Data Use in Monitoring Student Performance in a Secondary School

By

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Abstract
This work is a Professional Doctorate that was undertaken whilst I was employed as a teacher at St Joseph’s College Geelong. The Folio documents an evolutionary process of change that occurred over a period of seven years. Initially when I began the project I had a full time teaching load and was most concerned with improving my ability to support students in my classes. By the conclusion of the study I was in a position of senior leadership directing the manner in which all teaching staff were utilising student data.

The dissertation component traces the significant exploration of data use at St Joseph’s and then documents the process of change that was instituted as a direct result of the accumulated data. When I began teaching at the College the collection, storage and ultimate use of student data was at a very rudimentary level. The project was initially devised to ascertain the quality of student data that was available and consequently to determine what improvements could be developed to benefit the learning experiences of students at the School. The study was wide ranging examining not only the quantitative data routinely extracted from student performances on standardised assessment pieces but also significant sources of qualitative data, particularly the perspectives of students gathered from personal interviews. As consequence of the work undertaken throughout the study significant changes were instituted at St Joseph’s. Changes made included rationalising the types and numbers of standardised test students undertook, identifying and imbedding user friendly systems that enabled easy access to student data by all school community members and importantly cultivating and developing evidence based approach to decision making processes that had direct impact on student learning.

The Professional Writing and Practice components of the work represent some of the practical applications of much of the findings of the research undertaken. Although the work was very much centred on St Joseph’s College and the
process of change that was established, a number of the examples discussed are shown to have potential for a much wider generic application.

This research Folio illustrates how the process of developing improved learning environments can be significantly improved with better utilisation of data. Through recording the experiences of data influenced change within the areas of pedagogical approach, reporting and assessment at St Joseph’s College a body of evidence has been documented that can be adapted to a wider educational community.
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“Like many others in the society, educators are trying to come to grips with the vast deluge of new and unfiltered information, and to find ways to transform this information into knowledge and ultimately into constructive action.” (Earl 2005 p6.)

1.1 Motivation Leading to Research

Historically the teaching process was understood to involve a person who knew a lot (the teacher) imparting their knowledge and wisdom on someone who knew less, (the student). This of course is a gross generalisation and simplification of the actual implementation of the educational process. Despite this, the first year or two of my emerging teaching career was a time when I invariably compared the school environment and the practices that were happening, with my previous experiences outside this field. I was acutely aware that I was a very inexperienced educator and yet many of my far more experienced colleagues were utilising pedagogies I believed were didactic and disengaging. I had entered the teaching profession with the aim of assisting students to learn and in the process develop and refine a personal theory of effective teaching. My scientific training had deeply engrained in me the need for evidence based decision making, and therefore, my pursuit of affective teaching practices would need to be rooted in evidence.

At times I would observe changes in practice and procedures at school and wonder what data was consulted to inform these decisions. Improved student learning would often be cited as the driving force behind such changes and yet the data on which this was generated was often diffuse and unconvincing.
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Equally concerning judgements made about student learning that were seemingly data driven and were often generated from test and assessment practices that were highly inconsistent. Sometimes the test and assessment protocols that were being used hadn’t been updated for very long periods of time. There wasn’t really any systematic approach to quality control to ensure the data on which important decisions were being made were either accurate or reflective of actual student learning or progress. To this end, the inadequacy of the data being generated meant that it was unable to provide meaningful insights into effective pedagogic practice, or guide student learning.

I spent three years teaching at my first school before taking up an opportunity to begin teaching at St Joseph’s College, Newtown. I was attracted to St Joseph’s College on account of the vertical curriculum structure that they were in the process of implementing. The vertical curriculum was based on progress of students according to knowledge and skill development and not their chronological age. I was very hopeful that this approach would be underpinned by a far more consistent and systematic approach to assessment data. I expected that the implementation of a vertical curriculum would be linked with improvements in the assessment of student abilities and the systematic analysis of related information. I envisaged that within an effective vertical curriculum the students would be undertaking classes that matched their academic needs and interests, not their chronological age.

Unfortunately, the reality was often far removed from this ideal. The actual implementation of the vertical curriculum at St Joseph’s College was in many ways only superficial. It very soon became evident to me in most subject areas the vertical curriculum far more closely resembled a traditional linear progression. The association with a vertical nature for the curriculum rested on the increase in student choice. Students could choose to undertake units that were designed to accommodate varying levels of student ability, but the system did not really allow progression to be determined by student ability; it was far
more dependent on students’ subjective choices. Much to my dismay, there had been no strategic pre and post measures put in place to assess the merits of the changes in curriculum structure and practice associated with this initiative. Interestingly, it was observed by the school Principal at the time that the mixing of year levels had resulted in a significant improvement in student behaviours particularly noticeable in the yard. However, he was far less forthcoming about measured changes or improvements in the academic performance of students on the basis of this initiative.

After a few years of working within the so called vertical curriculum model I began actively looking for assessment models and strategies that could accurately and meaningfully measure student learning. I was concerned that when I assessed students in my classes it was difficult to gauge how they were developing and whether this curriculum model was making any substantial difference. I was an inexperienced teacher and wanted some reassurance that I was assisting my students adequately, to learn and develop. My science driven background had always led me to rely on measurement and observational data that was accurate, reliable and repeatable. The inconsistency of the existing assessment practices was attributable to a myriad of factors; (i) some assessment was designed for efficiency of testing and correction, (ii) some was designed to be easy and give all students a chance to succeed, (iii) some was designed to be difficult so as to identify the best students, and (iv) some was designed to simply give students some feedback. Frustration arose because I wanted reliable data that could be used not only to monitor my students but so I could provide meaningful and reliable feedback and advice to students and their parents. Foremost in the effective implementation of the vertical curriculum was a burgeoning need to provide students with clear, evidence-based, advice on what subjects that they should consider when planning their future subject selections.
The more I read about and investigated ways in which assessment data could be used as a learning tool, the more I realised that due to the idiosyncratic nature of schools, any type of systemic approach to assessment data, collection, analysis and use was generally going to have to evolve from within the particular school context. My approach was to take a long term view and in order to more formally document the process I decided to undertake the task within the context of a Higher Degree by Research (HDR) program. The PhD by Folio at Deakin University has no coursework component and the aims of the program are detailed as enhancing educational practice rather than being devoted wholly to the pursuit of a single original contribution to knowledge in a specialised discipline. The Folio format was a significant catalyst in my decision to pursue this project within an HDR program. As a teacher working in a secondary school my practical and intellectual motivation was to improve the manner in which data was collected, stored, analysed and disseminated within this context. Following numerous conversations and presentations I garnered the support of the College Principal and Board that I be allowed to investigate changes in the School’s approach to data collection and usage. I then enrolled in the PhD (Folio) part-time, with the aim to implement a research agenda that was grounded in, and applied to, my professional practice.

The study was to evolve into three main phases. Phase one was undertaken to identify the data that was being collected at St Joseph’s College and to investigate how comparable schools were using the data that they were collecting. Phase two involved detailed analysis of the data used at St Joseph’s College and a wide ranging investigation into factors that could be influencing student outcomes. This included a statistical analysis of the data that was available being undertaken to assess the reliability of the data and the potential for using the data. Importantly, during this phase students’ perspectives were actively sort to support the investigation into developing understanding of how assessment data might reflect or influence student decision making processes. The third phase of the study involved the investigation, then development, of
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systems for developing databases that could be used effectively to support student learning. This phase drew heavily on the findings of the first two phases and involved school wide changes including the adoption of adaptive testing in literacy and numeracy and the increasing of accessibility of all assessment data as well as other important learning related data to all teaching staff.

The challenges faced by secondary schools today are many and varied. Incorporating modern technologies, maintaining student engagement, ensuring safe environments “real and virtual”, meeting community expectations for success, operating within strict financial constraints, and preserving staff moral are just some of the many responsibilities that face secondary school communities. In the current climate a large part of school performance is determined by the measurable outcomes that are proliferated by the everyday running of a school. The most obvious and by far the most common measure of school performance is the success that is attributed to its students. In a bureaucratic sense numbers are often the ‘Holy Grail’, but putting meaningful numbers to student performance is by no means a simple or straightforward process. This study sought to investigate the ways in which data, particularly student assessment data, was propagated, stored and utilised at a specific school and how this information could be used effectively by real people in a real setting.

1.2 Background of St. Joseph’s

St Joseph's College Newtown is a large Catholic Boys College with approximately 1550 students ranging from years 7 to 12. The College was established in its current form in 1935 and has various connections with educational facilities on the site dating back to April 1854. The school is one of a number under the auspices of the Christian Brothers forming part of
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Edmund Rice Education Australia (EREA), but there are no Christian Brothers employed by the school and the staff consists of only lay teachers.

St Joseph’s College remains the last one of up to seven Boys’ Schools that have existed in Geelong at various times in the past. Today it makes use of this position for branding and marketing of the school in an ever growing, competitive educational market. The school has had a strong history of sporting excellence. However, in the mid 1990s a conscious decision was made to extend and improve the academic reputation of the College. It was during this time that a culture began to evolve that placed great emphasis on the performance of students’ study scores as a measure of the academic performance of the school. This approach was very much influenced by the growing trend towards schools being compared by student study scores at the completion of secondary schooling and the percentage of students gaining higher levels of entry to tertiary education.

In 1995 the school trialled a pilot program to introduce a vertical curriculum. Initially this approach was undertaken to allow students from years 8 to 10 more choice with the inclusion of some optional subject choices. These choices were in addition to the core horizontal year level subjects that formed the majority of each student’s load. The vertical element of the curriculum that commenced in 1997 was named ‘Pathways’. The rationale guiding Pathways was that if students were given more choice of subjects they could control the direction their learning was taking. This added ownership would, it was claimed, improve the whole learning process for students.

1997 also saw the introduction of the initial testing of literacy, numeracy and cognitive reasoning skills of all new students as they entered St Joseph’s College. The testing procedures chosen were the Raven’s Progressive Matrices as a test of non-language based cognitive ability, the ACER (Australian Council of Educational Research) progressive achievement tests in mathematics (PAT
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Maths), and the Progressive Achievement Test in Reading (PAT-R). The timing of the actual testing procedures varied slightly each year but generally all the students that were to begin Year seven the following year undertook this testing regime during their orientation program. AIM (Achievement Improvement Monitor) testing was also conducted as prescribed by the relevant Department of Education for all students during Year 7 and again in Year 9. This testing regime was to be later refined and rebadged as the NAPLAN (National Assessment Program – Literacy and Numeracy) test. The data collected from this testing regime between 1997 and 1999 was not archived in a systematic manner and consequently much of the records and data associated with this testing has been lost. The death of a staff member who had been responsible for the maintenance of the data was also a contributing factor to the somewhat chaotic archiving process and difficulty in subsequently trying to collate any existing records. While the testing conducted from 1999 and 2005 was haphazardly archived, the work accomplished from this study did mean that it was retrievable. As a result of my interest in this area valuable information that would have otherwise been lost was now more securely archived, whilst at the same time being accessible. One of the early successes of my interrogations was the development of a student testing database that was later incorporated into a digital ‘student profile data base’. The improvements in data management instigated by my initial engagement in this study ensured the data that had been collected for the 2005 Year 7 cohort would be made available to all staff. Initially the data was accessed by senior staff when forming class groups, but subsequently, the data was utilised by school counsellors and some class teachers. In previous years, the data collected had been used sparingly in a number of small programs but never for large scale benchmarking or student profiling.

The Pathways Program at St Joseph’s College consisted of a number of minimum units that were completed between Year 8 and Year 10. Units consisted generally of a self-contained program that ran over a period of two
terms of about ten weeks each (one semester). There were some constraints over the number of units that were required to be completed from each of the key learning areas, but apart from this, it was basically up to the students to select the units they would like to do and, to a large extent, the order that they completed them in. The fact that students were given freedom to choose subjects was widely seen as a positive facet of the curriculum and yet, surprisingly, there had been no real attempt to systematically determine what factors were influencing student choices. A considerable number of staff were dissatisfied with this system because, although there was a process that students must follow including minimal requirements for completing certain units, it was difficult to accurately monitor student progress and some students would end up in Year 10 having undertaken very few academically challenging subjects. In extreme cases some students would choose to undertake nearly half of their Year 10 course studying practically orientated subjects, particularly physical and outdoor education, that had very small theoretical demands. Although this was still the exception, rather than the rule, it was a real concern for staff. At issue here was the inability to accurately and objectively gauge theses students’ academic skill level. Consequently, any attempt to assist these students to make important decisions about subject selections were inherently difficult. The subject selection process was dominated by student perceptions of particular subjects as ‘hard’ or ‘easy’, against their own abilities, and influences from their peers and parents. Student choices were not easily moderated through informed teacher knowledge based on clear objective evidence.

Initially, the majority of the Pathways units were devised with themes to attract student interest. For example, in science, students had the choice of “Jump in Your Car” a unit that was biased towards physics themes, or “Household Chemistry” with a self evident chemistry bent. The Pathways Program ran in this format for three years. The increased student choice did cause a number of problems as not all units had the same popularity. Timetabling and resource issues meant that at times a number of proposed units did not run and that some
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units were offered but never taught. Anecdotally, it was evident that many staff did not embrace the introduction of the Pathways Program. A common view among staff was that the process was more ‘top down’ than had been promised.

At the end of a three-year period the Pathways program was reviewed. The review process identified some areas of concern. Within the science faculty concerns had emerged about the actual benefits of the program. A decision was taken to reduce student choice, out of concern that students were rapidly proceeding through to Year 11 science subjects with, what many teachers perceived to be, a lack of adequate preparation. These inadequacies were not limited to the amount of content that had been covered and/or missed, but also the inquiry, synthesis and investigative skills that many students were appearing to lack. Other faculties within the school also expressed some concerns with the way in which the Pathways was influencing students’ progress. It had been observed within the mathematics faculty that although the total numbers of students undertaking mathematics was reasonably stable there was an apparent shift towards students undertaking what were perceived as the ‘less challenging’ units. It was also at this time that the range of subject choices available to senior students began to increase substantially from 17 in 1999 to 29 in 2001. In the following years offerings further increased from 35 in 2003, to over 40 at the completion of this study in 2012. This proliferation of choice was also substantially increased from about this time with a concerted effort by the school to provide even further choice with an expansion of the VET (Vocational Education Training) and VCAL (Victorian Certificate of Applied Learning). VET (in the VCE) and VCAL allow students to include vocational studies within their senior secondary certificate. Here, students undertake nationally recognised training from either accredited state curriculum or national training packages in the composition of their VCE and/or VCAL. The result of these changes meant that by 2013 students have an extremely large and varied array of subjects to choose from when considering what format their final years of secondary education will take.
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Amid the rise of student choice emerged a burgeoning concern that students were choosing to undertake units without making ‘informed decisions’. Teachers expressed concern that they had very little in the way of hard data regarding long term performance of students that could be used to guide their decision making around what subjects to undertake. For example, students could get to take Year 11 chemistry with very little exposure to basic knowledge such as balancing chemical equations. This was seen to be directly attributable to the choices they had made during the Pathways units whereon many students’ made a decision to undertake chemistry based on a poor understanding of the skills and knowledge required to operate successfully at this level. The challenges that Year 11 chemistry posed were often substantially more difficult than what they had anticipated or were seemingly prepared for. The Science faculty, along with other faculties believed that student subject selection had developed into a stochastic process instead of a logical progression, where skill acquisition was a linear and longitudinal process that allowed skills to be developed based on previously acquired skills.

It must be said that most of the concerns regarding student choices were based on anecdotal evidence and the general impression teachers were getting from students. This lack of substantiated information was one of the many factors that influenced the direction of this study. The seeming lack of capacity for a data-driven analysis highlighted the need to begin a process to quantify and decipher how students were progressing within the Pathways model. The process of determining where a student’s academic strengths lie was then, and continues to be, very much dependent on the quality and accessibility of assessment data. It was very apparent during the initial phases of this study that due to the idiosyncratic nature of individual schools and the sheer number of variables present in student performance there was no widespread nor readily available template that schools could easily adapt to be used to implement to monitor student progress.
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While data was being routinely collected at St Joseph’s College, the type of testing was predominantly determined by historical practice. Accordingly, most data was used for reporting purposes rather than to enhance the learning of students. At the commencement of this study there was no readily available process whereby teachers could peruse individual student’s previous performances in a timely and efficient manner. It was evident that to facilitate improvement it would be important to interrogate the reliability and usefulness of the testing that was being undertaken. It was also clear that assessment data needed to be made available to staff, students and parents in a format that was conducive to being used as a tool to guide student progress. Consequently, a significant amount of effort was focused on the reliability of testing and ultimately, procedures were adopted that significantly improved the ability of data to be used to improve student learning and outcomes. To achieve this, students were interviewed to determine what information they were relying on to make decisions about which subjects they would undertake in senior years.

Despite really only relying on anecdotal evidence, decisions were made to reduce student choice as a means of trying to in effect make decisions for students giving them little option but to undertake a greater number of specified units. For example, the number of choices for students in science was reduced in 2001 and the vertical format was developed into a more conventional ‘horizontal program’. Here, the ability for some limited choice was available to students that would be seen to benefit from an extension program and also to those that would benefit from a more consolidated program. The ‘typical’ pathway a student would take in science, for example, consisted of six units of general science over the three-year period. This would give each student a broad exposure to general science and prepare them for any of the VCE science units. Mathematics units had primarily remained in a traditional linear alignment with some scope for students to undertake more challenging or consolidating units. Students were actively encouraged to take mathematics subjects in all six semesters over the Pathways Program, with little avenue for
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acceleration. English was compulsory and had to be undertaken by all students. The remaining units, particularly Studies of Society and the Environment (SOSE), Physical Education (PE), Art and Technology, were adapted in a genuine vertical format with a great deal of student choice.

During 2002 the Pathways Program was once again reviewed. Interestingly, this review revealed many of the same concerns that emerged in the initial review. The most apparent concern that needed to be addressed was the fact that when the Pathways Program was established there was no real attempt to systematically evaluate the outcomes of the program. There had been little consultation with students to determine what factors they were considering when making their decisions about subject selection and their expectations of, and interactions with, the vertical and/or conventional offerings. This lack of student consultation was identified as a major weakness in the Pathways Program and as a consequence student understandings and perspectives were identified as being a critically important variable to investigate. The Pathways Program was superficially driven by student ‘choice’ but underlying the student choices were far more pressing needs of timetabling and resources. Compounding this, there was the lack of means for reliably assessing the possible benefits of ‘Pathways’. It was apparent that the need to address these weaknesses was substantial. Without a reliable way to benchmark student performance, it was not possible to determine whether the Pathways program was performing in a manner that was enhancing students’ learning experiences at St Joseph’s College, and positively influencing their academic development.

The initial format of the Pathways Program at St Joseph’s College was an amalgam of what was initially trialled, coupled with a partial reversion towards a more traditional horizontal format - especially in the traditional areas of English, Mathematics and Science. Student choice was substantially reduced in these three key disciplines but was maintained in other areas of the curriculum. Despite two reviews of the Pathways Program there was still no embedded
mechanism to monitor the performance of the program. This study has made significant progress in redressing this failing by developing an ability to track students’ performance chronologically within a continuum based framework. Significant progress has also been made in terms of digitally centralising all data on individual students. As well as monitoring of the performance of students and programmes within the curriculum the benchmarking allows for a far more individualistic approach to counselling students, in terms of what path would be most advisable for them to take based on their academic performances.

A widening engagement with student data has been a direct outcome of this project. Indeed, in the later phases of this project (2012), the entire system of testing, reporting and disseminating student data was radically revised. Significantly, all of the standard, non-government mandated, testing regimes that were in use at the beginning of the study were abandoned. Many of these adaptations were directly attributable to the findings and recommendations established throughout the course of this study.

1.3 Educational Context

The aspiration of mainstream schooling, to educate children and adolescents for successful adult participation in society, is an endeavour that has been pursued for countless generations. From its beginnings the educational process has been guided by intuition, previous practice and trial and error. As the practice of educating students evolved and the processes became ever more complex the need for an evidence base has become increasingly important. In the past few decades, with the advent of electronic means to collect store and access information, the educational process has become increasingly complicated. Whereas in the past much of how educational practice was understood was
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based on tradition, the contemporary education of students has become the subject of an ever increasing analysis, with an increasing focus on measurable student outcomes.

In the recent past most attempts at student tracking have been partial and relatively rudimentary, which in some ways can be counterproductive (Bambrick-Santoyo 2005). Hess (2009) uses a black box metaphor to emphasise the need to recognise that student achievement data was often examined in isolation. In isolation these results may illustrate how students are faring, but do not enable diagnosis of problems or manage improvement. The limitation of available methods for using or interpreting data was a major stimulus for this study. For example, St Joseph’s College had a history of trialling various versions of the vertical curriculum in the Pathways Program but, as was identified by a number of reviews, there was no system for monitoring the benefits or costs of these changes. It was apparent that a systematic approach of storing and using student data was required. Previously, authors have identified the value of being able to provide feedback to students to improve learning outcomes (Hattie 2009). It could be argued that as a method of monitoring performance in any endeavour, accurate timely feedback is always going to be useful. By extension, when monitoring students’ performance and progress, having accurate and reliable assessment data will obviously strengthen the ability to monitor the strategies that are being utilised.

Schools and related centres of learning are under increasing pressure to provide a reliable and measurable ‘product’ (an increasingly used neo-liberal metaphor), namely, the educational outcomes of students. In mid 2009 the Victorian Government announced that it was implementing a program to publish student performance data on the internet. Among other things, this online register of all Victorian Schools would allow all interested parties the ability to compare the performance of different schools (Tomazin 2009). The ‘My School’ website, launched by the Australian Government early in 2010,
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summarises the performance of students on the mandated NAPLAN testing carried out for students in Years 3, 5, 7 and 9. The performance of these student cohorts on the various literacy and numeracy tasks are pooled, tabulated and graphed. This rudimentary analysis is then used to rank the performance of schools compared with other schools in the state.

In reality however, much of the data available on the My School’s register is raw and is not suited to making direct comparisons between school performances. For example, when the performance of St Joseph’s College is examined, it is compared with statistically like schools that include Perth Modern School (which is Western Australia's only fully academically selective school for gifted Year 8 to 12 students), Chrysalis School for Rudolf Steiner Education (with approximately 175 students in classes from Kindergarten to Class 8) and Condamine State School (a small primary school of about sixty students from the Condamine Township and surrounding properties). In a similar manner, a benchmarking tool that tracks individual students will be open to misinterpretation unless some type of moderating approach is taken to demonstrate the improvement of the individual compared to their potential. This focus on student performance compared to estimated potential was initially considered a major concern, but ultimately, the limitation of not being able to determine potential accurately redirected the focus of the study.

1.4 Situating The Study

Educating students is a complex process that requires constant monitoring and vigilance, to ensure that the progress of students is maximized. The pursuit of quality education for students requires the establishment of meaningful and systematic means to capture, analyse and interpret student data. The meaningfulness of this can be gauged in its utility with staff, students and parents. Studies such as Science in Schools Project (SIS) (Gough and Tytler
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2001) use wide ranging research instruments and testing materials to develop a model for improving science teaching and learning. Identification of performance parameters that can be measured and used to guide improvement were central to this study. The focus of a similarly large-scale study such as The Third International Mathematics and Science Study (TIMMS) 1998 has obvious uses for the development of global, national, or even state wide programs to assist in the improvement of education. These studies have made significant gains in developing and incorporating data analysis into improving education of students. In relation to these studies, they are positioned at the opposite end of a spectrum compared to the work I sought to undertake in the current study, which was designed to investigate similar features of the educative process, but at the individual student level. Whereas large scale research projects, undertaken across multiple sites, may result in some type of trickledown effects into many classrooms, my research design was focused on a ‘bottom up’ approach to mobilizing change. Oriented in ‘the particular’, the study design I implemented sought to address issues that were pertinent to St Joseph’s College. As such, generalisations of my research would rest with the reader and not the writer!

Longitudinal studies that follow a particular cohort of students through part of their secondary education have shown that specific information can be a useful tool to identify areas of the education process that may be lacking (Lindahl 2003). Science, in particular, has been identified as a subject area that students often have a real interest in during the early years of education but suffers from a marked decline in interest as students progress through their schooling (Greenhalgh 2002). The cause of the decline has not been clearly identified, but some suggestions have been proposed that may be contributing to the phenomenon including cognitive conflict. It is proposed that where students notice discrepancies between their cognitive structure and external information from the environment that this “disequilibrium” can lead to students’ interest being aroused and deep learning is the likely result (Lee 2003). Alternatively,
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it is argued that a general lack of understanding and empathy for student weaknesses on the part of science teachers lead to student frustration and ultimately rejection of the subject area (Morrison and Lederman 2002).

The observation that a large number of students lose interest in science was initially an important impetus of this study. Given my discipline training, my initial interest was directed at attempting to identify students that seemingly had potential to do well in science but were no longer taking science subjects. Many previous studies have attempted to identify factors that influence student subject selection and consequently explain the decline in participation rates in the sciences (Greenhalgh 2002). Other studies have indicated the discrepancy between students’ potential and the observed performance may be more a reflection of inadequacy of the curriculum delivery as opposed to student capacity. This becomes very apparent, for example, when targeting gifted and talented learners and observing the disproportionate number of gifted and talented students that do not perform as well as expected (Gross 1993, Gross 2004). This rationale has often formed the basis for instigating a vertical curriculum as opposed to the more traditional progression of automatic promotion of students based on chronological age. Drawing on their research, Cohen and Maxwell (1985) argue that the learning difficulties that students experience in particular subject areas can be partly explained by an academic promotion system that fails to take account of a student’s asynchronous development. As such, the inadequacies of students may be averted by having more accurate assessments of student ability. This issue lies at the very heart of this study.

During the formative stages of this study my interest was directed towards the factors influencing students’ selection of and participation in science units. As the study progressed, it became increasingly clear that most of the issues I was interested in extended to other subject areas. As a result, the study quickly developed a far more wide ranging focus wherein the development of insights
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and strategies that could potentially guide student learning with a more holistic focus. And so, a significant component of this project developed towards assisting students to reach their potential via the development of performance data monitoring for every student. The challenge was therefore to develop and institute practices wherein every student’s learning performance could be measured and monitored. While this sounded straightforward it did not take long to realise that this was a lofty goal.

In the past, attempts have been made to identify the characteristics of an effective teacher in order to enable the identification of practices that could be incorporated into the pedagogy of teachers which in turn would enable a movement towards an improvement in the quality of teaching in a widespread manner (Tytler, Waldrip and Griffiths 2004). The quality of teaching has been shown to be highly correlated with the level of content knowledge of the teacher (Hickey 1999). Differences in the level of content knowledge of teachers will always vary and identifying such relationships with student learning is one more step towards developing better educational processes. The current study took a different approach, in that rather than examining the classroom curriculum delivery, it entailed examining student perceptions with an emphasis on their experiences and perceptions of Mathematics, English and Science. Individual teacher differences were not a major consideration.

During the course of this investigation student perspectives were regarded as an important aspect of the overall data. In developing the Pathways Program, at no stage were student perspectives sought or considered in any detail. The designers of Pathways simply made a range of assumptions about what was best for students. This, I believe, was a major oversight in the development phase. Students are the central component of the educational process, but their views and perspectives are often overlooked in key decision-making. I believe that it is essential to recognize that developing the best practices in promoting student learning must be based on consideration of all the available viewpoints and
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data. Student assessment data is one component of the parameters that can be used to develop an informed picture of educational effectiveness. If an individual student has a view of their education that does not coincide with the assumptions of their teachers, school or parents then it is likely that they will experience some form of disconnect. That said, it is not possible for any systematic analysis to take into account every possible variable that will effect student learning (Kirkup 2005).

Assessment for learning has been identified as an important dimension of ensuring that teaching and learning goals can be met (Black 1998). Here, the type of assessment used to guide learning is important. At St Joseph’s College, like many other schools, the amount of assessment data available is substantial, but decisions have to be made as to the appropriateness and purpose of this data. At times, it is evident that politicians, bureaucrats and educators have very different views on the type of data that is important and of its application and usefulness (Ferrari 2009). At an administrative level, assessment data is often used to make judgments about the performance of the school, its teachers and leadership. However, basing such judgments on student performance is merely conjecture. The variability between individual students, class groups, school systems, states and of course countries, mean that the only truly reliable measure that an assessment gives is an indication of how that particular student, or student cohort, performed compared to others. Whereas teachers within a particular class are far more concerned with how assessment can be used to benefit an individual student’s learning.
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1.5 Warrant for the Study

Within a highly competitive neoliberal socio-political context, schools are increasingly encouraged to demonstrate the value, or point of difference, of their ‘product’ (Ball 2003). In secondary schools, the performance of final year students is tightly measured and quantified and the reporting of these results is widespread. At St Joseph’s College, the school assessment systems are heavily biased towards the production of student reports, wherein very little of the assessment is directed towards strategically guiding or enhancing learning. Here the focus is on the assessment of learning rather than assessment for learning. This study was purposefully designed to help improve the use of assessment data, both quantitatively and qualitatively, in order to provide opportunities to actively enhance student learning.

The warrant for undertaking this research was rooted in improving current practice. The primary aim was to assess the progress of students at St Joseph’s College in ways that could simultaneously be used to assist them to develop purposeful learning goals and strategies. Embedded in this was the need to clearly identify what data was being collected, evaluating ways in which data collection could be improved and developing new approaches to making effective use of data.

1.6 Significance of the Study

The study evolved over time and the manner in which it impacted on St Joseph’s College grew significantly. The study was designed in an attempt to improve the validity of routine testing and use of the data generated at St Joseph’s College. The project was conceived with the aim of having an impact on many facets of education at St Joseph’s College. Changes were sought to reform the
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way in which the St Joseph’s community thought about and engaged with the types of testing undertaken, the manner in which testing is conducted and the ways in which the data is accessed and used to inform teachers and staff with regard to their dealing and interactions with students. The study set out to improve data reliability which could then be used to instigate significant changes in the reporting of student development to parents and guardians. Student perspectives were a source of data acquisition that had been poorly considered prior to the beginning of this study. The views and perspectives of students form an important component of my investigation and are discussed in detail within the Dissertation component of this Folio.

The study was positioned to identify a growing need to develop some form of coordinated approach to improving the learning of students via data utilization, which in part was responsible for the development of a new leadership position at the school on two occasions during the course of this study. The year 2003 saw the appointment of a Learning Enhancement Coordinator, who had key responsibility for looking at the use of data. The actual role description referred to a large number of responsibilities but one clearly stated the requirement - to collate and analyse statistics dealing with academic performance. This was obviously a clear reflection of the evolving interest of the potential importance of data use. This was clear conformation that the current study was fortuitously positioned to significantly contribute to a path of change for educational practices at St Joseph’s College. The first two appointees to the position focused on issues other than data analysis. Some superficial analysis would occasionally be presented to staff, but with no embedded process for widespread storage and access there was very little impact on the way data was being accessed. On the up side, the appointment of a learning enhancement coordinator did begin to raise the profile of data use within the school and provided a vehicle for some of the strategies that could be generated from my study. The Director of Curriculum at the time, recognised the importance of more efficient use of data and so a process began that was to allow the
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developments of my study to effectively shape a number of whole school processes.

From the very beginnings of the study it was anticipated that findings and recommendations that emanated would be developed and implemented heuristically. The process of generating change, based on evidence as it emerged, is very much consistent with the practice of a workplace-focused doctorate. As a longitudinal study, the investigative pathway this study was to take was to be determined by the results that it generated. The outcome of this nexus between the direction towards which the study was to head and the improvements that could be made to benefit students learning would continually allow refocusing the study towards improving student learning. The study was to become a significant voice in the ways in which the school community developed as a learning institute. This is a clear example of insider research and the nature of workplace-based research allowed the insider perspective to become a major strength of the study.

As the insights of my investigations were revealed, they began to have greater influence initiating ever more significant changes over the direction of practices of the school. Decisions were being made that took into consideration what evidence was identified from the research I was undertaking within this study. For example, the pursuit of improvements in data accessibility and storage was initially focused on trying to determine which data was the most critical and then work was undertaken to develop systems to use this data. Access to the data needed to be reliable and straightforward and it was recognized after some time that developing the actual hardware and software mechanisms to achieve this outcome would require far greater expertise than what was available at the school. The outcome from this was for the pursuit of a collaboration with six other schools to fund the development of dedicated and purpose-built software that would overcome many of the issues identified during the course of this study. Although the study wasn’t responsible for the actual production of the
new software it was intimately involved in developing the motivation to fund the contractors and no doubt directed St Joseph’s College involvement in this process.

The increasing influence and effect that was being generated by this study was also to impact on the way in which I was functioning as a teacher within the school. My professional existence was initially dominated by the needs of the students in my classes. As I began to undertake this Folio study it changed the previously limited focus of my professional existence, for now I was seriously working towards the aim of improving the learning of students I did not teach. I was also now working towards changing the way colleagues were working and importantly attempting to improve the way my colleagues viewed and ultimately utilized student data. On a professional level, I also found that the widening focus of my research was a significant factor motivating me to decide that to effect positive changes that emanated from this study I was going to have to consider less teaching and take on more leadership capacity. Initially I applied for and was successful in gaining the position of Learning Enhancement Coordinator as described previously. Although the time allowance was not substantial the position was relatively flexible and I was able to devote the majority of the time provided to data analysis and related issues. This increased the capacity for my research to influence change. The importance of data analysis and use in general was still in need of significant improvement and in fact, an external audit of the school towards the latter part of this work identified this weakness in the school and a new position of Director of Teaching and Learning was formed. I successfully applied for this new role and fortuitously the position provided a unique opportunity to begin a widespread program of change in the manner in which data was collected, stored and used. The results from this study were to become a platform for considerable change in the ways in which student data was to be utilized at St Joseph’s College.
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1.7 Research Questions

There are a number primary research questions that this study set out to address and these questions also reflect the organisation and structure of the dissertation component of the work. The dissertation chronicles three phases with each addressing one of the primary research questions.

The First Phase set out to determine;
1. How does the data collected at St Joseph’s College reflect the learning journey of students at the school?

The Second Phase of the study looked at taking the findings from the First or Pilot Phase to determine;
2. Can data be used more effectively to enhance the learning outcomes of students at St Joseph’s?

The Third Phase of the study was dominated by the need to determine;
3. Can strategies be developed to build accurate records of student assessment that can be used effectively by teachers to assist with ongoing student learning?

In order to address research question one, the first Phase of the study was focussed on understanding the reliability of existing, archived, testing data results. Testing being used was evaluated and as a result significant changes were implemented. Some objective statistical analysis of assessment results were undertaken to investigate validity of testing data, and importantly, subjective data was obtained from students directly through interviews to corroborate testing results. Student perspectives were explored to determine major influences in their decision-making processes and surveys of similar schools were conducted to determine the effectiveness of current approaches to data use.
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The next two research questions were far more complex. Strategies needed to be developed to transform data sets into tools that could be used to increase teacher effectiveness and improve student learning. These tools then required some type of performance analysis. This was a very complex and organic process that may have begun within the confines of this study but has led to significant changes in the whole school approach to data use.

As this study is a professionally focused Doctorate it differs from a more conventional Doctoral study in that it is far more located and contextual and as a result it could also be considered as a far more iterative undertaking. Although the study began with some clearly defined goals and was attempting to address particular research questions over the course of the investigation, the over-arching driver was to positively improve the learning of students at St Joseph’s College. The complex interaction of the research ‘environment’ meant that, while at some times the course of the study was influencing practices and processes at St Joseph’s College, at other times the processes and practices of St Joseph’s College were shaping the course of the study. This demanded a strong degree of reflexivity in the progress of the research.

