/teachers/leaders was used as a primary source of data collection. The analysis led to the establishment of criteria upon which informed judgement could be made, so recommendations offered to The College could be seen as a direct response to outcomes identified during the data collection process.

**Formative evaluation**

There are two recognised methods of evaluating an educational innovation or initiative - summative which is conducted at the end of the implementation of a program to assess its effectiveness in meeting the goals of the program, and formative which involves evaluation as the innovation is progressing to guide whether the initiative should be continued, changed or terminated. Tishman et al. (1995) characterize summative evaluation as tending to be more formal and largely reliant on results of quantitative data. Formative evaluation tends to be informal and based more on qualitative data and is often used in educational instances to examine the strengths and weaknesses of a program as it progresses and, therefore, guide development and future implementation. While both types are of comparable effectiveness and value in educational research, Tishman et al. (1995: 314) cite the work of Bruner (1966) who argues that evaluation after the fact is of little use and much more to be preferred (he suggests) is formative evaluation that can feed back into curriculum development and “help the refinement of methods”. As outcomes of this study were based on data from qualitative research procedures, and were of the initial stage of an on-going curriculum initiative, the final report presented to The College would be a formative evaluation of the program.
allowing The College to plan their approach to the continuance of the TOC. This report would answer Yin’s (1994) ‘how’ and ‘why’ questions which constitute the basis of a case study and allow The College to consider ‘what’ intervention they consider necessary for the ongoing implementation of the TOC.

QUALITATIVE RESEARCH DATA COLLECTION IN THIS STUDY

The strategies used in the data collection were those integral to qualitative research methodology (Lincoln & Guba, 1985; Merriam, 1988; Maykut & Morehouse, 1994; Stake, 1994; Yin, 1994) and would involve: individual, group or focus group interviews; direct observation; audio-taping; and written documentation.

The researcher was concerned that people in their natural setting should be captured with reality and honesty and recommendations from the study were based only on accurate analysis of the perspective of all stakeholders. Some data collection instruments (questionnaires, interview questions, tasks, observation checklists) were created ‘in the field’ as a result of initial observations and as unplanned opportunities arose which were perceived as able to yield valuable information to the study. When discussing data collection procedure, a full description of why these tools were designed, reliance on theories of thinking skills in their design, and how they met the requirements of the data collection are explained.

Criteria for all interview sessions

By pre-preparing questions for all interview sessions – with leaders, staff and students – the researcher made herself fully conversant with the proposed questions and plotted a ‘visual map’ for the direction of the interview. She had identified specific points judged to be of importance to the procedure and the results of the study. At the same time, the researcher was aware of the need for these interviews to be flexible enough to allow the participants the freedom to give honest appraisal of their impressions and thoughts (Maykut & Morehouse, 1994). Questions needed to be specific, yet broad and open-ended with the researcher being mindful that there needed to be the ‘looseness’ to follow divergence into unexpected areas of interest. “The researcher is free to explore and probe,” Maykut and Morehouse (1994: 83) advise but, at the same time, the researcher (as the interviewer) must basically know where the interview was heading and, if conversations became too divergent, to be able to bring the interviewees back to the focus of the interview. The interviewer’s planning of questions was to be a road map, but not a rigidly specific pathway.
In setting the questions for all interviews with staff and students, the researcher tried to avoid questions which were vague or too complex, and was attentive to Maykut and Morehouse's (1994: 90-91) recommendations that interview questions should cover certain aspects:

- **Experience/behaviour questions** – asking people what they had done;
- **Opinion/value questions** – finding out what people think about things, their opinions rather than feelings;
- **Feeling questions** – asked about the affective state to find an emotive response;
- **Knowledge questions** – seeking factual knowledge but avoiding a situation where interviewees could feel uncomfortable because they feel they should know the answer and do not;
- **Sensory questions** – steering the interviewees into letting the interviewer stand in their shoes; and
- **Background/demographic questions** – this information may be helpful in allowing the interviewer to establish the background of the interviewees and how this informs the data collection.

Patton (1990) warns that there is potential for this type of questioning to become intrusive, and may be better sought at the end of the interview.

Patton (1990) also suggests the interviewer holds in her 'back pocket' a set of probes or follow on questions to obtain more detail, elaboration, and clarification of instances that may occur during the interview. This led to the researcher forming sub-questions to have 'at the ready'. In setting these questions the researcher was mindful that research (Lewis, 1995 citing Kreuger, 1988; Stewart & Shamdasani, 1990) suggests that the number of questions in an interview should be limited to fewer than a dozen questions.

**Classroom observations of student behaviour**

The purpose of these sessions was for the researcher to study the actual rather than the reported behaviour and to “learn the perspective of the individuals being observed and the context in which their actions occur” (Borg, Gall & Gall, 1993: 118). Three ‘indwelling’ sessions were spent with each class to observe the general running of a classroom lesson. During this time, the physical environment was considered to determine how observation could be best carried out and if any problems could be foreseen and rectified before the main field observations began. Classrooms which were part of these observational sessions were set-up with teacher in front, and rows of students facing the teacher.

Before starting formal observations, it was deemed important to develop an understanding of the dynamics of the classrooms. Therefore, three sessions were spent with each class as ‘indwelling’ time. Maykut and Morehouse (1994: 5) describe this term as “neither philosophy nor method” but “a state or condition in relationship to other...
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persons or situations”. In naturalistic inquiry, indwelling allows the researcher to become part of the natural environment of the observed, part of his/her life. Indwelling can be seen as developing a combination of empathy and understanding while allowing the researcher to remain apart from the person. Indwelling sits well with qualitative research methodology as it brings an increased degree of understanding to the researcher as she/he interprets the impact and effect of various activities upon the participants of the research within their normal setting (Haig, 2000) and which Patton (1980: 121) defines as being “a part of and apart from”. ‘Living’ with these students, experiencing the curriculum as they did, allowed the researcher to bring heightened understanding of the relevance and effect of activities to all aspects of the future data collection. The time spent indwelling allowed the qualitative researcher to observe occurrences and environment in its entirety before needing to focus on particular instances or personalities.

Before the indwelling sessions began, the researcher was introduced to the students and they were briefly told the purpose of her presence – an interest in how students were thinking. Students were welcoming of the researcher, chatted to her and told her a few of the things they were doing and then the researcher was left to ‘fade into the background’. During these initial indwelling sessions, the researcher’s focus was not on interpreting events and audio-taping interactions, but rather coming to know the students and teachers in their normal setting and gain an appreciation and understanding of this environment in order to later take this understanding/empathy to other elements of the data gathering process. The researcher was able to plan how best to undertake observational sessions, gain an insight into the classroom dynamics and how students interacted with each other. The researcher believed that the students were comfortable with her presence before she began more probing sessions with them. Quietly observing the different personalities of the students allowed the researcher to interact (at later sessions) with different approaches which, in turn, opened the data collection so that a wide range of students were included in conversation – formal and informal. Knowing how a student interacted within the classroom helped to quickly establish a connection between student and researcher. Indwelling time contributed to honest and open interviews where the students felt secure in expressing private thoughts and opinions – knowing the researcher was different to a teacher yet someone genuinely interested in their classroom activities (Haig, 2000).

During these indwelling sessions, the researcher undertook ‘ad libitum’ observations (Maykut & Morehouse, 1994) noting whatever seemed interesting. This then lead to a

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better understanding of what information it was possible to access, and how such procedures could best be implemented. The researcher’s experience in interpretation of classroom interaction influenced her decision to establish a replicable manner of measurement such as used by Flanders (1970) and Wilks (2000) to categorise student behaviour. During this in-dwelling time, it was decided that it would be too difficult to study everything students did and that it would be necessary to limit the scope of the observations. The researcher set about identifying what characteristics of thinking skills could be observed to provide evidence of the students’ use of thinking skills in this setting. Such a structured observation would allow for these observations to be replicated thus adding to the validity of the research. These characteristics needed to be founded on recognised, valid and explicit principles of thinking skills’ behaviour. After specific criteria were created, they were tested in an indwelling session. This ‘testing’ did not involve the recording of data for analysis, but served as verification that the criteria for the checklist would be suitable for the systematic observation which was to follow. In order to continue to lay a reliable audit trail, the researcher needed to ensure that comparative observations could focus of the same aspects of behaviour being observed and the checklist gave immediate categorization of observed thinking skills.

Once indwelling sessions had been completed, the researcher was able to confidently observe student behaviour knowing that there was structure to the recording of thinking skills and that the direction of these observations could be replicated. Sections of these sessions were audio-taped and indwelling sessions had shown that about 20 minutes would be productive without becoming too long and protracted and losing focus (Wilson, 1981; Maykut & Morehouse, 1994; Merriam, 1998; Hoepfl, 1997; Haig, 2000). This slice of classroom time was at the discretion of the researcher who could select those sections of the lesson where there was interaction between students as opposed to times when the teacher was ‘teaching’ or the students were involved in recording of data. Understanding the routine of the classroom assisted in the design of other data collection activities which strengthened the belief that the indwelling time was most productive.

While indwelling sessions allowed the researcher and the student time to become acquainted before the actual recorded observations began, it also provided time for the researcher and other members of staff to become known to each other. The College operated on a six period day on the timetable, and the researcher was only directly involved in classroom observation for three of these six sessions. Therefore some time was spent in the staffroom (or other rooms) in transcribing field notes, or working at
other tasks. Teachers who struck up conversation were interested to know why the researcher was there and what she was doing. Although none of these conversations played a direct part in the data collection methods, and the researcher retained confidentiality with work she was completing, these casual conversations did provide some anecdotal information about how staff perceived the initiative. (Some of these remarks were repeated as answers to sections of the staff questionnaire.) Again, there was a fine line in 'holding off' so that the researcher did not try to be a visiting teacher i.e. there could be perceived possibility of alignment with staff, but rather a researcher who needed to keep independence from staff issues and ensure subjective analysis was not tainted by staff influence.

The role of the passive participant observer

It was deemed that a valid and reliable way of obtaining information about how students responded to the thinking strategies now forming a part of their classroom curriculum was to observe these students as they went about their usual activities in their natural setting. By paying close attention to their classroom behaviour it was hoped to identify if students were overtly demonstrating a use of thinking skills as they set about their classroom tasks. Such observations were based on the principles of naturalistic and systematic observational methodology as they were occurring in the field, involved studying multiple behaviours in a particular setting, and focused on qualitative description and interpretation.

The initial indwelling enabled the researcher to move easily into the role of a passive participant observer – suspending personal views and reporting from the perspective of the students being observed. Closer personal involvement occurred at later appropriate times. Sometimes the passive participant role was a 'fine line' between retaining neutrality, yet being able to assist if a student was obviously experiencing difficulty and had come to an adult accepted as part of his/her natural environment to ask for assistance. This difficulty is also mentioned by Haig (2000). If the student’s question directly related to the lesson, these questions were 'diverted' to the teacher. On occasions, a passive participant observer can be disadvantaged in some aspects of data collection if he/she has been unable to build a relationship which allows for sensitive understanding and interpretation of data obtained the participants of the observation. In this project, indwelling, acceptance of the researcher by the teachers, a willingness to quietly wait for the best time to interact with students, and the consistent appearance of the researcher, all helped to ensure that this possible disadvantage was minimised.
For later observational data to be accepted as reliable and valid evidence of 'normal' classroom behaviour, it was necessary that staff and students were accepting of the researcher as a natural part of their environment. What the researcher observed would, as much as possible, follow the regular classroom practice and would honestly reflect the usual classroom behaviour and student reaction to set activities. Therefore, students and teachers needed to feel comfortable with the presence of the researcher, and the researcher needed to be comfortable with the routine of the classroom. Earlier familiarisation sessions with the staff had given the researcher an insight into these teachers' personalities and how the researcher would need to adapt to the conduct of each classroom. It was essential that the presence of the observer would not disturb the interaction and communication between students or between students and teacher.

The students saw the researcher's interest in what they were thinking as different from their classroom teacher's viewpoint. In some cases they saw this specific interest as a diversion from their normal routine and this helped the ease of acceptance of a non-participant observer role (Haig, 2000). Informal discussion with students who readily spoke about what they were thinking, or the choices they were making about their work, generated data and led to the formation of some of the questions later posed in formal interviews. Kellehear (1993: 10) supports combining observations with interviews as this procedure may actually increase the validity of the findings because one method may turn up findings which can be explored by the other.

**Documentation of students' written responses to thinking skills tasks**

Dockrell et al (2000: 53) state: “When we collect data from children we can only ever measure their performance” and that this performance is viewed as “an indicator of a child’s competence.” While observations and later interviews would provide data about students’ responses to thinking skills, the researcher decided that such data was mainly based on behaviour or oral indicators. Therefore, undertaking a written task could open up pathways for students more inclined to respond in a written format.

A written task was set for the students of both observed teaching classes as, during indwelling sessions, the researcher determined how a routine activity in the classroom (normal setting) could be used to increase knowledge of how these students viewed their response to thinking. A second activity, distributed to all Year 7 students, was designed after observational sessions had shown the researcher how a theme being followed in the classroom (normal setting) could be expanded to understand how these students could
apply the thinking skills they were being taught to a current study theme. Although this task aligned with a recent topic of study, it did not intrude upon directions taken in these classroom activities which had been observed by the researcher.

**Holistic perspective of the research**

If a previously stated tenet of holistic perspective of qualitative research procedures, rather than a narrow aspect was to be achieved (Merriam, 1998), then it would be necessary for the researcher to regard all the people involved in the implementation of the TOC as being a major source of information. The viewpoint of all stakeholders of the thinking curriculum initiative would require consideration as represented in Figure 7.

![Figure 7: The three elements integral to the data collection of the TOC at the Junior Campus of The College.](image)

Data would need to take into account the perspective of the leaders of the school, staff members who were responsible for the delivery of this initiative into the classrooms, and the students who were anticipated to benefit from a new direction in pedagogy. While the manner of obtaining data varied, these three elements became the basis for the data collection in this study allowing for an holistic perspective where the action and communication of the concerned members of the community is taken into account - "the whole is greater than the sum of its parts" (Patton, 1980: 40). This plurality of perspective would allow the phenomenon of the case study research to be viewed in its entirety rather than one narrow aspect.

**Leadership Perspective:** It was decided the best way to obtain information about the introduction of a TOC was to interview the two leaders closely involved in setting the direction this curriculum initiative was to take. Questions were prepared along the previously explained criteria for conducting an interview (Maykut & Morehouse, 1994; Patton, 1990); and were designed to discover the underlying reasons for introducing this initiative, the method to be used, how it was to be implemented within the junior
campus, and how staff would be supported over, what would be for some, a ground-breaking change in pedagogy.

**Staff Perspective:** The researcher needed to understand the perspective of the three staff members whose classroom lessons would form a major source of data for this study. Contact, on a personal basis, also needed to be established with these teachers; as the researcher was mindful that her presence in the classrooms was at the discretion of these teachers. Familiarization sessions and later individual interviews were arranged with staff members whose classroom teaching would become a focus for the researcher. The individual familiarization sessions allowed the teachers and the researcher to become acquainted and to be able to clarify any doubts, and the direction which the project would take. The researcher was able to allay fears that this project was to be based on ‘how well they were teaching the thinking skills’ and that, if the researcher did not see evidence of thinking skills, then this would reflect poorly on their teaching skills. The researcher was able to gauge some idea of personalities of these teachers and how she could best interact with each of the teachers. These informal sessions established a workable rapport between teacher and researcher, and were most helpful in setting a collegial tone for later interviews and presence in the classroom as the researcher was recognized by the students as someone the teachers were happy to have in the room. Familiarization sessions were not audio-taped but the researcher took field notes. Formal individual interviews (which were audio-taped) were held at a later session, and all these sessions are fully explained in the data collection chapter of this study. Later in the review process, the researcher designed an open-ended questionnaire which was distributed to all teachers of Years 7 and 8. The design of this questionnaire was reliant on staff expressing their opinions and the researcher’s analysis of the information. Rather than providing a statistical response to a given statement, this questionnaire shed light on the reasoning behind that response – allowing the “I wonder why they thought that” doubt to be clarified.

**Student Perspective:** Staff members have multiple resources for airing their perspective on educational issues. Internally, staff meetings and a general sense of collegiality enable topics to be raised and discussed and, externally, professional networks allow specific curriculum concerns to be addressed. But often students’ opinions are ignored or, at least, little credence is given to what they say as a means of evaluating educational issues. While individual teachers incorporate the ‘student voice’ into planning classroom activities, this does not generally occur on a whole-school basis. Schools have used student councils to encourage student participation in framing some school
policies e.g. bullying, but few have allowed the student voice to be involved in
curriculum discussion. As more schools respond to recommendations of the MYRAD
report, increased opportunities are being made to ensure “students are partners in
decision-making” (Hill et al., 1999: 12).

The students’ voice is an important and integral part of the setting being observed
(Dockrell et al., 2000; Lloyd-Smith & Tarr, 2000; Lewis & Lindsay, 2000). Lloyd-
Smith and Tarr (2000: 60) refer to UK Education Acts which require “that children be
given the opportunity to contribute to decision making about their future interests” and
they are also convinced that “young people are capable of producing analytical and
constructive observations and react responsibly to the task of identifying factors which
impede their learning”. The same authors further state that listening to children and
including them in decision making “is an acceptance of an ethical imperative that
children have the right to be heard” (2000:60). The researcher decided to incorporate
student opinions as part of the data collection associated with this research. The
observational sessions with the students, interview sessions, and written tasks presented
to the students, all followed the principles of qualitative research in that they present
the participants with an opportunity to express their interpretation of their world as it exists
for them (Lincoln & Guba, 1985; Maykut & Morehouse, 1994; Lewis, 1995; Lewis
& Lindsay, 2000), but the researcher was mindful of suggestions (Dockrell et al., 2000)
that consideration be given to the setting, the students’ capabilities and the most
effective way to put questions to them. When working with students, their comfort,
privacy and self-esteem were a major concern of the researcher and no student was
placed in a situation which caused obvious stress or discomfort.

WORKING WITH STUDENTS

The researcher was mindful of obtaining rich information from a concentrated, intensive
study but, at the same time, responding to the need to be divergent and include a wide
enough sampling for results to be validly extrapolated to the general student population
of The College. Formal permission to work with students was obtained from
parents/guardians but when working with individual students, each was asked if he/she
was comfortable being part of the activity. One student declined to be involved in
interview sessions. To impartially judge student behaviour, the researcher relied heavily
on establishing measurable criteria against which data could be validated and
subjectivity of the researcher’s evaluation could be minimised. Sometimes these were
not standardised forms of assessment but purposely designed for the specific situation.
As this project was conducted over only one semester, consideration needed to be given to the types of activities undertaken. Classroom observation was seen as the prime source of information with the researcher acting as a passive participant observer of the students. As this aspect of the investigative process was a weekly observation of three classrooms, a wider base was sought to extrapolate findings to the broader school body. A written activity was planned to tap into the perspective of more students. Interviews were seen as a means of obtaining meaningful data from the students and it was decided to interview some students individually and others as part of grouped interviews as there was benefit in students hearing other students' views and being able to interact with each other about these points of view. These interviews were conducted nearer the end of the project as the students would be more familiar with the researcher as part of the school environment and were planned to involve students from observed classes and some from the other Year 7 classes. As the researcher had been a passive participant observer in the classroom, there was not a distinct link of the researcher as a member of teaching staff. When seeking information from the students the researcher focused on the elements shown in the Table 16: why the data was being collected; what sources could best elicit a spread of information; how the activity needed to be designed to provide the data; and from whom this information would be sought.

![Table 16: Collection of data about the TOC from a students' perspective.](https://example.com/table16.png)
Chapter Three Research Methodology

Conducting student interviews

While qualitative research interviews are usually lengthy (one – two hours) to allow for a prolonged engagement with the participants of the research, the researcher determined that the focus of the students would be enhanced, and more informative, if sessions were shorter. Interviews were held with students selected from across all of Year 7 to provide the interviewer with a portrait of how different students in all class were engaging with course material (Smith & Southerland, 2003). Smith and Southerland (2003) offer the following points to support the use of student interviews in a data gathering process as they: allow the researcher to understand how well students understood a concept; identify gaps in understanding, or misconceptions, that may be common among a group of students; allow students to raise areas of concern and obtain verbal feedback of interviewees about the topic under discussion – in this instance, the implementation of a Thinking Oriented Curriculum.

Students were interviewed either as individuals, in a group of two, or as part of a focus group of three students. Individual interviews allowed the researcher insight into the way in which students perceived the TOC impacted upon their learning. Group interviews allowed access to information from more students, and the inter-active format of a focus group interview encourages students to expand their perceptions by listening to the viewpoint of peers. All interviews followed the format of a structured interview with similar questions, directed at finding out the students’ understanding of thinking skills, prepared for each of the sessions (Maykut & Morehouse, 1994; Lewis, 1995). Some questions were omitted from grouped sessions as the interviewer did not wish to raise issues which could impinge on personal privacy. After the questions had been posed, students in individual interviews were asked to participate in a metacognitive task; but this task was deemed unsuitable for group sessions and these students were presented with another activity. The questions posed at these interviews and the different tasks asked of individuals and groups are presented in the relative data collection section.

Focus and group interviews

Although the concept of focus groups stems from market research, in social research within an educational setting, a focus group is an accepted method for several perspectives, on the same topic, to be collected at the same time. Gibbs (1997) suggests...
focus groups can be used at any stage of a program – at the implementation of a new program, to assess its impact, or to identify new directions. The researcher was using a focus group to elicit data to inform the progress of the program and, also as Gibbs notes "as a complement to other methods, especially for triangulation (Morgan, 1988) and validity checking". The focus group was another element in the audit trail.

A focus group differs from a group interview. In a group interview, questions are directed by the interviewer, in turn, to each of the participants and there is less opportunity for interaction between these participants as they listen to each response; whereas, in a focus group, it is interaction between participants that provides information about how a group of people may respond to issues introduced by another member (other than the interviewer). A distinguishing feature of a focus group is that it encourages exposure to multiplicity of view and allows the interaction between participants to add data in a group context to expand the interviewer’s analysis of the situation under investigation (Gibbs, 1997). In an individual interview session, although the interviewer may strive to remain objective, there is a possibility that the interviewer can take the lead and results could reflect preconceived ideas of the interviewer (Lewis, 1995). In a focus group, there is less possibility of this occurring as the interaction between participants continually opens new points for discussion. Lewis (1995: 2), citing Glesne and Peshkin (1992), also suggests that “some young people need company to be emboldened to talk, and some topics are better discussed by a small group of people who know each other”. Most focus groups consist of participants with a common interest in ideas being discussed. Their opinions may shift as they are influenced by the justifications of others, or they may stay steadfast in their beliefs; but the diversity of responses presents an extended basis for the outcomes of the research (Lewis, 1995). Discussion between students could also provide a consensus of opinion not available when interviewed singularly. The number of students in this group was kept to three as it was believed that this small number would allow opportunity for all students to share responses to the questions within the time that the researcher felt students would remain focused.

Dockrell et al. (2000: 53) caution against using language the student may find difficult to understand and cause incorrect assumptions to be made about the students’ performance/competency. However, it had been bought to the researcher’s attention that in interviews conducted by the staff in the previous year, a comment was made that students had found it difficult to accurately reply to a survey as they did not understand some of the terms being use e.g. Multiple Intelligences, Bloom’s Taxonomy. Therefore,
the researcher decided to use this vocabulary to gauge whether students did, or did not, understand the correct terminology of the programs and to discover if this anomaly still existed. To alleviate stress or feelings of inadequacy for a student, the researcher explained that during the interview she might use terms that were not familiar to the student and, if this did occur, it was OK as it would tell the researcher that this was something The College still needed to work on. An important factor in the short time that the interviewer spent with students in all interview situations, was to ensure that the students believed in the purpose of these interviews, and that heed would be given to how they reported their experiences of the TOC in their classrooms.

DATA ANALYSIS IN QUALITATIVE RESEARCH METHODOLOGY

Categorising and coding of data brings together information that the researcher decides holds a reasonable interconnection to each other and together may strengthen and validate conclusions based on the assembled data. These categories are not a haphazard collection of observations, but stem from how data relates to the focus of the inquiry while recognizing and retaining the value of ambiguity so that valid deductions are not excluded too early in this collection of data. While advocating the idea of categorizing and coding, Lincoln and Guba (1985) suggest that there needs to be put in place rules or criteria for placement of data in specific areas – a sense of similar meaning which cluster the information together. Maykut and Morehouse (1994: 126-127) state, “One of the defining characteristics of qualitative research is an inductive approach to data analysis” where categories are not predetermined but “what becomes important to analyze will emerge from the data itself”. This process is shown in the Figure 8 which Maykut and Morehouse (1994) term a constant comparison model.

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Inductive category coding and simultaneous comparing of units of meaning across categories.

Refinement of categories.

Exploration of relationships and patterning across categories.

Integration of data yielding an understanding of people and settings being studied.
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Figure 8: Constant comparative method of data analysis (Maykut & Morehouse, 1994: 135).
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This researcher followed these steps when handling data. While each piece of information must agree with the criteria for inclusion in the category, it may even meet the principles for inclusion in more than one category. Refinement of categories through the frequent rereading of data determines if the properties of each piece of collected information continue to warrant inclusion in the category. The collection of data according to the meaning this information brings to the inquiry will later assist in reaching conclusions and recommendations which can be then traced back to the source. The categories which emerge from the data become the specific areas addressed in the recommendations presented as the final report for The College.

Categories were not pre-determined, rather "what becomes important to analyse will emerge from the data itself (Maykut & Morehouse, 1994: 127). Field notes and audi-tapes were transcribed as close to the time of actual collection as possible. These pages were collated, coded and photocopied as the photocopies can be cut, moved etc without altering or detracting from the primary record of information which remains in its original state. This record could always be reviewed in its original state. Data were searched for chunks of related material that either developed from the focus of inquiry or issues from new perspectives the data brought to the original focus. These areas of meaning were then scrutinized and arranged in supportive groups to establish inter-relationships and unity (triangulation). This unity and cohesion confirmed deductions made from the data and allowed for the reliability and authenticity of conclusions reached. Scrutiny needed to be made with a sense of open-mindedness and tolerance of initial ambiguity, but without the influence of personal opinions and prejudices. Conclusions could then be made with the certainty of supportive and consistent data. Discussion and explanation of how such deductions were reached was then able to be presented with reference to data. After examining all data and establishing reliable conclusions from the study, critical recommendations were able to be made. Such recommendations indicated relevance of outcomes to other educational areas and offered reasoning for why a change of procedure or process may be required to make outcomes more effective.

The data collection methods described in this chapter address four validity issues raised by Lincoln and Guba (1985). The first of these is reliability where results are credible and believable from the particular perspective of leadership, staff or students. Secondly, there is transference as general findings can move from one context to another as data collection methods provide a rich description of content and participants. While some tasks were specifically designed for this project, they can be transferable to other similar
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studies. A third issue is dependence on a true description of the setting and participants with any changes noted for impact they bear on the outcomes. This leads to the fourth criteria where results could be corroborated by others in this setting if they were to follow the described trail of data collection.

The use of the data collection methods for this study of the TOC also confirm those criteria for the case study tactics set by Yin (1994) and shown on p.67.

- **Construct validity** – there are multiple sources of information which establish a chain of evidence.
- **Internal validity** – there is sufficient explanation in the analysis of the data in Chapters 4 and 5 to confirm recommendations.
- **External validity** – replication is possible although “a study which uses a single school as a ‘case’ cannot be presumed to provide evidence which is necessarily generalizable to others” (Lewis & Lindsay, 2000: 191). This was not the purpose of this project but data collection procedures could be replicated.
- **Reliability** – case study protocols have been followed.

The project was to study the thinking oriented curriculum as it was introduced at a particular college, and was deliberately undertaken with scientific rigour and followed the principles of using qualitative research techniques as part of a single case study so that there was validity and reliability of outcomes. While some of the methods for gathering data as part of this study were innovative, with the need for specific information driving the creation of new techniques, descriptive footprints were laid so that the study could be replicated in similar educational settings.

The outcomes of this project conducted as a single intrinsic case study will add to the professional body of knowledge of the initial stages of introducing an infused thinking curriculum into the daily routine of a secondary college.
Chapter Four

CHAPTER FOUR

ESTABLISHING DATA COLLECTION PROCEDURES

The answers derived must be shown to be valid. This does not necessarily require that the same answers be replicated with a new sample, a standard often sought in the physical sciences, but it does require that the study could be replicated (Lewis & Lindsay, 2000: 191).

The need to replicate data collection and the ability to either confirm or contradict the findings, Gage (1994: 372) states is an “ideal” of quantitative research and one which other leading researchers in this field (Yin, 1993, 1994; Stake, 1995; Hoepfl, 1997; Elliott, 1991; Bassey, 1981; Lincoln & Guba, 1985) advocate as important for establishing validity. This rich descriptive explanation of how the data collection was established for this study lays an audit trail which allows for the replication of each aspect of the data collection.

Using Maykut and Morehouse’s eight elements explained in Chapter Three as a guideline, the researcher designed and implemented tasks that would allow for the collection of data giving consideration to: a) the rationale for collecting the data; and b) how the task could be designed to achieve desired outcomes. Another important aspect was to consider the viewpoint of all stakeholders at The College – leadership team, staff and students. The data collection is, therefore, presented under the headings of these three perspectives. It is not presented in chronological order or in a hierarchical manner, but follows the direction of the initiative – from leadership, through to the staff, to students in the classroom.

Leadership perspective
1. Interview with the heads of the junior and the middle schools of The College.

Staff perspective
2. Familiarisation sessions with staff teaching the classes to be observed.
3. Interviews the three staff members (as above).
4. Questionnaire distributed to all Year 7 teaching staff.

Student perspective
5. Classroom observations of two English classes and one technology class.
6. Students’ self analysis of their thinking with all students in the two English classes.
7. Thinking prompt cards – random selection of 12 students from the two English classes.
8. A written task based around using the targeted thinking skills was completed by all Year 7 students.
9. Student Interviews – individual/focus/group.

LEADERSHIP PERSPECTIVE

DATA COLLECTION 1: Interview with the leadership team of The College
An initial meeting was held with two leaders of The College, the researcher and the researcher's supervisor to determine what processes could direct reliable and informed judgement about the beginning stage of this thinking skills initiative. The scope of the project, how the research would be conducted, and the procedure for reporting of findings were considered (Maykut & Morehouse, 1994). A formal interview was later conducted by the researcher and the Head of the Junior Campus and Head of Middle School. The researcher considered it essential to understand the background behind introducing a thinking skills program to the curriculum of The College and why such a step was considered against other initiatives. The proposed direction for this interview is shown in the questions presented to leaders of The College and shown as Table 17.

Table 17: Questions posed to leadership team of The College.

1. Why did the college decide to incorporate thinking skills as part of classroom teaching?
2. How did the college decide on the training model/trainer etc. that would occur with the Professional Development?
3. What changes do you as head of the campus notice in:
   - classroom teaching,
   - teacher attitudes to thinking oriented curriculum, and
   - any other points you consider important.
4. What sort of support are teachers currently being given?
5. What do you know about Enterprise Education in relation to The College?
6. What might the others on staff know about Enterprise Education?
7. Where does Enterprise Education fit into the thinking oriented curriculum?
8. What do you consider is the purpose of this review?
9. What outcomes do you hope/see the review will achieve?

Supplementary questions
10. Is there any documentation of the objectives of the PD or of the implementation of the thinking skills program?
11. Are we using the term “thinking skills”?
12. Are there specific thinking skills being ‘taught’ at The College?
13. Can you tell me how the thinking skills are being introduced to the students’ curriculum and how was this method decided upon?
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Establishing Data Collection Procedures

The interview allowed adequate time to pursue all questions and for the leadership team to explain The College’s philosophy of introducing a mandated infused thinking curriculum. The meeting was audio-taped and detailed field notes were taken. Field notes (Maykut & Morehouse, 1994) proved most valuable as one of the leadership team spoke very softly and some words were lost on tape, but intermittent words correlated with the sense of what had been recorded in the field notes.

**STAFF PERSPECTIVE**

**DATA COLLECTION 2: Familiarisation with teachers of the observed classrooms**

Following school organisation for introducing the thinking skills, the researcher would observe classes in a ‘teaching’ KLA and a ‘support’ KLA where teachers explicitly introduced de Bono’s Six Thinking Hats program. Two Year 7 English classes were selected allowing for two separate classes to be part of the observation. Both staff members had previously been approached by the Head of the Junior Campus and were agreeable to participating in the classroom observation component of the research. A technology class, including some of the students from the observed English classes, was also to be part of these observational sessions. The researcher decided that it would be productive if an informal meeting could be held to ‘sound out’ the best direction for further interaction. Two separate familiarisation sessions were necessary as all teaching staff participating in the observational data collection had not been determined when the first of these sessions occurred. The informal conversations clarified the following issues.

1. Formal permission for the researcher to be a passive observer in their classrooms; the format the observations would follow was discussed and suitable times were determined so that the least disruption occurred.
2. A working relationship was established which facilitated on-going interaction between researcher and participating staff, and allowed the researcher to gain a feeling for the ‘tone’ of each class culture.
3. The purpose of the study was understood by all teachers and it was firmly established that during the observations, the students were to be the focus of the study to ease any pre-conception of teaching style or classroom management being observed.
4. Issues to be raised and clarified without feeling that comments were being scrutinized.
5. Teachers were keen to understand why each had been asked to participate in the observational sessions.
6. The researcher was asked to explain what would be done with the findings of the review.
7. The teachers queried the researcher about her educational background, experience in this field of research and level of independence from The College.

| Table 18: Issues established in familiarisation sessions with teachers of the observed classrooms. |

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As these sessions were treated as a conversation between educational professionals rather than an interview, field notes were taken but it was decided that audio-taping would be intrusive (Lincoln & Guba, 1985). Some points raised in these discussions were used to frame questions asked in later interviews. Time was allowed for the teachers to quiz the researcher and clarify any indecision they had about the direction of the research before the project began.

**DATA COLLECTION 3: Interviews with teachers of the observed classrooms**

The researcher determined individual interviews would be productive as each of the teachers could independently offer ideas and opinions and would not place anyone under an assumption that they must be in agreement, as allowing for diversity of information was important to the data collection process. The interview sessions were semi-structured and the following set of questions was used for each interview session. The individuality of each teacher offered differing perspectives to these prepared questions (see Table 19) and sub-questions, which followed the line of the discussion, varied with each teacher and could not be pre-planned.

1. What is your current understanding of a Thinking Curriculum?
2. Why do you think a thinking oriented curriculum is being introduced at The College?
3. Do you consider it an important direction for The College and why?
4. What school structures do you see as important for the introduction of the thinking curriculum?
5. What are your perceptions of the PD you have been given in the area of thinking skills?
6. How has the training that you have received affected your approach to classroom learning and your teaching style?
7. How do you intend to implement thinking skills into your own teaching?
8. What do you foresee will be the benefits of a thinking oriented curriculum?
9. Could you detail any difficulties you foresee with this implementation at The College?
10. What is your main goal as you approach this first term in the thinking skills initiative of The College?
11. What do you understand by the term Enterprise Education as it exists in the curriculum at The College?
12. Do you foresee that the Thinking Curriculum will make a difference to teaching and learning at the Junior Campus of The College?

| Table 19: Questions posed to the teachers of observed classrooms. |

Aspects of conducting an interview are discussed in Chapter 3, and the researcher was also mindful of setting a non-threatening atmosphere and one where the staff member would not feel disquiet or a sense of inadequacy. There was a deliberate avoidance of posing questions which could push the interviewee into predicted answers or would not allow for individual
interpretation. Patton (1990) and Maykut and Morehouse (1994) suggest the skill of the interviewer lies in keeping a commitment to the perspective of the interviewees, making it evident there is genuine interest in understanding their position, and ensuring they feel confident their actions and words will not be misconstrued or their trust will not be ignored or misinterpreted.

The interview sessions sought to ascertain staff understanding of what a TOC encompassed; why this initiative had been introduced at The College; how the specific skills were to be incorporated into lessons, and how this would impact upon their classroom teaching techniques. It was also important to understand the staff's attitude to the Professional Development that had occurred at The College and to investigate areas where they believed further support would increase their competence in implementing the TOC. Each interview was audio-taped and detailed field notes were taken to construct a reliable data trail.

DATA COLLECTION 4: Staff questionnaire

The researcher was keen to obtain a more heterogeneous perspective than that gained from the interview of three teachers to better understand: how other teaching staff accepted the obligation of implementing a TOC; to establish whether this new direction for The College altered the way in which they approached classroom teaching/learning; and how staff identified students displaying strong/weak thinking skills and incorporated this knowledge into their classroom teaching. The following methods for collecting this information were considered and the reason for eliminating each choice is explained.

- **Interviews** were seen as a means of eliciting a rich range of opinions. However, with a teaching staff of 59 in the junior campus of The College, it was deemed impractical to conduct personal interviews with such a large number of teachers.

- **Focus group interviews** (Gibbs, 1997; Lewis, 1999) would allow for the researcher to understand the viewpoint of all staff. However, if focus groups of six staff members were formed, conducting these interview sessions was deemed a time-consuming way of reaching all staff. It would be very difficult to bring all group members together at a mutually convenient time, and there was the possibility that some staff members may feel intimidated in a group situation, and might not respond in an honest, unfettered and impartial manner.

- **A 'tick-the-box' survey** was an alternative, but in framing suitable questions, the researcher was aware that there can be an implied direction of expected responses.
and thus responses given may not truly reflect the opinion of staff, or there is little room for movement between the usual three to five categories for response. Ticking the box can also be interpreted as a ‘quick’ task and does not always require the person responding to make ‘considered’ judgements. But most importantly, with this method of collecting data there is limited ability to explain how decisions are reached.

- The same channelling of responses could be an undesired outcome of using a continuum. The researcher was keen to avoid any inbuilt assumption of the ‘correct’ answer being a particular end of the continuum.

A questionnaire to allow teachers to express their personal thoughts on how the TOC impacted on the design of their lessons, assessment and classroom management was designed using the questionnaire as used by Wilks & Cherednichenko (1995) as a reference. Spaces, in which teachers wrote their responses, have been omitted in the example presented as Table 20. Staff was able to give a full explanation of their decisions, thus avoiding shallow responses. Specific questions to cover areas of interest were indicated by the researcher, but there was no overt direction towards a ‘correct’ answer as might be found on a survey or continuum. Instead, the open-ended design recognised questions were to be answered on a self-assessment basis which tacitly accredited that person’s ability to make informed observations. The researcher was aware that such a format could be an imposition on staff time, and some members of the staff may decide not to respond. It is also acknowledged this style of questionnaire may only draw responses from staff members interested in the outcome of the initiative and whose responses were likely to reflect a positive attitude in regards to the implementation of the initiative. Some staff may not wish to question themselves, their program, or their response to student learning, in the way that the questionnaire required. However, it was the researcher’s judgment that the rich meaning of these responses was essential to the data collection. The questionnaire (shown as Table 20) covered the following areas:

- teachers’ perception of a thinking curriculum;
- the impact of a thinking curriculum upon teaching strategies and content of lessons;
- how students’ thinking skills are identified and catered for in planning the delivery of curriculum content; and
• the opportunity for staff to respond to areas of concern or approval that may not have been covered in the design of the questionnaire.