1.8 Research Aims

As a professionally focused Doctorate it was essential that the aims of the study were intimately entwined with the educational goals and commitments of St Joseph’s College. As with any educational facility the welfare and educational outcomes that are provided to students are of primary importance across all aspects of school practice. In keeping with this, all aspects of this investigation were underpinned by an intentionality to improve the learning of students at St Joseph’s College. To achieve this primary aim a number of significant goals needed to be met.
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Initially, the study was positioned to determine which testing data may be most valuable, in the sense of what data was reliable, accurate and useful. Objective and subjective methods were used to develop an approach that validated data but also presented it in a readily available teacher friendly format. Next, steps were taken to rationalise the testing so that it was reliable, valid and cost effective. Testing for its own sake is obviously an unnecessary expense, testing for reporting is inefficient but testing to promote learning is an effective use of resources.

Once testing material was decided the next significant aim was the improvement in the storage and retrieval of student data. This was to occupy a significant amount of the study. Schools, as a general rule, are very effective at collecting data; but disseminating and utilising data in an effective and productive way is a very complex process. The process of making data a learning tool is closely associated with the process of encouraging staff to not only access data but to incorporate it into their professional planning and pedagogy. The effective use of data would also include the data being used for reporting purposes and as a resource for students when making decisions about potential subjects to study.

Another important aim of the study was to ensure that the systems and continuing processes developed were not dependent of any particular individual or small group of people to function. A number of schools were identified as having developed some useful mechanisms for data use, but it was very obvious that these systems were heavily dependent on the expertise and motivation of, in many cases, one person. It was apparent that any effective system for data storage and use must be able to function in a somewhat self-perpetuating system that could be used successfully for an extended period of time independent of any specific staff.
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1.9 Structure of the Folio

This Folio documents a professional journey as it played out over the seven years of the study. As outlined, the study was very much a workplace Doctorate and as a consequence the actual structure of the work is distinct from a more traditional Research Doctorate. The current Introductory Chapter provides an outline and warrant for study and prepares the reader in terms of the context of the work. The Literature Review provides insight into relevant research that has influenced the development of the study and provides context to position the developments at St Joseph’s College within the broader education field. The Dissertation forms a major part of the study and primarily presents the research undertaken and presents the findings in thesis form. The Dissertation is followed by the presentation of two Professional Writings that reflect the contributions that the study has made to the practices undertaken by the professional community at St Joseph’s College and acknowledges some of the paradigm shifts that have been propagated by this work.

1.9.1 Literature Review

It is vital to identify the professional context within which this study lies. The traditional method to achieve this is of course through the production of a literature review. One of the difficulties with a study such as this is very much entwined with the nature of a professionally focussed Doctorate. There are few accessible examples of studies that examine circumstances of an educational facility such as St Joseph’s College with similar idiosyncratic characteristics and features. Notwithstanding this, the literature review contextualises the current study predominantly to help position the reader as to what previous studies and insights have been influential in the process of framing and undertaking this research.
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The literature review is divided into a number of sections that will explore what student data has previously been considered as most useful, how that data has been generated and stored and, of course, how may this data have been used to improve the learning outcomes for students.

1.9.2 Dissertation

The Dissertation is comprised of three distinct but interconnected and dependent Phases. The first initial phase chronicles the early findings that formed the impetus for the second phase which in turn lead to the development of the third phase. Each of the phases can be considered as important incremental developments forward towards the aim of the study, to positively improve the learning of students at St Joseph’s College.

Historically, schools have been very active in collecting and collating assessment measures of student performance on a range of academic testing procedures, teacher opinion and even more recently, student opinion. Generally speaking, most assessment data was then used to produce a report of performance and progress for each student. This information is typically presented as a letter grade, percentage mark, progression point, qualified statement or graphically in the form of a box and whisker plot. The reporting of data is usually used in conjunction with some form of parent-teacher interview to supplement the relative limited information that is conveyed through the limited representations of data. The relative lack of functional use of the assessment data to actually guide or enhance student learning was a driving factor for this investigation. An initial survey of six schools with similarities to St Joseph’s College was conducted to determine the range of data utilisation that might be appropriate. The survey results revealed that although all schools were conscious that assessment data was an important dimension of school practice, none of the schools surveyed had any formal process of using
data in any sort of regular or systematic way. Through this work I became increasingly convinced that if the current failure to have defined protocols for data analysis could be corrected, it would undoubtedly contribute significantly to optimising the learning outcomes of large numbers of students. The most obvious weakness for data utilisation within St Joseph’s College was the lack of any systematic institution-wide, longitudinal monitoring of student achievement to determine if progress was being made, and importantly whether effective learning pathways were being developed for each student. Some of the surveyed schools would “visually monitor performance” in a very general way, while one school in particular would “look for any high achieving students” that seemed to be underperforming and this might entail speaking with a couple of students to ensure the “high flyers” kept performing. The aim of this study was to develop a more sophisticated approach to monitoring students’ performance that could be used to enhance the learning of all students.

In the pursuit of addressing the first research question posed for the study it was important to attempt to standardise all assessment data that was to be included in student reports and then use this to provide a direct comparison of all students’ performance. In a school of 1550 students this meant that up to six assessment pieces per student for at least six subjects had to be recorded, standardised and then analysed each semester. A total of around 46,000 results would need to be compared. The difficulty of being able to process this large amount of data meaningfully and within a very short time frame would require a very different approach to the whole school approach to data collation. Attempts were made to modify the way in which data was processed in the reporting program used at the school, but this was eventually deemed to be too difficult in the short to medium term and so alternative approaches were developed. During the course of this study, steps were taken to develop databases in spread sheet format that could be accessed by teachers. This was clumsy and teachers were reluctant to readily utilise the resource. This was one of the driving factors that lead towards a wider search for a means to effectively
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incorporate assessment data into a simpler benchmarking process. The momentum for attempting to utilise data then led to a more widespread approach to using data of all types not just academic, but personal, social, attendance etc.

Attempting to use all available data related to assessment for a student has some intrinsic problems associated with the actual volume of information. Many of the educational assessments performed by teachers have a significant subjective component, that although quantified for reporting purposes, are rarely manipulated to allow direct comparisons between assessment tasks. For example, a piece of work in English may be given a variety of values depending on the assessor and not the intrinsic value of the work. These problems are addressed in large scale assessment programs such as the VCE, but in individual schools for individual subjects this is a far more uncommon practice. When using many assessment values to determine a mean value for each student the variation between assessment values tends to be smoothed over, making students of varying ability seem similar. These issues were central to a decision to restrict assessment data for benchmarking overall student progress to a few major assessment results that would form a reliable measure of each student’s achievement and still allow comparison of performance.

The standardised tests initially used at St Joseph’s College were:

- Year 7 NAPLAN (National Assessment Program Literacy and Numeracy) (formerly AIM) and ACER Literacy and Numeracy testing, Raven Progressive Matrices and the South Australian Spelling Test.
- Year 8 ACER Literacy and Numeracy
- Year 9 NAPLAN
- Year 12 VCE
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Although the NAPLAN testing is used it has a major limitation in that the results are not made available until very late in the academic year that the students are already undertaking. All students were tested before beginning year 7 using the ACER PAT maths, PAT comp, PAT vocab standardised test, Raven’s Progressive Matrices and the South Australian Spelling Test. At the commencement of this study, the test results of these tests were used sporadically to identify very low performers and also to create class groups of mixed ability. Phase one of this study was undertaken with the goal of being able to use the test results to identify student potential and then use the data to produce an initial benchmark of the students’ academic ability for comparison with subsequent performance.

Investigations into the reliability and accuracy of the aforementioned tests were undertaken during the first phase of this research. The testing results were analysed statistically taking results from students when they first enrolled at the school and compared with their subsequent performances six years later in VCE. More subjective exploration of testing was also investigated. Factors such as the way in which students perceived the program and curriculum were reconnoitred through interviews. Student interview data was also investigated as a means for corroborating the objective data of standardised testing. Survey data was also collected from similar schools as a means of determining a broader perspective into how data was being utilised in like schools.

In the early days of this investigation attempts to simply locate the data were more difficult than anticipated. All students that had been accepted to attend St Joseph’s College had undertaken some form of academic ability assessment for the decade previous to this study beginning in 2005. The testing used was readily available testing such as ACER (Australian Council for Education Research) numeracy and literacy testing, Raven Progressive Matrices and a number of popular spelling tests. The tests were all widely used by schools and St Joseph’s had made a significant financial commitment to this system of
testing. In order to determine how the mechanisms at St Joseph’s College compared with the practices at similar schools a survey was conducted to ascertain the types of approaches and the manner in which data was being used. Six schools participated in the survey and the responses from the survey were used to develop a strategy that would improve the way in which data was utilised at St Joseph’s College. Input from other schools also meant that developments were made that held some scope for application in schools other than St Joseph’s College, although this was not a primary aim of the study. Towards the completion of this study some of the surveyed schools made specific requests to visit St Joseph’s College with the primary aim of observing firsthand how the College now approached the use of student data. These interactions were particularly affirming especially when colleagues from other schools sought advice and were then keen to adopt some of the practices developed during this work. This suggested that the developing outcomes from the study were tangible improvements in the way students at St Joseph’s College were being educated. Presentations were also made at various professional conferences and meetings and much of the feedback indicated that the way in which data was being utilised at St Joseph’s College was significantly advanced in comparison to many schools.

The suite of ACER tests that had been previously used during Phase One of the study were eventually discarded in favour of an adaptive testing facility. The adaptive testing format had the benefit of giving reliable assessment results for all students with the important advantage of requiring no extra work for teachers. As the testing was conducted via the school intranet and results became available as soon as the student completed the tests there was virtually no resistance from the teaching staff toward conducting the testing. The results from adaptive testing allow a far more individualised approach to student monitoring and ensured that all students are challenged with assessment tasks that are appropriate for their individual abilities. This process of trialling a range of testing procedures took a considerable amount of time and represented
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an important improvement in the acquisition of student assessment data. The process had taken place due to some significant paradigm shifts, from testing students routinely because it had been done so in previous years towards choosing tests that gave virtually instant feedback on students that could be used to inform the pedagogical processes that were impacting directly on the learning of the students.

During the same period of rationalising testing formats, the search for a new mechanism that would ensure the optimal use of the data lead to St Joseph’s College becoming involved in a program that was to become known as the Geelong Central Project Steering Group. This was a group of schools including local Government Secondary Schools and Catholic Secondary Schools that had all become interested in improving the management of data within their schools. The group was a development of the Post Compulsory Change Project (PCCP) a development of the Smart Geelong Region Local Learning and Employment Network which had been launched in April 2007 as a government initiative to encourage in depth research and analysis of young people’s transition through schools. The ultimate aim of Real Time Student (RTS), as the project later became known, was to develop a comprehensive web based system that centralised the data relevant to student learning and performance from a range of sources and make it readily available in user friendly formats. This development was quite fortuitous for the current study. A major hurdle in the process of better utilising students’ data had proven to be in reality a software issue. Despite extensive investigation there was no commercially available software that could be readily adapted to track students in a manner that not only highlighted the progress and standards achieved by the individual student and could also give valuable insight into whole class progress or even year level cohort progress.

Ultimately, the resources of eight schools were utilised to engage a software development company to build the program. This process would have been
prohibitively expensive for any of the schools independently, and even despite
the use of an experienced computing firm, the process was by no means
straightforward and involved many delays and setbacks. Although RTS
provided ease of access to data it was not capable of analysing data or even
storing data. It was in effect a search tool that collated and presented students
data. Important information and analysis of the data was still required and this
was achieved with a separate software tool. This time a commercially marketed
system was available and this greatly reduced the time and resources required
to collate and analyse student data. The software chosen called SPA (Student
Performance Analyser) (Holmes-Smith 2012) became available during the
middle part of this study. In fact, a considerable amount of time during the first
few years of the current project was dedicated to trying to adapt readily
available systems to achieve the functions that SPA was capable of. The effort
in attempting to develop systems was by no means wasted as it also produced
evidence as to which type of testing was most useful and importantly helped
the process of streamlining the collection and collation of existing data. If SPA
had been available at the beginning of the project, the progress made may have
been very different.

The process of monitoring student progress must in some way gauge a student’s
performance against their potential; keeping in mind that the potential of
students can vary significantly depending on ability, home environment, health
issues and a myriad of other factors. This study initially focussed on the
straight-forward statistical approach to monitoring students’ performance based
on routine testing. It quickly became apparent that although this approach may
work reasonably well for a large proportion of students, the fact that it does not
accommodate all students readily revealed the need to develop systems that
were far more comprehensive in the way that learning achievements were being
monitored. Meta-analysis is good for an approach that can be used to monitor
the overall process and therefore give an indication of the efficiency of the
school curriculum and the pedagogical approaches that are being used (Hattie
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2009). At the level of individual students meta-analysis is far less useful. Meta-analysis is useful for an administrative approach to managing students learning, but in terms of the learning needs of individual students the approach must be more of a case study type approach, many influences on students learning are not readily quantifiable. The learning processes, through which individuals progress, are far too dynamic and idiosyncratic to be averaged numerically. Ultimately though, any system that attempts to manage large numbers of students must have some type of objective, numerical value that is central to the system in order to allow some type of systematic processing. The outcome of this set of circumstances in this case was that initially testing was undertaken to assess students literacy and numeracy levels using computer adaptive testing (CAT) and then use this information as the quantifiable measure to place students in context in terms of academic ability within their year level cohort.

As time progressed, the limitation using linear, non-adaptive testing procedures had become apparent and lead to decisions that resulted in the pursuit of a process that included adaptive testing for all students. In a case where student performance was considered below the range where a student would reasonably expected to cope with standard classes, further testing and assessment was undertaken using the On Demand testing feature of NAPLAN data services. If the student was still considered to have potential difficulties with a standard literacy or numeracy class he was then recommended for the skills consolidation program. The placement of the student within a specialised literacy or numeracy strand would then be negotiated with parents and the student. These students were then placed in classes to allow more intensive assistance with numeracy and literacy skills. In an ideal system students that are determined as gifted would also be identified and suitable programs would be offered to accommodate their needs, but this is still to be fully explored at St Joseph’s College.
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During the course of this research a concerted effort was made, determining the predictive uses of the assessment data and the possibility of using this information to advise students in a far more evidence-based approach as to what areas of academic pursuits were most suitable for them. This was accompanied by a wide ranging interview process wherein a representative sample of thirty students from Years 7, 10 and 12 were individually interviewed to determine student perspectives of the St Joseph’s College learning experience. The interview responses were used to compliment the assessment data in trying to identify correlations between students’ performances as determined by assessment data, student perspectives of their own abilities and the type of advice teachers could potentially give in helping students determine their subject choices.

The final Phase of this study was dominated by the development of strategies to build longitudinal, accurate records of student assessment that could be used effectively by teachers to assist student learning. In fact, the final phase of the study was to a large extent about refining the mechanisms for allowing teachers to use assessment data productively. This phase of the study documents the process of how the development of the study began to influence more than just the process of gathering and storing of accurate assessment data. It also began to have an impact on the way student performances were reported to parents and guardians and also led to significant changes in the pedagogical approaches of some staff and the way that the individual learning needs of students were being met in the classroom.

Through the efforts of this study, adaptive testing of literacy and numeracy skills became routine for all Year 7 to 10 students. The tests used were objective in that all tests were generated, delivered and corrected automatically by computer with no input from teachers. This removal of teacher input was met with a variety of attitudes. Some teachers appreciated the availability of impartial assessments results that required little teacher effort while others
displayed certain reservations. There was some initial concerns expressed and a certain amount of reluctance from some teachers, particularly those concerned with the impact keeping detailed, accurate estimates of lower ability students. These staff voiced opinions that informing students in, for example, Year 10 that they had the literacy and numeracy skills of a Year 7 would be far too detrimental to the students’ self-esteem and also the parent would be disconcerted if we were suddenly “accurate” about reporting on the abilities of their sons. Although the third phase was the final phase it did not represent an end to the influence and changes stimulated by this study. Although the study effectively led to significant changes in the pedagogical approaches of staff and the way that the individual learning needs of students were being met in the classroom, the momentum created to investigate alternative and more efficient methods of data use continue to proceed past the end of the study. The changes catalysed by this study although significant, are not an end point. The third phase chronicled the development of attitudinal changes to the way in which information can be used to inform educational growth and development rather than document simply what has occurred.

1.9.3 Professional Writing and Practice 1

This Folio provides insight into the ongoing process of change and development of data utilization at St Joseph’s College. It also demonstrates the way in which my professional persona evolved due to my involvement in influencing change through the work I was undertaking. The Folio allows readers to recognize the strong correlation between changes that were occurring within the school and the influence that was originating from evidence that was being generated by this study. The Dissertation component presents a significant amount of ‘hard data’ that forms the evidence upon which changes within the workplace of St Joseph’s College were justified. This Professional Writing component gives insight into the impact that these changes had on the professional practice of
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not only myself but also colleagues at St Joseph’s College and the wider educational community, as results and experiences were shared with other school communities. Presentation of the study to parties outside of the St Joseph’s College environment facilitated perspectives that helped to enable more independent evaluation of the direction the study had been taking. This component establishes a context in which the insights generated through this project have the potential to be transplantable into educational environments external to St Joseph’s College.

1.9.4 Professional Writing and Practice 2

The second Professional Writing and Practice chapter provides insight into the processes of change that developed during the course of the study. This component of the Folio was produced as an internal report for use within St Joseph’s College. As completion of the project approached, I unfortunately, had many serious personal family issues to deal with and decided to withdraw from the position of Director of Teaching and Learning and return to a full time classroom teacher role. It was, therefore, important to create a document or report designed to provide management and my successor with a resource to assess the gains that had been secured through the work, but also to provide tangible recommendations that could be used in guiding future directions for this work. Introducing change is inevitably associated with complexity that at times can be foreseen but at other times develops less predictably. The work accomplished to date should not really be seen as an endpoint but as a period of investigation and reflection that was able to guide change during a defined period. To this end a significant part of this second piece of professional writing was to outline possible future developments, strategies and recommendations that may assist in future improvements for student learning at St Joseph’s College.
1.9.5 Folio Conclusions

This study was primarily concerned with the examination of the variety of student assessments and the practical applications of this data for the management and monitoring of student learning at St Joseph’s College. Analysis of major components of the data collected identified a number of significant deficiencies. These weaknesses in the type of data and lack of uniform utilisation of the data led to the direction that the second phase of the study was to take. Exploration of potential avenues for learning improvement through collection of standardised assessment results was examined and implementation of significant changes to data use were recommended and implemented. In this Chapter I review the major themes undertaken across the project and outline the major implications of this work.
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2.1 Introduction

Schools in Australia have significant autonomy in the early and middle years deciding how they teach and how they assess students’ achievement (Tognolini 2006). This autonomy is visible in Government run public schools but particularly evident within the Catholic and Independent School systems within Australia. By the time students reach their final years in secondary education the autonomy of program and assessment is reduced. Although the development of an Australia wide curriculum is still in process, the actual processes that students experience during their final years of secondary education are generally similar. In fact, the courses undertaken by students during the final years of secondary schooling are aligned so that they can apply for entrance to tertiary institutions. Their performance on assessments is converted to a numerical value that is then used to rank the performance of all students, Australia wide. A significant number of assessments are in the form of exams that are developed and distributed by the various responsible authorities within the states. There is significant overlap between the various states and in fact, often students are able to be compared directly within and between states by the production of ranking systems using statistical manipulation of student assessment data such as the Equivalent National Tertiary Entrance Rank (ENTER) (Tognolini 2006) which was then superseded by the Australian Tertiary Admission Rank (ATAR) (VTAC 2013).

Outside of tertiary ranking scores students do undertake other mandated Australia wide assessments. The Australian Curriculum, Assessment and Reporting Authority (ACARA) oversee a process of assessing the literacy and numeracy skills of all Australian students within the National Assessment Program – Literacy and Numeracy (NAPLAN). This program is administrated
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in each Australian State or Territory by the relevant local Authority under the direction of ACARA. This assessment involves the testing of students in Years 3, 5, 7 and 9, or their equivalent. Apart from these mandated assessment processes, the actual assessments of student performance is under the discretion of the individual school that a particular student attends. There are guidelines and procedural practices that are widespread in Government Schools, but within Catholic and Independent Schools a very large range of assessment strategies and practices are employed.

The autonomy that Catholic and Independent schools have can be considered as both a strength and weakness of the educational systems in Australia. Having the ability to respond to individual students and cohorts at an individual school level gives schools an ability to personalise and optimise the educational experience of the individuals. Particularly as students reach the senior levels of their education the ultimate aim of the whole process should be very clear. In an ideal world all students would be individually catered for and all students would be presented with genuine options linked to their interests and abilities, regardless of socioeconomic background or geographical location. This idea has been previously expressed as:

“A commitment to equity that is both a philosophical and a research-based position that counters beliefs which emphasise the fixed nature of intellectual abilities. Its fundamental premise is based on research that supports the idea that cognitive abilities are not dependent solely upon innate ability but that they are developed through socially supported interactions” (Bransford 1999 p.4).

The idea that individuals do not have a fixed nature of intellectual ability is really an acceptance that intellectual development is not merely a phenotypic characteristic that is solely controlled by genetic predispositions, nor is it merely a reflection of exposure to particular stimuli or environments. This, of course, is quite intuitive, as for any student to achieve their potential it is critical
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that they are in a supportive and stimulating environment that allows their achievement to be maximised and their potential to be harnessed. Trying to determine what the actual potential of a student is or what might be the most effective learning environment for a student will undoubtedly remain as an unanswered intellectual pursuit for as long as education continues to exist. The potential of human intelligence in general might very well be considered almost infinite.

If it is accepted that the process of learning and the most effective means to encourage learning are incredibly complex, then it is of no surprise that the number of proposed methods for monitoring and improving students learning are extremely numerous and varied.

2.2 Types of Data Analysis

Data generated from student activity, primarily responses to some type of assessment, can be regarded as falling into three main categories for analysis, namely, raw data, value-added and contextual. The same data can be interpreted in very different ways depending on which category is being considered.

(i) Raw data analysis, as the name implies, is simply an indication of the judged performance of a student on a particular type of continuum. The performance data that are most readily available and frequently used are derived from the measurement of an individual pupil’s attainment in statutory assessments, public examinations and other national assessments at different points in their education. Some educators have argued that the raw data of students’ test and examination results provide important information about the effectiveness of a school (Gilbert 2008). This data is analysed to generate key indicators, the most common being ‘threshold indicators’: being the proportion of pupils achieving a particular level or grade. As an example, commonly used, important threshold
indicators for schools are the percentages of pupils achieving particular levels in both English and Mathematics. It needs to be recognised that the data is only as good as the processes that produce them, and only reflect pupils’ attainment as measured by specific exercises undertaken on a specific day. It is possible to argue that the assessment is flawed or the tasks test only certain kinds of attainment in certain ways. However, imperfect as they inevitably are, these assessments have been developed and honed over time and their reliability is high (Gilbert 2008). Raw data analysis can be undertaken at the level of the individual student, class, school or even state or country. Further to this, comparison of individual performances based on their own previous performance is a very robust measure of learning. Performance of an individual compared to their relevant cohort is less informative but commonly used as a comparative measure of performance (Bernhardt 2013).

In broad terms the key indicators selected in such testing regimes are generally arbitrary, as others could equally well be given priority. A particular score on an exam, for example, a Study Score more than 40 in a VCE subject, may be regarded as very successful and yet any score over 30 reflects a result better than at least fifty percent of the student cohort undertaking the subject. However, other analyses and indicators are used for a variety of purposes alongside threshold measures. For example, average points scores are often regarded as a better indicator of student attainment as a whole and are used in some calculations of value added. These are important at a school, local and national level as a means of representing a more inclusive measure of raw attainment data. A further potential source of data is the range of assessments used internationally. The most high profile come from the Organisation for Economic Co-operation and Development (OECD) which conducted a Programme for International Student Assessment (PISA), most recently in 2012. Potentially these testing regimes are the key to evaluating the effectiveness of the education system of a country as a whole, and for
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comparing its performance with that of other countries. At this level the individual becomes less important.

(ii) Value added analysis occurs when comparing performance that recognises students have different starting points. Value added analysis is a measure of the progress made by an individual student, or a group of students, compared with the average progress made by similar students nationally between key stages. If based on the change in average points score from the end of one key stage to the next, a school’s value added figures can be compared with those generated in previous years and by other schools. Value added indicators may be standardised. The difference between a student’s actual points score and the average for those with the same prior attainment is calculated and translated into a standardised measure. Value added scores can also be aggregated for groups of pupils, schools and local authorities to indicate whether the pupils are progressing better than, worse than or broadly the same, as similar pupils nationally. By plotting the actual scores of individual pupils, it is also possible to see whether there are significant variations between the relative progress made by pupils from different starting points. Unfortunately value added analysis is based on an assumption that the development of learning in students is somewhat linear and comparable for all students.

(iii) In an attempt to account for individual variations, the most complex of the analysis types commonly used is the contextual value added data analysis often referred to as CVA (William 2008). In this process, factors such as prior attainment in English and Mathematics, ethnicity, gender, age within year group, special educational needs, eligibility for free school meals, degree of deprivation in the postcode area where a pupil lives, first language other than English, in care, mobility are all considered in developing an estimate of the progress made. Despite attempts to account for all these influencing factors, the data does have some limitations as outlined by Gillbert (2008). It is critical to realise that CVA should not be used to predict the performance of
individuals. It is solely based on the progress of pupils with different characteristics in the past. Misusing the data to predict future performance could depress expectations of groups of pupils that have performed less well in previous years. For example, just because boys may have performed less well than girls in the past, CVA in no way suggests that it is acceptable for this to happen. All it does is recognise that this is what has happened in practice and that when comparing schools’ performances it is fair to adjust the CVA figure to reflect the relative proportions of boys and girls in the school. When setting targets for future performance, schools should strive to set equally challenging aspirations for all pupils. To this end, they should not assume that pupils from particular groups will perform better or less well than others. In terms of utilising an individual’s data to assist in the learning of that individual, CVA analysis has serious limitations. It may be useful as a bureaucratic measure of performance and it can provide the basis for schools’ accountability to their users and the local community, for their own monitoring and self-evaluation and for their planning for improvement. Such data may also inform judgements about whether a school is providing value for money, but as a learning tool it far less useful.

2.3 Measuring and Analysing Performance

The nexus between measuring and analysing student performance and the benefit this may ultimately have on student learning has been recognised previously (Bambrick-Santoyo 2010). For decades students have been routinely assessed and promoted to the next level only to often receive some type of external assessment that alarmingly indicates that many students appear to lack basic proficiency, much less possess mastery over concepts and potential skills that they were supposed to have acquired. Systems that promote and encourage the use of data to drive decision making clearly convey advantages to the development of positive outcomes. Data driven processes
have seen marked improvements in areas as diverse as public service, business, politics and even sports (Bambrick-Santoyo 2010). Consequently, incorporating data driven processes into pedagogical practice in an education setting clearly has the potential to improve student outcomes. The premise of data being used to improve outcomes must be couched with the understanding that the quality of that data will have enormous impact on the potential benefits that can be derived from it.

The measurement and subsequent analysis of any variable is a process that can only be effective when the measurement system follows a clearly defined process. Three clearly defined generalised steps to performance measurement have been proposed previously (Jenkins 2012). As such the characteristics of all good performance measure variables can be presented as;

- The variables must be clearly identified as appropriate to measure.
- The variables must be the most appropriate to use.
- The information elicited must be applied correctly

This is only the beginning of any process that allows the productive use of information to produce positive change. There are also some important implications once the data is accumulated. It is essential that the variables measured are in fact those which will enable the intended goal to be reached. In the case of students in a secondary school setting the variables measured must ultimately accurately reflect the position or skill level that a student occupies within their specific cohort. This assessment of relative ability is of prime importance as in reality there are no absolute measures of academic skill and development. Even the most carefully designed assessment of student ability can only give an estimate of ability compared to an arbitrary set of criteria or to the performance of a large number of students’ results that have been standardised. The world of education would be much more straightforward if students’ ability could be determined as readily as for example
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student mass or height. There is no doubt that a student of mass sixty kilograms is heavier than a student of fifty nine kilograms and lighter than a student who weighs sixty one kilograms. The same type of confident, precise and indisputable measures cannot be made use of with regard to student academic ability. Realistically, measures of student academic ability and accomplishments will be predominantly relative and comparative and many language and creative pursuits are and always will be very subjective. Fortunately though, when the measurement of student performance is focussed on improving teaching and learning, the vagaries and the imprecise nature of the measurement processes are less important than the personal interactions that can be generated, from the data, between learner and teacher (Hattie 2009).

Identifying the most appropriate variables to determine the efficiency of any system is the first step in accurately monitoring change. After the most appropriate variables to measure are identified it is then important to design a measuring processes that accurately identifies actual change in the monitored variable (Bernhardt 2013). This of course in the context of the current investigation is related to student success, that may be ascertained. Excessive measurement of even the correct variables does not guarantee a positive outcome. In fact, frequent testing and its effect on learning is a somewhat contentious issue. Although student performance has been demonstrated to be increased with frequent testing, the amount of improvement in achievement diminishes as the number of tests increase (Bangert-Drowns 1991). Some authors argue that even regular high stake testing, that has implication in terms of potential motivation triggers for many students, has been found to have little effect on student achievement (Amrein 2002). This supports the view that constantly assessing student performance in an educative environment, or bombarding students with assessments, does not necessarily lead to desired learning outcomes. Assessment must have a place in the monitoring of student development, but the balance of sufficient testing to inform teaching and learning effectively is not always a straightforward pursuit. Continually testing
students does not necessarily lead to learning. In fact, rather than increasing the frequency of testing, if the testing is combined with quality feedback it can lead to improved student learning (Gocmen 2003). Another major factor that needs to be considered when developing systems for the acquisition of assessment data from students is that as teachers and learners become more adept and experienced with a particular performance assessment regime, the effectiveness of the assessment will improve (Kim 2005).

The final step in this process of using measurement to improve outcomes is the need to respond to whatever the data implicates as requiring remediation. In an educational setting where the collection of data is ultimately accumulated to improve the learning of students the mechanism identified as having a major impact on the consequent performance of the students is feedback to the student (Hattie 2009). Feedback can take many forms, but the recognition of feedback being an important component of the learning process is hardly surprising. Quality feedback involves the movement backwards and forwards of information that allows teachers and learners to be able to modify future behaviours that then allows improvement or lack of improvement to be associated with recent learning endeavours. In simple terms, regular and accurate feedback can be used to guide continued improvement in performance. Lack of quality feedback can lead to a directionless process that may or may not randomly lead to improvement.

Today’s students face the pressure of ever increasing choices to make with regards to their education and possible career options. This increase in choice is represented by a wider range of subjects being offered in the latter years of secondary education within the VCE; a far greater specialization in the career paths are now available. Increasing choice may be a factor that is promoting a greater need of ‘intrinsic motivation’ in students as it has been shown that student subject selection is significantly determined by student interest (Elsworth and Harvey-Beavis 1995). Faced with greater choice, students are
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required to be ever more aware of the need to make informed decisions. Making effective decisions is a complex process that is readily influenced by a myriad of factors. This study became particularly concerned with improving how informed students, staff and even parents are when it comes to deciding in which direction a particular student should head. The complexity of factors and the very fluid nature of the educational system, particularly in last two decades, have resulted in a dilemma for researchers. For example, trying to isolate, identify and measure the factors influencing trends such as falling science and mathematics participation has proven to be incredibly difficult (McBryde 1991). There are a large number of potential factors influencing student choice including, peers, teacher advice, parental expectations, school organization, student aptitude and educational expectations (Greenhalgh 2002). Realization that the sheer number of variables influencing the student decision making process means that most research undertaken needs to hone in on just a few of the variables. It was decided that to make informed decisions, accurate and reliable “measures of academic performance” are indispensable. As a result, a large part of this study focused on identifying what are good assessment measures.

In most traditional education environments curriculum has been developed with the intent of maximizing student learning and systems have been developed to measure teaching and learning performance. The process of monitoring student progress at an individual school level may be achieved via uniquely developed means that are reflective of the idiosyncratic nature of the particular school at which the monitoring occurs. The educational process in secondary schools has often been associated with a number of identifiable weaknesses ranging from the manner in which programs are introduced and monitored to the way in which students, with individual learning needs are catered for (Goodlad 1984). This phenomenon of identifying issues which impede the educational process has resulted in many studies attempting to assess the progress of students and determining some type of evaluation of the outcomes. Some studies have
concentrated on identifying practices that relate to individual teachers in an attempt to produce widespread increased improvements in the quality of teaching (Tytler, Waldrip and Griffiths 2004). This type of “macro-analysis” may not be as useful at the individual school level, as a more specific “micro-analysis” concentrates on an individual school and more specifically the progress of individual students. The specific nature of individual schools and the growing realization and acceptance that “teacher research”, which is often experiential in a particular learning environment rather than the more traditional forms of academic knowledge, can make a valid contribution to educational knowledge and practice (Gitlin 2002).

To this end, it is widely recognized that research into effective student learning is an incredibly complex pursuit. The number of variables involved in the education of a single student is incomprehensibly large and therefore via extrapolation, when considering large numbers of students, no single study, nor for that manner even a large number of studies, is capable of providing simplistic definitive answers. The use of data within educational settings is an example of a situation where research as a collective enterprise - comprising multiple studies, attacking questions from differing angles, and exposed to the checks and balances of studies in differing settings using differing methodologies can enrich our knowledge base (Henig 2009). Keeping in mind the limitation of discovering definitive answers it would be foolish to assume that without exactitudes research results have little place in the development of education pedagogies and curriculum. The power of research in the field of education is to allow educators to make informed decisions. Research cannot replace the need for professional judgment, but it can inform and complement the decision making process.
2.4 Measuring Student Performance

The purpose of assessment may be debatable, but in its simplest form it can be considered a process of collecting information for a specific purpose. It occurs in education whenever one person (generally the teacher) collects information on the skills, understanding, knowledge, attitudes, and the likes of the learners, generally the students (Tognolini 1999). Assessment without purpose is counterintuitive. It consumes resources and inevitably, will not be used in meaningful ways to promote student learning. It is at best an assessment of learning rather than assessment for learning and if the primary purpose of the assessment is for reporting, although this is a valuable purpose, it should be considered as the ‘shallow end’ of a continuum of purpose. Summative assessments lend themselves to reporting and also to the bureaucratic utilisation of data. As such, historically summative assessment practices have represented a significant proportion of assessments that have generally been utilised in secondary schools. The ultimate summative measure of student performance at the end of secondary education for a significant proportion of Australian secondary students is a measure or rank such as the ATAR (Australian Tertiary Admittance Rank), which is a measure of performance relative to all other students that had undertaken their final year of secondary education in a similar time period.

The use of assessment must be tempered with an appreciation of what an assessment is actually measuring. Accepting that intellectual abilities are not fixed and that cognitive abilities are not dependent solely upon innate ability but that they are developed through socially supported interactions (Tognolini 2006), then assessment data are merely estimates of a student’s position within a learning continuum at a particular moment in time. Assessment data must be viewed in the context of a whole range of parameters. These parameters are many and varied and all impinge on the development of the learner. Hattie’s (2009) meta-analysis of learning gives a clear example of the multitude of...
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influences on learning. The study synthesised many meta-analyses to produce estimates of the measurable effect of 138 varied influencing factors in the process of learning for students. Given that even the best assessment used in schools do not and could not realistically ever take into account all factors that contribute to a student’s learning capabilities and development of skills, data generated must always be accepted as an estimate. Good assessment data for most students will usually be consistent and relatively accurate, but even the best data acquisition processes will have weaknesses with regard to some students. This inevitably leads to the need for a process that continually monitors the effectiveness of assessment and has mechanisms for improvement in the process (Boudett, City and Murnane 2008). The corollary in biological systems would be a negative feedback loop. Parameters are chosen as set limits for performance and when performance falls outside the set limits action is taken to return progress to the desired direction.

The practice of archiving student data is sound, but if the quality of the assessment is poor then it significantly devalues the effectiveness of archived data utilisation. Many educators would argue that a classroom teacher is in the best position to measure students’ skills and to make judgements of their students’ performance. Although it would be unwise to dispute the importance of the classroom teachers’ assessment of student performance, teachers, like students, are individuals with varying abilities and competencies. Some teachers will be able to consistently and accurately assess the progress of individual students. Keeping this in mind it is clear why some authors have previously identified that having an external checkpoint against which to measure students’ skills can catalyse fruitful discussion about standards (Boudett 2008).

Longitudinal observations’, looking at individuals’ performance over time requires a significant amount of time to develop enough reliable data to be able to confidently appraise student ability and performance. Adaptive testing is a
mechanism that has become far more readily available since the advent of widespread computer accessibility. Relative improvement in adaptive testing theory has meant that such testing is now approaching more traditional linear testing in terms of refinement (VanDerLinden 2010). Adaptive testing gives a far more accurate and useful snapshot of a student’s performance. Adaptive testing results can be used within a short time frame, with significant confidence in the assessment, to determine the level at which a student is operating at the time of the testing. This is not to say that the longitudinal approach of linear test should be abandoned as it gives valuable insight and when combined with adaptive testing it gives the ability to confirm the validity of the testing results. Collecting accurate test of performance a number of times over a long time period allows any aberrations in performance to be identified quickly. An adaptive testing result significantly affected by extraneous variables is easily identified due to the increased accuracy and therefore reliability of the adaptive testing. Compared to the same situation using non-adaptive models, means unusual results can be significantly masked. Nonadaptive testing generally “clumps” students. Very strong students all perform very well, students at the other end of the spectrum struggle and the average students are clustered in the middle. Due to this lack of differentiation large changes in student performances may become apparent but subtle movements in student performances are generally hidden by the lack of fidelity.

In general, computerized adaptive testing greatly increases the flexibility of test management. Computer adaptive testing (CAT) has many potential benefits that have been identified in detail by previous studies (Rist 1989). The benefits have been summarised previously (Rudner 1998) and represent significant advantages over more traditional linear tests. CAT is given ‘on demand’ and scores are available immediately. Neither answer sheets nor trained test administrators are needed. Test administrator differences are eliminated as a factor in measurement error. Any characteristic that reduces error is of course a positive development. Tests are individually paced so that an examinee does
not have to wait for others to finish before going on to the next section. Self-paced administration also offers extra time for examinees who need it. In practice, allowing students to work at own pace potentially reduces one source of test anxiety. Computerized testing offers a number of options for timing and formatting. Therefore, it has the potential to accommodate a wider range of opportunities and can be administered very rapidly at short notice. Significantly less time is needed to administer CATs than fixed-item tests since fewer items are needed to achieve acceptable accuracy. CATs can reduce testing time by more than 50% while maintaining the same level of reliability. Shorter testing times also reduce fatigue, a factor that can significantly affect an examinee's test results. CATs can provide accurate scores over a wide range of abilities while traditional tests are usually most accurate for average examinees. This is a significant advantage, particularly, when viewed with the immediacy of the feedback and the potential positive effect this has on student performance (Hattie 2009).

Although there are significant advantages of the adaptive testing, as with any system, there are also negatives that need to be considered. CATs are not applicable for all subjects and skills; for example, at St Joseph’s College, the adaptive testing is primarily focussed on literacy and numeracy. The range of tests available with the system used at St Joseph’s is relatively restricted. The program used only contains tests that been written for general literacy and numeracy skills. The program has not been written to account for the specific content of subjects taught at St Joseph’s and so the outcome is an attempt to focus on skill acquisition rather than content knowledge. Most CATs are based on an item-response theory model, yet item response theory is not applicable to all skills and item types. Hardware limitations may restrict the types of items that can be administered by computer. Items involving detailed art work and graphs or extensive reading passages, for example, may be hard to present. CATs require careful item calibration. Each item must be carefully calibrated in line with the continuum of performance that is used to indicate the position
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of students on that continuum. It is essential for questions to be extensively trialled against significant numbers of students to confirm the fidelity of that question. Once the question is calibrated accurately a correct response by a student can then be viewed as accurately indicating the skill level of students that can answer it. CATs are only manageable if a facility has enough computers for a large number of examinees and the examinees are at least partially computer-literate. As the test administration procedures are different, this may cause problems for some examinees. With each examinee receiving a different set of questions, there can be perceived inequities, but this is not really an issue when understood in the context or attempting to determine the level at which the student is able to achieve results comparable with all other students.

Using data to determine the influences on student learning such as gender, socioeconomic background, peer pressure, student interest, parental influences, teaching quality, school culture, previous experiences, type of school, and availability of subjects are all areas that have been researched (Hattie 2009). Attempts have been made to synthesize all the data into a cohesive description of learning influences, via a meta analytical approach (Hattie 2009). The issue with meta-analysis is that it basically uses statistics and very large numbers, to distill down the influences of various parameters to a single numerical value. In epidemiological studies, particularly in the efficacy of certain drugs on a particular disease, a simple number may be useful to guide a decision on which may be the most appropriate drug to initially trial in combating a particular condition. If not successful this is generally remedied by using the next most effective drug. However, the education of students does not lend itself to this process as easily and consequently, distilling down influences to simple numerical values must be carefully considered. Tracking student performance accurately and providing easy access to the data is the first step in any process that can be utilized to improve student performance.
2.5 Testing and Ranking Regimes

Educators, psychologists and researchers have often grappled with the dilemma of proceeding with research that is often very reliant on qualitative data, whilst at the same time attempting to produce a more orthodox quantitative outcome that can be readily scrutinised by a range of interested parties. Hodkinson (2004) discusses in detail many of the pressures that impinge on the way in which social research, particularly in the past, is deemed more substantial if it follows a more quantitative approach. When investigating the processes that occur in educational systems, many methods have been utilised previously, in an attempt to allow assessment of diverse characteristics. Onwuegbuzie and Daniel (2003) explored some of the shortcomings of quantitative and qualitative educational research. They argued that a large proportion of the analysis and interpretation of empirical data is flawed and in need of serious improvement due to the highly variable and at times incomplete statistical analysis of data. They also discussed the issues created by the development of the apparent false dichotomy between quantitative and qualitative research methodologies and indicated the benefits of utilizing both methodologies as points on a continuum of strategy. This continuum approach, it is argued, leads to a more holistic and comprehensive approach to research (Newman and Benz 1998).

In Victorian secondary schools the most widely known and utilised mechanism for gauging outcomes of students that have been through the educational process is the Equivalent National Tertiary Entrance Rank (ENTER) Score. This was modified to the Australian Tertiary Admissions Rank (ATAR) in 2009. This score is an overall comparative assessment on a linear scale from 0 to 100 that a student is awarded on the basis of the results that they receive for their Study Scores for individual subjects. A complex process of moderation is undertaken by each individual State body responsible (in Victoria this is the Victorian Tertiary Assessment Centre, VTAC) to calculate a score (VTAC
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2013). The moderation process allows direct comparison of student performances in a large and diverse range of subjects, within the same State, but it also enables universities and TAFE institutes across Australia to directly compare students regardless of the subjects undertaken, or the State in which the studies were undertaken.

The ATAR Score is an attempt to measure the overall outcome of every individual student that completes their secondary education in Australia. Many testing and assessment procedures are undertaken during the normal six years in which a student undergoes their secondary education. One which has been undertaken extensively is the Raven’s Standard Progressive Matrices (Raven 1995). This test is used to assess cognitive capability and educability of individuals, whilst not relying on literacy skills. Using a series of visual matrices individuals are encouraged to identify patterns and solve problems. This is thought to allow the measuring of the individual’s underlying mental acuity and problem solving abilities, whilst removing any variations caused by varying literacy skills. Interestingly, this particular test was used for over a decade within St Joseph’s College, before this study began.

When gathering data on student achievement it is common practice to use established testing procedures for all groups to be compared. At a global level, large scale studies such as the Third International Mathematics and Science Study (1998-1999) involved selecting random samples of students, from 38 countries, and comparing students’ ability to undertake conventional testing procedures (Zammit 2002). At a national level, the Australian Council for Educational Research (ACER) have developed a range of testing procedures for assessing students, particularly in Mathematics and Literacy. ACER has developed many testing procedures for assessing students. The Progressive Achievement Test in Mathematics Revised (PATMaths-R) and the Progressive Achievement Tests in Reading (PAT-R) have been used extensively in Australia and have been developed with Australian specific norming tables and
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the advantage (for ease of analysis) of providing diagnostic and descriptive reports in both percentiles and stanines (ACER, 1997). These tests have been specifically developed to be used on Australian students but still have some limitations due to the lack of a nationally uniform curriculum. Extensive norming studies have been undertaken which have developed means to accommodate such discrepancies as varying age at enrolment and differences in nomenclature of year level (de Lemos and Wright 1997). The ACER tests are well designed and very reliable measures of student performance. Despite this, the ACER tests were, like the Raven’s Matrices, abandoned at St Joseph’s College. The ACER testing is relatively expensive and correction and return of results are generally slow. If students are absent for the testing this is problematic. Organising the testing and correction for one or even a small number of students involves significant time and resources, posing a significant inconvenience.

Any assessment that can produce a numerical categorisation of an individual learner presents as a convenient tool for measuring student performances and outcomes. When the assessment allows direct comparison of cohort performances the data also lends itself to being used as a benchmarking tool, allowing interested parties to compare classes, schools or even broader categories, as occurs with student study scores in VCE. In Victoria, there have been a number of developments that have led to the routine comparison of schools based on student performances in the Year 12. This utilisation of VCE data has caused widespread debate within and outside educational circles (Fraser 2002). Much of the debate is propagated by the difference in understanding and interpretation of data by educators, students, parents and bureaucracy. When considering the different interpretation of measures Goldstein (1999) expressed concerns that at times the interpretation on data can be misinterpreted to the extent that popularly held perception can be such a distortion as to become meaningless. This was of particular concern from 1996-2002, for example with VCE performances indices as published by the
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Victorian Curriculum Assessment Authority (VCAA) (Rowley 2005). With the advent of developing a system to gauge performance of schools the VCAA did not anticipate that once made available to media outlets, and the public in general, confidence limits of the assessment would be ignored. As a consequence, some schools were deemed as performing better than others, when in a purely statistical sense they were equivalent in performance. It is apparent from a bureaucratic viewpoint that the numerically comparable ranking of schools is a very useful tool, but from the standpoint of an individual student the VCE results have a much more direct and personal meaning in that the results can affect choices for tertiary study and possible post-secondary employment. The convenience of numerical comparison has resulted in the VCE result becoming an entrenched and perhaps the most significant measure of student performance within secondary education within Victorian Schools. This in turn has resulted in an overwhelming trend for schools to be directly compared using the aggregate VCE study scores of students as the main indicator of a school’s success status.

Of course ‘school success’ and ‘student success’ may not be closely correlated. If the cohorts of students that enter a school at Year 7 are generally better performing than those that start at another school then it would not be surprising that the second school would generally not have students on average performing better on the VCE than students from the other school. This analysis is very simplistic compared with looking at the amount and diversity of improvement that a school may be responsible for across overall students’ performance. If a group of below average students start at a school and in VCE perform as a cohort of slightly above average students this may indicate a more ‘successful’ school than one that begins with a cohort of above average students and finishes with a group of above average VCE students.

Studies have been made to examine in detail the use of final secondary subject assessments as a basis for monitoring school and teacher performance.
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DeCourcy (2005) undertook work within secondary schools in New South Wales to identify performance indicators that could be incorporated into a feedback mechanisms for improving the performance of schools and teachers. The work involved developing detailed means of analyzing the performance of students completing the HSC, the New South Wales equivalent of Victorian VCE, across more than 120 Catholic Secondary Colleges in New South Wales. This type of analysis has been previously identified as most useful when it is incorporated into an heuristic system that allows educators to effectively utilise the acquired data to effect change (Visscher and Coe 2002). The implementation of School Performance Feedback Systems (SPFS) is often accompanied with difficulties associated with unintended effects that result as a consequence of particular interpretation of the data. Neglecting to take into account confidence levels is a common phenomenon that may be one of many features of data analysis that leads many educators to be wary, and at times defensive, about data analysis that may indicate large differences in students’ performance as a result of school or teacher effects. These large differences may not even be significant and if the differences are real it is often acknowledged that many of the reasons for these differences are beyond the control of the teacher (O'Day 2002).

In order to effect change that has a positive effect on student outcomes reliable measures are paramount. Concentrating on the analysis of performance of students during the final years of secondary education has been a common pursuit, see for example DeCourcy 2005; Richardson 2005; Rowley 2005. Concentrating on the final outcome of the secondary educational process may be very useful as a means of monitoring school performance, with certain limitations. Incorporating a more holistic approach of systematically assessing the ongoing performance of students, as compared to performance at the completion of the process, would provide a broader perspective on this complex experience (Allen 2005).
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The performance of students using any traditional system of assessment is associated with the reality that a ‘test’ result often represents a much more complex finding rather than just a student’s ability to complete that test to the best of their academic ability. Cooper and Dunne (1999) examined various mathematical assessments, highlighting the need to be aware of the complexity of issues a student may bring with them that interact to directly affect their performance on an assessment. A student’s understanding and hence performance on any assessment item is never going to be simple direct correlation. The performance will always be affected by factors as diverse as student preconceptions, socioeconomic environment, or even how the student was ‘feeling’ at the time of assessment. Hence, any objective gauge of student performance is only capable of highlighting limited components of a student’s understanding and potential. A student is in many ways as complex as an object for study and analysis as any conceivable object for study. The complexity of phenotypic learning ability demands a comparable means for assessing progress and outcomes. Testing all students’ ability to complete a standard test is a very simplistic approach and the analysis of such data would as a consequence be extremely limited. However, having all students complete a common test does result in some very convenient means for analysis, as occurs in Year 12.

Assessing students to determine where changes may be made to enhance proficiency is more difficult than using simple testing methods (Kingsbury 2005). Adaptive testing models that challenge students to perform tasks at the level they find challenging, but can succeed at, are possibly an order of magnitude more useful, particularly when feedback from results is available in a timely manner. In terms of curriculum assessment, adaptive testing also allows differentiation of the performance of students over the entire range of abilities. Questions such as, “Does the curriculum cater for all students regardless of ability?” can realistically only be answered with such detailed information. Determining curriculum performance based on the method of testing procedures undertaken is an aspect that must be considered as having an
impact. The strength of adaptive testing to discriminate between the performances of all students, regardless of the level at which they were functioning, was a major driving factor that ensured that adaptive testing was incorporated into the monitoring of student performance during the development of the current project. Although linear, formative and summative testing are all useful, without the benefit of adaptive testing a significant proportion of students, particularly at the extremes of the range are rarely assessed with the same accuracy as the modal students. Unfortunately this phenomenon of testing the “average” student well and the students at the extremes poorly is not a new nor uncommon occurrence (Rudner 1998). Large amounts of the testing and assessment undertaken in the classroom is less than ideal for the students at either end of the ability spectrum; but with the more widespread use of adaptive assessment identifying accurately the level at which the student is operating, it becomes more realistic.

Accurately assessing learners is complex and ultimately subjective in nature, and as a result it would appear to be self-evident that analysis of performance must have a substantial subjective element. The subjective component involved can be supported by the learners themselves. It is important for student input into assessment of their performance and it is also important for curriculum performance to include a significant amount of student input (Boudett 2008).

2.6 Data Analysis

Detailed analysis of student performances at VCE has been routinely undertaken using a method developed as a comparison of student predicted performance with actual performance (Richardson 2005). Students’ performance on the General Assessment Task (GAT) is used as an indicator of student skill levels and this is compared with the result of the actual results that students achieve subsequently, around five months later, i.e. the VCE study.
scores. The difference between the GAT and VCE study scores are used as an indication of the performance of the student compared to their predicted performance. Richardson (2005) proposes that this ability-adjusted analysis as opposed to the raw VCE data, can provide a more valuable assessment of performance than the raw score. Raw performance scores are utilized widely as a bureaucratic tool by schools and government departments and perhaps in an unfortunate trend, are widely publicised information of VCE performance. The VCAA publishes the names and scores of all high achieving students (top 8% of each study which equates to a study score of 40 and above) and it would appear that increasingly parents, teachers and students consider this as one of the key ‘measures’ of a school’s success. Many schools use the raw percentage of students with study scores of 40 and above as a major selling point to attract potential students. Using raw percentage data as a measure of school success is very simplistic and intensely problematic. Each cohort of students will have varying abilities and given large enough numbers and the variability associated with ever changing curricula and assessment, and the general homogenous nature of the pool from which individual schools draw their students, it is hardly surprising that the raw percentage results of schools often seem rather static. For a large school, such as St Joseph’s with no special academic requirements for entry and around 230 students undertaking Year 12 each year, the results of each cohort from year to year would be expected to reflect reasonably closely the distribution of results statewide.

At an internal level, using study score achievement of each subsequent cohort of students as a measure of school success or improvement has a limited analytical value. The study score is very much a summative measure of performance and because of this, in isolation, it does not give much indication as to the causative relationship between the study score and pedagogical approaches, curriculum content, students’ ability or any number of parameters that might be considered important. The VCE study scores represent a somewhat anomalous situation for schools wanting to use the results for
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benchmarking purposes. The results are standardised and so consequently represent a rank of each student’s performance compared to the cohort of students that have also completed the subject. The results are heavily weighted towards performance in a small number of exams and in most situations the students for whom results have become available have left the school. In fact, interpreting the study score results without any attempt to include input from the students regarding their experiences of the process will reduce the power of the study score results as measurement tool. By including student feedback of the process the value of the information to effect change will be increased (Zbar 2011). As identified by Hattie (2009), providing formative evaluation of programs, particularly when the information is then used by teachers, can have a significant impact on the development of excellence in teaching. Incorporating subjective information from students that undertook the studies as well as the objective study score measure would allow a more formative approach to assessing cohort performances and subsequently allow greater ability to track longitudinal changes in performance between cohorts from one year to the next.

According to Smith (2005), data is often considered more valuable as a monitoring tool of performance if it is “value added”. Between 1996 and 2001 the Victorian Curriculum and Assessment Authority publicly released annual VCE results of schools that compared the performance of student cohorts at schools to the students predicated performance based on results of the GAT. The rationale being, that by developing an achievement index that was more than raw achievement data would be more useful. The comparison was that if a school cohort on the whole performed as predicated from GAT results then that cohort would be given a rank of 100, therefore students performed as predicted. A school ranked as 105 indicated that, that cohort on the whole performed five percent better than predicted, and conversely 95 indicated the performance was five percent less than predicted. This was seen to offer a convenient means for schools to monitor performances over time.
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The publication of school achievement indices resulted in an unintended perception within the wider community (Rowley 2005). A notion of school rankings developed that the higher the ranking, the better a school. So a school that had an index (perceived rank) of 105 was much better than a school of 95, and at face value the school was 10% better. This perception could be considered a gross distortion as the indices, particularly in the media and hence wider community, were considered without reference to any confidence limits. This meant that in reality there was no statistical reliable difference between a school with an index of 96 and one with 100. It has been previously observed (Goldstein 1999) that, in relation to the use of value-added measures, when used as an accountability tool in the public domain the usefulness of such performance tables or “value added league tables” can be distorted in such a way as to render their credibility and usefulness inappropriate.

To their credit the VCAA recognised the issues that had developed with the VCE performance indices. It was acknowledged that the performance of students during VCE was markedly influenced by factors such as that most students would perform better when placed in a class of higher achievers compared to being placed in a class of lower achievers. It was recognised that independent non-government schools had student populations from high socioeconomic groups and generally far more homogenous populations consisting of higher ability students. This resulted in performances of students in these schools that were consistently higher than the majority of all schools. In fact year after year, that is what was observed (Rowley 2005). Due to the outlined phenomena it was no surprise that particularly from 1996-2001, schools, due to public perception, were under growing pressure to improve their ‘performance’ in the rankings.

In 2002, the VCAA attempted to address the issue of not only the distorted public perception of VCE indices but also to provide schools with a more effective system of accessing ‘useable and useful data’. Data released to the
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public was expanded to include, the variety of studies schools provided, student achievements in units, median study scores and the percentage of high achievers as well as student pathways in terms of applications for placement in post-secondary education. Schools were also given access to more detailed information allowing analysis of ‘value added’ data, allowing comparison between schools, classes, gender, ethnicity and the like. This system was designed to balance the desire to publicly report VCE performance while maintaining strict confidentiality and still allowing schools to access detailed data for analysis. In more recent times, the issue of transparency and accountability for school performance has led to a push towards the development in the future of a Victorian Schools Register that would allow for the performance of schools to be available to parents of students and the public in general. As discussed by Rickards (2009), this approach is far more sophisticated than previous approaches, such as league tables, previously used in England or the USA. Ultimately, in 2010 the Australian Government released the Myschool site on the internet (Australian Curriculum 2010). This system unfortunately represented an example of a good idea that when put into practice created some less than ideal outcomes. For example, the site groups schools into ‘like school’ groupings; but, unfortunately, the criteria for groupings results in very different schools being collected into cohorts. At times these grouped schools have very little similarity to one another. Large, single gender, non-government, suburban schools can be compared to small P-12 rural co-ed schools. It highlights the need to balance access to information with the potential for misinterpretation and is discussed more fully in the next section.

2.7 Using Data

Student assessment results and student related data have become increasingly scrutinised to form the basis of mechanisms to improve teaching and learning. Debate around which testing is most appropriate and how the data can be used
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to support learning is an ongoing phenomenon that will undoubtedly continue for as long as formal education facilities continue to exist. Hattie (2009) synthesised the findings of more than 800 meta-analyses involving thousands of individual studies to produce measures of the effect size of some variables. These effect sizes are then ranked according to how important a role that variable plays in the learning process. According to Hattie, the most significant variable is that “self-report grades have the largest influence”. Other previous studies have shown that students are in fact very accurate at understanding their achievement levels across all subjects (Kuncel 2001). On the evidence available, it seems that students generally are very knowledgeable about their chances of success. This high level of predictability does raise some interesting questions as posed by Hattie (2009). If students are very capable of assessing their own abilities are students generally being unnecessarily subjected to redundant testing wasting time that could be utilised for more productive learning? Of course this ‘knowledge of future performance’ could be considered a double edged sword. If students know what they are going to achieve, does this in fact become a barrier to performing only at their expected level? In effect, could it be that student’s expectations are a significant determinant in how the students perform?

Schools often use a great variety of types of evidence to determine students’ achievement. While there are a wide range of reasons for this variability by its very nature variability restricts developing protocols that are transposable from one school to another. The consequence of this is that previous authors have readily recognised that examining students’ performance on externally imposed tests, such as state mandated standardised tests of basic competencies, has many benefits (Boudett 2008). Individual teachers can look at student performance on such tests and then as professional educators begin to see connections between what they are doing in the classroom and how the students perform on the external assessments. This provides a means to obtain an objective measure of students to compare with the teachers own assessment of
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the student. Comparing this with the students own assessment further increases the sophistication of analysis. Indeed, analysis of standardised tests in isolation can be counterproductive. Labelling students’ abilities in an overly rash means may change a student’s own perception of their ability, not to mention how ‘labels’ can influence the ways teachers view students who carry labels. As discussed previously, students own preconceived assessments of their ability may have profound effects on their performance and negatively influence their learning potential. Variance in student performance is often explainable by many factors not related to ability and hence any well founded assessment must be countenanced by the input from a variety of sources.

The use of data in the context of learning is far from a simple process. Ornstein (1994) for example, reports on how the public expect normative report cards whereas evidence indicates that traditional grades may not communicate or motivate as much as may be expected or believed that they do. If the information that is accumulated and then reported to parents, guardians, students and even teachers has such a variety of interpretations and misunderstandings then the data selected to monitor student learning development must be considered very carefully. Student data takes many forms and as such the purposes for which it can be used vary greatly (Tomlinson 2004). Using student data for learning within the classroom is dependent on using data that has common meaning for teachers and learners. A significant issue for a large amount of assessment that occurs in many classroom situations is that the data that is generated is from common tasks that may be efficient to utilise but lack any type of accurate and importantly subtle ability to differentiate student ability. The range of actual student ability within any class can be significant and the difference between assessed abilities can even be greater. For students to undertake most forms of assessment they are required to go through a process of meaning making and this process can be varied according to the intellectual means and method that the student uses.
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The way students learn is dependent on certain personal predispositions for learning that are innate to the individual. However, despite the rhetoric of individual difference in the educational system there remains a strong commitment to profiling and categorising learner attributes. These features can be categorised and identified. Some authors have suggested that individual’s learning is significantly impacted by learning styles that form the learning preferences and abilities of individuals. Prominent here is the work of Gardner (1993) who argued that individuals have varying strengths in a combination of intelligences that are classed as verbal linguistic, logical mathematical, interpersonal, intrapersonal, visual spatial, music rhythmical, bodily kinaesthetic and naturalistic. Others such as Sternberg (1985) suggest that individuals have varying strengths in combinations of intelligences referred to as analytic (reminiscent of learning in linear sequences that is very suited to traditional educational settings), practical (a contextual type process with preference for seeing how and why things work in the world as they are actually used by people), and creative (problem solving intelligence with preferences for making new connections and innovations). The fact that such varieties of interpretations exists to explain the way in which humans learn strongly suggest that it is such a complex process for which it is unlikely that any past or current theories provide full and complete explanations. While theories and ideas are useful in trying to understand the process of learning, the growing number of works clearly indicates that if the process of learning is so complex and open to different analysis then the assessment of learning will consequently be just as open to varied elucidation. The complexity and difficulty of identifying the exact processes involved in learning is of course no reason to abandon the pursuit of reliable assessment methods, but it does warrant careful consideration of the data that may be produced, and its application.

An important consequence of assessments is the use of the generated data to attempt to differentiate the work that is given to students. The ideal is a situation where all students are challenged with tasks that have adequate
structure, complexity and clarity of purpose, and expectations for students, regardless of ability. Commentators such as Tomlison (2004) argue that this is possible and have explained at length the most appropriate ways to achieved this aim. Importantly, differentiation within classrooms is a productive approach for learning. Presenting students with challenges that they are capable of achieving but at a level that extends their current abilities is intuitively a sensible approach.

Traditional grading systems generally involve a process of all students completing the same assessment and then students are generally graded in competition or comparison with the rest of the cohort whether that be a class, school or state. This system has begun to be replaced by more complex systems that involve a process whereby students’ performance is graded against themselves rather than in competition with other students (Tomlinson 2004).

There are different ways to report on the performance of learners and therefore understanding some of the most common ways of reporting is important to develop a clear expectation of what the assessment results are in fact informing about student ability. The simplest way to record performance is a raw score from a simple linear assessment. This is by far the most common way to report internal assessment (Boudett 2008). It is well known that students and teachers and student work is graded in terms of the percentage of possible credit. Students with any given level of proficiency will get a higher raw score if the test contains easy items and a lower score if harder items are used. This creates a common issue for teachers in schools in which the percentage correct is traditionally a cut off score for a letter grade. The problem is that a teacher can turn a B student into an A student and vice-versa by changing the difficulty of the test rather than reflecting the actual ability of the students.

There is no doubt that data is critical to the pursuit of optimising students learning. The manner in which data can be used to work towards this end has
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been a common topic of discussion within education for many years. With the increased emphasis on personalised learning some authors have identified the move towards differentiated learning as one of the most pressing issues of modern education (DCSF 2008). Strategies for developing a differentiate approach to teaching in schools is in simple terms a mechanism for identifying the individual needs of learners and then taking steps to provide for these needs. The execution of this pursuit is far from simple, but as suggested by Zbar (2011) with the careful and systematic collection, storage and analysis of data this can be achieved.
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3.1 Introduction

The most common research paradigm used in the pursuit of new knowledge has for the past several centuries been that of Logical Positivism (O'Brien 2001). This paradigm is based on a number of principles, including: a belief in an objective reality, knowledge of which is only gained from sense data that can be directly experienced and verified between independent observers. Phenomena are subject to natural laws that humans discover in a logical manner through empirical testing, using inductive and deductive hypotheses derived from a body of scientific theory. This approach to data acquisition relies heavily on quantitative measures, with relationships among variables commonly shown by mathematical means. Positivism, used in scientific and applied research, has been considered by many to be the antithesis of the principles of action research (Winter 1989).

In the beginning of this study a concerted effort was deliberately made to substantially follow the principles of logical positivism. Data was collected and analysed with a significant reliance on mathematical means, primarily statistical analysis was used to expose the relationships between students’ performance on assessment mechanisms and the students’ innate abilities and academic potentials. Considerable time and effort were committed to collate testing data into formats, digital spread sheets that were then subjected to standard statistical analysis. Initially it was envisaged that students’ performances in their final secondary education assessments represented an accurate measurement of the students’ abilities as a result of experiencing the educative processes at the school, St Joseph’s College that was being examined. Another initial presumption was that assessments made on student performance from the beginning of secondary education all the way through to completion
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of secondary education would be consistently accurate as well. The presumption of accuracy of testing data would require verification as the presumption of accuracy was merely part of the initial hypothesis that the assessment data would be able to be used in a manner that could improve student learning.

Data gained from student assessment is often the culmination of a mixture of objective and subjective processes. Now this has implications for the sole use of positivism in such a situation where large portions of the data to be collected will not necessarily be purely quantitative. The obvious solution to such an issue is to consider a more Action Research approach to the enquiry. As summarised succinctly by O’Brien (2001 p.6),

“Action Research is more of a holistic approach to problem-solving, rather than a single method for collecting and analysing data. Thus, it allows for several different research tools to be used as the project is conducted. These various methods, which are generally common to the qualitative research paradigm, include: keeping a research journal, document collection and analysis, participant observation recordings, questionnaire surveys, structured and unstructured interviews, and case studies.”

Action research particularly in education has been utilized for a significant period of time, as far back as the 1920s American educational philosopher John Dewey began to express the view that professional educators should become involved in community problem solving. Practitioners of this type of enterprise are often researchers operating within educational institutions that focus on the development of curriculum, professional development and applying learning in a social context. It is often the case that university-based action researchers work with primary and secondary school teachers and students on community projects.
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As the current study proceeded it evolved in terms of the methodology that was being utilised. The initial approach of logical positivism was obviously not adequate but the project was also not going to fit clearly in to a situation where Action Research was going to successfully fulfil all the outcomes of what was being attempted. A melding together of the two processes was going to provide a system that would benefit the movement forward of the project. Although this study was one where knowledge was going to be derived from practice, and practice informed by knowledge, in an ongoing process which is of course a cornerstone of action research, an important perspective of the motivation of the project was to remove some of the subjective components in the process to increase objectivity and reliability of measurement of student performance.

The identification of objective measures within a very subjective environment and then the utilisation of objective measure to help inform and develop subjective processes is perhaps a good definition of what education is all about. Schools and hence educators spend every day dealing with and interacting with students, learners and try to measure how they are going. Consistent, accurate measures must have significant objective components to be reliable and reportable. This is positioned against the complexities of how to assess the performance of learners. What does it mean to be a good learner? Is performance on a written test the most accurate estimation of a learner’s ability? Perhaps the best learner is the student that achieves outcomes that equal their maximum potential. But here is the crux of the difficulty of “measuring” and reporting and consequently analysing student performance. How can potential be reliably measured? In reality, potential is the best possible outcome or performance that may be achieved at some time in the future. Potential would obviously be influenced by innumerable variables and unless all variables are maximised to allow maximum potential to be achieved the best possible performance of any student is unlikely to be achieved consistently in actuality simply because of the number of variables or events that must occur in some type of serendipitous way. Thus as this study was significantly occupied with
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recognising and utilising assessment data in an attempt to improve the overall educative outcome for students a mechanism evolved that had components of both logical positivism and action research.

This hybrid methodology is reminiscent in many ways of a biological feedback mechanism. Data was captured from a variety of sources and this data processed. The information then informed the direction that the study was to follow. In keeping with the biological analogy this made the study quite organic in the way it evolved. At each stage the findings were often implemented and so changes in practices led to changes in the type of data that could be collected. This work was undertaken as a professional Doctorate and ultimately the aim was to improve the teaching and learning of students at St Joseph’s College and so the way practices were influenced by the study was inextricably linked with the methods deployed. An ongoing cycle developed observations and findings feedback into the study that then would help generate more findings that would then feedback and so on. This process also had significant implications to what might happen after the completion of the Doctorate. The way the process evolved was very different to a traditional research Doctorate. There was no ultimate goal to be achieved, problem to be solved or hypothesis to be tested. The fundamental aim was to improve some of the mechanisms involved in the education of students at a specific school St Joseph’s College, and obviously improvement is an ongoing open ended endeavor. The processes begun would not cease at the completion of the study. Due to the “insider” nature of the author, developments that were to come from the study would result in having influenced the movement towards practices recommended from results generated. Thus, within the context of the study, the author was positioned as an expert in the further implementation of recommendations. This displayed some of the action research characteristics of the endeavor.

The intimate connection between implications of analysis and changes that might occur in future practices was recognized as a strength of this study but 75
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was reliant on a number of fortuitous idiosyncratic characteristics of the school in which the investigation was taking place. Change in practice can often be significantly hampered by inertia to change that is often associated with a reluctance to adapt to new systems. Fortunately, management at St Joseph’s College was very open to suggestions and ideas that could be used to assist the teaching and learning of students. This readiness to embrace change was likely related to recognition of apparent underperformance of students at the school that predated the beginning of the current study by a number of years. A concerted effort had begun to improve the academic standing of the school and it was recognized that clearly change was necessary for this to happen. An open mind with regard to change is undoubtedly the first important step to developing improvement. Improvement will not continue to proceed if the same processes are continually utilized. Improvement can obviously be gained for some time while perfecting a particular method, but once the method is operating optimally no improvement will be gained. The current Principal was keen to improve the school and when an external review of the school clearly identified that the use of data within the school required to occupy a higher profile, this gave even more impetus to the current study. As outlined the study was an open ended endeavor and so the methods developed for the study have the potential to continue to influence the way in which mechanisms are to evolve and develop into the future of the school.

3.2 Relationship Between Teaching and Research

Research should not be considered as simply discovering or creating knowledge, and teaching is more than simply transmission of what is already known. Within the realm of post-secondary school and tertiary education there is a large amount of research to indicate the various approaches that can be taken to incorporating research into teaching pursuits. There are several different relationships between research and teaching and these vary between...
disciplinary groups (Colbeck 2004). These studies deal extensively with a number of factors that can impact on student learning. The way in which research is incorporated into the learning of students is far more direct than is experienced in secondary schools and even more so in primary schools. Research within universities for example in terms of subject content “the linkages are more difficult to enact in the hard disciplines than in the soft ones particularly before the final year of the undergraduate course” (Healy 2006).

Healy argues that this is because of the more hierarchical and cumulative construction of knowledge in the former. Hence it is more difficult to incorporate the latest research findings in the undergraduate curriculum in, for example, mathematics than it is in, say, history. In contrast it is more common in many of the hard disciplines for undergraduate students, particularly in their final year, to work with staff as part of a research team than it is in the soft disciplines. Hence undergraduate students are more likely to have opportunities to work as, for example, a research assistant on a research project in a biology laboratory, than to work alongside, say, an English professor interpreting a play.

Teamwork also tends to be a more common feature of work in the applied disciplines than in many of the pure ones.