**QUESTIONNAIRE**

_How do you think we are doing?_

This questionnaire is part of the review of the thinking oriented curriculum being implemented at *The College* and the information you provide will assist in a more accurate and relevant evaluation of this implementation.

Your experience with the programme in the classroom is most important in providing information for the setting of future goals, or determining where adjustments could improve the programme.

All information will be private and no names (or coding) will be attached to any comments used in the review. Thank you for your participation and assistance.

Name: (for follow up purposes only between Cath Milvain and yourself)

..............................................................

KLA/s in which you teach: ................................................. .

Thinking Skill being introduced in your main KLA teaching area:

..............................................................

*Please answer each of the following questions as each applies to your own classroom teaching.*

1) What do you understand by the term "a thinking oriented curriculum"?
2) Explain how the development of thinking skills is part of your role as a teacher?
3) What special approaches do you take to develop thinking skills in your classroom teaching?
4) How do you evaluate the development of thinking skills?
5) How do you evaluate the approaches you use to develop thinking skills?
6) How do you identify what thinking skills your students possess?
7) How do your students display these skills?
8) Think of the classes that you teach.
   a) How do you identify students who show highly developed thinking skills?
   b) What factors contribute to this?
   c) What classroom activities do you feel assist these students?
   d) How do you identify students with underdeveloped thinking skills?
   e) What factors contribute to this lack of ability?
   f) What classroom activities would enhance the thinking skills of these students?
   g) What direction would you like future P.D. about the thinking oriented curriculum to take?

Although this thinking oriented curriculum has only been in place for a short time, are there aspects of the program you would like to comment upon that have not been covered in this questionnaire?

Again, thank you for your participation as I appreciate that filling in this questionnaire will have taken time from your busy schedule.

Table 20: Questionnaire distributed to teaching staff of Years 7 and 8.
Staff had recently completed a survey within the school, and the researcher was mindful of not repeating questions, as this repetition could give staff the impression that previous responses were not heeded, or that they were 'wasting' their time on doubling up of information.

STUDENT PERSPECTIVE

DATA COLLECTION 5: Classroom observation

Observations were documented about general instances in the classroom while following groups of students as they worked on class tasks. There was no deliberate decision to follow particular students. Because of the physical set-up of the classroom with power points placed in the walls, and often only one or two placed in a classroom, if the researcher wished to audiotape the students' conversation, then the most conveniently placed group was chosen. Students needed to move desks if the lesson required group activities.

It is an accepted element of qualitative research for observational notes to be taken as part of the data collection process (Lincoln & Guba, 1985; Taylor & Bogden, 1984; Maykut & Morehouse, 1994). The observational notes fitted the criteria of field notes as they were a record of the spirit of conversations, included direct speech, referred to instances observed (not always included in taping), and, as a separate element, immediate analysis of what was occurring when this was appropriate. The criteria detailed in the work of Maykut and Morehouse (1994) were the basis for the researcher's interpretation of how these notes were to be used effectively and efficiently. Transcription of the audio-tape, with the support of written comments, would assist in the accurate recording of thinking behaviour against the check list of criteria. This combination of both methods of recording students' classroom behaviour assisted in obtaining a correct and reliable cross-checking and analysis of observations. At first students were very excited by the use of the audio-taping, but this taping also became the 'instrument' of noticeable distraction. Some students used it like a karaoke machine, or shouting to make sure they were heard, or wanting to hold the microphone etc. After a few sessions, this distraction dwindled and the researcher's audio taping became an accepted part of the routine of the researcher in the room.

It was decided that regular observational sections would be approximately 20 minutes and taken at the discretion of the researcher. This periodic recording Kellehear (1993) states is a
commonplace practice among ethnographic fieldworkers. Recording over too great a time span could also produce an excess of data that may not be conducive to the study. Sometimes observations were taken over a briefer time slot, as the classroom teachers moved the focus of the lesson, or student interaction was halted, or the activity altered. In some sessions, there was no student dialogue and therefore, little opportunity to ‘observe’ student thinking skills. During some sessions, students were working on set class projects or were involved in individual informally research or the writing up of their findings. The researcher used these times to talk with students to understand how they were approaching the task and the criteria they set themselves in making choices when offered a multi-choice format.

One session was involved in silently reading a magazine before later beginning a set task about this magazine. In one lesson students were reporting on their projects; another lesson involved performance of plays which they had completed as part of a class task. The researcher listened to these sessions, did not audio tape, but took field notes to give an understanding of student activity. At any oral sessions, the researcher focused on listening to student vocabulary to seek evidence of ‘cognitaire’, the term used by Costa (1997) to denote the classroom use of words which indicate thinking skills e.g. compare/contrast, analyse. The confident, consistent and appropriate use of these terms would imply knowledge of what they meant and the thinking involved in the process of carrying out the action being described. Some sessions were ‘chalk and talk’, and the researcher did not use the check list (discussed in following section), or audio-tape at these times.

During another of these observational sessions, students were working at individual projects and the researcher decided to interview some students about why they had made various selections from among a set of multi-choice items in a project had been designed to incorporate William’s Taxonomy and Gardner’s Multiple Intelligences. Four students were selected for these informal interviews. The term ‘informal’ is used as these were unplanned discussions (emergent design principle of qualitative research) and questions were framed in the researcher’s mind as she watched the class work at the task. These questions were designed to elicit corresponding data about issues raised in other sessions with students, and to obtain further information about decision making processes engaged by the students. The same questions were asked of each student.

1. When you have choices, how do you make your decision about which one to do?
Chapter Four

Establishing Data Collection Procedures

2. When doing the research topic, how did you find your information?
3. Tell me why you chose the creative writing topic you did.

These informal interviews have not been written up as part of the data collection, but responses to these questions became part of the students’ perspective on classroom activities and their comments were considered relevant when analysing student data.

It was intended classroom observational sessions would run for the first semester of the implementation of the TOe, but an enforced absence of the researcher meant that some of the planned sessions could not occur so these observations continued into the third term. The students were not at all disturbed by this interruption, and the researcher was able to slip back into the passive participant role. However, after four weeks into the new term, the researcher judged that saturation of this method suggested these sessions should be wound up. Time was then used to administer an unplanned follow-up session for another activity and to complete all student interviews.

Establishing criteria for the observation of thinking skills

While there were many interesting occurrences in the classrooms, the researcher was mindful of focusing on looking for the presence of thinking skills. The researcher considered the plethora of possible information which can be found to explain thinking skills. Perhaps because ‘thinking’ has an intangible outcome, with different expectations held by different people, educators have difficulty in assessing and labelling the process. Marzano (1991); Perkins (1995); Costa (2000); de Bono (2000); Vygotsky (1962); Lipman (1991); Feuerstein et al. (1980); McGuinness (1999); Atkin (1999); Resnick, (1987) etc. bring us different perspectives and understanding of this very complex mental process. Many of these writers have developed specific theories and, in some instances, their own models of thinking. Current understanding of thinking skills identifies common threads in this knowledge of thinking. For example, from an auditing of thinking theorists’ lists of thinking skills (presented as Appendix 2), two main divisions of thinking skills emerged – creative and critical thinking - with each being different and bringing its own set of behaviours, yet linked and existing with the other. The researcher also looked at another dimension to thinking – metacognition, where students reflect about their own skills and
ability. These three major categories of thinking were selected as thinking criteria for this project.

Critical thinking is understood to be based around questioning and querying. Huitt (1998) offers the definition that critical thinking is a mental activity concerned with evaluating arguments or propositions and then making judgments that guide ensuing action. Marzano et al. (1988: 18) see the goal of teaching critical thinking as: "to develop people who are fair-minded, objective and committed to clarity and accuracy". Creative thinking is understood to refer to opening the mind to different ways of arriving at a solution. Rather than expecting the 'changing the world' high creativity (Craft, 2002), creativity for this research was observing a student practising Gardner's idea of creativity, "the ability to solve problems or fashion products, pose questions, or raise new ones" (cited by Craft, 2002: 55). Perkins (1984: 18-19) implies output must be a criterion for creative thinking: "Creative thinking ... tends to lead to creative results". Metacognitive thinking (Perkins, 2000; Pohl, 1997; Langrehr, 1988; Marzano et al. 1988) is understood to be an awareness and control of a person's own thinking. What is my thinking like, about, missing etc.? Metacognition is a higher level activity which is often termed self-knowledge about cognition/knowing. It involves a person being aware of his/her own thinking, monitoring this knowledge, and then regulating behaviour according to this studied reflection.

Having established these categories, the researcher then looked at identifying explicit performance criteria for each mode of thinking. Further comparison of thinking skill descriptors (using the work of previously acknowledged experts in the field of thinking) allowed the researcher to construct a set of characteristics to incorporate qualities of each of these categories – critical, creative and metacognitive thinking.

These characteristics became a 'check list' for the researcher who recorded when they were observed in the classroom. The characteristics which formed the checklist for classroom observations are presented as Table 21. The evaluation that such characteristics were occurring in observed classroom activities is reliant on the judgement of the researcher; but this is a judgement developed over many years of practical teaching, and a sound understanding of thinking skills through previous research work.
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Table 21: Characteristics of thinking skills observed in the classroom.

DATA COLLECTION 6: Student self analysis of their thinking

This task was undertaken to allow the researcher to: a) further understand and gauge student perceptions of themselves as thinkers; b) provide a communication pathway for students whose preference may be a written format; and c) broaden the data collection base. Students of one Year 7 class were accustomed to spending 10 minutes in a weekly lesson 'wondering' and writing their thoughts. The wondering was an open-ended task and a private communication between teacher and student. Students were not asked to respond to a particular topic, simply to engage in the phenomenon of wondering. The researcher sensed such an exercise would be an opportunity to examine students' response to a metacognitive task and, with teacher permission, decided to extend this idea of 'wondering' to a self analysis of thinking skills from all students in the observed English classes. To allow for collection and analysis at a later time, a work sheet was designed using an accepted schema of 'thinking', and the text "I wonder what I am like as a thinker" was printed on the worksheet. Accompanying graphics provided a visual stimulus for thinking and this is shown as Figure 9. The worksheet was a half A4 sized paper so that students did not feel compelled to make it a long or onerous task. Many students wrote on the back of
the sheet and the researcher understood this to indicate students were generally comfortable with the task, and had no difficulty in thinking about their thinking.

![Proforma for students' self analysis of their thinking](image)

Figure 9: Proforma for students' self analysis of their thinking

The work was distributed to all students present on the day in the two English classes (43 responses). It was explained to the students that this work would be slightly different from their usual task, as work would be collected and read by the researcher, but there was no obligation to pass in their work. No student declined to participate. Students in the class who were used to this idea of 'wondering' showed no difficulty in responding to the task. With further explanation of what was required, students of the second class completed the task with only one student not able to handle the abstract element of reflecting on thinking.

**DATA COLLECTION 7: Thinking prompt cards**

The researcher was endeavouring to establish a line of communication with students which could provide some insight into the way in which the students think at particular times for as Brooks and Brooks (1993: 60) state “students’ points of view are windows into their reasoning”. Usually this type of information is best obtained by conversation carried out on an individual basis and the researcher set about finding a means of initiating this conversation.

Posing specific instances and asking students how they might behave in the given situation was considered, but a means to encourage the student to elaborate on why choices were made was required. Creating a continuum asking how students might respond to a task, or a survey, or a questionnaire was considered; but the researcher was interested in eliciting
richer information than these methods might bring. A first consideration was to construct a rubric with graduated criteria as to how the student might react to a stated thinking scenario. However, there was the possibility that the student may think one column could contain the ‘best’ answer and only chose from one area of the rubric. It was then considered to use descriptors, as in a rubric, but present them as a list under a given scenario (a format used by Marzano et al. 1993, Marzano, 2000). While being a recognised assessment procedure, it was decided that it would not be an ideal self-assessment tool as such a set-up could suggest to the student there could be a hierarchical response, and it might be best to select the last given (or first given) statement. A multi-choice format was considered as choices could be arranged so that there was no continuity in the placement of what could be deemed the best answer. Finally, an amalgam of these methods was decided upon, and a set of specific purpose thinking prompt cards was designed. These cards consisted of a thinking scenario and four separate responses which could be randomly presented to each student.

**Designing the thinking prompt cards**

**Step One:** An open-ended prompt was needed to lead the student to discuss what he/she would do in a situation. To select these situations, the researcher gathered the work of many experts in the field of thinking skills and looked at published lists of such skills. Marzano’s thinking dispositions (1989; 2000), the goals of Enterprise attributes, a list of thinking skills given as a staff handout by Pohl (2002); Marzano’s core thinking skills (1988); the outcomes of a learning survey given to leaders of The College at a previous in-service; Key Competencies; Peachey’s (2002) list of key features of thinking skills, Beyer and Costa’s Major Thinking Skills Strategies (2001), Presseisson’s Taxonomy of Basic Thinking Skills (2001), Quellmatz Framework of Thinking Skills (1998) and Taylor’s Multiple Talent Model formed the starting point for this scrutiny (see Appendix 2).

The copies of these documents were scrutinized by the researcher to establish common aspects that could be linked to create instances where a specific style of thinking could be required and engaged. These commonalities were investigated and framed into situations which could cover the majority of these characteristics. The researcher decided on eight situations which could be posed to students to try to understand how they would think and behave in these situations. The eight scenarios which were decided upon, and this
researcher’s explanation of the intended outcome of each thinking scenario, are shown as Table 22.

<table>
<thead>
<tr>
<th>SKILL</th>
<th>UNDERSTANDING OF THE SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflection</td>
<td>Where the student is able to consider previous experiences to give direction to new</td>
</tr>
<tr>
<td></td>
<td>undertakings/situations</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Where the student is able to apply reasoning and initiative to comfortably confront new</td>
</tr>
<tr>
<td></td>
<td>ideas.</td>
</tr>
<tr>
<td>Creativity</td>
<td>Where the student is able to create new pathways in an investigative process and decide</td>
</tr>
<tr>
<td></td>
<td>on the most appropriate method of presentation of data.</td>
</tr>
<tr>
<td>Organization</td>
<td>Where the student is able to arrange information so that it can be used more effectively</td>
</tr>
<tr>
<td>Information</td>
<td>Where the student is able to examine various resources to retrieve relevant material.</td>
</tr>
<tr>
<td>Gathering</td>
<td>Evaluation</td>
</tr>
<tr>
<td></td>
<td>Where the student is able to examine criteria and data to consider the value of the</td>
</tr>
<tr>
<td></td>
<td>information.</td>
</tr>
<tr>
<td>Analysis</td>
<td>Where the student is able to remain focused on the main aspect while examining specific</td>
</tr>
<tr>
<td></td>
<td>elements of the task.</td>
</tr>
<tr>
<td>Open-Mindedness</td>
<td>Where the student is aware of the contribution and knowledge of others, but can reasonably</td>
</tr>
<tr>
<td></td>
<td>disagree with others’ opinions.</td>
</tr>
</tbody>
</table>

Table 22: Understanding of the targeted thinking skill for each scenario presented to the
students.

Dockrell et al (2000: 53) state that there can be elements of the design of the task which
cause us to underestimate the students’ performance and, therefore our interpretation of their
competence. One of these features is that of language, with these authors stating that if a
student is struggling to understand the language of the task, then they may be unable to
reliably show their competence. When setting the language for the cards, the theoretical
language of thinking skills previously detailed, were translated into the language of the
students. These thinking situations were then printed on eight different coloured cards -
eight scenarios, eight cards. Graphics were designed to highlight a focus of the scenario and
appeal to those students who respond to visual clues.

Step Two: Having established the thinking skill prompt card, stimuli for how the student
could respond were then considered. As in designing a rubric, a range of responses was
needed. The researcher returned to the prompt card, and the original list of the
characteristics of thinking from recognised experts in this field (see step one), and
considered possibilities of answers – from the uncertain to the confident, from the novice to
the expert. As with designing a rubric, a central response was determined and then variation
from these formed. For each of the eight prompt cards, four sets of responses were created.
Four responses were decided upon as, quite often, if there are only three alternatives,
interviewees tend to ‘hedge their bets’ and stay with the middle. The researcher wanted to
‘move’ students beyond this comfort zone. It was difficult to couch four different replies to each situation, but the researcher determined that four responses would produce a better understanding of why choices were made. These four choices were different for each of the prompt cards, and the language of these cards incorporated the thinking characteristics as previously mentioned. While there is no hierarchical response to thinking, and each individual will respond in his/her own manner, choices were designed to show movement from the hesitant and uncertain, to the practiced and confident thinker.

By presenting eight thinking scenarios, a range of responses was opened up to the students which would show if a student responded in a confident range in one area as distinct from another where they do not respond with the same confidence. The colour of the four responses was the same colour as used for the prompt card. These were all laminated so that, even with frequent use, they remained neat and attractively presented to the students. This was an advantage as the researcher had not envisaged how often students would handle cards and move them around as they considered responses. The use of corresponding colour made it easy for the researcher to present each scenario and its possible responses to the students and made certain that cards were not mixed as without the colour co-ordination, a response card could have been placed under the wrong prompt card. As each set of response cards was deliberately placed randomly under the corresponding prompt card, it did not matter in which order they were presented to the student. This inability to pre-empt the ‘best answer’ or the answer the teacher may want, was the explicit design factor of these cards.

At the completion of creating prompt cards and the corresponding response cards, there were very few characteristics from the original reference lists which had not been used, and the researcher was satisfied that these cards generally encompassed the ideas of the selected theorists mentioned in step one. As each scenario and its corresponding responses were read to each student, this would ensure that students who worked best with aural and visual learning attributes were catered for. Some students physically interacted with the cards and often ran their finger across words or sketch. The researcher believed that this presentation of the statement on a moveable card (rather than a pen and paper task) also appealed to kinaesthetic learners. An example of the open mindedness scenario and the corresponding choices of the response cards for this scenario, are shown as Figure 10. Other scenarios and responses are shown as Appendix 3.
I like working with friends so that we can share the work between us all.

I like sharing ideas in a group as this increases my own knowledge.

I like listening to other people's opinions to help me understand what they think about a topic.

I listen to other opinions but don’t make up my mind until there is enough evidence for my decision.

Figure 10: Open Mindedness scenario and corresponding response cards.

Step Three: The cards, prompts and responses, were shown to educators with recognised knowledge in the field of thinking skills\(^\text{14}\), and then used with some students, not connected with The College, of the same age as the students with whom they were to be used. After this consultation and trailing, it was decided to proceed with these cards as part of the data collection.

Administering the sessions

From the observed Year 7 classes, twelve students were selected from those who had returned specific permission letters. In making this selection, an equal number of boys and girls, a range of ‘academic ability’ and a mix of ethnicity were factors which were considered. As normal noise from classroom activities could interfere with the smooth running of this task, and to allow for a sense of privacy, the researcher worked with individual students in a quiet area of the school.

The prompt card was placed on the table in front of the student, and then read to the student. This reading helped eliminate any reading difficulty for the student and the inflection of researcher’s voice could also aid interpretation. Text, graphics and reading ensured that each student understood the scenario. The four response choice cards were placed, one-at-a-time, before the student (under the prompt card) and again, these were read to the student as they were placed in line on the table. The cards were placed in the conventional way of

\(^{14}\) Dr Susan Wilks, University of Melbourne, and other colleagues of the researcher.

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reading - from left to right. The student was then asked to choose the card that most resembled the way in which he/she might act. The researcher was then able to ‘move’ from this response to further develop conversation by asking open-ended questions. The researcher followed the lead of the student, or drew the conversation to an end if she felt the student was uncomfortable or did not fully understand the questions being posed. In some cases students made their choices very quickly and others needed to eliminate choices before settling on what suited them. The researcher allowed as much thinking time as the student needed, and only re-read or paraphrased if she felt the student was struggling to reach a decision, or seemed uncertain of what was being asked. After discussion of why the choice had been made, the cards were removed, the next prompt card displayed and the process repeated until each of the eight cards had been worked through.