The above findings are concerned with Universities, but some of them are applicable to a secondary school environment; particularly in terms of the way in which a Healy (2006) reports on some of the differences between hard and soft disciplines. This is really a differentiation of predominantly hard data based evidence approach as opposed to a more subjective opinion based method. The use of terms such as soft and hard is probably not ideal carrying connotations of particular academic pursuits being more difficult or more valuable in comparison to others. A corollary of this is the way in which empirical measurement data and more subjective anecdotal evidence are often viewed. Data collection associated with student learning should always be a process that is capable of incorporating objective measures and subjective information. Within the secondary schools it is a commonly held opinion that
measuring performance and the accuracy of the assessment is dependent on the type of subject that is being assessed. Anecdotally, many teachers report the opinion that assessing mathematics is very straightforward as the answers are either correct or not and therefore, a mark is either awarded or not and the total represents a good measure of the student’s ability. Teachers will argue assessing a piece of creative writing in English is far more subjective and difficult to accurately pinpoint with a value. It could be argued that it is the assessment design that is the cause of the perceived differences in difficulty and not the actual subject or content of the subject. Mathematics tests for example are often designed so that a question is posed and in many situations only one solution is sought. If the student has not produced the sought after answer then often this will be recorded as incorrect. In a piece of writing where a student is asked to comment on a particular topic there are far more possible correct answers and of course incorrect responses. This leads of course to an increase in the amount of analysis required to determine if the response will be awarded marks or not. In reality, it is not the content of the subject that is causing variation in the perceived difficulty of assessment but the skill that is actually required to undertake and subsequently assess the student’s attempt to display that particular skill. And so the differences between hard and soft disciplines may be explained as not really a difference in difficulty nor importance, but one where hard means the processes involved are far more biased towards a more linear, logical and chronologically dependent process whilst soft means a more networked based, imaginatively time independent process.

This current study obviously involved research of a kind that would not directly involve students undertaking work in the actual research as might be the case at University. The study was developed to look at using data to improve the learning of students and although the students were predominantly at the central core of the data collection process they were not actively involved in the research. Students were obviously the subject of research and in these circumstances not active participants in the research. This represents an
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obvious difference in utilising research as a learning tool, but it does highlight the way in which the research undertaken in the current study was not an attempt to simply collect data and discover new knowledge. It was about researching a specific educational setting to identify some important features and characteristics and then to take this information and use it to modify the practices that were being undertaken within the school. This whole process was a means to improve the learning of students within the school, St Joseph’s College. Categorising the research method that was to form the basis for undertaking the work in the current study was not particularly straightforward.

3.3 Implementing Finding into Practice

Obviously the primary goal of this study was to improve the learning outcomes for students at St Joseph’s College and the methodology that was to evolve over time was an amalgam of previously stated approaches. The process was similar in many ways to a biological negative feedback loop. In a biological process some type of input is detected in the form of a stimulus. This stimulus will then be detected and processed to produce some type of response that attempts to return particular parameters to within some set tolerance range. In this study, data was identified as having the potential to be used in new ways that may have influence in affecting the way in which teachers were responding to the learning needs of students. Student data, particularly assessment data, was readily created and recorded but there was no effective mechanism for this information to be efficiently incorporated into the process of improving learning at St Joseph’s College. The methodology that was to develop was driven in part by the need to have some type of feedback mechanism that was at times driven by a trial and error approach.
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Initially the study identified the extent to which data was collected and disseminated. This information was, in the feedback analogy, the initial stimulus that was subsequently analysed and used to produce a response. The response in this case was to more carefully examine the data and once a shortcoming of the data was identified, a period of trial and error began. During this period adjustments and changes were made to the way data was being used which led to the propagation of new stimuli that were analysed and responded to and the cycle continued. This system of responding to perceived changes based on an assessment of whether the outcome was positive or not is also very closely related to another well recognised biological process in evolution. The improvement of adaption of organisms to their environment is dependent on selection pressure that selects for the most suited variant of a particular group. By constantly questioning and assessing the benefits or costs involved in changing the way in which data was used a mechanism of constant evolution was formed.

This method could be referred to as a feedback response driven model. The current study was not intended to simply develop an understanding of data use at St Joseph’s College. The goal was not some type of taxonomic pursuit to accurately describe and categorise what was happening within a particular school as an exemplar for what goes on in secondary schools. This study had a very specific purpose that was inextricably bound up with the general goals and mission of St Joseph’s College. The methods employed were designed not only to improve the learning outcomes for students at St Joseph’s College by focusing predominantly on assessment data, but to also ensure that a system developed that would continue to evolve and assist in the pursuit of improvement. Obviously the process was very clearly an example of applied insider research.
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3.4 Collecting Data

In Phase One of this study a number of methods were used to analyse data that would be used to inform the direction in which the work was to take. As previously discussed, large amounts of data were routinely collected at St Joseph’s College, stored haphazardly and used minimally. This, therefore, led to an initial period of physically identifying storage methods and the contents of each system. The poor quality of storage was a significant impediment to salvaging data, but when data was found that was suitable it enabled some systematic analysis of the information. Simple tests of correlation, the Spearman’s Rank Correlation (Wessa 2008), was used to determine the relationship between initial performance of students in Year 7 on various assessments tests and then their later performance in the VCE. The results of this analysis are discussed in Chapter 4 and were fundamental in terms of providing the impetus to investigate more valuable data sets. The results indicated that the testing data generated previous to this study were far from optimal and led to significant changes in practices at St Joseph’s College.

The study was always going to be longitudinal in nature and fortuitously the data saved in Phase one was able to be used to compare student performance from Year 7 to Year 12 without having to wait six years for results. The time frame was actually reduced to about four years. The fact that a number of previous years testing could be identified and used to correlate with student performance ultimately in Year 12, without the delay of six years was an obvious advantage; but it does introduce one of the serious limitations of the current study. Having to wait six years to obtain a complete measure of a student’s development over their time at St Joseph’s College still takes six years and as a consequence, the problem remains that any fundamental changes in assessment procedures and data utilisation will still take six years to have fully influenced any particular cohort. This, of course, also means that to collect data for two cohorts takes seven years, three cohorts eight years and so on. And so
the burden of time restraints will inevitably impact on the amount of data analysed for the current Folio. But at some point in time evaluations of procedures and results must be made and common sense dictates that a “status quo” approach cannot be taken waiting without making adjustments for years just to see if improvements have been gained.

Data which had not been collected previously, but was determined to be highly valuable, was information relating to the experiences of other educators and also the students attending St Joseph’s College. The collection of data from other educators was very straightforward. A survey document was written and copies sent to schools with a request for educators with responsibilities in the area of assessment and data storage to respond. Not all schools volunteered to take part, but over fifty per cent invited did respond and the analysis of data collected (Chapter 4.2) was invaluable in confirming the direction that the research at St Joseph’s College should take.

Survey information was also sought from students. An interview format was the preferred method as it would allow some flexibility in determining student perspectives. Limitations determined by ethics committee requirements were relatively minor and all students that eventually took part were selected randomly from a larger group of volunteers. Students were categorised according to previous academic results, basically a high level, mid-level and lower level. All volunteers were categorised and then equal numbers from each category at Years 7, 9 and 12 were randomly selected to be interviewed. A total of thirty students were eventually interviewed. Students were asked a series of questions to which their response were digitally recorded. At a later date the responses were transcribed and then analysed as seen in Chapter 4.4.-4.6.

Collection of data in terms of survey and interview results during this study was predominantly concentrated during Phase One of the study. Large amounts of data were collected and analysed during this phase as opposed to Phase Two
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and Three. These subsequent phases relied less on collecting large amounts of data and were more focussed on developing and monitoring systems and mechanisms for the use of data.
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Dissertation

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4.1 Identifying Initial Data Sets

It is not uncommon for schools to collect and store large amounts of data. It is less common for them to possess data analysis tools that are actively used to enhance student learning. When using such “tools”, some schools have often been assumed to be making a difference to teaching and learning. This is not always the case and generally this perception is purely anecdotally based and not quantifiable. When changes are initiated without any reliable measure, the school risks falling into a cycle of change for changes’ sake. St Joseph’s College historically would trial programs with a “see how it goes” attitude. Whether the program continued or not was often dependent on the enthusiasm of the concerned staff member.

Approximately a decade ago some of the testing undertaken by the incoming Year 7 students was used to identify students that may possess higher ability cognitive skills, and these results were then used as the basis to offer extension programs to these students. These students were identified primarily using the Raven’s Progressive Matrix Test (Raven 1995). During the course of this study the Raven’s Test was demonstrated to be of questionable value and its use was discontinued, and yet it formed the basis for the selection of students and allocation of resources for a number of years without any form of systematic and objective monitoring. The failure to have any systematic assessment process that could be used to help to clarify the degree to which the process had benefitted students is not an uncommon occurrence within educational settings. This failure to have a systematic quality assurance process has probably been a result of the almost diametrically opposed ways in which student outcomes are
often measured. At a very basic level all mainstream schools “measure” their performance by traditional exam results, a relatively straightforward objective comparison of numbers. Although it is acknowledged that the way in which the assessment result is determined is not necessarily objective; many subjects have significant assessment components based on opinions particularly in the Arts and Humanities subjects. This, at least superficially objective, measure of success is therefore very different to the often esoteric measure of what sort of “well rounded balanced” individuals are the end product of the educative process at a school.

These two extremes of measuring success are of course merely examples of a continuum of the process that schools use to measure success and clearly display the intense complexity that teachers, students and administrators face when trying to develop simple comparisons of performance. This conundrum of simplifying the complex has probably contributed to the often encountered scenario in schools where any real detailed analysis of performance at the school level is at best often superficial and in many cases non-existent. Even when schools have very obvious motivations for developing strategies for detailed analysis, schools can be quite slow to actively respond, more than likely this inertia stems from the daunting process that it ultimately represents. For example, the previously mentioned reviews that were conducted of the Pathways program at St Joseph’s College clearly stated, in the initial review, that it was essential for some type of benchmarking process to be initiated to determine the perceived success of the program and yet by the time the second review was conducted a number of years later no progress had been made in monitoring systems.

Analysis at a higher level including groups of schools, regions, states etc. are often far more objective and detailed, but this is due to the much simpler means by which comparisons can be made. Collapsing individual student performance into school averages and then comparing schools and groups of schools is
relatively easy and produces data that at least statistically is valid and on initial examination would seem useful. Perhaps the issue is not that it is not useful, but that it is not useful to the individual student. In 2010 the Australian Government released the My School site on the internet (Australian Curriculum 2010). My School enables you to search the profiles of almost 10,000 Australian schools. The facility allows one to locate statistical and contextual information about schools and compare them with statistically similar schools across the country. This is obviously an interesting facility and of substantial benefit to bureaucrats that have an interest in comparing at some level school performance, compared to like schools. Although when looking at the “like schools” the criteria selected have resulted in many “unlike schools” being compared. St Joseph’s College for example a secondary school of 1400 boys from predominantly urban families that obviously have at least reasonable means to meet the significant school fees is directly compared with schools ranging from, Condamine State School, a small school that provides educational opportunities to its students, from Prep to Year 7 and draws students from the Condamine Township, a small Queensland town and surrounding properties with a student enrolment of approximately sixty students, to Perth Modern School which is a large select entry government school, the only one in Western Australia.

This type of valid statistical comparison is ultimately dependent upon the decisions that are taken to decide what the important criteria that determine the similarities of the schools are. Obviously from the examples given, many socioeconomic, geographic, school size, school cohort composition, independence and obviously many more differences are considered to be less important. As an individual parent or indeed student how this information is directly useful to an individual learner is far less clear. If a student is performing well in a school that has performed poorly are there any guarantees the students would do better in a better performing school? These types of questions are inherently difficult if not impossible to answer satisfactorily.
because it is not possible to do the appropriate control experiment on that individual student. Anecdotally many educators have felt that there may be an effect of improving individual performance by placing them in a class of more talented learners but even this is empirically hard to prove as a student can only be in one class at a time. It must be conceded that any form of comparative longitudinal performance assessment in an educational setting is very difficult and this is at the root cause of the relatively poorly developed quality control mechanisms in secondary schools that are clearly relying on quantifiable methods and are directly applicable to individual students, subjects and curriculum.

Data storage at St Joseph’s College has been a very important focus of the current project. Initially, at the beginning of the current research, large amount of data, particularly testing data was haphazardly stored. Some data was kept in hard copy, some in digital format and it was discovered that substantial amounts of testing results had been lost. The data that was most comprehensively stored tended to be data concerning personal details, medical information and previous student term and semester reports. The data was primarily being used for reporting purposes and there was no readily available system to use the data for learning.

4.2 Comparing Like Schools Data Use Practices

In an attempt to identify what strategies nine similar schools might be using to utilise their student data a survey was conducted (Appendix 1). The schools were all affiliated with Edmund Rice Education Australia (EREA). This is an organisation of Catholic Secondary Colleges that have at some time in their development been under the auspices of the Christian Brothers, an educationally oriented order of the religious that in the recent past have become less formally involved in the day to day running of the schools, due to falling
numbers of brothers within the organisation. The schools are all Catholic Colleges, most are single gender boys’ colleges and represent a group of relatively similar, homogeneous educational facilities. The actual survey was restricted to these like colleges, but a number of government secondary schools were also contacted and visitations and observations of their practices were made. Each school was contacted and an electronic survey was delivered to the Curriculum Director or equivalent of each school. Of the nine schools, five responded to the survey. The four that did not respond were sent subsequent requests but still chose not to participate. It is difficult to determine the reasons some schools may have chosen not to respond but having more than half of the schools responses allows valid summaries to be constructed. An analysis of the survey results follows.

1. Does your school utilise any type of statistical analysis of AIM Testing, VCE (or equivalent), VET results or GAT results?
   All schools replied in the affirmative to this question. This was of no particular surprise as it was a very general question. It does indicate that all responding schools were aware of the significant resource that government mandated testing provides. The AIM testing mentioned in the question was subsequently changed to NAPLAN, but it is a reasonable assumption that name changes would not significantly affect the result.

2. If answer NO for Question 1 go to Question 3. If answer YES please specify the data sets used and the type of analysis used?
   The responses to this question indicated that there was significant bias towards analysing VCE results rather than the AIM data. All schools use VCE results and predominantly they use the statistical analysis directly from the VCCA. Only three of the schools acknowledged that they use AIM data and one school indicated that they also use VET, GAT and Ontrack data. It would appear more emphasis is put on data generated during the final year of secondary education clearly indicating that using essentially formative assessment data as a learning
tool is subservient to using summative data as a measure of performance. This measure of performance is probably focussing on VCE results as a measure of overall “school performance”, a phenomena that is clearly entrenched in the majority of people. It would unfortunately appear that schools often advertise their VCE results to the general public to “inform” the public of a measure of the schools success. Is it public perception of VCE that drives a school to extoll its virtues in terms of VCE results or is it schools “educating” the public that VCE results are the most important measure? Regardless of what are the causative factors and what are the subsequent outcomes, the schools’ responses to this question confirm rightly or wrongly that VCE is seen as the fundamental public quantity of a school’s success.

3. Does your school store student data obtained from any type of standardised testing apart from AIM Testing Results, VCE (or equivalent), GAT or VET results?

All schools responded that they stored standardised testing data and interestingly all schools used different testing. This may indicate that schools recognise the importance of standardised testing, but the fact that five very similar schools use different testing points to the idiosyncratic nature of schools. The schools were not questioned as to why they undertook particular testing but from observation, it appeared that this phenomena of schools using a unique combination of standardised testing was less apparent in government schools.

4. If answer NO above go to Question 9. If answer YES, what type of testing is carried out? Please name the tests that are utilised.

Four of the five schools undertook literacy and numeracy testing together; highlighting a common opinion that literacy and numeracy skills are critical for the overall performance of the vast majority of students. The school that did not undertake either of these testing formats only administered the Myers-Briggs Type Indicator (MBTI) assessment, a psychometric questionnaire
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designed to measure psychological preferences in how people perceive the world and make decisions. This approach would seem to be somewhat unconventional and may warrant some further investigation but was not pursued during the current study. Of the four schools that undertook literacy and numeracy testing all also undertook testing of some type of learning preference or cognitive ability testing. This clearly highlights that schools recognize that a student’s ability in literacy and numeracy although fundamental and important to learning does not operate in isolation from many other important characteristics that comprise the makeup of an individual student and their learning.

5. How is the data stored?
All schools stored the information electronically and four also stored it in hardcopy format. As an interesting aside this is confirmation that the advent of the paperless society is still a long way off with 80% of surveyed schools choosing not to abandon archiving data in hardcopy form.

6. For what period of time is the data archived?
All but one school archived data for more than six years. Six or more years would seem appropriate as the vast majority of students attend the schools for six years and all schools in the survey were Years 7-12. No reason was given by the school that stored data for five to six years.

7. Is the data used in any type of benchmarking, student performance monitoring or any other type of application?
Of the five schools one answered in the negative for this question, but even one school that readily acknowledges that they do not use data that is routinely collected is an important result. Admission that a school is not using data that is collected, for any purpose, has some serious implications. Why waste resources on something that is not used? Why waste student and staff time? The survey respondents were assured of anonymity and assuming all
respondent understood the questions the result highlights the difficulties and complexities of using data effectively.

8. If NO go to question 9. If YES briefly explain the application.

This question was at the heart of the survey. It was designed to illicit the actual purpose as to why a school would collect and store data. The responses to this question were all very general in nature, to the point of almost being vague. One respondent wrote in terms of evaluating teacher effectiveness and teaching methods but made no mention of using data to assist students. Two of the respondents described the data as a means for determining literacy and numeracy support, but particularly in terms of determining allocation of teacher resources. Only one of the respondents even mentioned that the data was to be used directly to assist in student learning. The responses to this question confirmed suspicions that data in schools can often be collected and stored because it is clearly recognised that data is important, but when pressed to clearly articulate the mechanism for how the data is utilised the explanations can become diffuse. Analysis of data can be complex and often involves statistics and there is a widely observable attitude that such information is “too hard”, “too complex, and irrelevant” and a host of other negative responses. The widely reported declining interest in Mathematics is not restricted to students.

9. How do you regard standardised test data in terms of importance?

Responses to these questions present the complexity of the issue. Respondents had difficulty in articulating the mechanisms for applying the data collected to some clearly defined purpose and yet three respondents classed standardised test data with high importance, one with important and the fifth with useful and this in the context of one respondent admitting the data is not used in any applied manner.

10. Please explain your response to question 9?
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In answering this question the respondents became far more succinct in explaining how important the data can be. Respondents wrote of allowing student needs to be addressed, the information being used to improve student learning and the ability to remove teacher bias by using external measures. It became clear that the respondents did in fact realise the importance of data and had very clear ideas of what it might be able to be used for, but it was also quite evident that mechanisms for taking the data and using it to achieve some clear outcomes are not very well developed. Respondents realise the importance of the information, but are struggling with the application of data to achieve outcomes.

11. Would you be interested in further involvement in the study such as participation in an interview to discuss your school practices in more depth? Only two of the schools other than St Joseph’s College were interested in further participation perhaps reflecting the reluctance to openly admit that schools are struggling to effectively use the data they already have.

One of the schools that was surveyed during the study had markedly better results than the other like schools for students completing their final Year 12 subjects. The very large difference in the performance of this outlier seemed to warrant further investigation and as a consequence a face to face interview with the Director of Curriculum of that school was also organised and undertaken. Where most schools were in high single digits to mid-teens in percentage of students gaining study scores of 40 plus, this school achieved around 25%, a very marked and significant difference. The school in question did not use standard academic type testing to select students for Year 7 and were adamant students of all academic standards were accepted. This does beg the question as to how do you know the students are of all standards without testing. The factor that seemed very different to the other schools was that all students were interviewed before being accepted for enrolment. The outcome
of this interview was a very important factor in determining if the prospective student gained a place at the school.

During a discussion about the selection procedure it was reported that the Bursar conducted the pre-enrolment interviews and he was very good at what he did with many years of experience of selecting students that would be suitable for the school. It is highly probable that this suitability was really a reflection of the student’s attitude. Within a few minutes of interviewing students during the first phase of this study it was apparent very quickly, if the student was going to fall into the very low ranking band, simply from their manner of responding. Students obviously tend to achieve poor results in assessments for all sorts of reasons, but two broad categories of ability and attitude are the two most important. Any interviewer with experience would probably as a general rule be able to quickly identify students that have poor attitude or learning difficulties or other factors that are going to impinge on their ability to be relatively successful academically and by excluding these students, perhaps it may result in remaining students forming a cohort of substantially more skilled or advanced learners. This does not necessarily indicate that students are consciously being selected on ability but perhaps suitability as defined by the criteria set by the interviewer. These phenomena could of course be more clearly identified with some form of standardised testing of all applicants and then comparing their results on the tests with the probability of being enrolled. St Joseph’s College has a very different approach to enrolment. There is generally no interview for Year 7s. There is a list of criteria that students are evaluated against to determine whether or not they are to be enrolled. Students are classified into groups for enrolment based on criteria such as for example, did the student attend a local Catholic Primary School, has the student completed the appropriate religious rites, do they have a sibling at the school, did a close relative attend, is the family active in their local Church etc.? None of the criteria bear any relationship to academic performance and in that sense the student cohorts are very much of mixed academic abilities.
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The very high performing school also had an extensive advisory system for Year 10 students proceeding to VCE. Students that are not clearly capable of succeeding at a VCE subject are strongly guided away from undertaking that course and in some circumstances it was even advised that perhaps they should reconsider undertaking VCE. This type of approach would inevitably lead to an improvement in overall VCE study scores above 40, but it is definitely not a system that enables all students to strive and obtain their best possible results. The result driven approach is very much a school reputation centred approach and diametrically opposed to what should be the goal of any school where individual students’ success should be tantamount. Particularly where the student achieves not some arbitrarily determined objective i.e. a score above 40, but the student performs to the best of their ability and develops their skills as far as possible.

The results of this component of Phase One made it quite apparent that all school leaders with responsibility for curriculum and learning were well aware of the importance and potential value in better utilisation of student data. At the same time none of the schools had available a readily recognisable mechanism that would be able to promote and enhance learning by using collected data. It became apparent that despite the generally accepted view that using data for reporting is important and most schools do this well, it is also widely accepted that using all available student data for learning is a goal that is very difficult to achieve. After completion of the survey a wider search to identify a school that may have a more practical data utilisation mechanism already functioning was undertaken.

A number of potential schools had been identified as purporting to “use data”, but on closer examination the school which had the most advanced type of data utilisation was determined to be a Melbourne metropolitan government secondary high school, Fitzroy High School. The system in a large part was designed to be able to personalise the learning of each student (Davidson 2010).
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Within the school in which it was designed this system seemed to work well. Fitzroy High school with a relatively small student population, less than 400 students, has been able to develop a very good system of incorporating student data into action for learning. The tool itself had become known as the “Fitzolator” and is a system that centralised most of an individual’s student data using Excel™ spread sheets (Bennet 2008). Although it seemed to work well at Fitzroy it did have a few limitations. Its operation and general running was heavily dependent on the developer Peter Bennet and also dependent to some extent on the small number of students at the school, as opposed to St Joseph’s College where the system would need to be able to cope with up to approximately 1600 students. Although in its current form the Fitzolator worked apparently very well for the school in which it was developed it was not very portable and was not well suited to being transplanted unmodified into a different school, especially one that is substantially different such as St Joseph’s College.

The lack of portability of assessment monitoring programs is the reason many of the monitoring devices tend to be either so specifically and idiosyncratically designed as in the Fitzolator that it can only really be used at the one school, or are so general in their application that they can be used at any school but they can only be used for some very specific analysis, such as the Richardson method of analysis of VCE results (Richardson 2005). In this analysis students’ performance on the General Achievement Tests (GAT) which are administered before the VCE exams are used to determine a potential performance ability of the student. This potential is then compared with the actual performance of the student and the theory is that if the student cohort generally performs better than expected this highlights that the school, curriculum, teachers etc. are performing well, whilst if the student cohort on average does worse than expected this indicates some need for improvement. This analysis has been used for nearly a decade and has consistently shown that students at St Joseph’s College have invariably underperformed in English. Obviously though since
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the analysis has shown underperforming for a significant time in terms of being a tool for remediation it is still being developed. The school has devoted much energy to improving this aspect of student performance, but the GAT versus VCE analysis is not designed to suggest strategies, it reveals general trends. One of the weaknesses of the Richardson approach is that it is a summative type appraisal of a process that had occurred over six years for most students. It is not really a diagnostic tool for isolating causative factors in the learning process. Although it may draw attention to areas for improvement the students within the cohort have already passed through the system when the results are generated and so it is far easier to use this model to monitor apparent school performance and implement changes to curriculum, staff, pedagogical practices in VCE classes rather than identifying individual student performance changes that might be used to help individual students during their time at school.

A system that was to be trialled eventually at St Joseph’s College was the Student Performance Analyser (SPA), a commercially available program whereby student results could be uploaded to a web-based analyser (Holmes-Smith 2010). The SPA was still in use at the completion of the current study, it did initially exhibit some limitations in that it is specifically designed to analyse only a few specific types of data in order to allow it to be generic enough to be used by a range of schools. At St Joseph’s College one particular problem was that the SPA initially would only allow students to be accessed in class cohorts related to homeroom groups. Students at St Joseph’s College are rarely in homeroom groups for subjects apart from Year 7. This issue was addressed with later versions of SPA that allowed each individual student’s timetabled classes to also be loaded onto the software to allow any class of students to be accessed at the same time. This had the major benefit of allowing any teacher of any subject to access all their students’ data with very little effort. In summary, the survey endeavours of Phase One clearly demonstrated that the educational communities are very aware of the difficulties of effectively using data to enhance the learning of students. Many educators have clear ideas
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of the potential for student data to be used but many have reached an impasse in terms of the application of data to learning. Many educators would very much like to be able to improve learning through the use of data but have not been able to easily adapt any existing protocols and mechanisms. The challenge for this study then became how to circumvent the issue of not being able to locate an “off the shelf, one size fits all” mechanism that could readily be implemented and grafted into St Joseph’s College.

4.3 Assessment Results Statistical Analysis

Student assessment data is often analysed in two distinct categories. These two categories can be viewed as high stake as for example VCE external examination results and low stake school based teacher assessments. Discussion and argument over the reliability and accuracy of each is ongoing (MacCann 2010) but what is clear is that in the current environment “high stake” VCE assessments are generally the far more publicly visible forms of data generated by schools. This bias towards the VCE results often results in a certain amount of tension within schools’ management and teaching staff when desired results are not achieved. In a school such as St Joseph’s College there is no form of academic ability selection process for entry to the school. As a result it is not unreasonable to assume that the performance of the large cohort of final year students, around 200, would on average perform at standards expected to be relatively consistent each year. This is of course based on a multitude of assumptions. At a very basic level it assumes that each cohort of final year students is representative of the total number of final year students in the state, this is complicated by the fact that most final year students at St Joseph’s College are male, therefore biasing results already. Even though St Joseph’s College does not select potential students based on academic ability it is not unreasonable to assume a certain amount of “innate” selection occurs due to financial constraints. Although in comparison to many independent schools
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and Catholic colleges St Joseph’s College fees are relatively low and any parents with barely sufficient means are likely not to choose to send a weaker student to the college. Anecdotally there would also seem to be a strategy by some independent schools to attract potentially high achieving students with the inducement of scholarships. St Joseph’s College does not offer any types of scholarships. It is beyond the scope of this study to determine any potential impact of these actors on the expected performance of the cohorts at St Joseph’s College, but it does present some interesting questions that if investigated may have some bearing on the expectations of how each cohort may perform.

At the time this study was begun student assessment data was relatively difficult to access. As previously mentioned many of the standardised testing results were haphazardly stored and at times incomplete. The results that were retrievable included the pretesting results composed of the ACER literacy and numeracy tests, the Raven’s Progressive matrices and AIM Year 7 results. Predominantly the data was being used in only a very limited way to identify students that would struggle academically and may benefit from some extra assistance. For Phase One of the study the decision was taken and considerable effort was made to develop a means to use student data to predict what might be the potential of students to perform at the VCE level. The approach involved retrieving the Year 7 standardised testing results and then comparing this with the VCE results. An obvious problem is how to directly compare the two data sets. With six years between assessments and testing that is attempting to determine ability in very different areas would require some type of moderation. Obviously statistical comparison is a very large and often complicated component of the field of Mathematics. This study was aiming to produce a mechanism for the use of assessment data that would be user friendly and as such trying to keep the use of highly sophisticated mathematical statistics to a minimum. A simple approach is not necessarily a negative, and so a type of “Occam’s Razor” approach was adopted. The comparisons needed to be simple but valid.
The mechanism that was decided upon was to rank students according to their performance on the Year 7 assessments. The students were allocated a rank number for their performance on each of the tests. The student that achieved the best result was given the rank of 1, the second best student 2 and so on. When all students had been allocated a rank for all of the assessments their rank numbers were added up to give a rank total. The students were then sorted according to their rank total. The student with the lowest rank was given the rank number 1, the second best 2 and so on. This rank system was referred to as the Global Students Performance Assessment Table (GSPA T). The students’ performance in their final year were then ranked according to the performance in terms of their ENTER score (this was to later become an ATAR score). Only students that had begun in Year 7, completed all assessments and completed VCE gaining an ENTER score were included in the comparison. The students ultimately were then positioned in two ranks one for Year 7 and one for Year 12. Using a Spearman’s Rank Correlation (Wessa 2008) the two rank positions of each student were compared to see whether the students maintained their position in the rank. In an ideal world all assessments would be 100% accurate and each student would maintain their rank from Year 7 to Year 12; this would of course also make the VCE assessments obsolete if a 100% accurate predictor for VCE performance existed. This was obviously not the case, the correlation between each students’ position was mildly positive $R^2 = 0.4354$. (See Appendix 3). The weaknesses of correlation led to the realisation that attempting to accurately predict performance on assessments six years into the future had limited value. Determining potential ability is a very difficult quest, particularly when considering ability is determined by a set of innate and acquired skills. Innate ability acts in concert with acquired skills and the debate becomes very similar to the very old genetic argument of nature versus nurture. Considering potential in the future is a culmination of innate plus acquired skills and the interactions of these two facets is complex. It is also not unexpected that potential itself is variable and changes with time thus complicating even
more the theoretical attainment of potential. This change in time no doubt is not linear and unique to every individual student so rather than trying to predict future performance the study began to focus on utilising past and current assessment results to inform present decision making processes.

### 4.4 Student Perceptions Year 7

A component of Phase One of this study included a plan to determine the student perspective of the learning journey of students at St Joseph’s College. Using data to aid in the learning process of students seems a very simple statement and superficially a relatively straightforward process. As has already been identified there is a somewhat gaping chasm between the theory and the actual implementation of the concept. Rather than relying solely on the data generated by predominantly routine testing, measures were taken to take a wider approach. With this aim in mind, students were interviewed to gain insight into the student perspective and fuse this with the testing data. This would then produce a far more global perspective of the students. Historically very little student input had been officially considered when designing curriculum, assessments or developing pedagogical processes and so steps were made to collect this vital information. Students were selected from three year levels 7, 10 and 12.

Thirty students were randomly selected from each level making sure that representative students from high, middle and low academically performing students were included from each year level. To determine whether the student was high, low or middle in terms of academic ability their ranking for their Year 7 GSPAT was used to identify their academic ability. Students in the top 25% of the rank were ascribed as high, the bottom 25% were low and the 25% of students either side of the median student (making 50% in total) were classed as middle. These students were invited to participate in an interview and
parents’ permissions were obtained. For each year level, students were interviewed under similar conditions. The students were interviewed in an informal setting of a lounge area in the school library and presented with a series of questions verbally (see Appendix 3). Their responses were recorded and transcribed. Once transcribed, the responses were then placed into a variety of categories. To simplify analysis the responses were divided into three basic categories; positive, which had been determined that the student was indicating that they were giving a response that was in some way associated with some type of enthusiastically constructive approach and negative that indicated the response contained connotations of negative aspects. The difference between these two categories was generally very apparent and most responses readily fell readily into either of the categories. A limited number of responses that were not clearly positive or negative were classed as neutral, but were very limited in number.

Ten Year 7 students were interviewed individually and their responses to the set questions were analysed and categorised. The initial major analysis involved determining whether a response from a student was giving either a positive or negative perspective. As an example below is a response to the question, about which subjects he enjoys at school, from Student F

“PE cause I’m good at stuff like that and probably drama. I like entertaining people, being fun. I don’t mind food tech I’m pretty good with hands on stuff.”

This was considered as a clearly positive response. It is obvious in his response that his answer to the question is giving detail about subjects he enjoyed. In contrast, when the same student was questioned about Mathematics his responses were classed as negative:

“With maths I’ve got no idea what’s going on”
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With all ten students the responses were predominantly positive or negative with very little ambiguity. It was apparent that there was a close association of the amount of positive responses to questions matched with the students’ performance on the ranking process. Students that were ranked highly, for example Student A who had an assessment ranking in the top 5% of the cohort gave only positive responses to all questions. Whereas Student F above only responded positive to one question and he was ranked in the bottom 5%. This phenomenon was consistent for all ten students with most negative responses coming from the two lowest ranked students and very few negative responses coming from middle or top ranked students.

The students were given the opportunity to suggest what changes they might make to improve their involvement and success within the curriculum. Most did not have any real criticism of the curriculum or the pedagogies they had experienced. Two students S and D both commented in detail on how they would feel more comfortable if they were in a class of students with comparable abilities. S was in the lower 15% of rankings and felt uncomfortable in class with those students that were “smarter” whilst D from the top 15% did not like being “bored” waiting for other students to catch up. In general the students were either satisfied with the way in which subjects were presented and taught or if not completely satisfied, the dissatisfaction was due to class grouping and interpersonal dynamics.

Unfortunately with a sample size of only ten students it would be unreasonable to place too much emphasis on numerical analysis of responses, but in a very evident trend of the 130 classified responses only 20 were negative and of those 17 negative responses came from the two students F and S whom were both ranked in the bottom band of the testing. The fact that the students were interviewed in their first year at St Joseph’s College and the ranking system was predominantly based on data that was accumulated before the students had attended St Joseph’s College it can be reasonably assumed that the influence of
St. Joseph’s College on the students at this stage of their development would be secondary to most other educational experiences the students had encountered. Therefore a strong argument can be constructed that a low ranking from the accumulated assessment data may tend to reflect a negative attitude to learning as well as weaknesses in literacy and numeracy skills. This negative attitude could conceivably be a causative factor in the lack of performance of the students and reinforces the need to support some students to develop more positive attitudes, as well as providing support for literacy and numeracy skills. Many resources are directed at improving skills but less emphasis is currently directed at attitude modification. Trying to separate out whether student perspective is a cause or effect, of learning difficulties, is a very resource intensive process and requires inquiry with individual students. Negative attitudes are not evident from standard academic ability testing. If a student does poorly on testing because of negative attitude not reduced ability, this is not readily discernible. This is an important limitation of standard testing and supports the need for more student centred assessment that attempts to assess all aspects of the student’s propensity to learn.

4.5 Student Perceptions Year 10

The eleven students interviewed from Year 10 included students from the high, low and middle band of academically performing students of the cohort. Their responses were categorised as positive or negative in a similar fashion to the Year 7s. Their responses followed the same general pattern, with high achieving students giving almost exclusively positive responses and the lowest achieving giving many more negative responses. Of the 185 responses to questions 96 were considered positive but of these the lowest three ranked students only gave an average of 3 positive responses each compared to the rest of the students that gave an average of 9 positive responses. The discrepancy between low ranked students and positive response may be even more marked,
as Student 7 who was one of the three low ranked students gave 9 positive responses Student 4 gave 3 and Student 11 gave 0. Student 7 gave responses that were far more similar to the high ranked students and from general assessments since the assessment ranking data it is apparent that he has far better academic ability than seems to be indicated from his ranking data collected in Year 7. This phenomenon clearly proves that ranking data that relies on only a small number of assessments from standardised test can be misleading and interview responses can often give a more realistic picture of student ability.

When the lower ranked students did give a positive response it was often qualified and related to very specific experiences. For example Student 4 was asked to describe his math and science abilities he responded:

“Science last semester I did material science. Some parts I excelled in, like hooking up to power packs and watching current flow, I really liked that. Maths I did normal Year 9 and the teachers put me in bridging maths and I’m doing pretty good. The majority of class don’t do anything but I work and so does the boy I sit next to.”

This student was particularly weak academically. He enjoyed school but through the course of the interview it became apparent that he obviously was not able to realistically assess his own ability compared to the rest of the cohort. He was quite confident that he would perform reasonably in his exams actually stating when responding to a question to describe his English abilities.

“In English not the best but I’ll pass my exams and stuff.”