As the researcher needed to concentrate on conversation with the students, their replies were audio-taped. The researcher collected cards and left the student’s choice as the top card so that this choice could be later recorded in the field notes. This proved necessary, for although responses were audio-taped, and the researcher thought this would be sufficient, sometimes the student selected not by reading his/her choice, but by indicating “that one”. Therefore, a written record of this choice was needed. On the teacher’s master sheet of cards and responses, responses were numbered from 1-4, and this numerical reference is noted in transcripts of the work. This written recording was able to be done in the time it took the student to return to the classroom and for the next student to arrive. The correlation of audio-tape and the field notes ensured that an accurate record of each response was made at each interview. To test the validity of these purpose-designed cards, the researcher presented the same thinking prompt cards, with the same choice of responses, to the same students after a period of three months. Repeating this activity would: a) determine if there was consistency in results; and b) track any discrepancies. Again response cards were randomly presented to counter student’s first session choices with the later choices.

**DATA COLLECTION 8: Applying thinking skills programs in a written task**

In designing this written task, the researcher was seeking to complement other methods of data collection and to gain access to the wider student population. The activity, distributed to all Year 7 students to complete as an English classroom activity, was designed to expand understanding of how students responded to an activity that was specifically directed towards the application of the thinking tools taught as part of the TOC.
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All Year 7 students had just completed a special week-long integrated unit of study on the topic of water so the task followed this theme and was set around The Great Barrier Reef in the belief that all students would be familiar with this unique part of Australia. Graphics on the task sheet also suggested the idea of a marine environment. The task sheet (Figure 11) consisted of a collection of four statements about the Barrier Reef from other secondary school students, published in a Melbourne daily newspaper, as a prompt for asking students how they might respond to preserving this area.

Figure 11: Task sheet for applying thinking skills as a written task.
The activity was to be supervised in the classroom by another teacher and needed to be a 'one-off' task as there would be no lead-in, nor would there be a follow-up. The task also needed to be readily understood by all students, be non-threatening and centred on a topic which would be familiar to the students, as the sole purpose of the task was to see how students went about using the thinking strategies. The task was purposely geared towards the academic capability of the majority of students, and could be deemed as a rich learning task because: 1) students were asked to construct their own responses rather than to select from any presented; and 2) the task replicated challenges faced in the real world (Mueller, 2003). Such rich learning tasks are what Resnick (1987: 47) holds can be the "hallmark of a 'thinking' curriculum" and testing procedures should measure "the ... students' ability to apply skills and knowledge of real-world problems". Students were directed to use the thinking tools to help them organise their responses. There was a separate work sheet for each of the four thinking skills programs.

- Six Thinking Hats (see p.161) – students were asked to use the six thinking hats to consider reasons for preserving the area. The mode of thinking for each coloured hat was given on the worksheet.
- Multiple Intelligences (see p.139) – students were asked to consider how they could respond in a mode suited to each of the intelligences. Each of Gardner's eight intelligences was listed on the sheet.
- Bloom's Taxonomy (see p.160) – students were asked to frame six questions to ask of an imaginary visiting marine expert. Each level of Bloom's taxonomy was given on the work sheet along with trigger words to guide the student with each of the levels.
- Ryan's Thinker's Keys (see p. 106) – students were asked to use the Prediction Thinker's Key to identify how the Barrier Reef might exist in the future.

These four activities were randomly distributed among the students of the thirteen Year 7 classes. Each student was only expected to respond to one sheet so that in a class of 26 students, there would be at least six students responding to each of the four thinking tools (24 worksheets). The 'extra' two sheets were alternated between the classes to ensure that an equal number of each task was distributed. Across the thirteen Year 7 classes this would mean seventy-eight responses for each thinking skill could possibly be returned to the researcher. The task sheet for de Bono's Six Thinking Hats skill is shown as Figure 12.
THE SIX HATS.
Use the six hats to try to frame what you think about preserving the unique environment of the Great Barrier Reef.

<table>
<thead>
<tr>
<th>THINKING HAT</th>
<th>YOUR IDEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>YELLOW HAT</td>
<td>Benefits</td>
</tr>
<tr>
<td></td>
<td>and</td>
</tr>
<tr>
<td></td>
<td>Feasibility.</td>
</tr>
<tr>
<td>WHITE HAT</td>
<td>What</td>
</tr>
<tr>
<td></td>
<td>information</td>
</tr>
<tr>
<td></td>
<td>do you need?</td>
</tr>
<tr>
<td>GREEN HAT</td>
<td>Alternatives</td>
</tr>
<tr>
<td></td>
<td>and creative ideas.</td>
</tr>
<tr>
<td>BLACK HAT</td>
<td>Caution,</td>
</tr>
<tr>
<td></td>
<td>differences</td>
</tr>
<tr>
<td></td>
<td>and problems.</td>
</tr>
<tr>
<td>RED HAT</td>
<td>Feelings</td>
</tr>
<tr>
<td></td>
<td>and intuition.</td>
</tr>
<tr>
<td>BLUE HAT</td>
<td>Managing</td>
</tr>
<tr>
<td></td>
<td>the thinking process.</td>
</tr>
</tbody>
</table>

Name: ___________________________ Home Group: ___________ Male/Female

Figure 12: de Bono's Six Thinking Hats activity as part of applying thinking skills written task.

As there was no diagnostic element to the activity, analysis of this task would not follow the usual rationale for assessing students' work. The researcher was not seeking to identify areas of the subject matter the students did, or did not, understand and nor would responses determine the direction of further classroom tasks or have a direct influence on classroom learning outcomes. Instead, the researcher's assessment would be solely based on understanding how students had applied the thinking tool to the given task and whether this application reflected an understanding of the thinking tool. Criteria for analysing the students' responses for each thinking program needed to be determined. Some criteria would be generic to any classroom task and the thinking process itself; while others would be specific to the application of the targeted skill. Selected criteria would need to identify observable performance and allow the researcher to make judgments about the quality of these responses. Establishing these criteria became a difficult task for the researcher as much of the literature associated with the specified thinking tools was based on how the students 'matched' their response with the tool, rather than indicating how the quality of this response could show understanding of the underlying purpose of applying each program.
Six Thinking Hats: Much literature explaining the use of Six Thinking Hats concentrates on using the hats to channel thinking towards constructing a broad spectrum of response to a topic. While the researcher was able to find many examples of how this strategy can be used, there were very few guidelines to assist in the judgement of the quality of each thinking outcome. The researcher therefore decided that the thinking strategy had been used effectively if there was evidence that the student had used the Six Thinking Hats technique to obtain breadth of knowledge of the situation being posed, and if the suggestions presented by the student, moved from the idea of ‘brainstorming’ to how a practical or plausible application of responses could be implemented.

Multiple Intelligences: As the use of Gardner’s Multiple Intelligences falls across eight different categories, each can require different characteristics for assessment e.g. criteria for Kinaesthetic Intelligence would require a different set of criteria than for a Verbal Linguistic activity. The researcher needed to take a broader line than looking at the use of separate intelligences. Therefore, it was decided that the student had used the strategy effectively if there was evidence that the suggested activity encouraged the aspect of the intelligence being targeted, and that the activity did not detract from the purpose of the task. The performance or activity had not become the end but rather the means to the end – using a particular mode of approach to facilitate participation and learning.

Thinker’s Keys: When working with the Thinker’s Keys, the term ‘key’ implies an instrument used to open up to further information and understanding and name of the key being indicates the required response. The researcher was looking, not just to assess the direction implied by the name of the key (Prediction), but rather the quality of the response engendered by the use of this key. The researcher decided that, in an evaluation of the use of a future scenario, it was important that the student showed an awareness of possible ramifications of the response being suggested.

Bloom’s Taxonomy: Bloom’s Taxonomy is used for encouraging specific complexity of responses – from the very easy (remembering and understanding) to the more complex (applying, analysing and synthesising information to create a new approach). In segmenting an approach in this manner, it would be easy for the task to become disjointed and fragmented. The researcher decided that the strategy had been used effectively if the student’s response reflected the complexity of each level of the taxonomy and retained
attention to the overall purpose of the task – an ability to concentrate on each element, while retaining a focus on ‘the big picture’.

As previously mentioned, the evaluation of the students’ work would not take the form of ‘normal’ classroom assessment, but rather look towards establishing what Marzano et al. (1993: 19) considered to be a link between task and application of thinking strategies for “if students can successfully complete tasks involving problem solving, invention, and so on, then they meet the standard of effectively using a variety of complex reasoning processes”. The researcher would concentrate on identifying whether the student: (a) understood the parameters of the task and was able to maintain focus on requirements of the task; and (b) demonstrated knowledge of the targeted thinking strategy and used this strategy to generate a response to a problem. It would also be of interest to observe if the use of these strategies led the students to demonstrate higher order thinking skills relevant to the task – such as c) using knowledge of other environmental situations to apply to the given situation, d) respecting and understanding the viewpoint of others, and e) displaying originality in their responses. While any judgement of originality is fraught with difficulty because of reliance of evaluation of the part of the assessor, the researcher was looking for elements that would acknowledge a student’s reference to, or interpretation of, relevant aspects of a situation not alluded to by other students.

Pohl (1997) suggests that assessment of students’ comprehension of thinking skills can be shown on a continuum from “being exposed to the content (EX) to demonstrated mastery (M)”. The researcher decided to establish descriptors that would indicate where student responses to the thinking strategies would fall along such a continuum. A rubric was designed using these descriptors. Lockett and Kuehl (2001: 2) see a rubric as providing “teachers … with the option to later summatively evaluate their students’ performances with a higher degree of consistency”. Although work was eventually graded with a numerical value to provide a holistic impression of the students’ responses, the initial evaluation would be against the descriptors in a rubric. A rubric was chosen as the assessment tool as another educator\(^\text{15}\) (not connected to The College) would be asked to also evaluate the students’ work to help minimise any elements of subjectivity of the researcher. Marzano (2000:62) states that using a rubric has been shown to improve correlation between evaluators.

\(^{15}\) A teacher practised in using the thinking skills with students with an approximate age level as the students whose work was being evaluated.
Rubrics as an evaluation tool

In the field of education, rubrics are a proven method of assessment (Barker, 2000; Lockett & Kuehl, 2000). A rubric relies on explanatory words and Lockett and Kuehl (2001:1) define a rubric in an educational arena as assessing a student's work "given the conditions for the problem". Marzano (2000: 49) cites research into the use of rubrics as agreeing on at least one basic feature - they “describe levels of performance or understanding for a particular topic”. Andrade (2000) has defined rubrics as consisting of a scoring scale that rates performance against a set of predetermined criteria. In this work, the researcher used a rubric to gauge/measure student use of thinking skills in their classroom work. It was intended to use the rubric to indicate how thinking skills were being utilized by the students, rather than assess their acquisition of knowledge of the subject matter which could have been done with quizzes, tests or checklists. By establishing graduated degrees of acquisition of a skill, rubrics become the tool to measure the application of concepts where there is variation between what is considered proficient, what is still being practised and what is yet to be established. It is acknowledged that any evaluation is fraught with possibilities of subjectivity and personal judgement. However, by adhering to specific guidelines to indicate proficiency in the application of specific objectives, the rubric would moderate conjecture and a haphazard selection of ability. As this data collection activity was based on one particular topic, translating levels of performance into a rubric for the evaluation of these responses would establish to what degree students were applying thinking skills to this particular task.

Designing the rubric

The rubric designed to evaluate the written task, followed Mueller’s (2003: 1) definition of an analytic rubric as a tool which “articulates levels of performance for each criterion so the teacher {researcher} can assess student performance on each criterion”. A model used by Kollman and Peterman (1998) formed a starting point for the design of the rubric used in this project. As there was to be no feedback to students, it was unnecessary to involve students in setting the criteria of the categories being evaluated. Requisite design features have been established by researchers in this field (Pickett, 1999; Lovett & Kuehl, 2001; Mueller 2003). As the rubric used in this study of thinking skills was individualized to the situation in which it was used, attention was given to the principles of visual appeal,
description of specific outcomes and focus on specific skills. To achieve visual appeal, the rubric was designed with sequential movement across the grid allowing the user to visualize growth and progress. By keeping divisions of proficiency to an accepted minimum (in this case, three), there was less scope for confusion about what could be expected as an interpretation of proficiency. The use of grid set-up, spacing, changing font size, shading, and underlining contributed to the visual organization. The language of the qualitative descriptors was deliberately chosen to eliminate any ambiguity about the standard being assessed and contributed to consistency of interpretation. When determining the variation between measurable outcomes, the researcher set the 'middle', looked for the words which could lead to variation, and plotted the other levels from this basis e.g. generally, to always, to rarely. If the 'middle' level met the criteria of application of the skill, then the lower level would indicate that this application was not adequate and the higher level would indicate that the student was achieving results beyond a competent application of the skill. A rubric is designed to focus on discrete skills, and literature suggested these should be kept to a minimum with, ideally, the rubric fitting onto one page. There are many observable skills against which a student's classroom work could be evaluated, but in the research undertaken with the project, it must be re-stated that the researcher's main objective was to evaluate how the students had used their knowledge of the thinking strategies presented to them as part of the TOC. Therefore, the skills being assessed were limited to the cognitive and practical application of these thinking strategies.

Setting the parameters of the rubric

Step One: Criteria against which the students' work was to be evaluated were established and these were listed down the left hand side of the rubric. The researcher drew on her own extensive practical knowledge of classroom teaching experience and consulted with other experts until all were comfortable that the main objectives had been covered. Five criteria were selected to assess the students' ability to: 1) understand the requirements of the task; 2) apply a specific thinking strategy and demonstrate how this strategy could be used to show understanding of the proposed environmental situation. The students' work would also be examined to determine if there was: 3) evidence of heeding conflicting viewpoints; 4) aspects of constructivist thinking by linking characteristics of this task to other

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16 Dr Susan Wilks, Senior Lecturer at Melbourne University and Colleen Abbott, an Educational Consultant practised in the field of thinking skills.
environmental situations; and 5) a sense of originality in the students’ responses. These criteria were given an alphabetical symbol to assist in the collation of the responses and subsequent transference of results into a graph.

**Step Two:** Each criterion was then broken down into levels of competence against which the students’ work could be more accurately and reliably judged. This gradation of levels of competence was ranked to indicate a low standard, average expectation, and responses which indicated an understanding or application beyond the normal expectation. These standards were placed across the top of the rubric and, in this instance, ran from left to right — from the less competent to well established concepts — exposure, competency and mastery. While the rubric was designed with Marzano’s previously stated definition of assessment against one topic, in this instance how students applied designated thinking skills to generate ideas of protecting the Barrier Reef, the researcher was keen to consider other relevant aspects of responding to a task as indicated above. Therefore, assessment was broken into separate aspects which were then given a numerical rating where 1 represented the lower end of the scale and 3 the higher end. This ‘mark’ was applied to each criterion so an overall rating could be determined for each student. Such a system Mueller (2003) labels ‘holistic’ which he defines as “a level of performance [which can be obtained] by assessing performance across multiple criteria as a whole”. Holistic scoring, in this data collection, is interpreted as synthesising the researcher’s judgement of discrete elements of the task into one overall score. Breaking the task into multiple criteria and then assigning a numerical value to each segment would establish a holistic image of the student’s response which would later allow for easier comparison with another evaluator’s decisions.

**Step Three:** A clear description of the observable performance expected at each of these levels of competence was then created. As previously explained, these descriptors needed to reflect variances in each student’s application of a thinking skill. This detailed breakdown of the expectation for each level (exposure, competency and mastery) allowed the researcher to make reliable and valid judgement of the students’ performance. Although most rubrics are set with four levels of achievement in these descriptors, for the purpose of this task, the student responses needed to be viewed only against the idea of not showing an understanding of the task (exposure), understanding the task and applying the specified thinking skills (competency), applying the thinking skills to elicit practical, appropriate and original application (mastery).
Chapter Four

Establishing Data Collection Procedures

### RUBRIC FOR ASSESSING THINKING SKILLS WRITTEN TASK

**Barrier Reef Task – Data Collection No. 8**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Scoring scale</th>
<th>Exposure to strategy</th>
<th>Competent use of the strategy</th>
<th>Mastery of strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Responses did not indicate the student understood the parameters of the task.</td>
<td>Responses indicated the student understood the parameters of the task.</td>
<td>Responses indicated a sound understanding of the parameters of the task.</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>Responses showed the student understood different points of view.</td>
<td>The student was able to compare/contrast the Barrier Reef to other environmental situations.</td>
<td>The student was able to compare/contrast the effects of actions on the Barrier Reef to other environmental situations.</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>The student was not able to integrate past knowledge.</td>
<td>There is a clear and recognisable element of the student’s personal interpretation.</td>
<td>There is no element which indicates the student’s personal interpretation.</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>There is no element which indicates the student’s personal interpretation.</td>
<td>Six Hats: Responses indicated the student used the thinking strategies to give a broad understanding of the task.</td>
<td>Six Hats: Responses showed correlation between the selected activities and the targeted intelligence.</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>Six Hats: Responses indicated the student understood the thinking strategy required by each hat.</td>
<td>Six Hats: Responses were adequately based around the aspect of prediction.</td>
<td>Six Hats: Responses were not adequately based around the aspect of prediction.</td>
</tr>
</tbody>
</table>

Table 23: Rubric used to assess Year 7 students' written responses to the Barrier Reef task.

**Step Four:** The previous steps were reviewed and refined until a working model was produced. This rubric was then shown to other teachers, and to researchers experienced in the design and use of rubrics, until there was consensus that the criteria and descriptors were clear and precise, and that the rubric would allow for a reliable, accurate and fair analysis of each student's performance on the task. The rubric is presented as Table 23.
Results from the assessment of the students’ application of thinking skills, were reviewed to identify any incongruity between classes. A higher rating of criteria could indicate classes where students were confident in the use of the thinking tool; and this outcome could indicate which classroom teachers could, perhaps, be used as mentors to other members of the faculty.

**DATA COLLECTION 9: STUDENT INTERVIEWS – Individual/focus/group**

The aim of all interview sessions was to establish “the experience of the child” (Lewis & Lindsay, 2000: 191). All interviews were designed to: a) gauge how the students viewed the introduction of the four designated thinking strategies taught to all Year 7 students, b) gain an understanding of how the students used these skills; and c) identify the students’ perception of how these skills impacted upon their learning. While there were common elements to the conduct of these interviews, some aspects were changed to meet the varying purpose of each style of interview.

**Selection of students**

Students were selected from the complete list of Year 7 students so that there was a reasonable balance of gender, ethnicity and equal representation from each form. More students than deemed necessary were selected (twenty six) so that sufficient consenting responses could be obtained. When the list was compiled, the researcher asked the level co-ordinators to check the selected students to ensure that, to the best of their knowledge, the interview situation could cause stress or anxiety to any student. After consultation, an integration student with a severe speech impediment was withdrawn as was another student whom the co-ordinators identified as displaying signs of Asperger syndrome and, it was felt, the interview could be threatening for him. Being sensitive to impairment, and omitting a student, is a research procedure recommended by Lewis and Lindsay (2000: 194) and this would not negatively affect the overall aim of this data collection task. Replacements (same gender, same ethnic background, and same form) were made and then permission was sought from these students’ families. Sufficient replies were returned to allow the researcher to set-up interviews with six individual students, a group of two students and a focus group of three students. The list of planned questions was shown to the level co-ordinator to check that questions would not cause stress to participating students and no questions needed to be altered.
Procedure for interview sessions

The student interviews were conducted in a small meeting room at The College. There was a large table and the researcher arranged chairs so that each person could see all others and the researcher was not facing students across a table which could be perceived as ‘the teacher’s desk’. The interviewer explained to the student that the audio-recorder allowed her to be part of the conversation and remain accurate about what had been discussed, so that no important points were forgotten. The researcher was known, by sight, to some of the students, but a) why the researcher was at the school, b) the purpose of the actual interview and how it was to be conducted, c) assurances of privacy and d) the intent of The College to listen to the ideas of the students, were all explained before each session began. Students were assured that they would not be coerced to reply or to join in discussion. Although giving some directives, the researcher was trying not to restrict participants to the degree that they would not feel free to speak openly and honestly. The opportunity to ask questions of the interviewer was given. At the end of each interview, the researcher completed field notes which mentioned specific points of interest remembered by the researcher, and the intensity of how students spoke about issues that arose in the discussion.

Individual interviews

Gibbs (1997) states the purpose of one-to-one interviews is to gain the opinion of a range of individual attitudes, beliefs and feelings and to allow these opinions to be expressed in the language of the students. Individual interviews were designed so that a student could respond without influence of peers or the constriction of answering to a staff member.

As these were individual interviews, the researcher determined it would be acceptable for the student to consider classmates and to identify other students displaying what they thought was ‘good’ thinking skills and endeavour to isolate why the student selected that person – what behaviour did good thinkers demonstrate? Names were not required – just that the student visualise this person and then answer questions about characteristics of behaviour of this student. Although these questions asked the student to be judgemental about peers, all information was private and could in no way be used outside of the interview situation. In a series of interviews, it is usual procedure to ask the same questions of each of the interviewees but in these interviews the researcher decided that important
information could be obtained in there were minor changes to some of these questions. Deviations were made, such as asking alternatively about Six Thinking Hats and Thinker’s Keys so that a spread of information about thinking tools would be received. Similarly, the researcher alternated questions about the benefit to the student of the teacher using Bloom’s Taxonomy and Multiple Intelligences. When questioning about thinking skills, the specific skill suggested to the students was alternated e.g. analysing, classifying, comparing. The questions presented to individual students are shown as Table 24.

1. What do you think is “good thinking”?
2. What would you take as proof that someone was doing some good thinking?
3. Can you describe someone in your classes doing some good thinking?
4. Who is someone outside of school that you regard as a good thinker?
5. What type of things do they do?
6. When you are making a decision, what is the first thing you consider is an important step in reaching this decision?
7. What do you think are the benefits of using thinking tools: Six Thinking Hats/Multiple Intelligences/Bloom’s taxonomy/Thinker’s Keys?
8. Can you predict the result of your using a specific skill e.g. one of the hats?
9. Can you name some benefits of using particular thinking skills e.g. analysing?
10. What sort of questions do you ask yourself when you want to understand something better than you do?
11. What do you think is good about your teaching using Multiple Intelligences?
12. Can you give an example of something you’ve done outside of school tasks that shows you are using thinking skills you have learned at school?

After working through these prepared questions, the researcher then posed a personal Metacognitive task.

Think back over the week at school.
See if you can remember a time when you had to think very hard about something.
Try to remember what your thinking was like when you were thinking hard.
Then try to imagine how you could have made your thinking better at that time.
What would you have done to make yourself a better thinker?

Table 24: List of questions and metacognitive task posed at individual student interviews.

Focus group interview

Following Berg’s recommendation (1998: 101) that: “A far larger number of ideas, issues, topics ... can be generated through group discussion than through individual conversations”, a focus group was formed to allow a group of students to respond to the researcher’s questions and for interaction between participants to enrich and extend students’ feedback about the introduction of the TOC beyond that which an individual interview may elicit. When working with groups of students, the researcher judged that students would be more
comfortable not naming (or discussing) particular students before other peers; therefore, some alterations were made to the set of questions. This decision was also taken because the interviewer would have no way of ensuring that points aired in this session (although identifying positive aspects of thinking skills) would not be discussed outside the interview, where perhaps a different interpretation could be made public in the playground. The metacognitive task was changed from that posed during individual student interviews and this is shown in Table 25.

1. What do you think is “good thinking”?
2. What would you take as proof that someone was doing some good thinking?
3. How do you talk about thinking in discussions with your friends? (Coral Program Booklet, MWSC, July 2003)
4. What do you think are the benefits of using Six Thinking Hats/Multiple Intelligences/Bloom’s Taxonomy/Thinker’s Keys?
5. Can you predict the result of your using a specific skill e.g. one of the hats/keys?
6. Can you name some benefits of using particular thinking skills e.g. analysing?
7. What sort of questions do you ask yourself when you want to understand something better than you do?
8. What do you think is good about your teacher using Multiple Intelligences/Bloom’s Taxonomy?
9. Can you give an example of something you’ve done outside of school tasks that shows you are using thinking skills you have learned at school?

After these questions were discussed, students were asked to consider the following scenario:

Suppose you had one minute to talk with (Head of Junior Campus) on the teaching of thinking skills at The College. Discuss ideas you all have, and suggest three important things you might say to her. (Based on a suggestion in Coral Program Booklet produced by The College, July 2003.)

Table 25: Questions and thinking skills scenario posed to students in focus group interview.

Group interview

A group interview would present the researcher with the means of analysing data from the different points of view of two students. The group interview was not deliberately structured to encourage interaction between participants and how this may expand perspective (intention of the focus group). Rather it was used to allow dialogue between the interviewer and the students and provide the opportunity for each student to present their response to the activity, and, if appropriate, expand this viewpoint to confirm or contradict the other student’s views. Questions and scenario (as presented to the focus group) were asked of each student with the researcher alternating which student responded first. The
researcher did not know if the students' personalities were forceful or acquiescent, and it was thought that this format would prevent any perceived likelihood that a student may (each time) simply agree/disagree with the opinion of the other student. Each student would have equal time and opportunity to offer their own opinion and not be dominated by a more articulate or assertive. This group would also allow the researcher to confirm/repute information discussed between students.

The data collection allowed for a spread of information across multiple sources, took into account the perspective of all stakeholders and laid an audit trail which could be replicated.
Suspension in judgment is critical in phenomenological investigation and requires the setting aside of the researcher's personal viewpoint in order to see the experience for itself (Kantz, 1987: 36-7).

This discussion of results lays the basis for understanding the investigation procedure and how specific decisions were reached by the researcher. Primary sources of information were used to understand why certain decisions were reached, and how these contributed to the recommendations rising from the analysis of the research. Direct speech, “the individual’s phenomenological reality” (Borg et al., 1993: 199) has been used, for in stating the participant’s interpretation of each situation, there would be less intrusion of the researcher’s opinion.

There was a deliberate intention to lay aside the researcher’s personal views, to the extent this is possible, which Kantz (1987) stated could impede accurate interpretation of results. Suri (1992: 2) suggested it is not seeking confirmation or generation of theories that becomes the main aspect of qualitative research, but rather to “facilitate a fuller understanding of the phenomenon ... under consideration”. Soy (1996: 2) stated the “key strength of the case study method involves using multiple sources and techniques in the data gathering process”. Such multiplicity is shown by data tasks shown as Figure 13.

Figure 13: Multiplicity of data sources supporting stated outcomes of the data collection.
Each data source in this study contributed to a chain of evidence between questions, answers, observations, recorded work and conclusions drawn from this information. The multiplicity of data sources, contributing to establishing internal validity for this project, is shown in Figure 13. The number of times something occurred was not the focus for validity of this study; rather it was the quality of analysis and interpretation of multiple data sources. In analysing the data collection, the objective was to identify relevant elements and explain how this data could offer information to assist the on-going implementation of the TOC. The range of sources allowed for triangulation of context data to support the research outcomes. Kellehear (1993) stated that the validity of findings would increase as one method revealed findings that could be explored by another. To allow for ease in collation of responses, discussion follows the perspectives of each of the data collection tasks describe in the previous chapter.

LEADERSHIP PERSPECTIVE

The two leaders (coded L1 and L2) gave their interpretation of the TOC, and the following points were held in common.

- The purpose of introducing the TOC was to allow all students access to skills which would enhance their present learning and better prepare them for demands of future life management.
- The implementation of the TOC was supported by: (a) all staff PD sessions, (b) the on-going support of an external teaching and learning consultant, (c) the work of an Innovation and Excellence Educator leading a cluster group of local schools focused on implementing thinking skills and (d) intraschool network of KLA leaders and Professional Learning Teams (Figure 6).
- School leadership was keen for staff to implement policies raised in previous staff professional development sessions, current knowledge of the unique needs of middle school years of schooling (MYRAD report), and form a link with the Enterprise Education program at the college. The TOC initiative was supported by staff with 80% opting for the introduction of an infused thinking skills curriculum.

Coding for all participants in the review is shown in Appendix 4.
Chapter Five Discussion of Results

- It was believed that many members of the staff were proficient in the use of the specific thinking skills being implemented, but the college leadership wanted this to be a whole school approach with all staff teaching the skills, and all students practising the use of these techniques as they worked in all areas of the curriculum.

Summary: Leadership at the college took a proactive approach in introducing an infused thinking oriented curriculum. The aim of the initiative was to empower students by familiarising them with skills to assist them in taking some control of their future lifestyle and employment. The TOC was well organised across the KLAs, and leaders believed the teachers' professional development was supported as they adapted to the new pedagogy.

STAFF PERSPECTIVE

Familiarisation sessions with teachers of the observed classrooms

These sessions allowed the researcher to understand the perspective of each teacher and establish a working, personal relationship before beginning the formality of the review process. All teachers were keen for this project to occur, were willing to support the work of the researcher and readily welcomed her into their classrooms. This ease, and acceptance of the presence of the researcher, contributed to the manner in which the students responded to the researcher.

Summary: Members of the staff spoke freely about their perception of the project and were keen to support the work of the researcher. They were generally enthusiastic about the initiative, and showed a preparedness to incorporate the thinking strategies into their classroom activities.

Formal interviews of teachers of the observed classrooms

Interviews with the teacher participants enabled the researcher to ascertain staff understanding of what a TOC encompassed; their understanding of why such an initiative had been introduced at the College; how the specific skills were to be incorporated into lessons, and how this would impact upon their classroom teaching techniques. It was important to understand the staff's attitude to the Professional Development that had

Establishing A Thinking Curriculum
occurred at The College and investigate areas where they believed further support would increase competence in implementing the TOC. Of the three participants, two were experienced practitioners of the thinking strategies, and anticipated no difficulty in incorporating the Six Thinking Hats methodology (consistently referred to as ‘Six Hats’ by T1 and T2) into their classroom lessons. The other teacher taught in a specialist area and seemed to anticipate there could be difficulty in incorporating the Six Thinking Hats techniques (again referred to as Six Hats by T3) into many of the classroom activities.

There was a positive response to the introduction of the TOC, for example:

(T1) A means of keeping the college at the forefront of it.
(T2) About quality practice and quality management and that kind of stuff.
(T3) Consistency of teaching styles.

Each staff response identified the TOC as being of benefit to the students.

(T1) Getting kids engaging, studying, planning questions, thinking about what they’re doing, making learning more challenging, but also more lasting.
(T2) That is what we aim for at The College because I see the thinking curriculum stuff as not just about being academic. It’s about thinking about their own lives and what choices they make, the consequences they make and what outcomes might be in those terms.
(T3) It will make students think for themselves ... think through issues ... think through how they can tackle a problem.

Staff believed the Professional Development undertaken by the college was adequate, although T3 was keen to undertake PD targeted to the area in which she taught.

(T1) This is probably one of the best programs I’ve ever seen ... It’s been thoroughly done.
(T2) Oh, there’s support from administration – enormous support.
(T3) We’re swamped with how we can dissect and create lessons with a novel or a play or in maths, but very little help, I feel, with our area, and It was overall PD – not subject specific – and I think a few of us in these subjects need specific PD. [This thought was also expressed by other specialist staff members in the questionnaire.]

The work of the curriculum consultant was acknowledged.

(T1) She empowered them [reluctant staff members] to do it on an individual basis, (and in response to a later question) the follow-up coming from the individual person is a masterstroke.
(T2) Intimate [PD]. on a personal level.
(T3) I unfortunately have missed sessions with [consultant] ... It has been, yes, just one of those things ... I haven’t been with her yet.

Teachers saw the constraint of curriculum and the ‘fixedness’ of some staff members as a hurdle to be overcome, and the difficulty of flow on from primary schools.

(T1) There’s some of them who won’t do it at all and become quite negative.
(T2) There is always that drive as you go through education towards the senior years of – We want tangible results. We don’t have time.
(T3) Yes, this is an extra thing to the curriculum. It’s having the time ... to get the consistency going, is an issue.

(T1) There’s a lot of teachers who are not empowered after one day of in-servicing and even after three days – I was shocked here with someone, when we started with (Curriculum Consultant) and they actually – a few teachers realised they had to do it, even though it had been clearly stated as school policy.

(T3) I think we need to know what levels the grade 6s coming into Year 7 are at, and whether it is being taught or in what forms it is being taught at their primary school as we are going quite blind in our area.

Summary: Each staff member was eager to work within the TOC and was in agreement that such a program would benefit the students. Each believed PD had been well received by the staff but, at the time of the interview, expressed a belief that once the TOC became mandatory, some staff would need greater support and encouragement. The specialist teacher indicated that she would like further workshops that specifically targeted specialist areas. Each teacher used the term “Six Hats” to denote the thinking program.

Staff questionnaire

As The College distributed the questionnaires into all staff ‘pigeon holes’, it is not possible to offer a finite figure of how many were ‘accepted’ by staff. Fifteen were returned for analysis. While this is a small sample, the willing respondents used the opportunity to explain their thoughts and this richness of data allowed the researcher to make reliable statements about staff attitudes to the thinking curriculum. While many showed a positive response to the curriculum initiative, they could not be fully representative of staff because it was only those truly disposed to the TOC who replied. However, responses offered constructive pathways for improving the implementation of the TOC, and raised issues helpful to the on-going professional development of the staff. Staff responses were coded QS1- QS15 in the order in which they were returned to the researcher. Staff responses were divided into the following groupings: (a) the Thinking Curriculum Initiative; (b) how staff viewed students’ thinking characteristics and how they worked with these issues in their classrooms, and (c) the direction they would advocate for further staff Professional Development.

A: Thinking Curriculum Initiative

All responses showed staff linked a TOC with positive learning experiences for students.
Chapter Five  

Discussion of Results

(QS14) It gives a student a better understanding not only of the topic they are studying but it gives them a better understanding of themselves and how they learn. In turn the students become more involved.

Nine responses specifically indicated a belief that the thinking curriculum involved improving how students acquire knowledge.

(QS11) A curriculum that is based around teaching the students how to think for themselves, solve problems and develop solutions to real-life problems.

B: Thinking Skills in the Classrooms

Six staff saw thinking strategies, such as the specific four forming the basis of this study, solely as thinking skills in themselves.

(QS2) I've just used thinking hats and multiple intelligences to date ...
(QS8) Range of questions and activities that involves the use of MI plus Thinker's Keys.

Six staff specifically mentioned the importance of asking open ended questions and setting open ended tasks as a means of developing thinking skills in students.

(QS11) Open ended tasks that allow them to use a wide variety of skills to extend tasks ...

When asked to respond about evaluating thinking skills, five staff specifically mentioned the difficulty of evaluating of thinking skills with the statements below being representative of their comments.

(QS8) It is hard.
(QS10) With great difficulty.
(QS1) I don't think I have an effective way to do this.
(QS11) I don't think I do → Need improvement in this area.

Staff mentioned judging thinking skills by the quality of the end result (project) or visible outcomes.

(QS3) Give out projects for students and evaluate them.
(QS9) The quality of the work produced.
(QS13) It's the end product it creates ...

One staff member looked beyond the outcome:

(QS14) Sometimes the end product is not important. What I sometimes (often) look at is the process.

One staff member used instinct:

(QS15) Just my own opinion of how well it goes with the kids.

One specialist teacher did not see evaluation as her responsibility.

(QS2) I'm not a classroom teacher.

Another specialist teacher mentioned being impeded by lack of contact time.

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(QS9) It is not possible yet to evaluate student development as only 1 period of (KLA) makes it difficult to even try out a range of thinking skills.

Other comments from staff members linked evaluation of thinking skills to students’ interaction with the task, their ability to instigate questioning, respond to challenging problem solving, independence, application to a task, being proactive, and the personal touch that some students give to their work. Many saw engaged, participating, giving beyond what was asked, and questioning as signs of good thinking. Whereas, disengaged students who experienced difficulty working unassisted, who came unprepared for classes, lacked focus and did not submit finished work on time, were seen as having underdeveloped thinking skills.

(QS10) Responses tend to be very concrete and static – also simple to the point of bare details.

Thinking skills need to be integrated throughout, and across, the KLAs.

(QS1) Curriculum development across the curriculum.
(QS11) How to do thinking oriented curriculum, not just how to use a thinking skill here and there.
(QS13) The development of a KLA based -scope and sequence for the whole school worked out, teachers have to follow it.

C: Professional Development

Specialist staff questionnaires [QS7, QS6], interviews [T3] and anecdotal conversations, confirmed specialist staff believed they needed further direction in implementing the designated thinking strategies as part of their program. One aspect of this was the short amount of time they spend with each group – sometimes once a week contact and this can be disrupted when school events force a change of timetable.

General indication from staff was they felt they needed further PD but this needed to focus on classroom activities, for example:

(QS13) No more talking.
(QS15) Stuff that helps us put this into practice.

Mention was made that they would like to see other staff members working in their classrooms.

(QS5) Like to observe someone who carry out thinking type activities in a real classroom situation.

Staff saw each other as support for how they might gain increased knowledge about thinking skills issues.
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(QS5) Sharing → from teachers who have tried a certain activity that actually worked well in class of 25 students.
(QS15) One teacher who knows/able followed by one who is unsure.

Summary: The 15 teachers who responded to this questionnaire provided some insight into how the TOC was received by the staff. All replies indicated there was benefit for students in this new approach to classroom activities. All spoke positively of the PD put in place at The College, but indicated that they would like further assistance in practical application to their teaching and the need for a wider curriculum view in activities presented to staff. Many expressed unease about their ability to competently evaluate thinking skills shown/not shown by their students. One specialist teacher did not respond to some sections believing the issues were only pertinent to classroom teachers. These interviews would support research (Ong, 2000; McGuinness, 1999) that for sustainable pedagogical change to be maintained there must be carefully planned PD which addresses staff concerns, support from leadership and an effective supportive structure established within the school (Figure 6).

STUDENT PERSPECTIVE

Classroom observations

A valid and reliable way of obtaining information about how students responded to the thinking strategies was to observe them as they went about their usual activities in their normal setting. Classroom observations allowed the researcher to study the actual behaviour rather than reported behaviour (Kellehear, 1993), the real rather than the ideal. Audio-taping of these observations was at the researcher’s discretion but, at all sessions, field notes recorded relevant student responses and interaction. Marzano (1991), Perkins (1995), Costa (2000), de Bono (2000), Vygotsky (1962), Lipman (1991), Feuerstein et al. (1980), McGuinness (1999), Atkin (1999), Resnick, (1987) etc. bring us different perspectives and understandings of the very complex mental process of thinking, and lists of thinking skills from such theorists were audited to establish a ‘check list’ of characteristics of explicit performance criteria. Some of the observed lessons did not give opportunity to evaluate thinking skills e.g. presentation of plays, oral discussion of projects, preparation for school events, working on individual projects etc. During some of these sessions, the researcher spoke to individual students about their work and questioned their reasons for selection of certain categories in their work. Student observations were coded as CS but when
interviewed about selection of choices for project, this coding was shown as PS. The following elements arose from these observations.