His responses were typical for the lower ranked students. They typically seemed to overestimate their actual ability and underestimate the amount of work it would take to achieve good results. Generally their motivation was far
less easily discerned. Student 4 could not articulate any real goal in terms of a career or pathway, in any detail, after VCE. Student 7 and 11 were also ranked very low in the bottom band. Student 11 gave similar responses to student 4 and was very negative and yet still made the prediction that in year 12 for his ENTER score.

“I’ll probably get between 50 and 70 got to do better than my brother to shove it in his face, we are really competitive.”

Student 7 gave responses far more similar to high ranked students and in response to what he would get for his ENTER he responded;

“I’d aim for something fairly high about 92, around there.”

This statement was consistent with student 7’s goal of doing physiotherapy. This inconsistency of assessment ranking and responses to interview questions is a clear example of the need to conditionally accept the objective testing results because the student clearly performed well below his actual level of ability. This inconsistency became apparent quite early as the students performed very well and consistently well from Year 7 through to Year 10.

The Year 10 interview results gave clear indication that as opposed to the Year 7 students they had begun to seriously consider the future ramifications of their subject selection and academic performance. It appeared that the high and middle ranked students were able to assess their own abilities with a certain amount of accuracy. This was not apparent with the lower ranked students as they tended to overestimate their abilities and underestimate the effort that would be required to achieve their goals.
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4.6 Student Perceptions Year 12

Ten students from Year 12 were interviewed. This included students from the high, low and the middle band of the cohort, based on their initial pretesting data from the beginning of their six years at St Joseph’s College. Their responses followed some of the patterns of Year 7 and Year 10 with some variations when it came to career focus. The Year 12’s were obviously more career driven as they were required to make decisions about the directions they would take in career terms post-secondary school. They, therefore, generally had more of an idea of what potential careers their secondary studies were preparing them for.

Due to the numerical ranking nature of the ENTER score these students obtained at the end of Year 12, it was possible to analyse results more objectively in relation to any predictive value in pretesting results compared to ENTER results at the end of the educative process at St Joseph’s College. When a Spearman’s statistical comparison (Wessa 2008) was conducted the correlation of pretesting GSPAT rank to VCE ENTER rank was not particularly strong (see appendix 1). In fact, although there is an obvious pattern whereby students that performed well on the pretesting in Year 7 generally did well on their VCE exams, the correlation is not anywhere near strong enough to enable it to be used as an accurate predictive tool. This result is perhaps not surprising considering the enormous number of variables impacting on the process of ranking students on a range of assessment procedures. The result, though not useful as a predictive tool at the level of the individual, does reinforce the highly generalised nature of any attempt to predict future performances of students. The table below summarises the performance of students on their original Year 7 GSPAT rank, their rank according to VCE ENTER results and then a comparison of their predicted performance on the ENTER compared to the actual ENTER result that they were awarded.
As previously stated, the small number of observations precludes any meaningful statistical conclusions to be drawn but it would appear that there is a trend whereby low performing students are far less realistic or accurate in self-assessing their likely performance on the VCE exams. Students 6 and 10 are interesting as on the initial GSPAT they both were quite low down in the middle achieving band and both finished Year 12 much closer to the upper middle band and clearly gave very good estimates for their predicted performance. This indicates that a student’s self-assessment of predicted performance is relatively accurate for most students and agrees with previous studies that have shown the students can relatively accurately predict their performance (Kuncel 2001). The exception for prediction from the interview data would indicate that this reliability of prediction does not necessarily hold true for the clearly low performing students. These interview results pointed to the benefits that would be gained in including student perspective into any type
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of performance monitoring. Student input, for the majority of students, gives an extra dimension of insight into the student’s potential, as it in part takes into account variables that may only be known to the individual student. This inclusion of “hidden” data can only increase the validity and reliability of any performance estimation system. What became apparent anecdotally was that performance in VCE was a combination of innate ability and internal motivation that manifested as good work ethic. This no doubt accounts for the only mildly positive correlation between testing results and VCE performance. The harder a student is prepared to work the higher the score they will gain on their final assessments, which were ENTER scores when this study began but had become known as ATAR scores by the end of the study. Due to the huge numbers of influences on the way students apply themselves to their studies during VCE and the unforeseeable factors that can effect individual positively or negatively during the year, it is unreasonable to assume that any type of accurate predictor algorithm could be built that would accurately predict the performance of a student from objective testing alone. It would appear that for middle to high range performing students that an accurate predictor of future performance on completion of VCE is an honest self-assessment from the individual student themselves.

4.7 Data Use at St Joseph’s College

Comparing assessment results between student cohorts and even within cohorts is fraught with many complicating variables. Student performance on any type of assessment is the culmination of innumerable variables and therefore, when comparing the performance of a cohort of students with a different cohort there may be some use in comparing the overall performance of the cohorts to estimate the performance of features such as curriculum or teacher effect; but even this type of analysis can at times have minimal validity due to the inability to account for such a large number of influencing factors. In fact, ideally, if
truly accurate analysis was to be undertaken the only variable that should change would be the actual students, but of course in real life circumstances this is unattainable. In an attempt to improve the robustness of monitoring performance a system of viewing student assessment results as a function of their performance within their cohort as a measure of change in their rank performance was determined to be the best approach, as discussed earlier. Regardless of the assessment, a student’s performance was ranked within their cohort, thus assuming students’ performances are generally a reflection of their standing within the cohort it allows the development of a means to monitor the students’ ability, via the relative movement of their rank within the cohort. Students that generally perform well on an assessment will usually be well ranked; conversely those students that struggle will tend to be found ranked lower within the group. This method allowed virtually any assessment that had been given to the entire cohort to be included as part of the system to monitor student progress. Although fundamentally ranking students for every common assessment may be based on sound theoretical principles there were found to be some significant drawbacks. Unfortunately trialing this method for a number of years ultimately identified that the ability to provide data in a reliable format that was also readily accessible was very difficult. Spreadsheets were constructed and students’ results were entered and ranked. Appendix 2 gives an example of what the table would appear like.

The main problem with using ranking tables was in determining what might be considered a significant change in a student’s position, not merely in a statistical sense, but at what point did a change in rank correlate with a real change in the performance of the student reflecting a change in the learning process that would justify some type of intervention. This difficulty in correlating position change with the need for intervention was initially approached by arbitrarily deciding that a change of 25 positions or more warranted investigation. This method did not work particularly well as the vast majority of movement tended to be within the middle range of the ranks with an occasional movement at the
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extremes. Investigation identified that the movement of the extremes tended to be higher performing students that had some type of unusual influence on their performance. The influences varied from changes in family circumstances such as family breakups or extended absences due to illness or vacation. The performance of lower achieving students was consistent with little major movement. The movement of students in the middle bands was more variable and perhaps reflective of the closeness in performance of these students. The performance on just a few questions or criteria within the assessment was enough to change the position of the average students by a relatively large amount.

The trialing of this ranking system, the GSPAT, represented the final stages of Phase One and led to identifying the need to develop some type of assessment that could be used longitudinally that allowed comparison of student’s performance with their own performance. It was apparent that the most accurate system of tracking would be one that at the individual student level gave specific information about the individual that was independent of their performance compared to the cohort. Comparisons with cohort performance is useful information as a guide, but to accurately track the individual, comparison must be made with the individual’s previous performances to gauge individual improvement. Although at some level it is common sense and logical to realize that comparing an individual student’s performance with their past performances is going to give information that directly relates to the student’s progress, many students, parents as well as educators will often focus on a student’s performance compared to the rest of the class, year, school etc. The assessment data that was being used at St Joseph’s College was not entirely suitable to form an efficient easily accessible benchmarking system monitoring individual performance and so the next phase of the study was to develop a more user friendly system that highlighted an individual student’s assessment data. The search was to lead to computer adaptive testing (CAT) that could accurately estimate the students literacy and numeracy abilities thus allowing
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the progress of students of different ability to be quickly and accurately assessed, providing the basis for a system that could efficiently monitor students’ progress.
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5.1 Developing a Data Use System

During the course of this study the identification of the reliability of the assessment data was a paramount concern. The process of validating how reliable data is can be a very difficult process. When dealing with the multitude of variables associated with students and learning it was found that there was no straightforward way to verify the accuracy of assessment data for an individual student on a particular day. In fact it must be accepted that when analysing student assessment data it is best to consider all assessment data is indicative rather than diagnostic. This viewpoint should not be used as an argument to devalue the usefulness and necessity of student assessments but it should act as a moderating influence when tracking student progress. A significant amount of uncertainty in assessment reliability begins to reduce when monitoring an individual student’s performance over time. A longitudinal approach to assessment analysis is essential to ensure the accuracy of any monitoring process. Unfortunately, in many circumstances, the improved accuracy of a longitudinal approach is circumvented by the convenience of a more instantaneous analysis.

A clear example of this convenience versus accuracy is the typical ranking of students in VCE at the end of their secondary education. Although many subjects have assessment components determined from a number of less “high stake” school assessed coursework, the majority of each individual student’s rank is determined by performance on possibly one or two summative exams. This clearly will not reflect the true ability of all students but it is by far the most efficient means to compare large numbers of students. It would be unrealistic to suggest using a small number of school based summative assessments as the basis for developing a VCE rank as this approach would
inevitably lead to many inconsistencies. The system would be highly vulnerable to invalid manipulation and cheating. Keeping this in mind the current inclusion of some school based assessments in determining students’ final results in VCE is confirmation of the recognition that simple summative exams, although convenient and robust in terms of reducing any untoward manipulation, in isolation they do not present an accurate reflection of all students’ abilities. Unfortunately, despite the recognition of the importance of formative assessments VCE results are still predominantly driven by exam performance and the summative approach. It would be naïve to expect the VCE to be driven differently as it must be realised that essentially the VCE rank is constructed to allow tertiary education institutions a quick and efficient means to differentiate students into a hierarchical list. The list is then used for offering enrolment to students starting with the highest ranked applicant down the list until their enrolment is full. Although the system is not perfect experience has shown that for large numbers of students it is an equitable approach. Students that work very hard often do well on the exams, tertiary institutes want students that have acquired the skills that allow them to do well on exams and so in a sort of circular argument the system achieves its objectives. A significant chasm between VCE results and student performance can arise when the skill set a student possesses does not align well with the skills required to do well on high stake exams. Some students with extra time and assistance can make significant improvements, but due to the pressure and time constraints of VCE the student is not able to perform to the extent that their talent would allow with more time. The result is that some students are ranked lower than their abilities really warrant. This phenomenon of misdiagnosing a student's true abilities must be accounted for by all systems for assessing student performance. If it is accepted that an assessment result is merely a snapshot of performance for that particular assessment it is less likely that students will be unfairly categorised. To this end Phase Two of the current study was positioned to isolate and collate assessments that could effectively and actively be used to build a monitoring system for tracking students’ performance at St Joseph’s
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College. Most importantly, it was essential that the system could be used to facilitate active intervention when required. The results from Phase One indicated that data that had been collected historically at St Joseph’s College was not adequate and the storage and retrieval systems used were very ineffective. This resulted in some clear aims for Phase Two, the system should:

- Be based on reliable, valid data.
- Be longitudinal to monitor changes in student performance.
- Be readily accessible and teacher friendly.
- Not be dependent on complicated statistics or data manipulation.

5.2 Monitoring Student performance

Any non-standardised testing requires a significant investment of time to be able to be utilised successfully. In terms of an individual classroom teacher this is not such an issue because the teacher is very familiar with the student and the circumstances of the assessments. The real problem often occurs when the student moves on to a new teacher. The teacher may very well have access to assessments and reports but without any standardisation and no context in which to place the student’s performance the new teacher must dedicate much time and effort in developing their own evaluation of the student’s performance. This process becomes very inefficient when considering that at a school like St Joseph’s College for example, a student begins in Year 7 and by the end of Year 12 it would not be unusual for that student to have had over twenty different teachers for their subjects. Over the course of those six years some students will have the same teacher a number of times, but this is not guaranteed and with normal staff turnover in a school it is absolutely essential that the student has been assessed as objectively as possible and that the results are standardised and directly comparable with every other student. This problem with changing
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staff is not new and has been identified previously (Davidson 2010). This is the foundation for the rationale as to why the standardised adaptive testing model has become central to the development of a practical benchmarking tool at St Joseph’s College.

During some initial trials, attempts were made to use the routine assessments on students’ reports, particularly on overall subject results. There were some difficulties with this though in that the only way results were centrally stored was via the students’ term reports. These reports were accessible, but all results were stored as letter grades. Although letter grades are not uncommon as a means for reporting results they do carry inherent difficulties (Cross 1995). Converting letter grades back into numerical values to allow statistical analysis is by no means straightforward and results in far greater inaccuracies. The letter grades also allow a far more subjective approach to assessment. This does allow for a lot more discretion on the teacher’s behalf, allowing a far greater emphasis on professional judgement. For the purposes of this study this approach unfortunately was very counterproductive. Using results with significant subjective components increases variability and thus severely reduces reliability of the assessment as a measure of longitudinal change.

It is not feasible to assess all students with exactly the same assessments all the time. The dynamics of teaching a class of students are unique for every class and as such teachers will often adapt pedagogies and content to suit that particular class. This can result in assessments being made that are unique to that class, it would be imprudent to devalue the importance of this type of data particularly when discussing student progress with parents; this information is often the most useful in terms of what parents are interested in hearing about. Parents are often very pleased that their child was able to readily prepare an impromptu presentation to the class about what they just discovered in a particular class activity or some such similar circumstance. The problem comes when trying to quantify this type of information and pass it on in a meaningful
way to subsequent teachers of that student. At times this information may be contained in the student’s actual school reports, but considering that a student at St Joseph’s College takes home four reports a year a teacher that is just beginning to teach a student may have to read through up to twenty reports to get a complete picture of their new student. If the teacher had twenty students in the class and had six new classes this would mean literally hundreds of reports to read. Although this approach may be ideal, it is not really viable. Teachers have limited time and the reading of hundreds of reports and synthesising that information into a usable data is not realistic. At this point in time at St Joseph’s College there was another significant hurdle to this type of approach. Storing complete copies of all a student’s reports that are available for all teaching staff to access has only become a real possibility with the advent of storing reports digitally on computer. The problem with access has resulted from changes in reporting software every few years. This has resulted in technical difficulties in terms of formatting issues. It resulted in only a year or two of reports being easily accessible at any particular time. This issue has been circumvented in the recent past with steps taken to standardise at least the format of reports so that for the foreseeable future all reports will be readily available in digital format to all staff, students and parents. Parents in the past have been supplied with copies of all reports and a special report folder to at least encourage the collation of reports longitudinally by parents. This process was not duplicated at the school which was mainly associated with the cost, space required and importantly the cumbersome nature of trying to allow access to all staff whilst maintaining the integrity of the database. Hard copy archive systems are very labour intensive and costly to justify.

During the course of this study the actual exam results of each subject was eventually recorded on the student’s semester reports and staff was beginning to have some access to a student’s previous years reports, but there were still some major inconsistencies. If a student’s teacher in Year 7 English was a “high marker” and their Year 8 teacher was a “low marker” analysis might show
that the student had not proceeded as expected. This of course could be negated by pooling all assessments of all students and standardising all teachers’ classes or cross marking subjects, which in effect is what occurs with VCE school based assessments. This was trialled for a short time, but was met with a lot of negative attitudes from factions of the teaching staff. Many staff expressed that it was causing a large increase in workload and to alleviate this a period of blind marking was trialled. Staff that taught a particular subject were given the number of exam papers to correct that correlated with the number of classes of the subject that they actually taught. This did alleviate some of the concerns of increased workload by teachers, but extra work then fell upon subject coordinators to arrange exam correction collation. The trial of blind marking was also abandoned before any benefit could be determined. Overall the amount of time required to moderate and standardise all classes’ results was deemed to be inefficient and so monitoring reports as the major tool for identifying students with increased needs was seen as impractical. A system was required that particularly put no extra burden on teachers, as this seemed to be a pivotal factor in getting teaching staff to unanimously accept changes in practices.

In the early stages of this study it was envisaged that detecting student potential and then monitoring performance against this predicted ability would be a very useful tool. This approach, it could be argued, allows the performance of teachers, curriculum and indeed the school to be somewhat objectively determined. If the students are performing according to their potential then obviously all is well with the school, curriculum etc. It was assumed that the assessments students were already undertaking could be adapted to some type of statistical analysis that could clearly identify students who were not performing as expected. Hopefully students that were overachieving and underachieving would be readily identifiable to allow intervention for remediation or to identify factors that were accelerating development. This approach though is based on a number of assumptions that need careful examination. The testing and assessment of potential is not an exact process.
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As was discovered early in this study various assessment approaches can produce very inaccurate results. The South Australian spelling tests used previously at St Joseph’s College were inaccurate and yet had been utilised for quite some time. The ACER pretesting of St Joseph’s College students when compared to VCE results six years later only had a mild positive correlation (see Appendix 2). In fact it could readily be argued that the attainment of potential is never achieved. An assessment of potential is in a large part determined by the current skill set that the student possesses. If via learning the student develops better skills then the potential of the student will invariably change. Conversely if skill development is hampered particularly by influences beyond the control of the school environment does this mean that the success of the school should be devalued because the student has not reached their potential? Probable potential can be a very esoteric variable due to its malleable nature. Rather than concentrate on whether this ideal has been obtained, a more fruitful endeavour is to ensure that the student is continuing to further develop in a positive manner.

Rather than focussing on ensuring students reach some predetermined level of performance a far more useful approach is to monitor each student’s performance on a series on standardised assessments. This can be used to ensure that the students’ performances are continuing to develop positively. By using standardised testing it does have the advantage of removing many of the problems outlined previously when using results recorded on semester reports. Also, importantly there must be consultation with the student to determine how they feel they are proceeding. The student interview component of this study revealed that students are very capable of determining the likely hood of their successes. Steps have begun at St Joseph’s College to incorporate student self-assessment within the student reporting format and in the future this will be further explored to incorporate this feedback into a system whereby any major discrepancies between student assessment and teacher assessment will enable timely identification and perhaps remediation of influences having a negative
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impact on the students’ learning. Currently the process to involve students in the assessment process is for the students to be guided in trying to identify areas of their own work practices and behaviours that might be able to be improved. This strategy is built on the concept that the person that knows the student best is of course the individual student. Ideally because the student has access to innate motivations they have the greatest opportunity to effect change. This is the theory and not necessarily the reality, but it is a step towards including students’ perspectives in the reporting process. Evidence from the First Phase in this investigation would support the view that student self-assessment can be accurate and consequently form an invaluable component of a fully comprehensive assessment process.

The pursuit of the most appropriate form of testing to gauge students’ progress was guided by a number of requirements. These of course included practical considerations such as cost and the ease with which they could be incorporated into the actual curriculum. Primarily the results are used to track student performance and allow timely recognition of students that have significantly changed their rate of progress. The actual absolute value of any one performance on the testing is not as important as the rate at which the student is developing. Not all students develop at the same rate, but simple logic dictates that if a student’s progress stops or even becomes negative then this is an issue for concern. To increase the sophistication of analysis it could be argued that if the progress of a student slows well below that of the cohort this could be detected and begin a process of investigation to identify potential concerns that may be able to be remediated. Looking at change of rate of progress is readily converted into a visual format and interestingly, anecdotally at least there would seem to be a staff perception that a line graph is more easily interpreted than a series of numbers on a table. These factors were fundamental in determining that the testing system that was going to be most useful in developing a monitoring system was some form of adaptive testing.
5.3 Implementing Adaptive Testing

The theory behind adaptive testing is not new. Louis Guttman among others was developing test theory in the 1940s to try and build tests that were not only measuring performance effectively but had sound mathematical basis. Why adaptive testing tended to be limited to areas like psychology rather than education was probably related to the need for highly trained and skilled delivery. The next question to be presented to the person sitting a test at times had to be selected from a specific list and this would vary according to the responses of the tested person. This labour intensive process was reasonable for a therapist working one on one with a client but for a teacher in a class of many students it was just not practical. So adaptive testing never caught on in educative settings. Significant changes have occurred since the 1940s, the evolution of the computer has reached a point where applying adaptive test to a large number of students is no longer hampered by intensive labour constraints. Routine adaptive testing has been a practical reality for quite some time but there has been a very significant lag between the ease of administering the testing and the actual wide spread implementation of adaptive testing.

Previously, around the year 2000, St Joseph’s College had responded to an invitation by the Victorian Curriculum Assessment Authority (VCAA) to join a pilot program to trial the use of adaptive testing. The school was provided with hardware, free of cost, including a computer server and the related instructional manual detailing how to set up and run adaptive testing. A small number of students were tested and the trial was finished. The testing was not widely publicised and very few staff were even aware that it had occurred. The server had been disconnected within a year and left under a bench in the IT department. Relatively early in the development of this current study a fortuitous coincidence occurred during a discussion with the Curriculum Director. Whilst discussing testing procedures, the subject of adaptive testing came up. He recalled that the trial that had been undertaken a few years
previously and he was fairly certain that there was a computer somewhere associated with the testing. A brief investigation with the IT staff located the said server and steps were taken to reinstall the server and renew adaptive testing. The server was by now a few years old but still adequate; however the related software was more problematic.

The tests available for the initial trial were somewhat limited. The VCAA website stated that testing would be available for Years 3-10 across a range of study areas. Initially there were adaptive tests for Year 7 and 8 for literacy and numeracy, but none in the areas of science or humanities. The tests for Years 9 and 10 were not available. Now that the server was up and running a few classes were used to investigate the use of the adaptive testing model provided by the VCAA online service known as On Demand Testing. The program was slow and difficult to load and the number of students that could undertake the testing was limited to one class at a time. These software issues were not unknown to the developers. During 2006 information was provide that the entire system was being upgraded including new tests and a far more flexible program would be the result. Unfortunately, the new system was introduced into government schools first and it would eventually take nearly 18 months until the new version for non-government schools was released and available to St Joseph’s College. Eventually the new version of the software was installed and by 2009, St Joseph’s College now had the capability to test a whole year level simultaneously and access results immediately. The frustrating process of gaining access to a reliable adaptive testing mechanism had taken considerable time and persistence. The extended time for installation does not probably represent the expected time to set up the adaptive program in normal circumstances. The upgrading of the software by VCAA coincided with St Joseph’s College installing a school wide upgrade of the computer system. The combination of circumstances probably slowed the process, but even so it took considerable motivation and persistence to get the system installed and operating efficiently. Without the motivation generated by the
pursuits of this study it is quite likely that the utilisation of the adaptive testing would have for a second time petered out very quickly and quietly.

5.4 Implementing change

Now that the system was upgraded and installed, the protocols for testing classes had to be devised. There were some initial issues with being able to log students on to the system and ensuring data was saved appropriately but these teething difficulties were resolved through using a few “guinea pig” classes and teachers. The first time that the adaptive testing was to be applied to a whole year level cohort was the incoming Year 7 cohort for 2009. Late in 2008 they would be invited, as is the normal procedure, to attend an orientation program. During this time literacy and numeracy testing was routinely conducted interspersed with orientation sessions with teachers that would have the classes the following year. In the past the tests had been ACER tests and the students entered responses in hard copy which were collected and mailed off for correction. The turnaround time was generally a few weeks. The introduction of the adaptive testing had been embraced by the Curriculum Director and the Year 7 Coordinator was also very supportive. Staff involved in administering the testing had mixed reactions which tended to be related to their expertise with computers. The more technical savvy and younger staff seemed very comfortable with the testing whilst more experienced staff with less familiarity with computers were less confident. The students of course with no experience to compare the test procedure with did not exhibit any behaviours observably different from previous years when testing had been conducted using traditional hard copy methods. Most students were unfamiliar with the adaptive testing model confirming the apparent relatively infrequent use of this type of testing, at least in the Catholic primary school sector. With a sample of 250 students from several dozen different schools it was firm evidence that many schools
were yet to take advantage of adaptive testing. A larger proportion of students from government schools had previously undertaken adaptive testing. No surveys or formal intensive questioning of students took place as it was outside the criteria for the ethics approval that had been sought for this study. To this point in the current study the use of the adaptive testing had really only replaced the previous ACER testing. The next stage was to take the results and embed them in a system whereby they could be used to track a student’s development over their six years as a student at the College. In the past the pretesting was used primarily to identify the weakest students for determining extra support needs. After this minimal use, the results were often then set aside and neglected.

5.5 Developing a Data Overview

The data generated by the adaptive testing system was primarily to provide a general overview of the students’ literacy and numeracy level. The On Demand general literacy and numeracy tests that were chosen were used to moderate the estimation of a Victorian Essential Learning Standard progression point. These progression points were described by the VCAA (VCAA 2010) as:

“The progression point is a scale used in the assessment and reporting of student achievement. The progression point scale ranges from 0.5 to 6.75. Each progression point represents six months of expected student progress. For each reporting period, teachers make on-balance judgments about student progress in relation to the standards. As students’ progress along a continuum of learning, teachers will assign the progression point that most closely matches where the student is at in relation to the standards at each level.”

In the past at St Joseph’s College the determining of where a student should be placed on the VELS spectrum had been a keenly debated topic. At staff
meetings debate had ensued over how to accurately categorise a student. Generally it was accepted to utilise teacher experience to make “on-balance” judgements as to where to the student should be placed in reference to the continuum. Some staff was uncomfortable with the vagueness of “on-balance”. Within the VCAA system the smallest increment is a 0.25 increment and this equates to a three month period of development. Allowing that a student may be at the very beginning of one increment or at the very end in some teachers’ estimates, the student could be assessed within “on-balance” over a range of 0.75 points, nearly a whole school year. This problem is directly related to the lack of any real defining unit of measure. A VELS progression unit does not really have a scale against which a measurement can be made. Teachers are asked to categorise the student from professional judgement. This type of subjective assessment is not uncommon particularly in areas of the Arts; for example plenty of critics make a living using subjective judgement alone to rank and assess works of art. But in the process of education having more concrete standards is useful and relatively straightforward. The adaptive On Demand tests assign a numerical value to the estimated student’s progression based on the questions that they are able to correctly answer. Now albeit that the testing available at this stage was only for Literacy and Numeracy it still presents a platform on which to support an “on-balance” estimate. Maths and English teachers, not surprisingly, were very keen to have the availability to use an objective measure that could be used to compare with their professional judgement. This feature of the adaptive testing was crucial in gaining support of the teaching staff. Mathematics and English teachers were unanimous in supporting adaptive testing and many staff in the areas of Science and SOSE were also easily sold on the concept. Teachers of applied subjects such as PE, Technologies and Arts were not immediately enamoured; but this was to be expected particularly until the testing models are made more inclusive of a variety of content areas.
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Once the Literacy and Numeracy results were collated, a system to utilise them was begun with the construction of a table to summarise a student’s standing in the cohort. This initial use could superficially be compared to a performance table. The mention of performance tables often raises concerns with some people. Performance tables have become a controversial topic in Australian Schools, particularly since the development of the “My School” web based Federal Government initiative. This site makes an attempt to compare school performance and hence is presented as an important tool for parents to be able to compare the performance of their children’s school. This type of league table is always going to be divisive as it makes many assumptions and generalisations. The resultant data may have legitimate bureaucratic use for monitoring general trends and monitoring change of school performance longitudinally, but as a means for parents to select a high performing school for their children it is fundamentally flawed. Producing a table that ranks every school’s overall performance is a complex process of selecting a finite set of parameters, many of which are very arbitrary, and in its simplest form reducing all this data to a single numerical value, that being that school’s position on a list. These negative aspects of comparisons are more a consequence of placing too much prominence on relatively inexact and simple data.

Reducing the overall performance of a school or for that matter student to a rank must be analysed cautiously. In the case of the student rank generated from the adaptive testing results it produces a snapshot of the students’ performance on that day and allows a quick assessment of whether further investigation is warranted. Generally the students that ranked lowest were often already expected to be there as all students’ previous schools were required to provide some basic academic assessment and generic performance information. There were exceptions and some discussions with the school counsellors and student support services revealed that there seemed to be at times an attitude that students starting at high school needed a “fresh start” and to avoid labelling students quite a few reports from primary schools could be
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relative vague and general. The adaptive measure would quickly identify a very weak student that might have “slipped” under the radar. In fact the results from adaptive testing were to later prove invaluable in accurately determining the actual level that a student might be operating at.

5.6 Pedagogical changes and Adaptive Testing

The initial implementation of adaptive testing, to form a tracking system, was able to have positive effects far more rapidly than anticipated. In one particular Year 7 class, a teacher was having difficulties with a student who according to his previous schools report was operating at a particular level. The teacher was aware of the student’s limited ability and consequently modified the students program to that of about Year 4 standard as suggested by the primary school report. But despite the accommodations the teacher had made, the student was still struggling. The student completed an adaptive test with his class and it was discovered that his development was far closer to Year 2 than Year 4. This then allowed the teacher to make even more allowances and radically modify the program for the student. As a consequence of the changes, the teacher reported that the student had made significant progress in settling into the class. He was more attentive and as he was now obviously able to actually understand and complete the work assigned to him he was nowhere near as disruptive in class.

This ability to more accurately classify the actual ability level of a student has been instrumental in enabling the adaptive testing to be integrated into the curriculum. After the initial phase of trialling and fine tuning, the actual conduction of the testing the above scenario was the catalyst for a procedure that was to be adopted for all testing. Year 7 and 8 Students were to be tested using the adaptive tests at the beginning of the year, towards the end of the semester one before semester reports were written and towards the end of second semester once again, before reports were to be written. The rationale
was simple; teachers were required to determine a VELS progression point for their students on semester reports. Having an objective measure of literacy and numeracy standard would greatly benefit Mathematics and English teachers in writing their reports, but would also form some form of objective measure of skill for the teachers. Some science staff had found that having an accurate knowledge of a student’s literacy and numeracy skills could be used to help determine whether students was performing within his abilities or slacking off to some extent. Instead of just testing a class and adding the results to a databank and then hoping that teachers will at some time access the results, the actual class results were presented to the Mathematics and English class teachers. The feedback from this procedure was all positive, teachers reporting that although the test results predominantly were in agreement with their appraisals it was useful to have an extra piece of evidence to support their judgement. It was also most useful when trying to identify the level of performance of students that were perhaps on the cusp of one progression point and the next. Any system that reinforces the confidence that can be placed in assessments would normally be viewed as positive progress.

In 2009 adaptive tests became available for Year 9 and 10 in literacy and numeracy. This then allowed all students from Year 7 – 10 to be routinely tested towards the end of semester one. The amount of data being accumulated was now significant. With this increase in data volume a new method of allowing teacher access was required. Up to this point once a class had completed a test the teacher would inform the Learning Enhancement Coordinator via email. The class results would then be retrieved from the system and emailed back to the teacher. It was a very labour intensive process that was tolerable when only Year 7 and 8 were being tested but the amount of work doubled with the extra two year levels. The testing software did have features that would allow teachers to be able to control the delivery and correction of testing for their own classes but the decision was made to limit individual teacher’s administrative access. This decision was based on the
observation that the computer knowledge and technical abilities of teachers varied so significantly that it would have been logistically very difficult to ensure all classes were tested correctly and in a timely manner. Centralising the test delivery and administration meant that another program was required to be used as a database and access point for teachers of individual students and classes.

Fortunately the need to be able to store and access On Demand results as well as NAPLAN results had already been recognised by an educational consultant company SREAMS (School Research Evaluation and Measurement Services) and a commercially available program SPA (Student Performance Analyser) was available and capable of storing the data and giving easy access to all staff. Interestingly, in 2011, this software was made available by DEET to many government primary schools in the South Barwon region, as it was recognised as a valuable tool in storing and accessing student data. The SPA was still under development when first installed at St Joseph’s College and this did present some limitations. Students could be reviewed as an individual or member of a homeroom, Maths or English class. This of course was valuable for homeroom teachers and teachers of Maths and English classes. This would also be quite acceptable in a small school, particularly a primary school, where most students are always timetabled with the same cohort or class and the actual total numbers of students is relatively small. In a large secondary school such as St Joseph’s College these limitations did cause some problems. It was also generally very useful for any Year 7 teacher as most classes were organised simply in their homeroom groups. For classes other than Year 7 there was an issue, a Year 9 science class for example might have students from ten different home groups and so the science teacher would have to manually search for individual students which was very time consuming. This type of issue created another “blocker” for staff to adopt the use of individualised student data records as a means to use the data to enhance learning.
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If the data was too hard to access or too time consuming to collect then the likelihood was that staff, other than the most motivated, would most likely not persist. In 2012 an updated version of the SPA was available that allowed all students subjects to be loaded onto the system and it became possible to access not only the homeroom, Maths and English classes, but any class. This greatly enhanced the ease of access for teachers and so staff interest and consequently use of the available data increased commensurately. A significant advantage was that current classes of any year level 7-12 could be accessed by any teacher at any time. For example, a Year 12 Biology teacher at the beginning of the year could easily access their class results to familiarise themselves with each student’s previous five years performance in the routine Literacy and Numeracy adaptive testing as well as their previous NAPLAN results. Having access to this longitudinal record of previous results formed an invaluable tool to quickly identify where each student’s strengths and deficiencies might lie. This accessibility would not necessarily instigate huge changes into pedagogies particularly in Year 12, but it becomes another important tool in being able to identify the individual needs of students in a reliable and efficient way.
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6.1 Data Influencing Practice

Phase two as a process occupied a significantly longer time than Phase one. The first phase had identified the data that was most appropriate for use at St Joseph’s College and the initial developments in Phase two had produced tangible benefits well in advance of what was expected. As detailed in the previous chapter individual results from the adaptive testing were being utilised in a practical sense almost from the very first cohort wide testing. Although beneficial, the main intent of the study was not to merely identify the best practice means of testing students, it was to develop a system for monitoring performance over time of all students. The system was planned to be equally accurate for students of all standards and the adaptive testing was just the appropriate testing mechanism to achieve this goal. In retrospect, it is not surprising that a testing regime that was very much more accurate in its determination of student level compared with the previous testing mechanism and one that for teachers was time saving was quickly embraced and consequently utilised by teachers.

The challenge was to now take the data and develop protocols for collation, storage and importantly dissemination to teaching staff to directly benefit the learning of students. Attempts had been made when the GSPAT was first developed to use spreadsheets. The spreadsheets were maintained on the schools main server and all staff had access to the information. Very few staff were accessing the information and so presentations outlining the system and its potential uses were given during full staff meetings. These presentations did increase use of the system but nowhere near as widely as anticipated. The school counsellor was very active in accessing the data as it gave convenient access to information to be included on specialist referral reports and
applications for specialist funding. The Mathematics Coordinator and staff involved in determining which students should be allocated to consolidating courses or acceleration courses in Mathematics were very keen users of the information, but few staff were accessing the information to inform their everyday pedagogical practices.

Investigation revealed that the data, although relatively straightforward to understand, was difficult to access in class groups as students changed homerooms from Year 7 to 8 and were in different class cohorts. The maths staff was primarily dealing with year level cohorts and this was in fact more straightforward than class groups despite the huge increase of student numbers, perhaps 220 students instead of 28. Year 7 coordinators and staff were also significant users of the data in the GPSAT format, but once again this was primarily to assign homerooms to ensure classes had a relatively even spread of abilities in each class. Interestingly, the increase in accuracy of the adaptive testing that was adopted actually created an opportunity to, in effect, supersede this approach. In the past, students in Year 7 have very much been put into mixed ability groups and then at the end of Year 7 when a good idea of the students’ abilities had been obtained from a year’s observation, students that had serious difficulties in English and Mathematics were placed in consolidation classes. These classes known as foundation classes were limited to less than 18 students and were allocated very experienced staff with teacher aides in an attempt to maximise these students’ development. It was argued that now that the adaptive testing gave a far more accurate and immediate estimation of students’ abilities why place such students in a general mixed ability class for all of Year 7, when they could be in a much more supportive environment from the beginning of Year 7 and may even by the end of that year be able to cope adequately with a general mixed ability Year 8 class the following year? And so another significant development was generated from the simple procedure of utilising better testing regimes. The problem still remained of how to present the data to encourage more generalised use of the
data as fundamentally the discussed procedures were really only benefitting a fraction of the whole cohort.

Mathematics teachers were generally very quick to adopt methods of utilising the data available for use within the context of their classes. It possibly is a consequence of Maths teachers consistently dealing with quite objective measures of student achievement. Much of the assessment of students in Mathematics is purely quantitative and therefore these teachers are very comfortable comparing students’ abilities longitudinally on set assessment pieces. Initially a very motivated and experienced teacher expressed the opinion that having the adaptive testing and NAPLAN results readily accessible would allow them to cater for the individual needs of the learners in a class in a far more efficient manner. The teacher was able to use the data to quickly identify the learning needs of members of the class and then develop programs that would suit the skill levels of the students. In one particular foundation class for students that already had been identified as needing more support in Mathematics the teacher developed a system of breaking the class into roughly three equal groups. Each group was almost a class within a class, an efficient method for individualising the program to suit the needs of the students. Having reliable accurate information on student skill level at the very beginning of the year allowed the teacher to begin the process of differentiating the curriculum, dependent on the student requirements and needs, in a far more efficient manner. It may have taken many weeks of routine linear testing and assessment to sort the students into skill based groups without the previous data.

6.2 Identifying Storage and Analysis Mechanisms

Before this study was undertaken the only data that was centralised and routinely updated was data pertaining to facets of students’ medical needs, family contact details and all the associated administrative information that is
collected routinely from students. Data pertaining directly to learning was obviously incorporated into the report production mechanisms but this information was not collated in a useful way. Copies of students’ reports and consequently academic performance could be retrieved but individual student’s reports were not collated. To retrieve a longitudinal collection of just one student would take a concerted effort to trawl through each semester’s entire year level cohort, pull out that report and then proceed on to the next semester. This was excessively time consuming and accounted for the lack of easily accessible overview of each student’s academic performance. Parents were encouraged to maintain a copy of all reports in a provided folder, but this was obviously not available to teaching staff. The crux of the issue seemed to really be a computer software problem. The reporting system used was being regularly reviewed and changed and there was a definite lack of consistency. Some of the programs trialled lasted less than two years and when changes were made problems arose in transferring previous report data into a format that was easily accessible and efficient.

Decision were taken to trial Markbook©, a commercially available software system that was beginning to be used in many schools with some success. The trial was initially to phase in the use of Markbook© with Mathematics and English and then to expand the program the following year to include all subjects. Anecdotally the staff that had begun to use the software were beginning to feel it was making significant improvement in data handling. The motivation for the installation of the software was to improve the efficiency of the reporting process. It would also improve access to data generally. As the current study had been underway for about 12 months at this time the next school year 2006 would see changes that would provide a great opportunity to improve some of the limitation of data use that had already been identified. This anticipated path was not to eventuate. At the beginning of the next school year instead of switching all staff over to Markbook©, staff was informed of the decision to move all students data including reports over to SIMON©. This
program was not widely used and was in the developmental stages. Some staff were a little surprised considering there had been a certain amount of approval of Markbook© and now the school was heading in a different direction. The designers of SIMON© came to the school and provided professional development for the staff and explained the features and uses of the system. It was explained in terms very similar to the current explanation on the programs website (SIMON 2010).

“In 2000 the Ballarat Catholic Secondary Schools were frustrated with having to manage a large number of disparate databases and software packages to meet the technological needs of the schools. From this the Ballarat Catholic Secondary Schools and the Catholic Education Office Ballarat worked together to create a software package that would grow with the increasing demand for information solutions in these schools. The goal was to produce software that would absorb many of the databases used in the schools, and empower the users with a system in which a whole range of technologies could flourish; from this aspiration SIMON was born.”

It then took two years before the software had been developed to a point where it could be used in schools. The project formally started in 2002 with Mark Vanderkley (Senior Developer), Kevin Brodie (Project Manager) the personnel that eventually developed the system and introduced it into schools. From the presentation at St Joseph’s College it was apparent both Mark and Kevin were obviously very keen to involve teachers, students, administrative staff and parents in the development of the system. The system had been trialled in a couple of schools prior to it reaching St Joseph’s College, but it was very much in the development phase.

This information was greeted with enthusiasm as one of the major problems for this study in trying to improve data utilisation was accessibility and the frustrations caused by the inability to easily resolve incompatible software
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issues. Data was held in many different ways at the school and developing software to access all the data was well beyond the capabilities of the present work. At the initial introduction the designers outlined the features of the system but it did become obvious that it was very much under development and many of the features were potential rather than actual. This did present an opportunity to become involved at the design level to influence the directions that the system was to take. When installed the system was able to be used for storing and retrieving administrative information on students, the student attendance features were an improvement of current systems, the reporting systems was well underway and was able to improve the collation of reports. There were some problems with the installation and running of the SIMON system and in its initial term of operation it was generally considered by staff that had trialled Markbook to be less efficient.

As SIMON was still being developed and at this stage was only being trialled in a small number of schools (8 years later it was still only running in 15 schools, all Catholic secondary schools) the developers were keen for suggestions and input into its design. A meeting with the designers was arranged to allow input of suggestion that had arisen out of this study. As Phase one of the current study was almost complete, the issues that had arisen in terms of trying to utilise all student academic data were still actively being investigated and attempts were made to develop means to incorporate statistical analysis of students’ assessments into SIMON to allow far more detailed tracking of student performance. The developers were presented with a request to construct a mechanism so that the program would sort through recorded results and be able to be used to produce a detailed assessment of each student’s performance. It was hoped that the system would be able to statistically analyse results and eliminate the influence of variability for class and cohort comparisons. For each “subject” a student would have a number of variously weighted assessments (e.g. Year 10 science exam 50%, tests 10%, practicals 30%, and homework 10%). These assessments would be taken straight from
semester reports and combined to produce a subject aggregate score for the subject that would then be used to compare students’ performance for that subject with class and cohort peers.

The subject aggregates would then be standardised to eliminate variability and allow more reliable comparisons. All students’ subject aggregates for that subject (e.g. Year 10 Science) will need to be pooled to determine a Z score (Cross 1995). This is calculated by subtracting the cohort mean score from the student’s score and then dividing the result by the standard deviation of the cohort. This results in a positive or negative number that can be difficult to work with, so this needs to be converted into a T-score (Cross 1995). The Z-score needs to be transformed as follows: T score = 50 +10Z. Thus a T score of 60 represents a result one standard deviation from the average. If the results roughly follow a normal distribution these results will then give reasonable spread of results (e.g. 16% of T scores will be above 60 and 16% will be below 40 and 10% above and below 63 and 37 respectively) allowing clear differentiation of students performance.

Each student with a T score calculated for each subject aggregate could then be combined to produce a Global Student Aggregate in manner similar to the GSPAT that had used the standardised testing previously from ACER and AIM testing. The advantage of using real class assessment data would of course be that the assessment rather than being one test on one day would be a more realistic longitudinal summary of each student’s performance. SIMON would have been required to accept each student’s assessment results and then process the data so that for each student a standardised subject aggregate can be easily extracted. The system would also be required to provide a class list for each subject with all assessment listed as well as the calculated subject aggregate. Similarly each cohort will need to be able to be extracted as a whole, listing students in order of subject aggregate performance. Simple analysis of performance should also come with lists of the class mean, mode and standard
deviation of aggregate scores. It would be most preferable if all results were exportable in spreadsheet format to readily allow more detailed analysis. These suggestions were not particularly complex, especially considering that the previously used Markbook system could perform functions very similar to these. Unfortunately after a number of months awaiting the inclusion of the analysis functions, the developers eventually stated that they were not going to be able to even consider the inclusion of the analysis functions in the foreseeable future due to more pressing needs to further develop other features of the software. The idiosyncratic nature of school computer systems, particularly in the non-government sector, and the vastly differing methods of data collection and storage it would be a monumental task to develop a generic system of data handling that can accommodate all schools. It would also be an unacceptably expensive exercise for a single school to employ the required expertise to develop the perfect data storage and analysis system. SIMON was entrenched at St Joseph’s College; it had significantly improved the administrative side of data handling and was providing some significant improvement in producing reports, but it was not going to facilitate widespread increase in the use of student data for learning.

6.3 Refining Data Retrieval

The SIMON system had been embedded at St Joseph’s College for a little over a year when an opportunity arose in 2007 for the school to become involved in a program that had the potential to circumvent some of the limitations of SIMON. The Geelong Region Local Learning and Employment Network (LLEN) Post Compulsory Change Project (PCCP) had developed a two year action research project in which self-selected schools, both government and non-government including St Joseph’s College, had formally committed to undertake a change project activity aimed at improving and broadening pathways available to young people based on in-depth research and analysis.
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The actual project was launched by the Victorian Minister for Education Jacinta Allen in April 2007.

After careful consideration a major proposal came out of the group that was to become known as Geelong Central. The initial aim of the proposal was to develop a comprehensive web based system that pulled together data relevant to student learning and performance from a range of sources and make it readily available in user friendly formats (Wong 2008). This was a serendipitous turn of events for the present study as the software issues for gathering data that had been encountered had created an impasse that was beginning to cause serious impediment to the study moving forward to developing tangible outcomes rather than simply cataloguing observations. At its core Geelong Central was going to be developed to allow the collation and analysis of data, as determined by each participating school. This data could be selected by each school that was considered as relevant for supporting students in their learning. In effect, eight schools were pooling resources to overcome some of the major hurdles that this study had already identified as being beyond the ability of a single school to be able to afford to overcome.

The volunteer schools represented a cross-section of diverse schools. Apart from St Joseph’s College obviously a non-government boys’ college, there were two non-government girl schools and five coeducational government secondary colleges. The schools had agreed that a pathway to improve the education of students was to focus much more on a data driven approach to improving teaching and learning. The Geelong Central project had wide ranging goals which were shaped by the diversity of schools involved. A large part of the project was aimed at trying to support students in their transition from school to post school destinations. To achieve this end the project was gearing to allow data to be used effectively in whole school planning as well as at the level of the student and teacher to help improve the learning process and
maximise the choices for students particularly in their transition from secondary schooling to desirable destinations.

The Project member schools were well aware of the benefits of moving towards a data driven approach to education. This growing reliance on data was to a large extent being driven by an ever increasing need for accountability. In fact it is clear that accountability has become the watchword of education with data holding a central place in the current wave of large scale reform (Wilkinson 2007). Identifying the need to use data more effectively is still a long way from actual implementation of systems that enables data to be used, and as the current study had already found in Phase One having the data and understanding its importance is a long way from using it effectively without appropriate mechanisms. Having said this though the movement towards becoming inquiry minded and data literate are significant changes in practice that have become integral to communities of professional learning and have previously been identified as warranting concerted attention (Wilkinson 2007).

The enormous range of data available to schools obviously poses huge challenges in trying to identify the most important information and then attempting to understand and interpret the data. Improvements in information and communication systems have obviously created the opportunity to make the data accessible, but this still is only the first step in “using” the information to effect changes in learning. A very interesting and pertinent observation came out of the initial discussions of the eight schools in the Post Compulsory Change Project (PCCP). The schools had readily identified the need to improve the use of data. Through their experience in the PCCP and in their action research that systems this outcome was not readily available or used in schools (Wong 2008). This desire to improve the way data was being used to guide the learning of students but being hampered by not having any readily available mechanisms to achieve this outcome mirrored very closely the journey the current study had taken.
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6.4 Accessing Data

The Geelong Central project although having significant impact on the current study in terms of helping to overcome certain software issues was not going to be able to be simply installed as a quick fix template that would suddenly allow all data at St Joseph’s College to be used optimally. Geelong Central was designed to allow access to data from a large range of sources. It was developed to be able to form a “dash board” of information on each individual student. In some ways this goal was similar to the original plan for SIMON, but the major difference was that the Geelong Central Program’s only function was to search, retrieve and collate the data of each student. SIMON was being developed to be many databases whilst Geelong Central was being designed to access information in already existing databases and display the data as requested. The result of this was not that Geelong Central would replace SIMON but it would work within SIMON as a data presentation mechanism. Geelong Central would remove some of the most serious hurdles to data use by individual teachers. The amount of effort and time required to retrieve an individual student’s records was reduced to an almost insignificant amount, two or three buttons to push on a computer and the information was available. There was no requirement for the teacher to have any understanding of where the information was being retrieved from because the software would access all the different databases holding student information and present it as a “live” updated file on the requested student.

Now that the software was available to overcome the access to data issue the next problem was to develop protocols for which data was to be made available. Staff professional development was also going to be an issue to ensure the data was used as efficiently as possible. Feedback has already been identified as a vital mechanism for improving student learning (Hattie 2009). Feedback can take many forms but the student dashboard provides live data that can be fed back to not only students but teachers and parents. Feedback in simple terms
in a basic tool for monitoring how something is proceeding, so it is not really surprising that informing students constantly about how they are travelling academically gives them a mechanism for improving. Feedback is also the basis for ongoing conversations about improvement; just as for example feedback is used by a heating system thermometer to control temperature of a room, “conversational” feedback should form the basis for assisting students to develop their learning. To make the feedback genuine and accurate it needs to be based on valid data and so by ensuring the students “dashboard” data is accurate and up to date allows the feedback process to be positively influenced.

The data that was to be included in the students’ dashboard was to be determined by the eight schools involved in the PCCP. The diversity of the schools meant that in its initial phase common data had to be identified and built into the system before it could be individualised for each school. As a result, the actual implementation was to be structured into two phases. Alpha phase would see the introduction into two trial schools, including St Joseph’s College and when this had been completed the Beta phase where the system would be installed in the remaining schools. The design and building of the system was outsourced to a local Geelong company gPowered. The company was employed to build and then install the system into the eight schools. gPowered as a commercial business obviously foresaw the potential of the system and so although the schools in the PCCP were the driving force behind the design and together bore the significant cost of building, the actual software program was always in effect being leased to the schools and still owned by gPowered. This was not unexpected as there was an obvious gap in the educational software market and if capable of producing a product with enough flexibility gPowered would be well positioned to capitalise economically on the opportunity. Using an outside commercial contractor had some other advantages, as the company was not exclusively involved in solely educational software design they brought a broad perspective of what would be achievable.
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Timelines were developed and in 2009 the alpha phase was to be established and trialled in two schools, one government and one non-government. One factor that did begin to delay implementation was issues of privacy that had arisen. Privacy issues had become a particularly significant hurdle within the government schools. Legal advice was required with respect to how secure the information would be, who would have access, what sort of data would be stored. Many of the questions raised, although important, did highlight some of the misconceptions as to the ultimate goal of the software. It was not generating new data, it was merely collating existing data. The data was not being exported to new destinations all analysis was going to be undertaken on the relative schools computers where all the data already existed or was accessed. Any data schools had was not going to be any more accessible after installation than it had been before. It was planned that hopefully the data would be accessed more frequently, but obviously only by the staff that generally had access anyway. Previously access had been limited due to the convoluted route required to access it at most schools and consequently few staff had made the effort. The privacy issues did cause a delay but eventually the student dashboard from Geelong Central was installed in the second semester of 2009.

6.5 Using Data

The installation of the student dashboard had some immediate impact on the accessing of student data by staff. The system had been designed to produce a single student “homepage” that gave access to all information held on that student. A photo of the student with attendance, family contact details, timetable and access to academic records reports and NAPLAN results was available. The ease of access was widely reported by staff as being a significant improvement. Feedback was taken with regard to presentation and also the types of information that staff would prefer to be on the dashboard. The actual
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data that was included was relatively generic; this was due to the fact that the system was still being built to be embedded in eight very different schools and common data and applications had to be identified, implemented and refined before specific individual school modules could be added that took into account the various differences between schools. Despite the basic nature of the first instillation the improvement in access was a significant step forward in the process of improving data use.

The ability to easily access previous reports was an advantage, but this had been an improvement in access as opposed to the newly available access to NAPLAN results. In the past NAPLAN results were not routinely accessed by teaching staff. Specialist staff may have accessed it occasionally and management may have considered cohort results when developing whole school planning, but with the inclusion of NAPLAN testing on the dashboard all staff were exposed to the information whenever they accessed the student’s profile. The fact that this information was there created discussion amongst staff and quite a lot of the discussion was around what the NAPLAN information represented in terms of how this information relates to the students and what use can teachers make of this. Staff began to question the presentation of the information and proposals were made that perhaps the information could be presented graphically to increase the ease of access. These types of discussions were clear signs that conversations were now being data driven and provided some vindication that the changes implemented were heading in a positive direction. In the past NAPLAN had been this day of testing that some teachers viewed as an interruption to their classes, now NAPLAN was data that could be used more effectively if it were presented in a more user friendly way.

The way in which data was now more readily available began to create opportunities for developing better ways to use the data. The data at this stage was still somewhat administratively centred. The data had opened the way for teachers to now have instant access to information that could be used effectively
with course counselling, parent interviews or any situation where an overall picture of the student and their current situation would be useful. Many staff particularly expressed the view that having all the data available so readily added depth to discussions particularly with parents and students and allowed decisions based on evidence to be made far more readily. The challenge was to now refine and modify the data recorded and develop strategies for using it effectively.

6.6 Improving Data

Future modules to be included in the dashboard include the adaptive testing. Some staff had already requested that NAPLAN presented in a more visual or graphic manner and the adaptive testing would be particularly suited to this. Discussions with the designers had led to the idea that adaptive testing results could be presented as a line graph indicating the development of a student and this could be accomplished from the beginning of Year 7 and continue for as long as the testing took place. Students were to be tested routinely three times a year and these results could form the basis for a visual tracking device to be included in the dashboard.

Obviously the reliability and quality of data has serious impact on the ability to use the data effectively to improve learning. Staff feedback indicated that the way in which the data is presented also would have influence on the use of the system. Anecdotally it appeared that not all staff was comfortable with using students’ data. Conversations often revealed that this reluctance was often associated with lack of confidence in using computers as well as a widespread opinion that students’ data presented in such a way required some very sophisticated understanding of statistics and mathematical analysis. The variability of ICT skills amongst staff was very surprising and the extremes of abilities somewhat unexpected. Staff at St Joseph’s College had been provided
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with laptops for a decade and yet a significant number of staff struggled with some very straightforward tasks involving basic ICT competencies.

During the process of implementing adaptive testing across all non VCE year levels it became important for expedient return of students’ data to class teachers that all teachers supply their students’ details via email to receive students’ results in a timely and efficient manner. All staff were requested to create a class student list and email the list as soon as their classes finished the On Demand tests. The process would take a few minutes to create a list, ideally in an Excel spreadsheet, then only moments to email. Surprisingly, the numbers of teachers that struggled with this task was significant. Some staff would go to the extent of photocopying a handwritten class list and returning this hard copy in place of creating an electronic emailed version.

This variability of ICT competencies highlighted some of the potential obstacles to encouraging all staff to embrace a process of monitoring student development that was completely dependent on the use of computers and generated data that could only be effectively monitored and stored electronically. It became apparent that some staff did not fully comprehend that the use of computers allowed large amounts of information to become accessible with very little effort. Teaching staff that were apparently reluctant to embrace technology also tended to think that regular testing was unnecessary. There seemed to be some type of fundamental objection to data. Obviously, as previously discussed, students and their development are far too complex to be adequately or accurately assessed and described by simple numbers, but to discount the importance of pursuing some reliable objective measures is to remove any possibility of developing a system that can be evaluated and consequently monitored and improved. Fundamentally the process that students experience at secondary school has been designed to help the students develop some type of skill set. Regardless of which skills are considered and ignoring any debate or argument as to which skills are essential
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or the most important, the ability to determine whether or not the process has been successful and is continuing to improve must be based on some type of measurement. Humans are complex and ultimately individuals are responsible for deciding whether they are satisfied with their own performances and this is completely subjective. But in the complex society that individuals inhabit, outside objective measures are always going to form an important part of the mechanisms for determining comparative success of individuals.

Encouraging all staff to utilise the technology and data evolved into a major challenge during the course of this study. Acceptance of the data as important and valuable was not always a simple process. Approximately ninety individual classes across Year 7 to 10 were required to be tested for literacy and numeracy skills every time that the adaptive testing was conducted. The number of students being tested was approximately nine hundred, and with detailed results from all students a very large and extremely valuable database was being collected. Emphasising the importance of maintaining accurate assessment protocols did also become somewhat of an issue, particularly for the staff that had misgivings about the “use” of testing. Some of the reluctant staff would express an opinion similar to “haven’t we done this testing before, why should we do it again?” This blasé attitude did initially have an impact on the accuracy of testing in some classes. The testing from classes, where students were not encouraged to take the testing seriously and to try their best obviously created results that were not reflective of the students’ real ability and thus reduced the reliability of the testing. These occurrences did present a challenge initially that could have threatened the entire premise that the On Demand testing was going to be a far more accurate, reliable and useful system of monitoring students’ development. The testing results were quickly incorporated into a process whereby the results were used in reporting to parents. It would seem that reporting to parents is a significant motivating factor for both students and staff to take testing seriously. In an ideal world any type of assessment would be reflective of a student’s maximal ability. In reality, the number of influencing
factors result in all assessments being an indicative result rather than an absolute value, and incorporating practices such as using test results to feedback students’ performances to parents in some manner reinforces the importance of the assessment and encourage the majority of students and staff to give the assessment the appropriate attention. Future plans for the adaptive testing include its incorporation into the students’ dashboard in such a way that the results become available not only to staff, but parents and most importantly students at any time.

6.7 System Constancy

One of the major weaknesses of student tracking systems that had been observed was the reliance of the system on generally one person with the expertise and knowledge to maintain the system. A major strength of the Geelong Central program was that it was built by a commercial organisation with the prospect of marketing the system and so there was no great dependency on anyone within the school for the ongoing development. When a problem arises on most occasions the solution is provided by the outside contractor and no particular expertise or knowledge is required by any staff at St Joseph’s College.

Another strength of being part of the development of a system being developed with commercial applications in mind, was that as needs and requirements were identified the system was modified as required. The participation and cooperation between the initial schools involved in the development of the system also meant that the perspectives and influences of the other schools widened the St Joseph’s College perspective. This study obviously had a focus on particular types of student assessment and perspective, but ultimately student information takes a myriad of forms and all types have value when attempting to support and assist students in their pursuit of learning. The Geelong Central
program that was to become known locally within St Joseph’s College as the Student Dashboard will never be “completed”. It has been designed with flexibility in mind and has the capacity to have modules added over time as different sources of data are identified as being useful.

Student input and perspective was identified in Phase One of this study as being a very valuable and useful resource and the Student Dashboard has allowed student input to be recorded in the form of a module that allows the students to record some of their goals and potential career aspiration. Centralising student information and also taking student input into account has been an important step toward improving the ability of teachers at St Joseph’s to assist student learning in an informed and productive way. The process of embedding the use of the Student Dashboard into teacher practice at St Joseph’s is an ongoing process and will continue to evolve, but benefits have been tangible. The fact that St Joseph’s College was one of the two initial schools to trial the use of the system has also lead to a large number of presentations to other interested schools and staff. The process of sharing experiences has the benefit of encouraging self-reflection and leads to a continuing process focusing evaluation. The complexity and unique idiosyncrasies of every school shapes the required approach to monitor the performance of any school and as such every school must tailor their approach for their needs and requirements; but sharing experiences can help to consolidate and even inspire novel approaches. Teaching is often an isolated pursuit and at times some teachers can become insulated and even very defensive about their pedagogy and this at time seems to filter through to even whole school approaches. As this study found in Phase one, when approaching others schools it would appear that schools are not always open to freely admitting that they need to improve in certain areas and this forms an important and significant hurdle to the process of improving student learning. Accepting the need to improve is a positive approach although anecdotally there did seems to be some evidence that a certain amount of inertia to change is often encountered, particularly, when the process of
change is seen as being difficult or less than straightforward. It would appear that at times there is often an attitude amongst some teaching staff that some particular undertaking is just too hard and bound to fail or simply create more work for no gain so why bother? This has been in some part the strength of the online adaptive testing and the Student dashboard. It has led to significant gain and improvement with no extra work for teaching staff and in some regards it has lessened the workload.
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7.1 Identifying a Framework for Change

The process of education, at its core, should be recognised as the pursuit of a common good that serves all children focusing on their cognitive and social needs (Fullan 2003a). In the journey to achieve this purpose it is important to accept that there is no final point to be reached. The education of children will always have potential for improvement and the quest for improvement will always involve a process of change. Fullan has previously argued that for change to be affective it must involve three main levels of reform (Fullan 2003b). These levels of school, district and state are not directly related to the organisation here within Victoria. They are also not that directly relevant to the process of change being examined at St Joseph’s College. They do represent somewhat a theoretical perspective of the need to ensure change is managed in an hierarchical manner if it is to be successful. Fullan has previously discussed and described widespread change to systems of education that would benefit all students (Fullan 2001). The current study is very much focussed on the learning of a very specific group of students attending one school, St Joseph’s College. Change must be accepted as inevitable and the ultimate purpose of educational change has clearly been identified as benefiting students (Stoll 2006).

Effective improvement in educational practices must be based on the development of increased capabilities. As clearly stated by Fullan “strategies that do not develop increased capability (the skills to do something well) are similarly destined to failure” (Fullan 2011). A major part of developing capabilities within a secondary school is the need to maintain open and explicit
communication with the entire school community. When there is a clear avenue for dissemination of information from management to teachers and from teachers to management this is when it is most likely that change can be introduced that is more likely to produce positive outcomes. When communication is encouraged and valued it is far more likely for new and novel approaches to be at least considered by all concerned. This methodology is also applicable to interactions between teachers and learners. Most experienced educators find that when a teacher is able to convey a clear understanding of the purpose of a lesson or unit and the rationale for the approach taken, then the student will generally be likely to invest more effort in the associated tasks (Zbar 2011).

Open communication channels are essential in any sort of pursuit that is based on some type of cooperative or collegiate endeavour. In the pursuit of their own professional development educators obviously strive to maximise their personal teaching skills and it is essential that educators do not become isolated or too introspective. When a teacher lacks external feedback with regard to their performance as an educator they run the risk of reducing their potential for positive improvements. The current project was obviously focussed on improving the learning outcomes for students at St Joseph’s College but it was important that the work undertaken during the project not be accomplished in isolation. For the project to have the maximum chance of achieving positive outcomes it was essential that it not be attempted in isolation from colleagues at St Joseph’s College and importantly at other schools. This Professional Writing and Practice chapter represents an outline of the process of change that I led at St Joseph’s College with particular emphasis on the identification, evaluation and instillation of new processes for monitoring student performance. The work covers the implementation of findings from the research associated with the selection, collection, use and storage of student data conducted at St Joseph’s College between 2006 and 2012. It documents the process of proposing change to the St Joseph’s College community and then
implementing this change. This chapter also outlines the method used to include outside perspectives by presenting findings to interested parties external to the St Joseph’s College community. The document is designed to be of value to fellow educators exploring and perhaps even experiencing the process of change within a secondary school environment. It will have particular resonance with regard to changes in the use of student data to influence improvement in student learning but would also have application to change in a more general sense.

7.2 Developing Need for Change

Significant change in any form within a secondary school has a multitude of influencing variables. It is unlikely that an individual or even a small group of individuals can anticipate all eventualities and as a consequence it is vital to provide avenues of communication. In terms of technology the process of disseminating information may seem very straightforward. At St Joseph’s College all staff have laptops and have access to email and any number of electronic platforms that allow exchange of information. The volume of information that flows through these channels is significant. These means of disseminating information to large numbers of staff are most suited to what might be regarded as more traditional forms of administration, restricted generally to housekeeping tasks such as student and staff notices. They are not suitable for instigating major change. Electronic forms of communication are both convenient and time efficient. Problems arise when information is sent to large numbers of recipients as it lacks the nuances available in more “conversational” exchanges. This is despite the fact that email for instance does allow exchange of information. These exchanges are often delayed and when a number of recipients are “cc’d” these limitations in information transfer are prone to saturation and misinterpretation. This characteristic of creating
confusion was in fact the catalyst for instituting staff wide professional development sessions at St Joseph’s College. A large number of email conversations were often in the system at any one time. Confusion and misunderstanding that ensued was at times causing friction between staff members. Valuable time was being occupied in remedying issues caused by inefficient and at times inappropriate use of the emails. It should be readily recognised that electronic means of staff wide communication are not suited as the prime avenue for guiding significant change. This would also be true of introducing change by distributing a more traditional hard copy explanation as the first point of call. These considerations were an important factor in designing a process to introduce change at St Joseph’s College that was based on the research findings of the current project. The introduction of this major change was presented in a manner that gave staff an opportunity to voice concern, clarify their understanding and provide feedback.

My professional position within St Joseph’s College changed over the years that I was conducting research within the context of undertaking my Doctoral research. As my professional position become more senior the need to clearly communicate information, ideas and strategies become more important. The most effective means of communicating any idea to an individual is always going to be based on personal interaction, most likely conversational, but also perhaps incorporating a written component. St Joseph’s College community has a total employed staff of over one hundred and fifty, over fifteen hundred students and in excess of two and a half thousand parents and carers. It is not possible to maintain any sort of personal relationship with such a large number and personal conversation can only include a small number of this total. In the process of introducing and then developing change at St Joseph’s College it was essential for me to develop an hierarchy of information transference that would inform staff about the proposed change and the merit of these changes to garner their support.
From very early on in my teaching career I had become interested in trying to improve my own professional skills. My pre-teaching experiences in education and employment had instilled in me a desire to use evidence based decision making processes whenever possible and as a consequence I developed an interest in better using student data to inform my teaching practice. This led me to seriously consider undertaking further study to advance my professional competence. Although my initial aims were to improve the teaching I was able to accomplish in my classes, my ambitions soon broadened and after a relatively short period from beginning my workplace doctoral studies, I realised that observations and results that I was generating from my studies had the potential to positively influence far more students than just those that happened to be in my classes. To affect any significant progress in a school wide sense, it was imperative that I would need to develop a plan to introduce, then effect change.

The first stage in introducing change was to gain the support of management. This consisted of a number of meetings with individuals and small numbers of very senior staff to ensure support was gained through convincing management of the potential benefits from pursuing, in this case, significant changes to the collection use and storage of student assessment data. Once senior management’s support was gained, the next step was to present the proposals to middle management, the coordinators in charge of curriculum areas and various year levels. The subject area leaders were vital as they at some point invariably had conversation with all the teaching staff within their area of speciality, and these were the individuals that would have the most significant interaction with and consequently effect on students and their learning. To effectively change something as significant as the use of assessment data the process requires all teaching staff to be involved. But it was vital to also consider the implications for the students, as ultimately the existence of any educational facility such as a school is absolutely judged by the experiences of the students.
The described hierarchy of levels, that required introduction to the proposals for change, presented quite different characteristics. Considering the levels top down, the number of individuals at each level increases. With increasing numbers the ability to rely on conversational transmission of ideas and information becomes increasingly less personal. This more impersonal transmission of information requires special consideration, as the avenues for feedback and consequently confirmation of understanding became more difficult. Obviously the project was essentially working towards the improvement of systems within the context of learning environments at St Joseph’s College. Having said this, it would be unwise to assume that any developments proposed and developed within one school would necessarily be optimal without consultation or engagement with other educators at a variety of education institutions. Although the introduction of change required carefully planned communication of ideas within St Joseph’s College, the other significant flow of information was to external parties. Just as individual teachers can become introverted in approaches, risking the development of less than ideal practices; institutions such as schools can also suffer the same consequences. Developing change within a school without reference to the wider educational communities would be a risky endeavour. Consequently, successful implementation of change at St Joseph’s College included the need for a level of exchange of findings and observation with external individuals and schools.

### 7.3 Initiating Change

Clearly the difficulty of the process of introducing change into a secondary school, like St Joseph’s College, is dependent on a number of variables. Through the course of the project particular groups would express a variety of concerns. Senior management at St Joseph’s College was composed of
primarily the Principal, two Deputies, the Business Manager, and the Director of Curriculum. At times the Director of Mission and later on during the project once the position had been created, the Director of Teaching and Learning, were also involved. This group had overarching responsibility with at least one major meeting every week. Due to the large range of responsibilities that senior management are charged with, although they have final approval on all endeavours within the College, this project was channelled through a more specialised committee. Due to the project being intimately concerned with the collections of assessment data and then the subsequent use of this data, the first committee that a proposal was put to was the Curriculum Executive Committee. This committee was made up of the Principal, two Deputies, Director of Curriculum and a representative of the various faculty heads. Proposing this change meant that it was essential for the proposal to be based on evidence. Proposing change based solely on opinion without even rudimentary anecdotal evidence is an endeavour that would be unlikely to convince any reasonable committee. During the course of the work I had begun with my Doctoral research, I had begun to accumulate a significant amount of anecdotal as well as empirical data. The data was sourced from analysis of existing archived material, as well as information drawn from responses obtained from surveying management of other secondary schools. This data was valuable in guiding my thoughts in terms formulating a path for change. It had been essential to expand my own understanding of student data and its potential uses before proposing any type of radical change. It was fortunate that the Director of Curriculum at the time I began the project was very open to new ideas and also very interested in exploring avenues for improving student performance. This in effect was crucial to being able to develop a critical mass of support for implementing recommendations that were to eventuate from the project. With the interest and subsequent support of the Director of Curriculum the task of presenting management with recommendations for change and then implementing these became a far more achievable prospect than it otherwise would have been.
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The Director of Curriculum and subsequently the Principal were very supportive in providing access to existing data records. The records that existed were somewhat incomplete and had not been stored in any methodical manner. In fact, after a short period of investigation on my part it became apparent that some types of student data that had been collected had been stored so poorly that some was even lost. This poor method of data storage was in fact an important factor in gaining more widespread support for my project from senior management. It became a very straightforward process to convince management that student assessment data represented a significant investment of school resources that needed to be utilised effectively. Thus I was able to readily demonstrate the existence of tangible potential improvements that would readily evolve from the project I was undertaking.

Convincing management of the merits of the project was a vital hurdle. It was anticipated that the project would take a considerable amount of time to complete. It was longitudinal in nature and as I was interested in looking at the long term improvement in students learning by making improvements in data acquisition and use; if I was going to track the experiences of just one cohort of students at St Joseph’s College, this pursuit would take a minimum of six years. This would be a very significant period of time. The other concern with such a long term objective was the time it might take for any significant improvement to be realised. As I was enrolled as a part time student in a workplace Doctoral Program at Deakin University the timeframe would be compatible with my enrolment. The College had at this point provided me with access to data files but had no actual resources invested and as such the extended time frame was in effect a moot point. This did subsequently change.

During the initial period of the research a large amount of my personal time was actually spent improving my own knowledge through professional reading. I was required as part of the Doctoral Program to prepare for a Colloquium which in part involved researching and writing a literature review around the
field of student assessment data use as well as outline the basic problem I was setting out to investigate, including the methods that I would later use. This process was pivotal in focussing the project towards the goal of improving learning outcomes at St Joseph’s College by improving data utilisation. Two years (part time) into my Doctoral project, senior management were obviously aware of my undertakings. The Principal and particularly the Director of Curriculum would occasionally engage me in conversation about the developments being made. Apart from these interactions, few staff were aware of my pursuits. As outlined previously, effecting change on a school wide basis requires significant levels of communication, but to this point in the project, communication with colleagues was relatively minimal and even communication with management was sparse. This was probably an artefact of the process that was being undertaken. Up till this point in the project much of the work was about collecting information, observing current practises and developing plans for undertaking the research. At this point analysis was restricted to previously archived student data and was still relatively rudimentary. The first three years of the work associated with my Doctoral research had been more influential in developing my own personal knowledge of data and its relevance to students rather than having any significant impact on St Joseph’s College. This situation was to significantly change during the next year.