Students in the English classes were regularly set tasks that would reinforce their knowledge of how the Six Thinking Hats could be used. This was not consistently practised in the technology classes.

Tasks in English classes consistently referred to the use of Six Thinking Hats, PMIs and MIIs\(^{18}\) and these strategies were practised by students who used them to analyse novel characters, solve bullying scenarios, or as a framework for class essays etc. There was a beginning to the idea that these techniques could be used in Technology but observed lessons did not see students engaged in productively using these skills.

Lessons in technology classes were often teacher directed and little opportunity for class discussion or group work apart from practical aspect of the lesson. When students worked at a practical task, conversation was social (interest in TV program etc.), linked to the task (how do I chop this), or clarifying instructions with another group or partner. In observed sessions, there were no thinking skills (as identified by researcher) in evidence during such discussion. At one session, a student spoke about his task of making "six equal sized patties", and linked this to activities he’d been doing in mathematics – “halving, then each half into three” (CS3). In one session, four of the six thinking hats were used as a written evaluation tool. However, while the task linked coloured hats with an outcome, students simplistically applied ‘the hats’ to the activity and responses did not reflect higher order thinking skills. Responses from three students are presented.

Yellow hat → List some of the good things you achieved.
   soy sauce;
   It was fun making the rice I had never used a wok before;
   (no response)

Black hat → What problems did you have whilst making your product?
   None;
   no problems;
   when cooking on the stove I was not sure when it was ready.

Red hat → What things were you most happy about?
   All;
   eating it;
   I was happy with everything.

Green hat → What improvement could you make if you made it again?
   More soy sauce, no ham/bacon;

\(^{18}\) PMI – plus, minus and interesting points are discussed about a topic.
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none; there is nothing I would want to change.

The above comments are made to indicate that there is commitment to including thinking skills in these classes, but such activities need further refinement before they meet the targeted outcomes of a TOC.

In both English classes, students were quick to adopt the thinking vocabulary of the teachers and showed they were comfortable with the language of the Six Thinking Hats and understood the terminology of Multiple Intelligences e.g. “One’s about people, ones about me” [Interpersonal and intrapersonal] (CS2). A randomly selected student was able to explain the term ‘personify’ as he worked on this theme in a project. Students, when asked, showed no hesitation in offering ‘justification’ for reasoning. However, there was no evidence that students used thinking vocabulary when working with their peers.

In one English class, students conversed with their teacher about the various theories of Feurstein, Gardner, Goleman and Sternberg. While this was at a student level of discourse, there was evidence of awareness of various theories of thinking skills.

In a special activity based around “The Way I Prefer to Learn” students’ responses did not make reference to MI knowledge, instead focused on processes used such as videos, experiments, encouragement, creative activities etc. While this was a valuable discussion, it was noticeable that no student raised the ‘Intelligence’ most aligned with the manner in which each preferred to learn – which is often linked to Gardner’s Multiple Intelligences e.g. linguistic, kinaesthetic.

Students in one English class spoke about using ‘blue hat thinking’ when making selection from multi-choice activity. However, often students base their multi-choice responses on what is the easiest, or fun. “I am lazy” (PS9); “The other ones were hard because they take too much thinking” (PS6); “I only need my imagination” (PS5). One student did take on the challenge of the task “I thought it would get me more into the book, the heart of it, than before” (PS2). There was also the mention of having previously done a task “I think in Year 5 I did this” (PS 16). Such reasoning for selection of activity was confirmed in thinking cards responses, structured individual and group interviews and casual conversation with students. There was also reference to choosing the one you can do best, for the best mark.

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Students made judgements about their ability and how they could achieve best results – “Cause I like drawing” (PS17) or “I’m bad at poems” (PS16). To a degree, there is merit in this perception as it shows the students are aware of a preferred response style. While, this self-reflection indicates a confident approach to understanding their abilities, there is also the possibility that staying within their preferred approach could preclude them from taking on tasks outside their comfort zone [“I think I know what’s expected of me” (CS1)]. A better selection process needs to be instigated so that students, who may not always seek the more challenging task, can work in their comfort zone but can also be ‘pushed’ into taking on something that could open new learning. Designing a more challenging task selection process could add another dimension to using thinking oriented principles to drive the curriculum content.

Multiple Intelligences were often referred to in class tasks in observed English sessions. Students in observed English classes moved desks for group work, however, they often showed a reluctance to engage in this procedure.

Summary: At the initial stage of implementation, not all observed technology classes (food, woodwork) were effectively incorporating the Six Thinking Hats skills into their teaching programs. Students were showing increasing confidence with the terminology of the skill and were able to use the various ‘hats’ when working at a task. Individual students were able to speak about thinking skills e.g. justify, and to respond to teachers’ modelling when discussing issues in class, but this vocabulary was not an ingrained behaviour when conversing about tasks with their peers. Unless as a result of directed thinking skills activity, students rarely showed the use of thinking skills as they worked at a task. Group activities were regularly part of the English program.

Student self analysis of their thinking

This data collection task was undertaken to allow the researcher to: (a) understand and gauge student perceptions of themselves as thinkers; (b) provide a communication pathway for students whose preference may be a written format; and (c) broaden the data collection base. There were 43 responses to this task. Only 6 out of 43 wrote about ‘general’ wondering – what’s for dinner, why someone is doing something, will I get a job etc. While many of these ‘wondering’ responses were an interesting insight into students’ ideas, the
focal point of this research remained with thinking skills and the following analysis is based upon statements where students focused on the idea of self-evaluation of themselves as thinkers. Work has been coded as WS. Student spelling and grammatical errors have been corrected to facilitate the reading and understanding of these responses.

There were definite indications of students seeing themselves as competent thinkers.

(WS3) I think I am an OK thinker.
(WS5) I decide when I feel good with the decisions.
(WS18) But being a thinker might be great and I might have a good fortune in the later life.
(WS28) I am fairly confident.
(WS29) I make good choices.
(WS23) I sort through and evaluate ideas.
(WS27) Sometimes I make up many possible solutions and choose the best possible answer.

There were students did not follow this general self-confidence:

(WS10) I wonder why, when it comes to thinking I am a bit rubbish.
(WS16) Some time I think stupidly.
(WS21) I am not always quick at thinking of new ideas.
(WS36) I am not much of a thinker if any one is, it’s my brother (WS36).
(WS12) Why sometimes can’t I think properly when I want to.

Some students were able to positively acknowledge poor thinking

(WS30) Sometimes I don’t think and make the wrong choice. I am not a wide thinker.

There was evidence to suggest that some students linked the thinking tools to their own thinking –

(WS3) And sometimes I also use the six hats.
(WS25) I use the six hats to solve problems.
(WS24) When I have to make choices I think of all the positive and negative sides.
(This aspect of positive and negative/minus was mentioned three times in this work).

Most students were able to identify behaviour they thought was good thinking – re-reading a task, underlining key points, using trial and error (mentioned twice); clearing the mind; taking a break from the issue (mentioned twice); distancing self and thinking from the direct issue, and waiting for inspiration. (These descriptors of ‘good’ thinking behaviour were also evident in responses in student interview sessions.)

Summary: Students confidently approached this metacognitive task and responses indicated that they were able to give an honest opinion of their own thinking. Whether or not the student perception of their competency as thinkers is an accurate assessment of their
thinking skills, Marzano (1992) sees self confidence as an important element of his first dimension of learning. Conversely, those students who see themselves as not measuring up to their own expectations are the students that would possibly benefit from the structured thinking tools being modelled in the TOC.

**Thinking prompt cards**

Thinking prompt cards were used with 13 students (coded TC1-TC13) to provide insight into the way students think at different situations. Students were of mixed academic ability (one student was autistic), ethnicity and gender (7 females and 6 males). The design of these cards and the administration of the task have been detailed in the previous chapter. Students generally had no difficulty in responding to the task and spoke readily about why they 'thought' the response chosen was the way in which they reacted to the situation presented on the card. When tested three months later, there was general consistency (see Table 26) in the response chosen, although reasons for their choice were sometimes influenced by events which occurred after the first session. The first number given in Table 26 under student coding (TC) indicated the selection made by the student at the first session and the second number indicated the choice at the second sessions. Student 8 was absent when this second session was conducted. The response cards, when presented to each student, were not numbered as the researcher did not wish to introduce the idea of a hierarchy of responses and are only numbered in this table for ease of collation of responses. The numerical recording is only used to code responses for ease of comparison.

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Table 26: Comparison of choices made by students with the thinking prompt cards at the two sessions.
In discussing student responses, these have been grouped for each scenario presented to them.

**Reflection**

General responses (see below) would indicate students do reflect on their work and take notice of teachers’ comments – for improvement, to get a better mark or generating new ideas. Only one student was interested in just completing the task.

(TC4) I certainly think about what the teacher says during the task.
(TC5) Because when you think about what you’ve done, um, it can help you.
(TC7) Well, it could see, how much, I should have worked on and if I did a little too less for me.
(TC8) I do sometime …sometimes think about what teachers have said about my other work so that I can improve what I do, so I can improve what I want to do … at the time I do it. If that makes sense.
(TC9) Like, we may be doing some work on inventions and things, and I might have done something, and I’ll get that idea for another work and change it around a bit. So it makes a new thing.
(TC3) Because, I, like to get things finished quickly.

**Risk Management**

There was a wider spread of responses with this scenario, with students indicating they felt confident in seeking help from parents, teachers and friends.

(TC3) My parents, or the teacher or sometimes friends.
[In a later individual student interview, using friends was also mentioned.]
(IS5) I usually ask my friends because they explain it so I understand a bit more.

Others indicated value of experience, personal techniques and previous successes.

(TC5) I think when you work from experiences, it’s a lot better, you can learn more, and in the second sessions with the same student, “I find you learn more from experiences … if I have to do something, and I don’t know what to do, I just think of what I did then [a past experience], so it would kind of make me understand it more).
(TC9) 19 It’s better than just sitting there and trying to think of something to do.
(TC10) If I’ve tried something before and it sort of, um, got me a good mark or something like that, it sort of boosts my confidence a bit and I think it might work again.
(TC12) I usually think logical – most times it works.
(TC13) Like now if I thought I could never do something, like I am not the best, now I try to do them.

**Organisation**

Students replied they made choices according to what was hard and what was easy. There was an even divide about which to do first with one student selecting easy first because it

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19 A similar remark was included in the report on changes to the Maltese Education system when the Minister of Education stated “the beauty of these thinking skills … is that they enable one to generate new ideas on demand rather than waiting around for inspiration” (Atie et al. 2001: 4).

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gave confidence to attack other tasks. Other reasoning for choices was to clear the ‘more complex’ to be able to then do the easy tasks; or conversely, get the easy tasks out of the way to be able to spend more time on the more difficult sections. One student mentioned dividing the task to be able to give himself a break.

Students mentioned pre-sorting to identify areas where they might require assistance.

(TC9) I go straight on to the task, like doing something new, I might get something wrong because I don’t actually ask for help and I’ll end up getting it wrong.
(TC4) So you need to know the questions you need help with.

Other students mentioned following the list of tasks of keeping them on track.

(TC6) So I don’t loose my way and it makes it a lot easier to keep on track of what you’re doing.
(TC11) Cause it’s safer and you might get a higher mark (TC11). This student also saw the scenario posed on the card as meaning among a list of tasks rather than the one single task and mentioned: Usually tasks are given to you in order, so the first one is going to be due in the earliest.

Creativity
Some students’ interpretation of creativity was the use or artistic talent (borders and decorative touches) to bring individuality to work.

(TC4) Cause then it’s more my work, and not like other peoples’.

Other students interpreted creativity as displaying a sense of individuality, the use of imagination and initiating new ideas.

(TC6) Imagination, some new ideas.
(TC7) Well, basically, if you just think the old fashioned way, basically, you won’t get much, much of the information.
(TC9) Something that shows creativity in an idea and work, something that I can change the question to look better than it is.

In both sessions, TC5, clearly articulated the high value she placed upon this sense of personal interpretation.

Because I think my work is always some how better if I enjoy the topic I’m working on, and also if I can present it my own way then it – it’s hands out my own flair and it’s more like – what’s the word – it’s more original.

Because when it comes to tasks, I like being instructed, but when it comes to like creating something, I like having my own individual flair in it, like I like making it individual – my own.

Another student understood creative implied a sense of the unstructured and unplanned.

(TC13) Creative – you’re doing something spontaneous.
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Information Gathering

Student responses showed a general consistency between choices made in both sessions. There appeared to be a noticeable reliance on printed matter (particularly encyclopaedias) rather than querying or analysing material, and this may because this is the research methodology with which students feel most comfortable.

(TC1) Printed material, and that’s accurate.

However, there was acknowledgement of looking for confirmation of information by using a multiplicity of sources.

(TC3) By double checking with other sources (TC3).

However, one student mentioned confusion caused by this multiplicity of information.

(TC10) Well, I sort of—like if I find something that’s of use to me, um, I try not to look in too many other things. Like I might look in one other thing to get a bit of back up. But I normally try not to look in more than two or three, because, um, then I might get one completely different perspective and I’d prefer to have one sort of ideas, um, and not have it all sort of jumbled up and then I don’t sort of understand it or something (TC10).

Students mentioned the need to discriminate between opinion and factual information. This distinction they saw as “I think” or “I believe this”. Two students mentioned the idea that, when stating opinions, people often kept on explaining trying to convince the listener.

(TC5) When people are stating facts, they’re usually really straight forward with it and people’s opinions, I find, they usually drag on a bit because people kind of like keep trying to explain it in more detail.

(TC4) And then you only go by that [an opinion] and not the true facts.

(TC9) I like to find out what’s true instead, um, of going by what people say.

Evaluation

There was a general consensus in that students seek confirmation of information and if this is found, then that must be correct. No student was able to give their method of evaluation e.g. analysing, comparing/contrasting. Students mentioned the need to suspend judgement and look for a balanced opinion particularly when interpreting research material.

(TC4) Well, they just talk about, um, one thing all the time and don’t give any good or bad points about it, or just give the good points.

Student were able to identify bias in material and quite readily spoke of being wary of the ‘one-sidedness’ of some material

(TC5) I read information about *** cause different sites have different, like, opinions and also a site or a book is always made by one person, and that person always has their own
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beliefs - like, documentaries are useful, but some of them are really one-sided. I usually take alternatives.

(TC7) Well sometimes it just talks - it doesn’t go on about other things, it just does one topic - sometimes. When queried if the information is deemed one-sided, the same student stated: Well, I do some of the facts of it, but I try to get facts from more mix.

A student spoke of a recent class project on the Trojan war and examining information from the viewpoint of both nationalities:

(TC13) If you were looking for facts from a resource, I probably wouldn't rely on that that much as it was written by a Greek and it probably be the Trojans are all bad.

Analysis

Students saw benefit in both approaches – breaking into achievable pieces, and working through all tasks as these tasks led from one into another.

(TC10) Um, understanding where I need to start the task is just seems very important to me that I don’t try and tackle something really, really hard when I can try something easier that might lead me up to the steps that I can take for ... .

(TC11) Break it down, a problem, it’s easier to do loads of small little things, than one giant thing, I often find.

Students saw this following of order as a means of staying on task - ‘keeping on track’ or as a means of retaining focus on ‘the big picture’.

(TC1) Because I think you have to keep the main idea always in your head or you might like stray off the task.

TC5 had strong views on this aspect, and when responses from both interview sessions were compared, there was little deviation between both replies although these were given about three months apart.

Because I honestly think that everything is set up for a reason and, um, if I was *** each part of the task, it would change things a lot easier to kinda finish it all up, but I honestly must, I must stick to the main ideas because otherwise I might get completely side-tracked.

Um, I think it’s important, like, I think about why I was set the task and why the, um, task has been set, cause there’s always a reason. So, um, what I do is if the task is complicated, or something, I break it down to easier … kind of thing … and just keep in mind what I’m supposed to do. I, you know, work on it in like a way that I can understand – like if it’s a difficult problem, I’ll change into something I can kind of understand – like understand really easily. But I still remember that that’s not the problem, there’s still another problem.

Open-Mindedness

Students, who nominated working with friends, chose this option as they enjoyed the companionship of friends, liked sharing the workload and appreciated the lack of pressure that working with supportive peers gives to them.
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(TC1) It's cool cause you've got friends with you and it makes it fun.
(TC2) I like working with friends because, um, it's easy to express opinions and it's interesting to see what they think.
(TC10) I do quite enjoy listening to what other people have to say about things – not just because it helps me understand what they think about a certain topic, but, it's just nice to have like a discussion with them, and see what they think.
(TC10) When I work with friends, I sort of feel more comfortable, like that I can say my opinions and they won't find it funny or anything.

However, one student expressed concern of non-conformity.

Well, sometimes, I like to make something like a ... a ... opinion, but I try to wait until other people ... because I don't really like it have a different one. Sometimes, I stand out, but sometimes I just don't feel like I'm saying the right thing.

While students enjoy working with the friends and gain support from this camaraderie, another student saw that working with the same group of peers could be detrimental. Understanding student attitude could add knowledge to the way in which teachers construct groups within their classrooms.

(TC7) Well if worked with the same person all the time, I'd probably get the same ideas, but if I work with new people, I'll probably get newer ideas ... different ones.

Students had a sound knowledge of the aspect of open-mindedness and how they needed to be aware of understanding this before reaching their own decision.

(TC5) When I think of other people's opinions, I find it, like – nice – to listen to what people thing about different topics, but I don't make up my mind until I actually see facts, I see, like, evidence ... and that's when I can really make up my mind about it, or else it might just be based on false opinion.

Summary: The purpose of these thinking cards was to instigate discussion and thereby allow the researcher to better understand thinking processes students employed when in certain scenarios. Student comments are indicative of how the students ‘think’ at these times, as well as their reactions to classroom activities. The comments, diverse and individual as the students themselves, were informative and insightful. Many responses from the students as they worked at these thinking cards supported the positive self perceptions of achievement students expressed in the MYRAD surveys: “I want to get good results in my school work/subjects” (Russell & Hill, 1999: 11) and the college may need to examine the support for this value that MYRAD report recommends.

Applying thinking strategies as a written task

This written task was designed to understand how students applied the thinking tools and was given to all Year 7 students as part of their English classroom work and was a one-off.
task. After worksheets had been returned to the researcher, each class was randomly given a number (1-13) which did not relate to alphabetical identification and would preserve anonymity. While in any class task there will be a range of quality of response, the number of students who did not reply to the task, or whose response did not give enough work to show an understanding of the task, was disappointing and raised the question of whether these students did not know how to use the thinking tools, or whether they were disinterested in the task. Writing "I did not understand" or "I do not know" was regarded as a no response from that student.

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<tbody>
<tr>
<td>No Response</td>
<td>0</td>
<td>8</td>
<td>5</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
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<td>3</td>
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<tr>
<td>Minimal Response</td>
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<td>1</td>
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</table>

Table 27: Number of responses which showed minimal or no student response to the written task set for all Year 7.

As it is unusual for such a proportion of worksheets to be incomplete, or with a minimum of work attempted, when this task was set as a class activity, this lack of response within each form is shown in Table 27 where minimal response is defined as the student not completing at least two sections of the task. The researcher did not present this work to the students so it is not possible to offer definite reasons for this poor response. As the work was presented to the students by other teachers, perhaps their attitude to the task may have been an influencing factor. Some staff may have explained the task, others may have encouraged students to challenge themselves, perhaps others felt it was unimportant and gave the impression that it 'would not be on the test' so why bother. It cannot be, therefore, accurately determined why this lack of response occurred and if the student did not understand the task or understood the task and still chose not to make any reply. However, it would seem an unnatural event for students to spend twenty minutes of class time 'working' without making any response at all. Table 28 shows returned responses for each thinking skills task within each form.

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<tbody>
<tr>
<td>S.H.</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
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<td>7</td>
<td>4</td>
<td>7</td>
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<tr>
<td>M.I.</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
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<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
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<tr>
<td>B.T.</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>T.K.</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20</td>
<td>22</td>
<td>25</td>
<td>18</td>
<td>23</td>
<td>21</td>
<td>22</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>25</td>
<td>15</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 28: Responses returned for each thinking skills across each class of 26 students.
It was anticipated that this range would be either six or seven responses for each of the skills and that each form would return close to twenty-six worksheets. It could be assumed that this inability to provide an adequate response to the task would indicate that in certain forms there is not a confident application of the targeted thinking skills by the students to a relevant task. The researcher then endeavoured to establish if this ‘non-answering’ was linked to any particular thinking skill. No responses and minimal responses were tallied for each of skill across each form, and these results are shown in Table 29.

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<th>13</th>
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</thead>
<tbody>
<tr>
<td>S.H.</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>M.I.</td>
<td>24</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B.T.</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
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<tr>
<td>T.K.</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

Table 29: Number of minimal or no response for each thinking skill.

The above results would indicate that, for this activity, students generally showed they are experiencing difficulty in understanding/applying Multiple Intelligences. The application of the other skills seemed well understood. In student interviews, difficulties with recognizing MIs were also mentioned.

The work from each form was separated into the four thinking skills and then analysed. Two worksheets for each of the skills were then randomly selected from each form for assessment against the rubric presented on page 113. Two was the controlling number as, in one form, this was the only number of responses for one of the thinking tool returned to the researcher. In total, 104 worksheets were evaluated - (8 from each of the 13 Year 7 forms). Assessment was also carried out by another classroom teacher, experienced in using the targeted thinking skills, but not associated with the school. These two markings are shown as (i and ii) in Table 28, and these were averaged to establish an adjusted mark. A score of "0" indicated that there were no responses from that student or that the student had not understood the parameters of the task, or that given responses did not following the guideline of the thinking skill. Those sheets were a 0 is scored was, in most instances, because the student had not responded to the task and, therefore, no assessment could be made. Some responses were exactly the same for students indicating that these students had ‘shared’ ideas. This made it difficult to adjust scoring for a sense of originality if the same
idea was expressed in the same language by two students. On one student's work, it was obvious that the teacher had contributed one answer – as the handwriting style did not match the other responses on the sheet – implying this section of the work could not be assessed as a definite indication of student thinking.

Table 30: Holistic scoring of randomly selected student responses for each of the targeted thinking skills within each class.

<table>
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<tr>
<th></th>
<th>S.H.</th>
<th>M.Is</th>
<th>B.T.</th>
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<td></td>
<td>i</td>
<td>ii</td>
<td>i</td>
<td>i</td>
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<td>1</td>
<td>7</td>
<td>16</td>
<td>7</td>
<td>7</td>
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<td>2</td>
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<td>6</td>
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<td>7</td>
<td>16</td>
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<tr>
<td>13</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>TOTAL</td>
<td>99</td>
<td>81</td>
<td>69</td>
<td>27</td>
</tr>
<tr>
<td>TOTAL</td>
<td>180</td>
<td>96</td>
<td>240</td>
<td>151</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>90</td>
<td>48</td>
<td>120</td>
<td>75.5</td>
</tr>
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</table>

Table 30 shows the students' control of thinking skills in each program. The holistic scoring mark was obtained using the rubric (Table 23) and this scoring reflects that a range of students demonstrated a reasonable confidence when using the Six Thinking Hats. The highest scoring was from those students using Bloom's Taxonomy. It must be noted that the worksheet for these students contained all the trigger words to use to target each of the levels of the Taxonomy, allowing students to use these words to frame their questions at the required complexity of the level. This would confirm the usefulness of presenting this thinking vocabulary to direct student responses.

The Prediction key allowed students to see both sides of the future – positive and negative outcomes. As later student interviews, repeated responses indicated students did not understand the term “Thinker’s Keys”, and it is the researcher’s belief that the students...
working on these written responses were responding to the Prediction aspect of the task, more than a response to Thinker’s Keys program.

Results indicate that students have difficulty in applying the aims of a Multiple Intelligence approach. While each of these intelligences was given on the worksheet, some responses indicated that students did not understand these terms e.g. Logical-mathematical Intelligence activity was “stop tourism”. The task sheet which students appeared to experience difficulty is shown as Figure 14 and task sheet for Six Thinking Hats and Bloom’s Taxonomy are presented as Appendix 4.

![Figure 14: Applying Multiple Intelligences work sheet.](image)

Establishing A Thinking Curriculum
Chapter Five

Discussion of Results

Summary: The high percentage of returned worksheets where students had not given any answer, or indicated that they did not know what to do, was disappointing. The manner in which the task was carried out in the classroom may have been a contributing factor. Prompts on the sheet may have assisted the student applying the skill, but the Multiple Intelligences’ tasks was poorly responded to in nearly all forms, and this would indicate an area for continued focus by KLA leaders and Professional Learning Teams.

Student interviews

When transcribing and interpreting with accuracy the results of these interviews, the audiotape proved “indispensable” (Patton, 1990: 348) as tapes, and corresponding field notes, allowed for confirmation of all dialogue and recollection of what occurred. Interviews were individual (coded as IS), a focus group of three students (FS), and a group of two students (GS). Transcripts were analysed for common words in students’ responses and these were then studied to distinguish if specific trends could be identified. The relevance of these patterns was compared to field notes where consideration of the intensity of the response and the context in which it was made were noted. Conflicting views within grouped sessions were noted. After a separate analysis of each interview session, responses from all sessions were compared to establish where there was consistency of responses and attitudes.

Individual student interviews show many of the students found the reflective activity a difficult task and needed encouragement (talking through) to visualise themselves in a classroom situation. This difficulty could be attributable to the students’ inability to identify thinking skills occurring if the task did not directly involve a specific link to the use of the strategies (Six Thinking Hats, MI, Thinker’s Keys and Bloom’s Taxonomy), or whether it was the result of their inability to engage in a metacognitive task.

Students made correlation between good thinking and good classroom behaviour – concentration, paying attention, note-taking, work presented on time, keeping on track and not talking. One student, however, did mention a good thinker could manage other tasks.

(FS1) Doing something else at the same time.

This link between good class behaviour and good thinking is also one noted in responses to staff questionnaire.
Chapter Five

Discussion of Results

Students attributed good thinking to using brainstorming, questioning, breadth of knowledge, and participation in class discussions.

(IS2) She voices her opinions but she listens to yours.
(IS5) She understands lots of things. ... She’s creative.
(FS3) What you contribute to, like, discussions. ... Like if they ask questions.
(GS2) Common logic and things like that ... and for them to use their imagination.

One student mentioned that being interested and enthusiastic about class work was a sign of good thinking, but was quick to deny that not being interested in your work meant that you were not a good thinker.

(GS1) They’re into their work ... they’re really excited about every single lesson.

Students were asked to comment on the benefit of using each of the targeted thinking skills and their responses are presented in these groupings.

Six Hats.

Only one student mentioned that she knew little about this skill as her teacher was teaching this and then she became ill and was absent. While acknowledging that students understood this thinking skill could help you achieve a broad understanding of a problem, some saw Six Thinking Hats as a technique for working at a task e.g. writing an essay.

(IS1) Well they’re pretty good. They give you ideas like how to think.
(IS5) Um, well you like categorise how you think sort of. You can go to certain topics and think about how you want to think about something.
(FS1) Oh, well, if you work, doing a project or something, and you use the Six Hats, like you can talk about the red hat, the blue hat and so on ... you get better marks.
(FS2) We’ve been doing drafts and good copies and that kind of stuff whatever we had before and now we have to change to the Six Hats.

Students, at a later time, were asked to identify a benefit of using the Six Thinking Hats. The comments reflect the individuality of the students’ approach, but it was again evident that students continue to identify the Six Thinking Hats as a technique for writing an essay.

(IS1) Just more, more understanding, better results, more helpful result.
(IS2) As well as having what you think about something you might have what somebody else says.
(IS4) Cause you can use them in like lots and lots of subjects, and it’s the same with the Bloom’s Taxonomy, you can use it in every subject. So it’s like a good thing to have. You can cover all aspects of a problem.
(FS2) Well, it kind of helps you organise. Like I did a project about our story and we had to go and write a list of all these words to do with our character and the Six Hats actually helped me about what I chose to do and to think about with (the character) was like and what her feelings were and stuff.
(FS3) I don’t like them. Well, I don’t really understand them.
(FS1) I’d rather do my own thing – like whatever I’m doing or writing an essay or something my way. That way I know what I am doing and it’s the way I want to write it and I understand what I am writing.
Multiple Intelligences
When this thinking skill was mentioned, many students did not know of the skill – either because the name caused confusion or there was no knowledge of the method. However, as students involved in these interviews were selected from across all Year 7 forms, this could indicate that some teachers have not fully incorporated the Multiple Intelligences in their class activities. Lack of knowledge of this thinking skill was also evident in the students’ written responses.

(IS2) I don’t think we’ve done that.
(IS3) I haven’t heard of that.
(IS4) We haven’t actually used the Multiple Intelligences.
(FS2) You focus on one thing, you don’t focus on all of them like the Six Hats.

Bloom’s Taxonomy
Although some students did not recognise this terminology,
(IS2) We haven’t done that.
(IS1) Um, I’ve heard of it. What is it?
(IS5) Don’t know about that
there was recognition of this thinking skills with students noting that the Taxonomy criteria had been used in some of their class activities.

(IS3) Bloom’s Taxonomy, like, with the analysing and stuff, um, I’d say it’s all right because we get it in most of our projects and we have to pretty much think hard and figure things out.
(FS1) On my projects. I’ve seen the sign Bloom’s Taxonomy. I don’t know what it is.
(IS4) We use that a lot. A couple of times. I like, I myself, like the Bloom’s Taxonomy a bit better than the Six Hats.

Thinker’s Keys
There was little knowledge of this skill. During individual student interviews, none of the students showed that they understood the term.

(IS1) Ah, they’re just, ah, they’re sort of, they’re just, to me. I don’t really just use them for anything, so I don’t know about ....
(IS2) We haven’t done that.
(IS3) Haven’t heard of that.
(IS4) We haven’t used them either – [replying after not knowing Ms.]
(IS5) Don’t know.

There was a similar response from students in group interviews. One student confused the thinker’s keys with shoes (deBono’s Six Action Shoes)

(FS3) Never heard of them.
(FS2) Heard of them, but not much.

General Comments
Students were also asked to comment about the specific skill of analysing.
(IS5 & FS2) You get to focus on one thing.
Chapter Five

Discussion of Results

(FSI) I think I'm pretty bad at analysing. ... All the people who get A+, they're always good at analysing.

Students gave positive comments about their teachers using Multiple Intelligences in their class work, but this mainly focused on the choices offered in projects. As students had previously shown little understanding of the term, Multiple Intelligences, the researcher framed this question by linking it to the activities where students are presented with choices based on a variety of presentation methods.

(IS1) You've got an option of choices -- you can do anything -- which one you're best at.
(IS5) Because you like much more of a choice you can go for what you're good at and so then you can get better marks and stuff.
(FS2) You might be good at one thing and not good at the others so you can choose the one you're good at, the best you can achieve.

However, teachers need to be vigilant in guiding student choices. Students could confine their selection to what they are good at (their intellectual comfort zone) and not risk extending themselves.

(FSI) With some projects if you do an analytical essay, that will get you excellent marks straight away cause you've actually done something hard and that's all you have to do for the whole project. Or you can just do like the English things like 'choose a poem' that are really easy to do and don't give you that much marks and you just do all of them cause you can't be bothered doing anything else.

Students mentioned 'boredom' with repeated activities based on the Six Hats, while staff saw the other aspect that there must be repeated practice before the skill is readily applicable.

(GS1) I learnt that in primary school.
(FS1) You don't really have to emphasise it so much. Like they explain it, and then they explain it again, and before you know it, it's six periods and the whole thing was spent saying how, what the red hat is.
(TI) It's got to go past the 'ho-hum' to where it is part of them (TI).

Summary: Students responded most confidently to questions about the Six Thinking Hats but appeared uncertain of what is involved with other thinking programs. Students, and some staff, linked good thinking with good behaviour and this perception could be broadened. Students placed a high priority on getting good marks and, as previously mentioned, while this may be a suitable premise for VCE students, it is a concern if the mark, rather than the acquired skill base, drives selection of tasks at Year 7 level.

The discussion of results from the data collection was formed the basis of the report and set of recommendations presented to The College in a meeting with the two leaders.
CHAPTER SIX
SUMMARY AND RECOMMENDATIONS

The summary and recommendations of this project are based on information garnered from leadership and staff of The College and from students. A descriptive report which encapsulated each of the steps taken by the researcher was also written to inform The College about the initial stages of the implementation of the TOC. The narrative mode of reporting, a characteristic of a case study, allowed for a detailed overview of the initial stages of the TOC and was an effective way of reporting back to the people involved in setting this project.

After reviewing all data collected for this study, the following recommendations are offered for consideration under the areas: 1) Professional Development, 2) Thinking Skills and Curriculum Issues, and 3) Physical Learning Environment for Students. An overview of outcomes of each of these areas is presented and then specific points arising from this aspect of the study are addressed. Recommendations are then directed to each of these points. These categories and recommendations are not presented in a perceived order of importance, but rather are linked to relevant areas of school organisation.

1. PROFESSIONAL DEVELOPMENT

The TOC initiative has been well supported by suitable Professional Development sessions and on-going support services, but there are two aspects of concern to be addressed. One of these is the particular concerns of specialist staff, and the other is the need for some members of staff to make greater use of the external curriculum consultant to ensure current teaching material includes activities to promote the development of thinking skills. Adequate attention needs to be given to address specific concerns of teachers in some specialist areas who may find changes more difficult to implement. In many instances, there is less targeted professional development for these teachers beyond that of specific curriculum content issues for their relevant discipline.

Although all teachers had been given access to sessions directed at using thinking skills within the classroom, there was a stated desire for this to be extended. Staff members are looking for more practical advice, rather than theory, as they endeavour to include thinking
skills into their curriculum. Staff expressed belief that colleagues could provide assistance and direction within the college and a staff audit in 2003 identified staff willing to share knowledge of particular thinking strategies.

**Recommendation:**

1. **PD concerns of specialist staff need to be addressed**—either at school base or by professional networks. *These sessions may need to include activities that engage specialist teachers in authentic tasks.*

2. **Ensure practical advice on implementing Thinking Skills is available or undertaken.**

3. This could be partially addressed by **Professional Learning Teams** using colleagues to extend general expertise in using thinking skills within their lessons. *These teams would also mentor, and monitor, new staff members who may not necessarily have been exposed to the PD of other staff.* This team approach could also affect integrating thinking skills into the ‘curriculum’ rather than one-off activities or projects.

While there is evidence of some class activities incorporating the specific skills targeted in The College’s initiative, not all staff members are making sufficient use of the opportunity to work with the special curriculum consultant employed by the college to re-develop current projects and class tasks. Many ‘old’ classroom worksheets make no reference to the use of thinking skills and do not reflect increased knowledge staff has gained.

**Recommendation:**

4. **Worksheets should reflect the use of thinking skills and/or tools given the training the teachers have undergone and the commitment of the staff to the TOC.**

5. **The college must address the fact that some staff will slip back into the ‘comfort zone’ of previous teaching styles and must set some aspect of accountability if the TOC is to be a whole school program.**
2. **THINKING SKILLS AND CURRICULUM ISSUES**

Five areas for attention emerged from this project. Staff members may see the selected programs as promoting thinking skills, but limit their teaching to the program itself and do not necessarily name the thinking skills fundamental to these programs. Emphasis needs to be placed on the idea that de Bono's program is not simply Six Hats but Six Thinking Hats and the focus needs to be more strongly move to the thinking involved rather than the hat, or the colour of the hat. Some student responses raised concern when they indicated Six Thinking Hats was a method for approaching class essays. All four programs are incorporated into the curriculum to the same extent and, although in its early stages of implementation, some students display a greater awareness of programs than other students and consistent student responses showed no exposure to some of the selected programs. This should not occur within an infused thinking curriculum were it is expected all staff use all programs with all students. Not all teachers are aware of what the students already know from their primary education and expressed uncertainty about they could/should assess student competency in thinking skills.

Staff members are uncertain of the thinking skills of the in-coming students, and student responses indicate that some thinking skills (particularly) the Six Thinking Hats have been taught at their primary schools.

**Recommendation:**

6. *Given that three of the main feeder primary schools to the college are involved in the cluster group whose focus is the acquisition of thinking skills, staff must be informed that students entering the college have knowledge of thinking skills and they should be prepared to build on, and extend, this knowledge.*

Students have shown greatest awareness of the Six Thinking Hats in classroom work. Within the limits of this study, it is not possible to state whether this knowledge has been established from work within primary schools or by the school program. Students do not generally show sufficient knowledge of Multiple Intelligences and Bloom's Taxonomy to be able to use these skills usefully and effectively as they work at class tasks. While Thinker's Keys are mentioned by students, they do not appear to fully relate to the use of this strategy.
Chapter Six

Recommendation:

7. Thinking skills need to become an integral part of assessment of classroom activities and some staff members have indicated that this is an area where they would like more information. Designing specific assessment criteria could be pursued in KLA meetings, and in Professional Learning Teams. Responses show students do reflect on comments made by teachers about their work and this is an aspect that should be incorporated into assessment tools so the students understand what is ‘missing’ from their responses. Steps could be taken to address this, or they could be offered feedback on the steps they are using.

Student responses indicate that not all see the ‘Thinking Skills’ as thinking skills - but rather as tools for classroom activities e.g. writing an essay.

Recommendation:

8. Explicit references to thinking skills needs to be incorporated into sessions.

Modelling of thinking vocabulary by teachers is in evidence and students are becoming comfortable with the language of thinking when speaking to the class – but not when working with peers in group or partner activities. Some staff saw thinking strategies (such as the specific four forming the basis of this project) as thinking skills in themselves, and did not move beyond viewing these as strategies not skills per se.

Recommendation:

9. Not all members of staff are fully incorporating thinking skills, and its language, as part of their classroom activities and this must be further practised if students are to adapt this language and thinking as part of their own responses.

10. Staff must include a focus on teaching specific skills such as analysing, synthesising, classifying, comparing/contrasting, and using Six Hats, MIs, Thinker’s Keys and Bloom’s Taxonomy as a means of setting situations to develop these skills.
The TOC is in its initial stages of implementation and some staff members are making a determined effort to incorporate the ideals of the program. However, while some staff members are using the skill targeted by their KLA, they are not consistently incorporating the other skills.

**Recommendation:**

11. There is not evidence of all skills in all curriculum areas. This may be an unrealistic outcome for such early stages of an infused thinking initiative, but must be an on-going goal of the program.

3. **PHYSICAL LEARNING ENVIRONMENT**

The learning environment is an important aspect of student learning as it can stimulate and motivate students and promote peer interaction and collaboration as part of the learning process. It is essential that displays reflect the curriculum and are current to at least that year’s student group. Student interaction is encouraged with co-operative working groups.

Thinking skills resources are difficult to access and there is little visual stimulus within the classrooms.

**Recommendation:**

12. A home teaching room could allow individual teachers to arrange rooms and display resources and student work to suit their teaching style. Displays in some classroom and walkways need updating more regularly, and this is could be included in the responsibility of the Environment Group – particularly in common areas of the school.

The seating arrangement of students in rows across the room is not conducive to group working practice. Being able to follow the conversation of four or five students stretched across a row of desks is difficult.