In 2007 I applied for and was successful in securing the position of Learning Enhancement Coordinator. This position of leadership had a time allowance. The role description for the position was quite varied, but it was in part created to provide assistance to teaching staff for developing means to improve the use of student data. At the time of applying for the position I had expressed my views to the interviewing committee that I thought St Joseph’s College was in a position where it was important to invest more resources in developing systems that would enable better use of student data. I suggested that perhaps the majority of the time allowance of the Learning Enhancement Coordinator
should be directed towards this pursuit and my appointment to this position was confirmation that senior management agreed. I had the support of senior management and was officially installed as the Leaning Enhancement Coordinator. It seemed clear that I had an opportunity to now not only present information and ideas to staff in general about the project, but the opportunity was now presenting whereby I would be able to influence colleagues’ classroom practices and pedagogies. I would be able to present a new perspective on data to staff and I would be in a position to effect widespread change in classroom practice. This, I believed, ultimately had the potential to improve learning and teaching at St Joseph’s College.

7.4 Cultivating Change

As the new Learning Enhancement Coordinator a fundamental shift had occurred in the relationship between my Doctoral Project and my employment. Part of my professional responsibilities were now fundamentally entwined with my personal pursuit to improve my own expertise in the area of education. Initially work associated with the project was undertaken in my own spare time whereas now some aspects of the work were an integral part of my role as the Learning Enhance Coordinator. Communicating findings from the ongoing project became an important issue. The research focus of the project had initially been positioned to identify data that could be used as a means of clearly identifying every student’s potential for academic achievement. It was envisaged that if a student’s potential could be accurately identified, and in fact quantified, the school would have a powerful tool for guiding and tracking student performance, to ensure they were achieving somewhere in the vicinity of their potential.
The most intensive testing of students was undertaken by Year 6 students before they actually began attending St Joseph’s College in Year 7. Some testing was undertaken by Year 8 and Year 10 students using similar literacy and numeracy tests to the pre-YEAR 7 students. Decisions had been made that Year 9 students’ AIM (which was to become NAPLAN) results were sufficient. Early project findings clearly showed that some of the standardised tests being used at St Joseph’s College for the Year 7 students were far from accurate. A range of readily available commercial testing was used, ranging from non-language based cognitive tests, standardised spelling tests, literacy and numeracy testing. The reason behind the choice of particular tests used was never really identified as by the time the project had started the staff member in control of most of the testing, unexpectedly and sadly, passed away.

Careful examination of the benefits and costs of the standardised testing used at St Joseph’s College revealed some interesting results. Some testing particularly was found to be so unreliable that a recommendation was made to stop using some of them immediately. The Director of Curriculum agreed to the recommendation and this is what happened. This was perhaps the first major tangible achievement of the project. The testing regimes used were rationalised. Rudimentary analysis of the results clearly showed that when the results of a number of Year 7 pretesting cohorts were compared with their end of year reports some results were very discordant. The most troubling result came from the Spelling test used, based on the South Australian Spelling test and the cognitive assessment emanating from the Raven’s Progressive Matrices (Reid 1989). Due to their unreliability and substantial cost to implement the cessation of their use although perhaps not directly contributing to improving student learning, in a direct sense, they did represent over time, a financial benefit of many thousands of dollars. At this point the standardised testing of students was now restricted to ACER literacy and numeracy testing as well as the mandated AIM/NAPLAN testing in Year 7 and Year 9.
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The rationalising of testing was obviously communicated to staff as they were now supervising a different set of tests but they did not require much in the way of explanation. The testing that had been conducted previously had been under-utilised to such an extent that the majority of teaching staff had no idea what the results were used for. Generally teachers did not access any results and in reality most staff would not have even known where to begin in locating the results. This situation was indicative of the manner in which data use had not been routinely presented to staff with the aim of increasing teachers’ professional knowledge and capabilities. Presenting information in isolation has clearly been identified as not necessarily resulting in better performance by teachers in the classroom (Joyce 2002). A process of interactive, collaborative coaching of staff is essential to maximise the use of data in improving student learning (Zbar 2011). Developing coaching systems was an important consideration of this project, but the decision was taken to prioritise setting up data systems. It was obvious that accurate data collection, storage and retrieval systems must be in place and functioning well for the coaching to be based on robust reliable evidence. Much later on when my Doctoral research was drawing to a conclusion, a widespread coaching program became the new priority for St Joseph’s College. The work accomplished in the study that produced stable and reliable student data systems made the transferal to coaching priorities a much simpler process than it would have otherwise been. An important finding from the work accomplished throughout the project was that change in clearly defined stages is far more manageable and achievable than trying to change “everything” and “everyone” at the one point in time.

Once the types of testing used had been rationalised the project was to move towards concentrating on more carefully examining uses of the testing that had been retained. The leadership role I now held meant that more staff were made aware of the work that I had been undertaking. In my role as Learning Enhancement Coordinator I would be invited to speak at whole staff meetings and sometimes faculty meetings. On these occasions, particularly in the early
stages of the project, I would outline the direction I was taking in terms of examining data use within the college. The benefit of this increasing exposure of my purpose and findings was an increase in the professional discussions and interactions I was having with staff. My role was still a relatively minor position of leadership, and although I was at time consulted for my opinions by senior management, the process of change that was generated directly from my project was still relatively modest, in terms of improving student learning. From this small beginning though, far more significant change was to eventuate.

By the end of 2008 I had been in the position of Learning Enhancement Coordinator for two years and had been relatively pleased with the outcomes I had accomplished. All the time that I was observing and analysing data and its use at St Joseph’s College I was subsequently increasing my expertise in the area of data use. I was keen to continue in the role as I had been encouraged by what I had accomplished and saw an opportunity to further effect change. I re-applied for the position of Learning Enhancement Coordinator and was once again given the position. It had become self-evident that having even a minor position of leadership did increasingly facilitate my ability to effect change. It was clear that the fact I was also undertaking a Professional Doctorate seemed to influence Colleagues willingness to consider my opinions and insights.

The working environment for staff at St Joseph’s College is undoubtedly unique. Idiosyncratic influences emanating from innumerable variables ensure every school although similar in many ways to other schools, is at the same time equally dissimilar. As it happens at St Joseph’s College, further study, and particularly undertaking higher degrees associated with education, is highly valued. Staff are encouraged to undertake further study and anecdotally it is regarded by many as essential for promotion to more senior positions. Holding such pursuits in high esteem creates an environment in which the opinions of staff members that have completed or are undertaking higher degrees are valued.
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more as a result. It does present the possibility of good ideas being overlooked simply because the teacher suggesting it is without a position of leadership and may not be undertaking any further study. This could result in some very productive changes in approach being ignored. Recognition of such phenomena is probably an indication of one of the skills good educational leaders require. Anecdotally, conversations with colleagues from different schools did suggest that undertaking further study did not necessarily always have positive connotations. In some schools undertaking higher degrees, particularly involving research, led to conflict and suspicion that actively created even greater inertia to change and improvement. Although far beyond the scope of the work I was undertaking, it would a very interesting and worthwhile pursuit to explore some of the inputs driving such variability in teachers’ reactions to workplace research.

It should be self-evident that ideas for improvement need to be assessed on the merits of the suggestion and not by the originator of the concept. I had expressed ideas and opinions to colleagues in my first few years at St Joseph’s and most had politely listened and acknowledged them. I am confident, however, that none seriously considered changing their approach to teaching based on the ideas of an inexperienced classroom teacher. So at St Joseph’s College there was a definite correlation between the willingness of staff to seriously consider change and the “expertise” of the idea’s creator.

This observation did play on my mind at times. I realised that this apparent positive correlation between the seniority of the position a staff member held and the likelihood other staff would be take opinions seriously meant that any real change was only going to be successful if colleagues in senior positions were convinced. At times I had observed this nexus of seniority and believability to be concerning. In my first few years at St Joseph’s College there had been quite a number of staff meetings with presentations from internal staff and guest speakers concerning the peculiarities of ‘boys education’. I was 163
interested and attentive as my first three years of teaching had been in a co-educational school and I was keen to improve my knowledge of educating in a boys only school. Many ideas were presented over the various presentations, but the thing that began to become obvious to me was the extreme reliance on speakers’ opinions. Very little accord was given to any manner for supporting evidence. I would argue that expressing opinions is essential particularly when very experienced educators are concerned but at some point every academic pursuit requires some complimentary evidence to consolidate understanding and support expressed opinions. This is particularly true when presenting to an audience of teachers with the expressed aim of improving or at least moderating their professional practices. On the rare occasion that data was provided it appeared at best inconclusive. The practice of using evidence to support opinion was not widespread within the College at this time and far more weight was given to the ‘seniority’ or notoriety of position of the person expressing an idea. Considering this in the historical context of this project, it was not surprising to find that some years later when I would try to use a range of data, some student interview data, some statistical analysis and other types of empirical data, to support an opinion I was expressing, it was not uncommon for some of my colleagues to suggest that there was no need to revert to that sort of confusing information. While I had always valued the importance of evidence based decision making processes, it was very clear, particularly in my first few years as Learning Enhancement Coordinator, that this viewpoint was not necessarily universally shared by all staff. Research was undertaken early in the project which involved surveying the management of a number of other schools. It became apparent that this phenomenon of teachers not being overly concerned with supporting empirical evidence to support opinions was not confined to St Joseph’s College. The idea of using data to support change is now beginning to gain more traction in educational communities (Bambrick-Santoyo 2010). Fortunately, in part driven by work in this project, the importance of using data to inform decisions to undertake change has an entrenched foothold at St Joseph’s College and is becoming the norm.
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7.5 Catalysts for Continuing Change

Positions of Leadership at St Joseph’s are generally terms of two years. I began a second term as Learning Enhancement Coordinator and was keen to continue to improve the use of data. This time I was armed with the knowledge that implementation of change was possible, but would more than likely be limited to more minor processes. I was very keen to re-examine the actual standard test used to assess performance of students in Years 7-10. The testing was expensive and had quite a number of drawbacks. In my role I had begun to attend more conferences and through my reading I was aware that any type of testing regime had its own particular strengths and weaknesses. In my mind an avenue that St Joseph’s College had potentially not really taken advantage of was adaptive testing. In this model of testing, students are challenged with questions of variable difficulty depending on the students’ level of success in answering previous questions. When working optimally all students achieve about the same level of success in terms of questions answered correctly, it is the difficulty of the questions that changes.

St Joseph’s College had trialled an adaptive system of testing before I began the project, but in an example of working in isolation, the staff involved had not informed others. I recognised that this was an opportunity to potentially instigate a very significant change to assessment protocols. With the support of the Director of Curriculum I set up a trial in which initially a small number of English and Mathematics classes were tested using an adaptive testing regime. The system was known as On Demand and had been built by the Victorian Curriculum and Assessment Authority (VCAA) for use in government schools (VCAA 2010). The aim was to investigate if On Demand testing could be used to estimate some of the abilities of students in Year 6 that were to begin at St Joseph the next year. Apart from the benefit of more
accurate assessment of student skill levels, the adaptive On Demand model would be a far cheaper option than the battery of testing previously used. Implementing any technology based system of assessment is likely to have a few teething issues and this was certainly the case for the On Demand system. In its first year of trialling only a few classes could be tested at once and it was necessary to usually have technical support in the room for the teacher. Fortunately, classes were not randomly chosen. Short presentations were made at Mathematics and English Faculty meetings to inform teachers of the trials, and an offer was made to current Year 7 teachers to involve their classes in a trial. As a consequence, only teachers with some type of intrinsic interest were initially involved. Fortunately, these teachers proved to be particularly determined to help the trial proceed even when technical issues became quite common. English and Mathematics teachers, therefore, became the first cohort of staff to gain detailed insight into the new testing regimes. These teachers now had some detailed knowledge, through experience, of the trialling of testing using an adaptive model. It was at this time that a short presentation was also made at whole staff meetings to raise the awareness about the developments being made.

At the time that the adaptive testing was starting to be trialled in a more widespread manner, St Joseph’s College underwent a whole school appraisal. The appraisal was conducted by experienced educational consultants that were external to St Joseph’s College. Staff were approached to be interviewed and by virtue of my role as Learning Enhancement Coordinator I was invited to participate. Not surprisingly, the opinions I expressed during conversations with the consultants were based around my ideas of the need to improve the use of data with particular attention to be given to evidence based decision making. The appraisal was very comprehensive and a confidential report was prepared for the use of senior management. Interestingly, quite a number of the observations I had made in terms of the importance of data and its use were very prominent in the report. The report confirmed my stance, but in effect
went even further. The report recommended that a new ‘senior position’ needed to be created at St Joseph’s. This new role, included among other responsibilities, the responsibility for the use and analysis of data. The new role would be the Director of Teaching and Learning. The recommendation was obviously accepted as it was made known to staff that the following year a new position would be advertised externally and staff were invited to apply. In terms of my project the position of Learning Enhancement Coordinator would become redundant as the new position would fully encompass this role. I saw this as an opportunity. If I was to secure a more senior position this would come with the potential to more readily guide change developments. I applied for and was offered the new position, which I accepted. I was now in a position to not only make recommendations but to make decisions to effect change. The new role also came with the opportunity to have discretionary control over at least four whole staff meetings a year, drastically increasing the potential to communicate ideas of change to staff and ultimately, to influence student learning.

Once in the role of Director of Teaching and Learning the use of adaptive testing was expanded considerably. The adaptive model by this time had been trialled successfully and all pre-testing of Year 7 students was now centred on the On Demand adaptive model. Data generated was used to set a benchmark measure of student literacy and numeracy abilities. This baseline was then generally used to form the basis for all future comparisons of student development. The next step was to begin the adaptive testing in a manner that would allow a longitudinal record of performance to be created. This database could then be used by all staff as a learning tool to improve student learning outcomes. This involved trialling and subsequently installing software that gave all staff access to the accumulating information. Testing regimes were developed and intervals of testing experimented with, until a system of biannually testing all Year 7-10 students in literacy and numeracy skills was settled upon.
Being in the role of Director of Teaching and Learning the pathway to implementing changes to standardised testing protocols became far more achievable in a shorter time frame. The need to inform staff became paramount. If the database being developed was to be used as an effective, school-wide, learning tool then it was essential to gain support from all staff. The major task was not in the administration of the testing regimes. It’s not essential to have staff support to conduct a test but it is absolutely essential to if teachers are to use a new approach that will impact on their teaching practices within the classroom. Obviously in the role of the Director of Teaching and Learning I had the responsibility to provide staff with indications of why they should be using the proposed system, how it would actually be undertaken, how the information would be available and all the practicalities of using and accessing a database for monitoring student progress. I also made the decision that it was also important to consult with external educators. Consequently considerable resources were directed at securing professional development from a variety of consultants. All teaching staff were required to attend presentations from these consultants and time was allocated in subsequent staff meetings to allow discussion on implementing pedagogies and practices that took advantage of the newly provided avenues to student data. This process seemed to be generally accepted and as time progressed some staff even presented ideas and pedagogies that they had developed in their own practices at whole staff meeting. In essence, by keeping staff informed of developments and sharing the evidence on which the proposed changes were based, most staff seemed open to change. Indeed some were very enthusiastic.

7.6 Ongoing Evaluation of Change

To this point in the project the majority of discussion had covered the interactions, discussion, debate and analysis that had occurred within St
Joseph’s College. But significant effort was made to interrelate with the wider educational world to help negate any overly introspective approach that can tend to develop in the absence of external review or input. As outlined earlier, initial observations and investigations were made to determine potential avenues of investigation for the improved utilisation of particular data sets. This in effect was the beginning of the process to help determine a suitable point of origin for the work. Following these steps resources and energies were focused on the actual development and refinement of practices and processes. The next stage obviously required an evaluation and potentially refinement of the process. The most logical means of ensuring that developments generated from the project were assessed in an unbiased manner involved the input from educators external to St Joseph’s College. Consequently, steps were taken to present developments in forums that would engage external educators. The feedback generated from these external presentations was useful in helping to guide developments.

As Director of Teaching and Learning it was my responsibility to ensure that developments being undertaken at St Joseph’s College were, particularly in the area of data use, proceeding in a manner that was consistent with what was being acknowledged as best practice in the wider educational community. Opportunity to present achievements and insights gained from the project took a number of forms. On a number of occasions colleagues, from other schools would visit St Joseph’s College. As a general rule these visitations were from senior staff involved in senior positions related to Curriculum or Teaching and Learning at their schools. These meetings were obviously somewhat informal and in practice were found to be very useful. Conversations were often extensive and far ranging allowing detailed comparisons between the two schools use of data. In all cases it was apparent that the sophistication and development of systems at St Joseph’s was somewhat more advanced, but other institutions were beginning to follow a similar path to which St Joseph’s College had commenced some years before. This was confirmation that the
direction being followed at St Joseph’s College was constructive to improvement

The project had developed change on a number of fronts. Efforts had been made to identify appropriate assessment methods, new processes and systems for data storage, access and retrieval had been investigated. Time and effort had been put into inducting teaching staff with an increased awareness of the importance of data use. Gains had been made identifying important aspects of student perspectives that could be used to help monitor the overall performance of St Joseph’s College and its aim to cater for the needs of all students. The project had been very wide-ranging over the nine years that it was conducted and as a result presentations to external audiences tended to be concerned with a selection of aspects rather than the entire project.

This Professional Writing Practice piece has been written with a particular audience in mind. It is aimed towards teachers and educators that are interested in some of the practicalities and experiences of introducing significant change to data use in the context of a large secondary school. This piece does not attempt to cover all aspects of the work completed; it is an endeavour to explore in some way the relevance of the work accomplished to the potential change that may be undertaken at different schools. In a similar manner, the presentations made to professional audiences were generally not so concerned with the theoretical aspects of a research project but what how the journey of improvement that was occurring at St Joseph’s College and how this may be able to influence their own particular situation. This project was from its inception designed with the aim of improving the learning of students at St Joseph’s College, but for previously mentioned reasons it was still important to share the work.
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7.7 Reviewing the Process of Change at St Joseph’s College

Change is a process that inevitably occurs despite any effort to prevent its passing. In a sense change is like time, it cannot be stopped, but this is where the analogy ends because change can be directed, modified, assessed and reviewed. Despite the efforts of the most conservative members of any organisation, change will occur. That said, because change is inevitable it is essential to recognise the advantages of embracing change as an opportunity to improve. In schools, as in any organisation, change can be embraced to varying degrees by staff and in the case of schools, students. Through the course of implementing change in the current project at St Joseph’s College, a number of key experiences and events were recognised as having contributed significantly to the successful implementation of change.

Realisation of the variability in acceptance is the first step towards planning to direct and guide change successfully. Some very conservative individuals will often oppose change without seriously considering potential benefits simply because they feel comfortable with the situation as it is. This creates a centre for inertia that must be addressed. The objections to change expressed by individuals must not be ignored. It is essential to acknowledge the reservations expressed, and even more importantly to help sway the doubters, the proposal for change must be based in some type of defendable evidence. A proposal for change based on opinion with no basis in some type of reliable data is merely a guess at best and perhaps a fantasy at worst. In the current project, considerable time and efforts were put into clearly identifying potential advantages that may be gained from changing aspects of data use at St Joseph’s College. In the event that there was little resistance to change it is just as important to have evidence to help direct the change, otherwise there is risk of developing a culture of
change for change’s sake. In general it could be said that proposed change must have its foundations in fact not opinion.

In a large school such as St Joseph’s College, change will involve many individuals. As a consequence, the task of convincing all staff of the merits of the proposed change will at some point require the efforts of a core group of individuals that help to create momentum for all staff to accept the change. Staff members in senior leadership positions, and of course management, must be convinced, for without their obvious support it would not be possible to generate the required impetus and drive to instigate and then support the process of change. In the case of the current study this was achieved in a very straightforward manner. The proposed changes were based on solid data and when presented to the Director of Curriculum he was quickly convinced of the merits and became an invaluable supporter of change with regard to data use at St Joseph’s College. With his support and enthusiasm this was replicated within management and other senior leadership.

Once the support of key management was gained it was essential to present ideas to the wider teaching staff. The argument for change needed to be clear and evidence based in a similar way to the approach taken with introducing the proposals to management, with a major difference. In many ways, the use of data for teaching is a concept that management values, but in a very different way to teaching staff. Management look at the ideas as mechanisms for helping to improve the institution that is the school. Teaching staff have far more applied concerns. They ask questions about how it is to impact on their teaching in the classroom with their students. They want assurances that their efforts will not be in vain and that real gains are likely in terms of students’ learning. Teachers want to know what is they will have to do, how it will affect their workload, will they have to learn new skills? This, therefore, requires many of the practicalities to be explored before the ideas are presented to the wider teaching staff. The proposals do not have to be perfectly formed, but it is
essential that enough detail is available to allay Teachers’ concerns. It is also at this juncture of presenting change to staff that valuable feedback can be gained from the teachers. At a full staff meeting at St Joseph’s College for example, there were occasions when the combined teaching experience of the collected staff approached nearly one thousand five hundred years of teaching. This is an enormous collection of teaching experiences that should never be taken for granted. The same can also be argued for the resource of learning that may exist in any classroom. A group of twenty five Year 12 students has about three hundred and twenty five years of learning experience or the student body as a whole has over sixteen thousand years of learning experience. These are valuable resources that should be acknowledged and accessed.

Once the process of guiding change is underway it is essential to incorporate mechanisms that help monitor and review performance. Internal review and critique is valuable and indispensable, but avenues must be cleared for a variety of unbiased external assessments. This is readily achieved through communication and interaction with the wider education community. Presenting the internal evaluations of improvements beyond the boundary of the school in which they are achieved is vital to maintain perspective. It also provides the opportunity to recognise gains made in other schools that could also be incorporated. In the course of the work done at St Joseph’s College data, findings and observations were often presented in forums external to the school and all were found to be valuable, worthwhile experiences.
8.1 Development and Change at St Joseph’s College

A primary focus of this project was to provide leadership and direction to the effective use of student data at St Joseph’s College. Within this was the need to develop clear and sustainable strategies to guide the progress of students. A corollary of this was the need to engage staff and the wider school community in this journey. One of the underlying tenets of the project was to develop systems and strategies that were autonomous and independent, and did not rely on any one particular staff member to exist or drive. This was a clear lesson from past experience that could not be repeated in the pursuit of a sustainable future.

Early in the development of the project, I was given the opportunity to examine a number of different student data collection and dissemination systems at a range of schools. Like St Joseph’s, a common feature that I observed was the dependence or reliance on a highly motivated individual(s) to manage and maintain the system. This insight further impressed the need for my work on this project to be ever mindful of the need to engage/empower others.

The need for clear succession planning became particularly relevant towards the completion of this project, when I decided to step down from the position of Director of Teaching and Learning at St Joseph’s. At this time it was essential to provide St Joseph’s management and more importantly the new incumbent of the position, with an up-to-date report on the project; its progress and current status. This Professional Writing and Practice entry comprises the report that I provided to the College, overviewing the significant body of work that I had been completed over the course of the project. The Report has three main foci:
1. To provide an overview of developments in the School’s practices around data acquisition. 8.2 and 8.3 set out the improvements achieved in terms of rationalising the testing practices at St Joseph’s.

2. To describe the ways in which the School improved its institutional awareness and utilisation of the various forms of student data that were collected. 8.4 and 8.5 detail the changes in storage and accessibility of the data whilst 8.6 outlines the implementation of approaches that turned better data acquisition, storage and accessibility into a meaningful tool to advance student learning.

3. 8.7 provides insights into the potential for future adaptations to further the effectiveness of data collection, storage and utilization at St Joseph’s College.

8.2 Identifying most appropriate assessment models

The most common reported assessment of student performance is generally a combination of objective/quantitative performance measures moderated with observational/qualitative data that may be moderated with teacher professional judgement and opinion. Thus the feedback given to students, parents and carers particularly at school report time is often a grade or percentage for formal assessments along with a descriptive comment that may indicate endeavour, behaviour, aptitude etc. The data that is generated from this process often forms the basis for the actual report that in effect summarises the performance of the individual student over the previous term, semester or whatever reporting cycles the school chooses. When students are entering St Joseph’s College from primary school it is difficult to rely on individual student school reports as they come in an extraordinary array of formats. This is reflective of the relatively autonomous nature of schools within the Catholic Education System, particularly when compared to schools within the Victorian Government System.
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Obviously systems are in place to try and systemise and quantify reporting of student performance and the introductions of the VELS progression points was a clear example of an attempt to achieve this purpose. The issue that arose was related to the fact that in many schools the VELS progression system relied heavily on a significant component of ‘professional teacher judgement’ to position students on the continuum. Any system that is heavily reliant on qualitative judgment is always going to be less accurate than a system that is generally determined by quantitative unbiased measures. St Joseph’s has had a steadily increasing student population over the past decade and in 2013 over 270 students commenced Year 7 at the College. These students come from over 40 different primary schools. Obviously it is important to have a reasonably accurate assessment of the incoming students’ learning strengths and weaknesses. However, relying on the students’ primary school reports, in all their variety of forms, makes this process very difficult. In recognition of this, St Joseph’s has, for many years, undertaken some of its own testing and assessment of students before they begin at the College.

The types of testing regimes used at St Joseph’s to primarily benchmark students has evolved considerably over the last decade. Traditional linear tests were used extensively up until around 2008 when it was decided to begin trialling adaptive testing models. The rationale for changing to adaptive testing models was to improve the accuracy of measuring student performance and to more accurately gauge their learning aptitude and potential. Adaptive testing models provide distinct advantages over the previous linear forms of testing. All of the adaptive testing was conducted using computers and the scores were determined automatically and collated instantly. As a result, teachers were able to easily access objective measures of student literacy and numeracy with virtually no added workload. Another significant benefit of the adaptive testing was the reduced economic impost. The majority of linear testing conducted consisted of ACER tests which were paper based. These tests would be conducted; student responses collected and then the papers were posted off for
correction. The turnaround time from the point of testing to actually receiving the results was measured in weeks. This delay in time was not desirable and the financial burden of the overall process would extend into thousands of dollars. Students who missed the testing days caused another set of problems as they would have to be tested and papers corrected individually. Conversely, the adaptive models used were sourced from the Department of Education for no cost. At the time these tests were initially being rolled-out, the Department of Education even offered to supply computer servers so that the only cost to the school was time. The adaptive testing was accomplished using a computer software system, called ‘On Demand’ developed by the Department of Education. This system was very attractive to schools, including St Joseph’s, as, once set up there was no direct cost involved in conducting the tests and the results were available immediately on completion of the test.

8.3 Refining testing regimes

An issue that was to occupy a significant amount of consideration when implementing changes in terms of testing at St Joseph’s was the determination of what sort of testing regime should be followed. Previously testing was conducted when convenient more than when was optimal for use as a learning tool. The linear, hard copy testing that was used for a significant period of time required all students to undertake testing at the same time to allow efficient collection of papers for posting back to providers for corrections. This had an undesirable effect in terms of class disruptions to a large range of various subjects, as well as the recurring issue of absenteeism.

The change to online adaptive testing models greatly reduced the impact on class interruptions. Testing had always focused on literacy and numeracy, but the actual hard copy based testing would inevitably (read strategically) not
interrupt Maths and English classes. Indeed, most program interruptions for testing were incurred in more marginal subjects (eg, music, history, health and physical education), which caused considerable resentment. An important advantage of the online testing was that it could be conducted in English and Maths classes. As the testing data was generated it become available to Maths and English teachers virtually immediately and could be effectively incorporated into the curriculum. The data generated was also available to any teachers of the students. Although literacy and numeracy results are invaluable for Mathematics and English teachers these estimates of literacy and numeracy skills obviously have implications for a students’ ability to achieve in other subject areas. Hence the information can be used by teachers outside Mathematics and English to estimate what a student may be capable of within their own particular subject area. It would be somewhat inconsistent for a student with very well developed skills in literacy and numeracy to struggle with any primarily academic based subject that was not applied in nature. Admittedly a strong ‘academic’ student might not necessarily do well in music or art, for example, but in other areas which are more dependent on basic literacy and numeracy skills that student would be expected to have the ability if not the endogenous motivation to undertake any tasks within the subject and expect to have reasonable success. In the same way, a student struggling with literacy and numeracy skills would not be expected to excel in language rich subjects, such as history. The ability to gauge some type of performance expectations based on accurate objective measures was to become the basis for an increased ability for teachers to differentiate programs and assessments to more fully support individual student’s learning.

Further, the computer based nature of the testing fitted in well with the school’s widespread adoption of laptop computers for all students, commenced in 2012. When the testing regime was first trialled no students had laptops and as a consequence all testing required teachers to book testing classes in a computer lab. This created some logistical issues, as not all classes could readily book a
lab when demand was high. In 2013 every student at the College has a personal laptop and thus testing any class at any time has become a relatively straightforward and convenient process.

The testing interval for cohort wide testing was another regime structure that was considered and trialled for some time. There is an old farmer’s adage that is relevant to assessment of student ability, being, “You don’t fatten the pig by weighing it.” It is essential to realise that any type of student assessment should not be considered the end point or ultimate goal. Any assessment is a formative tool to indicate progress and point to potential strategies that might be considered in the learning progress. Measuring too often is inefficient and potentially counterproductive. Measuring too infrequently increases the chance of developing curriculum or pedagogies that are not ideal and results in unsuitable processes being used for extended periods of time delaying optimal student progress. The regime in terms of the ‘On Demand’ testing that was finally adopted was a process whereby all students from Years 7-10 were tested in literacy and numeracy towards the end of semester one and semester two. Generally, all students were tested between two and four weeks before their semester reports were finalised by class teachers. This allowed teachers to use the adaptive results as an objective measure to moderate their own professional judgements.

The semester-based protocol for adaptive testing also gave a time interval that allowed most students time to clearly demonstrate growth. An interval of six months was found to generally be significant enough, and although no detailed statistical analysis was carried out as part of this work it was observed that from test to test the majority of students displayed positive growth. Some students did not demonstrate any movement, while some exhibited negative development. Negative development of course is not real unless correlated with some type of external event such as family breakdown, death in family or some type of personal emotional trauma. Students that exhibited significant negative
growth almost always cited some sort of personal negative influence. Occasionally some students did perform unexpectedly poorly and this was often found to be associated with the student not feeling well on the test day or had had some issue with their laptop. These apparent irregularities in student performance were readily identifiable from even cursory examinations of testing results. The transient nature of many of these events was apparent when subsequent results returned to expected levels. There were some students that exhibited sudden and prolonged changes in performance and these are discussed in more detail in section 8.5.

8.4 Maintaining Data Bases

The process of guiding staff in the appropriate use of student data was seen as a high priority and the resources committed were substantial. Externally and internally provided professional developments were committed with the aim of maximising the move towards effective student data utilisation. Historically the movement towards a more evidence based approach to student assessment and later reporting was slow to gain momentum. Very early on in the current study the development data systems had been seen by a small number of staff as useful, but the more widespread consensus was that it was just a collection of confusing tables and inconsequential statistical analyses. Staff, in general, were not making use of the information apart from coordinators and counsellors. As a learning tool that could positively impact the majority of students learning it was not very successful. No formal data was collected as to why the data was being underutilised, although anecdotally, it would seem that the format and presentation was a very significant factor. Large tables with many entries were seen as meaningless. This issue was addressed though and attempts were made to colour code student performance (see Appendix 2). Green was to represent students that were in the top 15% of the cohort while yellow represented those
students that were performing in the range of the lowest 15%. Even with attempts to simplify and colour code data staff were still required to have some competence in using the excel® software. Although excel® is a commonly used software within schools it would appear that many staff were still reluctant to take advantage of its ability to facilitate data manipulation and analysis. A common response from less confident staff was that excel® was too complicated for them and they did not really know how to use it. There did appear to be a certain amount of correlation between the age of the staff, their areas of teaching expertise and their reluctance to use excel. Many younger and maths/science/accounting/IT staff seemed far more comfortable with the data in spreadsheet formats. So the dilemma that had eventuated led to a need to not only educate staff in the importance of consulting student data to be able to make informed educative decisions but to provide access to the data in a very teacher friendly way.

A more user friendly method of presenting data was obviously an important goal and this lead to the identifications of systems that would provide easy access to data. The systems would need to be able to store a profile of some description for each student, and it was imperative that the data was meaningful and accurate and could ultimately benefit student learning. This led to choices needing to be made in terms of what software would be the most appropriate. Through a trial and error approach the choice of software was found to not be as crucial as the process of inculcating the use of data into the way in which teaching staff approach learning. No software system was identified as being suitable to store all information available in a meaningful way, and in fact in hindsight, the storage of data is generally not an issue as opposed to access to the data. This realisation was fundamental to the decision making process that led to acquiring a number of systems that in simple terms retrieved information that was already available and presented it in a far more teacher friendly manner. Once reliable data had been identified the challenge was to ensure that it was readily accessible to teaching staff. Inevitably the next challenge was to
ensure that staff accessed the information and used it in productive ways that positively influenced the learning of all students.

Storage of data in typical data bases is a relatively straight forward process and as outlined previously, ease of access and interpretation is of far more importance. Trialling of a number of systems lead to a multi-pronged approach to giving staff access to the data. The main platform used at St Joseph’s in terms of data was a system known as SIMON (SIMON 2010) which was used to manage and organise much of the data held by the school relating to students. Unfortunately though, the SIMON system requires all data to be loaded into the database before it can become available to staff. This leads to a situation where data often has to be double handled to be available in SIMON. Creating more work for staff is generally a guaranteed way to create significant inertia to accepting any new system. The solution that was found to be successful was to look for software that rather than acting as simply additional databases operated more like collation engines that, if possible, searched the databases that already existed and simply collated the information rather than storing it. The software that was to be used in conjunction with the already existing SIMON platform was slotted into the SIMON homepage as a hyperlink, so although accessible to staff through SIMON the additional software was quite separate from SIMON. Interestingly, SIMON was originally conceived as a system that would be able to provide all relevant data to teaching staff, but it has never been particularly user friendly and many staff frequently complained of the time it took to find data on individual students. Many staff were dissatisfied with the large number of levels of menus that needed to be selected to get to the relevant documents. This in fact led to a situations where large amounts of data were available but due to the complex pathway to get to the data many teachers often chose not to access the data.

Ultimately, as a consequence of the work accomplished during the course of this study, there were two new software programs that were installed within
SIMON to encourage staff to not only access but use data that was available. The first, a commercially available program, SPA the student performance analyser (SREAMS 2013), was an improved version of the various excel based systems that were trailed early in the current study. The system was used not only to store NAPLAN and On Demand data but it gave staff members user friendly access to the data. Every staff member could access the stored longitudinal data for NAPLAN and On Demand for students in their classes. Teachers would merely select their class from a drop down menu and all available testing data was presented colour coded in terms of level of achievement. Obviously there is far more relevant student data other than testing data. Data relating to issues involving, behaviour, medical factors, learning styles, absenteeism, social circumstances etc. are all important when developing an understanding of an individual learner’s needs. As a consequence the other very important software that was implemented was the Real Time Student Program developed in partnership with five other local secondary schools under the guidance of the Geelong Region Local learning and Employment Network (GRLLEN). This software was not capable of storing any data, but was capable of accessing any nominated data base to draw together all relevant data for individual students. Staff simply entered the name of a student and the system would collate the relevant data onto a single page referred to as a dashboard (see 7.6 figure 5). This, in effect, short circuited many of the tiresome menu choices required within the SIMON system and made teacher access to the major databases a much more straightforward and immediate process.

8.5 Data Access and Use

Collecting data and making it available to teachers could be considered a relatively straightforward process. Ensuring data is accurate, reliable and the
most appropriate is a far more challenging exercise. A significant task is to encourage individual teachers to effectively incorporate the data into their teaching practice. The process of developing innovative uses of data was the next step in a very complex process of change. In a school environment, it is not unusual to get many very conservative individuals who are reluctant to embrace change of any description. Observations and conversations throughout this study indicated that many teachers become professionally isolated and as result develop very defensive approaches to their pedagogical approaches. Some teachers tend to covet their resources and are reluctant to share while others develop very a low opinion of their own abilities and very much prefer to remain out of view avoiding critique of their professionalism. As a result classroom teachers often become a defacto subcontractor for the provision of a teaching service. The individual teachers are their own bosses and on many levels would seem to be responsible only to themselves. Although this situation is very far from ideal it would appear that it is not uncommon and it is of course diametrically opposed to the pursuit of an open and collegiate approach to teaching that includes a mixture of self-evaluation and external evaluative processes. The impact of cohort wide collection of data is that it is not uncommon for some teachers to see the data as a means of comparing their performance as an educator with that of their colleagues. This situation was encountered on a number of occasions within the context of the current study.