**Recommendation:**

13. Some teaching rooms could be set into new patterns e.g. a “U” shape to encourage staff to become acclimatised to easier student
interaction. Timetabling may be needed to ensure that each staff member is rostered to teach in these rooms at least once a week.

While the above recommendations relate to outcomes from the specific study of the TOC initiative at The College, there are key conclusions which transfer to implementing such a program at other schools, and inform professional knowledge in this area of educational practice.

**KEY CONCLUSIONS**

1. **The Need for Thinking Skills.**

   Current educational issues are focused on achieving optimum results for students and ensuring teaching/learning addresses the acknowledged needs of students. Middle years' reform is placing increased emphasis on engaging students in their education, giving them greater input into their learning, and ensuring schools instigate tasks more relevant to students' needs in the world beyond schooling. The spotlight is widening to include not just content, but how this content can become a vehicle for allowing students to practise life management skills — thinking skills. Part of this reform is occurring because research presented within this work shows the future role of a member of the workforce will depend on a person's ability to access and control information, analyse unplanned problems as these might emerge, look for creative and plausible solutions, take an effective role in global agendas, adapt to changing employment situations and bring increased awareness of how each person can respond to the evolving demands of society i.e. to be life long learners.

2. **The Support of Professional Development.**

   Ong's research (2000) mentions the need of professional, financial and emotional support for initiatives in an educational setting, and the outcomes of the study undertaken in this project certainly support this opinion. Extensive PD is needed prior to the move to a thinking oriented curriculum. Such a change is not solely concerned with content of curriculum, but goes to the heart of pedagogy. Some staff may experience personal angst and even fear about this change to pathways they may have used for many years. While PD sessions may expose them to the general and expected change, it is not until some teachers are forced 'to walk the talk' that many realise the proposed has actually become a reality. Primary teachers are more accustomed to teaching students, but many senior teachers are...
focused on teaching the content of a discipline e.g. science. As the push for middle school reform falls into the realm of secondary education, these teachers will be forced to implement changes to their mode of teaching. While some method of accountability of staff is needed, on-going support would be seen as essential for many members of a traditional school organization. Further research needs to be undertaken to identify how teacher training facilities are meeting this challenge.

3. **Framework for Implementing Thinking Skills.**

There is no lack of information and direction for teachers to draw upon as they implement changes to empower current students as they move towards their future. McGuinness (1999) and Perkins (2000) stress, however, that this intervention needs to be of a high standard, and best directed at improving thinking skills. The many published lists of thinking skills Marzano, Costa, de Bono, Lipman, Aitkin, Langrehre, Perkins all offer practical means to develop these skills in a classroom setting. Costa and Kallick (2000a-d) and Marzano (2000) also encourage teachers to look at developing positive dispositions and habits of mind in students as they work towards increasing their application of thinking skills. There is current evidence, as with Queensland Education New Basics (2003) and Tasmanian Essential Learning (2003), that curriculum activities must also reflect this change in direction and introduce students to tasks that are related to the world in which they will ultimately function (authentic tasks). In carrying out these learning activities, students must become practiced in working in collaborative groupings as this is the manner that they will exist with colleagues within a working society. To learn to work in mutually respectful groups, students must be exposed to collaborative classrooms which actively aim to include group work as part of the teaching/learning program. The physical set-up of many classrooms is not conducive to this co-operative learning.

4. **The role of Professional Learning Teams As An Agent of Change.**

Research (Jolly, 2000) supports the belief that the teacher is the most significant factor impacting on student learning. If educational policy makers acknowledge the worth of changes by which students become practised in essential skills, then they need to look further than merely supporting staff understanding of curriculum changes. Pedagogical change also needs support. While teachers need adequate PD of a high quality to initiate curriculum change, supporting measures already established within each school and the encouragement of the efficacy of these support mechanisms, are also required. Professional...
Learning Teams (PLTs) which operate within schools, allow teachers to work together to study and apply research-based educational issues. PLTs allow staff to collaboratively analyse student achievement, reflect on shared experiences, work towards solutions, and improve instruction for students. PLTs have the potential to offer the essential emotional support needed to instigate change at a micro and macro level, and therefore need increased recognition and encouragement from educational policy makers.

5. **The Shift towards Thinking Skills.**
Whatever the method of implementing thinking skills is employed – infused, subject specific, general thinking skills as a curriculum discipline– there are many acknowledged and proven thinking skills programs which educationalists can access. However, while these programs provide excellent practice for students, it must be stressed that the programs are founded on developing thinking skills and it is these thinking skills which must become the dominant focus of attention. It is imperative to the success of a thinking oriented program that teachers explicitly incorporate the teaching of thinking skills *per se* not just the programs. In interviews and the classroom teachers refer to de Bono’s program as The Six Hats completely omitting the main thrust i.e. The Six Thinking Hats. As Perkins (2003) states, thinking must become visible so that students understand the process, see the modeling of the skills, are encouraged to reflect upon procedures and relate process to outcomes. There is need to look beyond the goal, to focus on the means of achieving the goal.

6. **Evaluation.**
With any change of direction in education, especially in pedagogy, teachers need to, not only become conversant with the new techniques, but also understand how to evaluate how students are relating to the initiatives. It is not always the best behaviour that indicates the best thinking. Teachers must be aware of three aspects of thinking – critical, creative and metacognitive – and provide opportunities for students to engage in all modes of thinking. This evaluation of student’s transfer of thinking skills needs to be based on observable behaviour or practice not on subjective, emotional judgement. Assessment of classroom tasks needs to move beyond looking at the product, to examine and value the process involved in reaching result. As teachers examine student performance, there must be transparent descriptors of thinking skills and clearly defined objectives against which this behaviour can be viewed. This project has been able to initiate some procedures which
would assist teachers to better understand how students perceive and apply thinking skills within a classroom context.

**Implications of this study beyond The College**

The project detailed in this thesis was an intrinsic case study examining the thinking behaviour of a specific group of students as they responded to a new direction in school curriculum and pedagogy. The study examined one college’s response to the perceived demands of future lifestyle and employment conditions. This required teachers to reflect on the focus of their educational objectives and examine how they could best support the needs of students under their care. A metacurriculum equally valuing content and thinking skills has the potential to re-direct the pedagogical focus of all teachers and guide them in their design of authentic lesson structures. The students in this study were purposely, and explicitly, exposed to specific thinking skills programs as part of their normal classroom studies. Staff at The College had undergone professional development sessions and all teachers were well supported by all levels of school organization as an infused thinking oriented curriculum was integrated into the regular programs of the classroom.

The rigorous and empirical research undertaken in this study would support McGuinness’s (1999: 1) call for research which examines programs based on core concepts she identifies as:

- "the need to make thinking skills explicit in the curriculum;
- teaching through a form of coaching;
- taking a metacognitive perspective;
- collaborative learning;
- creating dispositions and habits of good thinking;
- generalising the framework to thinking curricula, thinking classrooms and thinking schools”.

The research detailed in this study confirms that pedagogical change needs to be effectively supported by internal school structure and quality PD which addresses the concerns of all teachers involved in implementing these changes. There must be both emotional and financial support to achieve outcomes as teaching/learning is transformed and teachers
become metacognitive professionals – implementing and evaluating changes to their classroom procedures and curriculum outcomes.

While this study was limited in that it examined the early stages of a thinking oriented curriculum at a particular secondary school, the foundation has been set for a longitudinal study which could further examine how the explicit teaching of thinking skills has affected students’ learning patterns. The direction taken in this research could be replicated outside of The College and recommendations of this study, based on valid and reliable qualitative research procedures, allow for extrapolation into similar educational organizations. The study informs all educators about many pertinent issues affecting the implementation of a thinking oriented curriculum.

Often students have the clarity to reduce the most complex ideas to a simplistic statement. As teachers wonder at the value of teaching thinking skills, perhaps they could consider the wisdom expressed by a Year 7 student at The College about an infused thinking oriented curriculum.

*You can use it [a thinking skill] in any subject, so if one teacher teaches it to you, you can use it in every subject (IS4).*
APPENDIX 1

TIME TABLE for the introduction of a thinking oriented curriculum at The College.

In setting this timetable, The College made a proviso that slight changes to the original strategy may occur as a response to KLA leaders and needs or suggestions expressed by the teaching staff.

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Event Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>March</td>
<td>Michael Pohl Introductory Session.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All staff – 90 minutes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Then 90 minutes to all Junior School staff, KLA leaders and Middle School Management Team (Years 9&amp;10).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All staff surveyed.</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>Michael Pohl works with KLA leaders.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range of thinking tools selected for the whole school.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KLAs select tools they will teach, one KLA to explicitly teach it and another to reinforce it. (KLAs work in pairs for PD).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 tools to be introduced at the Junior School in Semester 2.</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>Pohl returns to spend one half day with each paired KLA, teaching their chosen tool and classroom approaches.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hawker Brownlow (publishers of educational texts) provided a sample of references and reading lists relevant to all KLAs.</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>Pohl teaches paired KLAs the other tools to ensure that all classroom teachers have a broad range of tools for their own teaching. The thinking tools are not exclusive to various KLAs but “responsibility” for the explicit teaching and reinforcement is clearly designated to various KLAs.</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>Individualised teachers and teams have access to the Teaching and Learning Specialist over 2 days to support their classroom implementation of various strategies, including the “thinking” tools. Contact made with University of Melbourne Doctorate student to establish procedure for evaluation of the initial stages of introducing the thinking skills program to students.</td>
</tr>
<tr>
<td></td>
<td>October-November</td>
<td>Pohl supports KLAs in the development of classroom related tasks and curriculum development using the thinking tools, sharing practise and review. One half day is for KLA leaders to work with Pohl and APs on plans for 2003.</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>Junior School staff will have most of the whole school PD day to work on curriculum development, including the implementation of “infusing thinking”.</td>
</tr>
<tr>
<td></td>
<td>October-November</td>
<td>The Teaching and Learning Specialist spends a further three days at the Junior School over these months supporting staff and a systematic approach to implementation.</td>
</tr>
<tr>
<td>2003</td>
<td>February-August</td>
<td>Doctoral student begins evaluative process.</td>
</tr>
</tbody>
</table>
APPENDIX 2

In setting all judgement of how thinking skills could be identified and then utilised in creating assessment tasks, the researcher drew on the work of major theorists in this field. Elements not specifically mentioned in the body of this thesis, but which were also influential in the creation of thinking scenario cards, and the thinking skills check list used in classroom observation sessions, are listed below.

Enterprise Attributes

- Collecting, analysing and organising information.
- Communicating ideas and information including Negotiating.
- Planning and organising including managing resources and people.
- Working with others and in teams including working cooperatively.
- Using mathematical ideas and techniques.
- Solving problems.
- Being creative and innovative.
- Making decisions.
- Using technology including information and communication technologies.
- Using initiative and drive.
- Being positive and flexible.
- Reviewing and assessing.
- Identify and assess opportunities
- Use their initiative
- Identify, assess and manage risk
- Generate and use creative ideas and processes
- Carry through an agreed responsibility
- Match their personal strengths and weaknesses to projects
- Learn from mistakes
- Plan their use of time and energy
- Focus of knowing how
- Seek information and advice
- Recruit and effectively manage resources
- Be flexible when dealing with change
- Establish and effectively use or manage a network
- Negotiate and influence
- Resolve conflict (in a constructive and negotiated manner)
- Cope with stress and tension
- Monitor and evaluate performance.

Taylor's Multiple Talent Model.

This clarification of the model is taken from Pohl, 2002.

- Decision Making – considering alternatives, evaluating evidence and justifying a decision or stance on an issue.
- Planning – deciding on pathways based on sound reasoning.
- Forecasting - predicting future events and scenarios based on evidence, reasoning and logic.
- Communication – using carefully constructed comparative, descriptive and clarifying language based on research, reasoning and evidence.

The other two elements of his model add some degree of balance by including:

- Creativity – creating new ideas, new ways of looking at things or new products – having used some or all of the critical thinking processes outlined above.
• *Specific talents* – planning to include the specific abilities of students, such as academic, musical, dramatic and artist abilities.

Taken from a handout distributed to staff from Michael Pohl (2002)

**WHAT SKILLS ARE BEING PROMOTED**

<table>
<thead>
<tr>
<th>Analytical and Critical Thinking</th>
<th>Creative Thinking</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributing</td>
<td>Brainstorming</td>
<td>Co-operation</td>
</tr>
<tr>
<td>Cause and effect</td>
<td>Inventing</td>
<td>Independence</td>
</tr>
<tr>
<td>Classifying</td>
<td>Designing</td>
<td>Listening</td>
</tr>
<tr>
<td>Comparing/Contrasting</td>
<td>Analogies</td>
<td>Pride in presentation</td>
</tr>
<tr>
<td>Inferring</td>
<td>Predicting</td>
<td>Sharing</td>
</tr>
<tr>
<td>Deductive Logic</td>
<td>Problem Solving</td>
<td>Self esteem</td>
</tr>
<tr>
<td>Decision Making</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>Prioritising</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawing Conclusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEARNING SURVEY DISTRIBUTED TO LEADERSHIP AT THE COLLEGE**

1. Taking Opportunities  
2. Managing Risks  
3. Research Skills  
4. Being Creative  
5. Solving Problems  
6. Collecting and Managing Resources  
7. Setting Personal Goals  
8. Working with others in a Team  
9. Being Flexible  
10. Negotiating  
11. Showing Initiative  
12. Reflecting, Monitoring and Evaluating  
13. Communicating Ideas and Information  
14. Planning and Organising  
15. Being Responsible

**MARZANO’S DISPOSITIONS**

1. Seek a clear statement of the thesis or question  
2. Seek reasons  
3. Try to be well informed  
4. Use credible sources and mention them  
5. Take into account the total situation  
6. Try to remain relevant to the main point  
7. Keep in mind the original or basic concern  
8. Look for alternatives  
9. Be open-minded  
   a) Consider seriously other points of view than one’s own (dialogical thinking")  
   b) Reason from premises with which one disagrees – without letting the disagreement interfere with one’s own reasoning ("suppositional thinking").
10. Take a position (and change a position) when the evidence and reasons are sufficient to do so
11. Seek as much precision as the subject permits
12. Deal in an orderly manner with the parts of a complex whole
13. Be sensitive to the feelings, level of knowledge, and degree of sophistication of others
14. Use one’s critical thinking abilities
15. Withhold judgement when the evidence and reasons are insufficient.
APPENDIX 3

The following cards present the scenario of Reflection and Risk Management and the corresponding choices of responses shown to students.

When I am thinking about starting some new task ...

- I am more concerned about completing the task than what the teacher says about my work.
- I sometimes think about things teachers have said about my other work.
- I know it would be a good idea to think about what happened with other work.
- I usually think about what I have done at other times and how this could help me as I do new things.

When I am thinking about doing something I have never done before ...

- When I don't know what to do, I wait for someone to help me.
- When I am trying out something new, I'm not sure how to know if what I try will work out.
- I try to remember something I did another time which worked for me when I try new things.
- I have worked out special things to try and always give these a go when I try something new.

Establishing A Thinking Curriculum
The following cards present the scenario of Information Gathering and Evaluation and the corresponding choices of responses shown to students.

When I am thinking about how I am going to collect information ...

- I use printed material for research as the information is always accurate.
- I only collect information from one source so that I don't get too much information for me to use.
- I just rely on blurbs and key words when I am collecting information so I know it must be right.
- I make sure I understand the difference between true facts and people's opinions in what I find.

When I am thinking about how useful information is for me ...

- Information is hard to find so when I find any information about a topic, I just use these ideas.
- When there is different information about a topic, I don't know how to pick out the right one.
- I am aware that some information is very one-sided when I read information about a topic.
- I look for ideas and opinions from lots of places and think about how people explain their opinions.
The following cards present the scenario of Organisation and Creativity and the corresponding choices of responses shown to students.

**Organisation**

- When I am thinking about how to organise myself before I do a task ...

**Creativity**

- When I am thinking about how I will present my ideas and my work ...

I work through tasks in the order they have been given and whatever way the task says to do.

I look at a task and sort out which parts need to be done first.

I look at the task and decide how I will answer each bit to find out the ones where I will need help.

I look for parts of the task that seem to be about the same idea and put these into the same groups.

I like to work on a task that lists all the things that I need to do to finish what I've been given.

I enjoy thinking out new ways to use the information I collect when I am working on a task.

I work better at a task when I can decide how I am to present my own ideas on the topic.

I like working out my own ideas about a task and deciding how to present my own work.
The following cards present the scenario of Analysis and Open Mindedness and the corresponding choices of responses shown to students.

**When I am thinking about how I could solve a problem I have ...**

- I understand it is important to know where I need to begin a task.
- I understand it is important to break down a task into pieces.
- I understand how each part works together towards a conclusion.
- I think about why the task has been set and I work on each part while keeping in mind the main idea.

**When I am thinking about what other people say about things ...**

- I like working with friends so that we can share the work between us all.
- I like sharing ideas in a group as this increases my own knowledge.
- I like listening to other people's opinions to help me understand what they think about a topic.
- I listen to other opinions but don't make up my mind until there is enough evidence for my decision.
The following two pages show the Bloom’s Taxonomy and Ryan’s Thinker Keys task sheets for the application of thinking skills as a written task completed by the students of Year 7. de Bono’s Six Thinking Hats (page 106) and the Multiple Intelligences task sheets (139) are presented in the body of this thesis.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>STARTER WORDS</th>
<th>YOUR QUESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>REMEMBERING</td>
<td>List, describe, name, tell, relate, state, find, list.</td>
<td></td>
</tr>
<tr>
<td>UNDERSTANDING</td>
<td>Re-tell, explain, choose, interpret, discuss, predict, re-state, compare.</td>
<td></td>
</tr>
<tr>
<td>APPLYING</td>
<td>Solve, show, use, illustrate, construct, examine, classify.</td>
<td></td>
</tr>
<tr>
<td>ANALYSING</td>
<td>Analyse, distinguish, examine, investigate, categorise, identify.</td>
<td></td>
</tr>
<tr>
<td>EVALUATING</td>
<td>Judge, select, justify, recommend, argue, prioritise, assess.</td>
<td></td>
</tr>
<tr>
<td>CREATING</td>
<td>Create, invent, compose, construct, design, devise.</td>
<td></td>
</tr>
</tbody>
</table>

Name: ___________________  Home Group: _________  Male/Female
THINKER KEYS

Use the prediction key.

Predict how you think the Great Barrier Reef will exist in the future. Try to think of five different points.

The Great Barrier Reef could be

The Great Barrier Reef could be

The Great Barrier Reef could be

The Great Barrier Reef could be

The Great Barrier Reef could be

Perhaps you still have some ideas you wish to make?

Name: ___________________________ Home Group: ________ Male/Female
APPENDIX 5.

Coding of research responses across all data collection:

Interviews with the two leadership staff are shown as:
L1 and L2.

Interviews with staff whose classes were observed in the collection of data are recorded as:
T1; T2 and T3.

Classroom dialogue is recorded as:
CS1; CS2; CS3 etc.

Interview with students using thinking prompt cards are recorded as:
TC1 TC2; TC3 etc.

Interview with students about a specific classroom project is recorded as:
PS1; PS2; PS3 etc.

Written comments on ‘Wanting about my thinking’ are recorded as:
WS1; WS2; WS3 etc.

Written responses given by all Year 7 students (Barrier Reef task) are recorded as:
BRS1; BRS2; BRS3 etc.

Individual student interviews are recorded as:
IS1; IS2; IS3 etc.

Focus group student interview is recorded as:
FS1; FS2; FS3.

Group student interview is recorded as:
GS1; GS2.

Results of the student survey are shown as recorded as:
SS1; SS2; SS3 etc.

Results of the staff questionnaire are recorded as:
SQ1; SQ2; SQ3 etc.
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Author/s:
MILVAIN, CATHERINE

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