Some confident teachers were keen to use the data as supporting evidence to illustrate that they personally were doing a good job with their classes. Some staff on occasion would use this “supporting evidence” to help persuade colleagues to change elements of curriculum or assessment. This situation was at times problematic, as the data in this case was not really being used to support student learning but to support the professional opinion of certain staff that had an agenda more associated with their desire to shape and influence the direction that the Learning Area as a whole might follow. This could be argued as not necessarily a negative thing as evidence based opinion is a strong foundation to
develop inertia for change. The problem is of course the data was not in reality very suitable to compare teacher or curriculum performance. The data was being collected with the express intention of following individual student development. There is no evidence to suggest that there is a direct and complete association between student performance and teacher ability. Hattie (2009) would argue that teacher ability is a factor with a measurable effect on student learning but it is one among potentially hundreds, and so, although teacher effect is undoubtedly a factor it is not reasonable to argue for any wholesale change simply based on a factor that may in reality only have a small impact. Especially when the assessment data being used to support the teacher effect is not designed nor intended as a measure of teacher performance.

Other less confident staff at times indirectly expressed the view that the cohort wide testing did not sit very comfortably with them and it was clear that they were rather defensive about their classes being compared with others. These issues and perceptions are unavoidable in any system that produces measures of student performance that can be organised or categorised into a number of formats that allows superficial comparison of subgroup performances. Regardless of these complex issues it was decided very early on in the development of more productive use of assessment data that all student assessment data should be made accessible to all staff. It is somewhat like walking a tightrope, giving all staff access to the data maximises the potential for innovative and positive outcomes to be developed. Novel ideas are more likely to be generated when more minds are considering the problem, but conversely this also allows more opportunity for interpretation to be presented that might not necessarily be motivated by the perspective of primarily improving student learning. This might not merely be restricted to some teachers using data to support an opinion they hold but can have implications removed a long way from the classroom. Occasionally, during management meetings, some not teaching staff were interested in exploring if data could be used to develop “targets” for measuring whole school performance. This
approach is obviously moving away from using data of students to help students’ in their own learning and not an area that was explored in detail during the course of the study. It is in reality a bureaucratic approach to education that is probably more suited to commercial businesses rather than education. This approach has received some credence from the way in which recent Victorian Governments have instigated superficial data analysis of school performances through NAPLAN analysis on the “My Schools” website.

An important task that presented itself was the need to educate staff in the central role that the data played in supporting student learning. Staff would still be able to access and compare class performances if they so desired, but steps were taken to highlight the insubstantiality of making simple direct comparisons between subgroups or classes within the year level cohorts. Class groups are generally formed according to timetabling pressures and with a certain amount of ability selection being used to form Mathematics and English classes which then inevitably has timetabling implications for all other classes. A direct comparison between class group performances is therefore in reality a very poor indicator of teacher performance due to the very significant relationship between student ability, subject selection and timetabling influences. Ultimately, the majority of staff did support the assertion that direct comparison of classes’ performances was of limited value and this led to a widespread acceptance that the data was most effective when used at the level of the individual student looking at their individual levels of ability, with the advantage of being able to easily and readily examine individual student performances longitudinally.

This phenomenon of attitudinal inertia can be very hard to overcome and often leads to the modification and at times abandonment of new ideas. Reforming educational approaches is well documented as a complex process that is fraught with pitfalls. Fullan (2011) clearly outlines that successful change in educational systems depends on the ability to intrinsically motivate teachers
and students. To be able to do this it is vital to make all stakeholders in the system aware of the potential for improvement a change may bring with it. Within the context of the current study the problematic process of change to some extent stemmed from the very isolated nature that teaching had develop into, when teachers had become comfortable in the professionally isolated environment of the classroom. The process of change is facilitated and even accelerated when the school teaching staff has an open and flexible approach to their workspaces. From the class teacher perspective there is a risk that the teacher can fall into the role of benevolent dictator. They can become acclimatised to making all the decisions, taking all the responsibility and in the process becoming desensitised to the value of constructive criticism. The place that student data occupies in this process of developing constructive criticism is critical. Some teachers unfortunately view the use of data as the “thin edge of the wedge”, an attempt to measure individual teachers’ performance that can then be used as a tool for putting pressure on staff. This is counterproductive and must be addressed with appropriate explanations.

Introducing change can be a somewhat dichotomous process. There is the potential to force whole school change, a very top down approach, whereby management demand all staff to adapt a particular process, this can work well at times for example when a new software is installed for roll marking purposes. By contrast trying to develop whole school change in terms of the way staff view and as a consequence use assessment data for teaching and learning can be a far more complex and demanding process. Roll marking involves no personal investment of the teachers. It is highly unlikely that a teacher will feel threatened or insecure when it comes to marking roles, there’s no statistical analysis of roles that will lead anyone to form opinions on the performance of the teachers from role data. Assessment data is a very different area and one where much insecurity can be exposed as teachers often regard detailed statistical analysis of students’ data is really a reflection of them as an educator.
The process of change that has occurred at St Joseph’s College over the course of the current study has highlighted a quite obvious change in priorities. In the beginning student data was collected without much regard to its reliability and then used haphazardly at best for a number of disjointed purposes. As the final phases of this research were reached the school now had a very different approach to student data and the way it was collected and utilised. Quality control of the learning experiences of students had started to become a reality rather than an ideal. Rationalising the way data is stored and accessed was the first step in an ongoing process that has led to a point where the school management was motivated to invest significantly in resources that would allow accurate assessment data to be routinely collected, analysed and reported. The adoption of computerised adaptive testing protocols was the catalyst that led to far more emphasis being placed on the accuracy and objectivity of assessments that were then reported accurately and transparently to students and parents and guardians.

8.6 Using Data to Develop and Differentiate Learning Relationships

When this study originally began, data collection, storage and use were rudimentary and as a consequence the use of data in terms of decision making process was also fundamentally rudimentary. Although not solely responsible for the gains made in data driven decision processes this study made a significant contribution to overcoming the inertia to change to develop far more evidence based models of decision making at St Joseph’s. The developing focus on data driven decision making process had significant consequences in the way that management at St Joseph’s viewed perceived weakness or shortcoming in the provision of an education to the students at St Joseph’s. Initially the process of monitoring student performances in their final year of schooling was the
most significant means that were used to determine the success of the six year process of educating students from Year 7 to 12. The view that the number of ATAR scores over 90 and the numbers of study scores over 40 was a good measure of performance or at least the most common amongst schools and the wider community particularly the media, was reflected in the importance placed on this above other measures at St Joseph’s. With the focus on a summative end measure using VCE results there were obvious weakness in the validity of the conclusions drawn. In fact, the comparison of VCE results to GAT performances as conducted by Carmel Richardson (Richardson 2005) were to dominate the focus and consequently allocation of resources to “fix” the perceived weakness within St Joseph’s students. A clear example of this was the apparent deficit St Joseph’s students exhibited in performance in particular in English.

The issue identified with relying on the summative endpoint analysis of student performance is that in this process an observation is made but the causative process is not readily recognised. Observation and analysis of formative outcomes need to be made in order to identify what might be at the core of the perceived underperformance.

In other words, significant analysis of data from all year levels, Years 7 to 12 was required before strategies could be designed that might have beneficial impact. As often happens in schools, when an issue is identified often the first response is to do something to fix the problem. Often though, the so called deficit may or may not really be “the problem”. It is somewhat intuitive, that if there is a problem we must do something now to fix it. But as with all highly complex processes one must be careful not to generate a “butterfly effect”. In the case of St Joseph’s worse than expected English results immediately resulted in changes for English Faculty staff including staff changes, more professional learning for staff, close examination of individual class results and consequently interviewing of teachers. This type of response is understandable,
but trying to improve performance of student cohorts is at times an overwhelming task. It is also very difficult to determine which parameters are the most important factors to focus on. Some such as Hattie (2009) would argue it is possible to rank and discern the impact of various factors on student learning but using meta-analysis to distil meaning which can be applied to individual students is potentially fraught with error and inexactitude. Individual students are unique and it is obvious that not all students follow identical linear pathways to understanding. The progress of each student is invariably different and so analysis of individuals will always be more relevant to individuals’ development rather than generalisations from large worldwide studies. This is not to say large meta-analysis studies are of no value, quite the contrary, but in application to individual learning these studies produce generalisations that are of immense academic interest but for applied practice in teaching individuals they are by no means as useful as first hand data obtained from individual students. It is self-evident that accurate and reliable data sourced from individual students is always going to be the most appropriate data to be used as a tool to assist in the development of learning of any individual student. The real difficulty is in identifying which is the most valuable data, then devising a method of storage and retrieval that allows it to be incorporated into the educative process.

Focusing on a Year 12 cohort that has already left the school was always going to be problematic in trying to “fix” poor performance. It is difficult, if not impossible, to determine cohort ability effects as opposed to teacher input effects, especially when looking at only one cohort. The added complicating factors of timetabling issues, that is to say the way students of particular skills sets are often timetabled together due to their common pursuits, creating classes of like skilled students, so how to compensate for the fact that a particular English class has all the Health and Human development students will invariably perform less well than a class that has all the English Literature students.
'How to compensate for this type of variability in a meaningful way to allow direct comparison of teacher performance as opposed to student performance is beyond the capabilities of individual secondary schools. As in a related example, moderating results of students in VCE to attempt to account for variation not directly related to student ability is a complex and much debated subject. In the VCE the moderation that occurs to account for subject cohort ability differences leads to all sorts of manipulations. This process results in study scores of certain subjects being marked up or down according to their estimated relative difficulty and ability of the participating cohort, but this type of adjustment of actual results to some type of theoretical result is time consuming and resource demanding and to be effective and accurate must be based on very large cohorts. Teachers typically only teach non-statistically significant groups as in one or two classes.

Monitoring performance and determining growth of learning in the form of skill acquisition is a far more logical and meaningful way to approach data. VCE data is purely summative and even using GAT results to determine achievement as opposed to expected performance is a comparison of virtually two summative measures taken only a few months apart. Data to be used in the monitoring of performance must conform to a number of criteria to be most useful.

- The measurement (result) must be an accurate reflection of the student being assessed. During this project extensive investigation led to the conclusion that although not perfect, On Demand adaptive testing and NAPLAN testing provided the most efficient and accessible form of assessment for monitoring student performance longitudinally. Other testing regimes such as those accessible through ACER would no doubt be just as suitable, but limited resources and need for efficient systems is always going to lead to compromises.
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- The measures used must be taken at intervals sufficiently separated to accurately reflect growth but not so frequent as to be swamped by minor fluctuations in accuracy. Students are after all simply human and they have their good and bad days. Ideally the best measure would not be obscured by a student having a good day on one test and a bad day on the next.

- The assessment must also be teacher friendly, not creating large amounts of extra work and importantly be able to be archived in such a way that the information is readily accessible and meaningful.

Once these criteria are satisfied the major obstacle to using the data effectively to benefit student learning is to encourage teachers to access and use the data in meaningful ways. The data can be used to help build learning relationships quickly. If a teacher has an accurate picture of where the students skill set lays then it is far easier to develop effective pedagogies and curriculum that challenge the students but present the student with achievable tasks. This is of course fundamental to differentiating curriculum to student needs.

The obvious way in which data can effectively aid student learning is through the ability to differentiate the manner in which each student experiences the educative process. In an ideal world every student would be presented experiences that perfectly suit the idiosyncratic nature of their learning.

In the Western world, prior to the industrial revolution, education could be considered a far more intimate endeavour. Post industrialisation education took on the “factory” model. Large numbers of products, educated students, were produced en masse, just as efficiently as the newly mass produced products were being produced. There of course were problems associated with mass education. Not all students could readily adapt to the new means of imparting an education. Over thousands of generations children had learnt from their parents, siblings, extended family and communities in very small groups and
often on a one to one basis. There was no specifically designed curriculum nor assessment, the process of learning was driven by necessity and the assessment was whether the child was able to develop skills that were effective enough initially to ensure survival, and then eventually to determine success and status within the community and ability to support a family and continue passing on acquired knowledge and help develop skills in their descendants. Not surprisingly this is why all humans have varying levels of abilities as “teachers and of course learners”; the social evolution of mankind has only been possible because of humans innate ability to “teach and learn” from one another.

The process of learning and teaching was consequently based for millennia on close relationships between teacher and learner and today the most significant learning still takes place in an environment just like this. When a child is born, in the vast majority of cases, the child learns to communicate, ambulate and generally relate to and interact with the world with the input of immediate family and a small input from the wider community. Within a very short period of only a few years the child will develop the skills that will form the basis for all learning for the rest of their life. This ability to learn is somewhat plastic, many children go into some type of extended care, day care etc. at a very early age and of course still develop normally, but the environment they develop in is still reflective of the family unit, there will be a consistent adult that cares for then and interacts in appropriate ways. The teacher will quickly become very familiar with the child (learner) and a relationship develops from which teaching and learning naturally develop.

Teacher knowledge of the student is imperative, intuitively adults know that children, especially small children do not have the skills to be able to have an adult conversation and consequently the adult speaker will adjust their communications with the child to a level that the child is capable of understanding. This will occur with any adult that interacts with any child and has its basis in an evolution driven process whereby natural selection has
ensured that the vast majority of adult humans are capable of fostering development in small children. For example, adults even with limited experience of small children and infants will instinctively change the way in which they communicate, based on the age and developmental stage at which the child is perceived to be. This phenomenon is observed in older children when they interact with younger children and this ability is no doubt reinforced by the observations by the children of older persons communicating and interacting with young children in different ways. These adaptations to behaviour although superficially simple are very involved and complex. When adults speak with very young children they automatically change the vocabulary used, the complexity of sentence structure, the tone and pitch of voice, the spatial proximity of the speaker to the listener and a host of other subtle changes. The more experienced speaker doesn’t consciously change the majority of their communicative processes, they just do it. This is no doubt due to a large part instinctual and in the same way learning is a very instinctual process and as such learners often just learn without thinking about it, and in a very similar fashion teachers just teach often using a very intuitive approach.

The issue with relying on these somewhat autonomic processes is that as with all behaviours and characteristics there is invariably a lot of variations between individuals in their abilities and this then manifests itself in the observation that many individuals have different proclivities to learn and an individual’s ability to teach is reflected in a position on an expansive continuum of teaching ability and skill. The issue with modern schools is that although catering for individual needs of students is paramount, the realisation that the abilities of teachers will always vary considerably is not always as high on the agenda. Maintaining consistency and high standards in the teaching provided to students is of course a valid goal of all schools but one that is not always readily measurable or even monitored accurately. Developing very clearly expressed expectations of teachers is the first step in ensuring teaching quality. When teachers have clear guidelines of what is expected of them the majority of
professional teachers will take steps to ensure that they meet the expectations. This is no different to the expectations that need to be made clear to students. When considered in the context of the commonly held view that all individuals should remain “lifelong learners” in order to be able to function optimally in our ever changing modern world the process that applies to students generally also applies to teachers. This is not to say that teachers are simply older students, the situation is of course more complex but many of the learning processes apply to learners of all varieties. When expectations are clearly articulated then developing personal goals is a far more straightforward process. Once goals are determined and steps are made towards attaining these goals this is the point at which reliable data becomes essential.

It is very important that there is a definite process that is followed to allow the optimal use of data. Using student assessment data to monitor teacher performance is not a productive pursuit, although there may be a significant “teacher effect” in the learning process it is not a linear nor predictable relationship, hence any process that relies heavily on student assessment performance to monitor teacher performance is bound to be at best inaccurate and at worst unrelated. Data that would be more reflective of teacher performance needs to be accumulated from sources specifically designed to determine performance of the teacher. Ideally, this would include self-assessment by the individual teacher, input from a colleague that had observed some teaching of the individual and information from the students in the class. Student feedback is of course vital as the students are always in the class and undoubtedly in the best position to determine the effectiveness of the teachers from the student perspective.

Learning through modelling in the first few years of life is still significant and in the preindustrial era it continued for many learners all through life. It did not really matter whether the learner was becoming a craftsman, farmer, labourer, academic, surgeon or servant, they would all go through some type of
developmental, instructional period that involved generally working one on one with a master often for many years. Large components of the learning process were based on modelling. The learner worked as an assistant of some type and gradually over time developed the skills under the supervision of the master. This type of teaching and learning was the basis of education for thousands of years. One measure of success for this process was the continuation of a supply of individuals that could supply the skill and expertise that enabled the community to develop and continue into the future. There was obviously no numerical measure of a specific performance on a set task, it was more a case of over time could individuals continue to perform within their area of “education experience”? In other words was the individual able to sustain a satisfactory performance in their field of expertise over a period of time? The outcome that was being pursued was to see if the apprentice was able to take over the role of the craftsman and later on in the same process the goal was to determine if the apprentice would one day become the master.

It is important to realise that this system is far older than even recorded history itself. Far back in time even hunter gatherer communities worked along similar lines. To become a successful hunter young boys would have experienced a long and arduous process of being shown what to do, young girls would have been taught about gathering and processing foods etc.; critiques from older more experienced community members would have occurred over an extended period of time generally on a one to one basis. This whole process of developing learners over time was very much in keeping with a “learning by example and doing” learning process. This ancient history of the way learning predominantly occurred for millennia is very different from the factory classroom that evolved relatively recently and then evolved into the situations that current day students now find themselves in. The large numbers of students in a room with one teacher is still a relatively new phenomenon and one that can readily be argued was born of convenience due to changes in manufacturing that required large
numbers of near-automatons to power the new manufacturing processes around the time of the industrial revolution.

Obviously modern classroom environments are far removed from the initial “factory classes” but they are also very distanced from the far more personal traditional and far more interactive ancient learning model. Families or small communities just did not entrust the education of twenty-six students to one adult routinely, as is common in modern classrooms. The number of students in modern classrooms cannot be reduced significantly without the use of far more resources. This is not a realistic pursuit, therefore improvement needs to be sought by developing processes that allow teacher and learner to develop relationships that more closely reflect the types of teacher learner relationships that existed in the past and still exist in the early years of developing learners. Obviously a large part of this pursuit would be a process that ensures that educators have qualities and personality types that are suited to being teachers. This issue was not considered in the current project but common sense would dictate that people unsuited to developing healthy learning relationships with children should not be in a position to be given this responsibility. Developing relationships with learners is in part based on the teachers’ knowledge of the learner. Parents obviously know their children intimately and particularly in the first few years of life no professional educators can approach the achievement that parents accomplish in the education of their children. Having said this, increasing the educator’s knowledge of the students can only improve the effectiveness of the teaching and learning.

In terms of the current study the improved utilisation of data was at a fundamental level a means to facilitate the improvement of teachers’ knowledge of their students. With improved knowledge the teacher is able to develop an understanding of the students’ needs. This leads directly to the ability to get to know the student and therefore develop a productive learning relationship with the student. The processes and regimes developed during the
current study were able to accelerate this process to a significant extent. The progress in facilitating teacher learner relationships and how these impacted on teacher practice within the classroom can be demonstrated when examining an example of some fundamental changes that occurred in the class of a very experienced teacher. The teacher “X” had around thirty years of teaching experience and had always been acknowledged by fellow staff as a very competent, conscientious hard working teacher. Teacher X taught a range of subjects, but in recent years had tended to specialise in Mathematics classes for junior level students. Student feedback and opinion of X was overwhelmingly positive.

X became aware of the work being undertaken during the course of the current study and would often instigate conversations about findings and volunteer perspective and opinion on potential practical applications. X would often express the view that determining student needs accurately was a vital component of assisting student learning. The problem was the time required to accurately evaluate student ability. Any system that could accelerate accurate assessment of student ability would assist in the process and inevitably reduce the time taken away from what was considered as “teaching and learning” time. X became significantly involved with junior level students who were identified as having lower skill levels, particularly numeracy and would benefit from undertaking a consolidation program. The range of student ability within these classes was very large even though all students were well below the average level for a student in their year level. Students ranged from perhaps two years below the expected level all the way down to very limited skills more consistent with very junior primary levels.

X found the immediacy and accuracy of online adaptive testing very beneficial particularly for differentiating tasks. X would in fact access data contained within the newly built systems to identify the range of skill levels within the class and then allocate students into one of three levels that would determine
the difficulty and complexity of tasks presented to the student, more closely linking the challenge presented to students with realistic expectations of their potential for success. X often commented that the ability to access the data routinely had become an essential tool in accommodating the needs of individual students and also it was an important indicator that could be used to objectively support X’s assessment of student performance. This was particularly true when conducting parent-teacher interviews of student conferences. On many occasions, X relayed with enthusiasm that having the objective measure not only accelerated the process of being able to differentiate for individual students but it gave objective support and confirmation of professional assessments and opinions. This was particularly appreciated when conferencing with parents and students who might be inclined not to accept teacher professional opinions for whatever reason. The presence of unbiased longitudinal data helped to minimise being put in the position whereby a parent might dismiss a teacher’s opinion as nothing more than biased and coloured by personality clashes or some such subjective matter.

8.7 Moving Forward

As expressed throughout this work the pivotal motivation for undertaking this study was for the betterment of student learning specifically at St Joseph’s College. The range of the uses of data can be varied from simple reporting of student performance to the far more complex and productive use of data to form and sustain detailed knowledge of the student that will ultimately form the basis for developing relationships that foster learning. At the time that this study was drawing to completion it was evident that gains had been made with regards to the improvement of student data collection and use for the purposes of student learning. To a large extent the pursuit of improvement has no end point and so in part a major success of the work completed was to begin the process of
embedding systems in place that allowed longitudinal monitoring of performance that could be used to monitor the influence of change. Measuring educational success is by no means an exact science. Using any one particular measure of student ability as the defining parameter, although convenient in a logistical context, will rarely give truly accurate insight into the perceived success of an educational process that as a general rule involves thirteen years of involvement from primary through secondary schooling. Looking towards the future use of data at St Joseph’s and building on the gains already made the following represent areas that could have significant impact in the immediate future.

8.7.1 St Joseph’s Students’ Writing Performance

Apart from the benefits to individual students, keeping accurate longitudinal records can provide benefits for managerial process and quality assurances purposes. Monitoring cohort performances from the beginning of Year 7 has some distinct advantages over the technique of looking at VCE results. In fact, towards the very end of this study analysis of NAPLAN for the Year 7 2011 cohort showed a surprising deficiency in the area of writing, but on all other measures students performed at expected levels. In the past, NAPLAN results would have been perused and perhaps a few comments circulated on what the results may mean. In terms of concrete actions, NAPLAN results would not generally be the starting point for any significant focus on learning strategies or stimuli for generating change. The unexpected writing result for 2011 was the catalyst for a number of actions that otherwise may never have eventuated. The obvious question posed when unexpected results are detected is of course, why? Followed closely by what does it mean and what should be done? Having lower results than expected for a writing task for a cohort of students at an all-boys college such as St Joseph’s could be written off simply as a gender effect. Many educators would be comfortable with this widely held opinion and generally the
perception within St Joseph’s lent towards this approach. With a more evidence based approach, observing lower than expected results led to closer examination of the data in terms of how did the St Joseph’s cohort perform compared to other cohorts from other schools? By identifying schools that provided useful comparisons it appeared that students in the Year 7 2011 cohort had indeed performed poorly even allowing for “gender effects”, but this below expectation performance was isolated to only the writing component.

Year 7 students for 2011 came from 47 different primary schools mostly within the Geelong region. The students had only been at St Joseph’s for a couple of terms at the time of the NAPLAN testing so there are a few possible explanations some potentially more likely than others. The factors considered included;

- Random chance influences.
- St Joseph teachers had significantly underprepared the students.
- The Geelong region primary schools had underprepared the students.
- Error in the NAPLAN data.

Assuming that random chance influences are unlikely to affect a large cohort of 273 students and that the likelihood of error in the testing or publishing of results is also likely to be quite remote, the most obvious avenues to investigate was the way in which the students were acquiring skills in preparedness for the testing. The issue would of course be how to differentiate between the impact of experiences at St Joseph’s and their experiences at their original primary schools. Students had only been at St Joseph’s for a very limited period of time compared to generally seven years at their primary schools. Yet St Joseph’s was the only factor common to all students.

The original identification of the unexpected performance was initially approached from the perspective of what is causing the effect and how can it be changed, but the complexities of attempting to identify the source of the poor performance...
performance quickly hastened a more heuristic approach. Students had not performed as expected and assuming our expectations were appropriate then the experiences that the students had been through had resulted in development of skills that were in need of improvement. It was not possible to change the performance of the Year 7 2011 cohort in the past, but steps would need to be taken to ensure opportunities for skill development of the cohort were optimal.

The English co-ordinator was informed of results and discussions initiated to make all relevant staff aware. An important step taken was to take a more global approach to the issue. If a significant component of the performance was due to primary influences then there would be benefit in informing the original primary schools of the results. Over 78% of the Year 7 2011 cohort came from local Catholic Primary schools and so steps were made to inform the primary Catholic principals of the results. A severe limitation using NAPLAN testing is based in issues of privacy and restriction of access to data. VCAA will not allow St Joseph’s staff to access St Joseph’s students NAPLAN results that were achieved prior to enrolment at St Joseph’s via the NAPLAN database. In other words students results in Years 3 and 5 NAPLAN testing can only be accessed by asking students’ parents to supply the data on enrolment at St Joseph’s, but logistically this is yet to prove efficient nor reliable. The data is held within the NAPLAN database but is withheld. Without reliable and efficient means of accessing prior NAPLAN results it is very difficult to determine if the observed writing deficiency may have its origins early or late in primary school.

Although the root cause of poor results could not be clearly differentiated it was quickly realised that action needed to be taken rather than ignoring or dismissing the data. In a somewhat unusual approach in terms of the way many schools operate, the observation was presented to the local Primary Catholic School Principals from which the majority of the 2011 Year 7 cohort originated. The Principals were presented with the data at one of their regular
Principal meetings and feedback sought as to what their assessment of the situation was. Generally the Principals were very interested in the opportunity to gain some insight into the performance of their ex-students. Fig 1 displays an example of the way in which data was presented.

The data presented was taken directly from the “My School” website, maintained by the Victorian Government. My School is used as a source of student and school performance made available to the general public. Individual student’s results cannot be accessed but school cohort performance can readily be accessed and compared. With more emphasis on analysing available data the site enabled comparisons of students performance at St Joseph’s with those at other schools. Although St Joseph’s is a boys’ school it was decided that a relevant school to also compare would be Sacred Heart College. This girls’ only school is geographically very close to St Joseph’s but very importantly has a very high proportion of female siblings to the male
students that attend St Joseph’s. Allowing for any gender biases, Sacred Heart provided confirming evidence that the writing performance of the St Joseph students did seem to be depressed. Another school chosen for comparison was St Bernard’s College in Essendon. This is a Catholic boys school very similar in all characteristics to St Joseph’s except that it is located in Melbourne. Once again data for St Joseph’s was compared to the St Bernard’s cohort and there were no obvious differences in cohort performances except for the writing components.

Identifying the cause of the writing result was beyond the scope of the current study. Time was spent looking for potential causative factors but with limited time and resources available the stratagem of making principals of feeder schools aware of the phenomenon was seen as the most appropriate pathway. The principals were very receptive to the information, but even collectively were unable to readily agree on any likely origins for the observed writing results. As student performance on the Year 7 NAPLAN testing is undertaken within months of the students beginning at St Joseph’s the results represent a somewhat summative measurement of the students’ experiences and growth derived from their primary school experience. This of course does represent a problem for St Joseph’s if students are beginning at St Joseph’s with an already present writing deficiency. It is a very difficult task to effect much change in such a large and diverse range of feeder schools. Preliminary analysis of student performance did not indicate that any specific schools were causing any type of distortion of results. Feedback was sought from a sample of Primary Principals and discussions initiated, but with no consensus on likely causes the observations were noted for further consideration with the possibility of the primary schools becoming involved in future research to more fully explore and potentially explain the observed writing results.
8.7.2 Improving Knowledge of Students’ Primary School Experiences

A commonly expressed issue was that the primary schools rarely received any feedback as to how well their students had been prepared for the transition to secondary school. This is in terms of the transition of students from Catholic primary schools to a Catholic secondary school. This phenomenon of very little feedback is to be expected. Catholic schools are very autonomous in many ways.

Primary Catholic schools are generally under the auspices of a parish priest that has responsibility for the majority of major decisions that are made. Few of these priests have formal educational qualifications and are therefore reliant on the advice and counsel of the principal and school council or board. Catholic primary schools tend to be small, catering for the immediately local Catholic community and tend to often have limited resources. This combination of features results in schools to a large extent operating in isolation and as a consequence the individual schools develop strategies of assessment and data accumulation that are not really conducive to passing on data about the student to the secondary college such as St Joseph’s, to readily assess the incoming students learning needs and requirements.

A surprising example of an outcome of this insular nature of the primary schools was the view expressed by a number of the schools that although they would like to use better practices such as On Demand testing, it was prohibitively expensive and beyond the resources of the individual school. This was surprising as in general the use of On Demand testing is free, being supplied by DEET and the school is only required to supply a computer server. On further investigation it appeared that some of the schools were under the impression that the use of On Demand incurred a cost of at least a few dollars
per student per test. This type of misconception may be representative of the way that small Catholic Primary schools operate to a large extent in isolation. Comparable government primary schools are far more likely to be aware of the actual way in which resources such as On demand testing are made available. The government schools are far less autonomous and are accustomed to receiving resources and information about resources in a widespread, highly managed and structured fashion. Further discussion with the Principals indicated that although they were somewhat isolated, the Catholic Education Office (CEO) did make some attempts to provide resources and systems. The fact that the schools had been run independently for an extended time meant that even trying to standardise any process amongst the schools was very difficult. For example, whereas government schools all operate under common administrative systems using common software, processes and practices there were no such commonalities amongst the Catholic primary schools. This was not really surprising given that early investigations of this study found that Catholic secondary schools had very few systems or processes that could be considered similar in terms of data acquisition, storage or analysis.

The use of standardised and adaptive assessment data is much more common in government primary schools. This would appear not to be a reflection of the importance that the schools place on the information, but more a reflection of the difficulty that Catholic primary schools face in trying to identify potential resources and then gain access to those resources. Interestingly at the meeting with Principals, a representative of the CEO was present and when the issue of accessing On demand testing came up the representative did explain that the CEO was aware of it and steps were in place to assist the Catholic primary schools to gain access. The fact that none of the schools had access or immediate plans to access On Demand testing clearly demonstrated that gaining reliable and accurate data on students skill development before beginning at St Joseph’s would require significant work which was far beyond the scope of this study; but clearly demonstrated an area that could dramatically improve the
quality of data that could be used to prepare for the needs of newly enrolled students.

The primary Principals were very clearly receptive to strategies that would help to improve the ability to monitor students’ performance and skill acquisition. When the discussions returned to the observations on the performance of the 2011 Year 7 cohort it was apparent that the lack of easily accessible student performance data would restrict any analysis to the realm of the hypothetical. It was not possible to examine actual students and so much of the discussion was centred on difficulties associated with preparing students for a new type of task. The 2011 writing task for the NAPLAN was a persuasive writing task that was generally considered to be more suitable for boys. In the previous few years the task had been a narrative writing task that had proved more difficult for male students as compared with female students. This was not reflected in the results of the newly enrolled St Joseph’s students. Initially the Principals were keen to discuss how difficult it had been to prepare the students for the new task. This was of some concern because it tends to suggest that the students are merely being prepared for the testing instead of developing skills that are reflected in the testing results. In an ideal world students in schools would not be prepared for testing regimes, they would be prepared for post school life skills. It is somewhat concerning that many educators still see experiences at school are really just steps towards preparing students for final assessments. This short sighted approach is understandable. When students do well on final summative assessments, then in the current climate, the students and hence the school are generally considered to be doing a very good job. In reality performance on summative assessments can give a general indication of students’ skill development, but there are serious limitations particularly when considering students that are far removed from the median student in ability. Reliance on common final summative assessments as the measure of student success in Victorian schools are going to remain in place for the majority of students for some time to come. This method is particularly convenient for
institutions seeking to rank students and determine which students will receive offers to study at higher education institutions.

Universities within Australia over the past few decades have come to rely heavily on the results of final year secondary students to determine which students are offered places in particular courses. Not all courses rely on a simple ranking number, but the ATAR (Australian Tertiary Admission Rank) has become the most significant measure of student performance for students considering applying for a tertiary education place. A significant negative aspect of this process that has been considered in previous chapters is that the focus of educating students can quickly become obsessed with students gaining the highest possible mark rather than developing skills within learners which approach their potential development.

8.7.3 Designing Curriculum to Accommodate Student Needs

One of the frustrating aspects of attempting to change the focus of assessment to one for learning rather than of learning is that at schools such as St Joseph’s once the students begin VCE the students become somewhat fixated on gaining the best possible ATAR. This combination of students wanting the highest ATAR, the school wanting to be seen as performing well, parents and guardians wanting the best for their children and even the media always highlighting the perfect 50 scores, results in a process that consistently reinforces the importance of the final score; and important features of students performance such as the amount of improvement an individual has made or how closely they have performed compared to their potential are overlooked. The preponderance of importance of final summative assessments is not as common in the students undertaking Years 7-10. At these levels it is interesting that the curriculum determined by VCAA is far less focussed on results and content, but leans
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heavily towards skill development and acquisition. And so a dichotomy exists that is difficult to fuse into a coordinated approach.

The students' last two years of secondary education at St Joseph’s is content driven and perceived success is focussed on the final ranking result of students. During the previous four years, in Years 7-10 great effort is made to ensure students are experiencing an educative process that has the aim of developing the skills of all students in a manner that approaches the individual’s potential.

At St Joseph’s, like many schools, there are options for students that would prefer not to undertake VCE in their final years of secondary education. The VCAL (Victorian Certificate of Applied Learning) is an option that is far more focussed on developing skills and preparing students for specific careers after secondary education. Rather than a focus on content it is far more skewed towards preparing students for employment in fields as diverse as trades, hospitality, fitness, and agriculture etc. Even within VCE there is option to choose subjects from the VET (Vocational Education and Training) program that are very much focussed on developing skills rather than content but not all schools provide these. St Joseph’s has recognised the limitations of the VCE program for many students and has allocated many resources to cater for students to provide these alternatives to the VCE. Interestingly, there has been significant trickle down effects of these alternative programs.

Alternative programs for students in Year 10 known as Ad Alta have been developed over that last few years that are specifically aimed at students that struggle with many aspects of school. The programs are far more focused on consolidating skills particularly literacy and numeracy and far less concerned with content. This process of tailoring programs to student need is a very positive step towards determining the needs of students as learners and then making changes to meet these requirements. At the heart of the ability to recognise need is accurate data, particularly assessment data. This study has contributed significantly towards developing means to accumulate, access and
analyse data that has meant that it is now possible for student needs to be identified even before the students arrive at St Joseph’s and so steps can be taken to provide for the learning needs of students from the very beginning of their time at St Joseph’s. As this study drew to its conclusion one of the most significant contributions that was made to the learning of students at St Joseph’s was the development of a system whereby early assessment data was to be used to determine which students would benefit from entering a support program in literacy and numeracy from the very beginning of their time at St Joseph’s. Students with very weak literacy skills would not be offered a LOTE subject but extra literacy support and those students with numeracy weaknesses would be identified and placed in more supportive classes.

Although this approach would seem obvious it has taken time to reach this point where reliable assessment data is being used to predetermine the education and learning needs of the students in a substantial and systematic way. Assessment data had been used previously to ensure classes had a reasonably balanced mix of students of varying ability. This was not really a move to cater for individual needs but more a case of trying to ensure classes were comparable in ability. The view that having bright students in a class was anecdotally seen as important because there was a widely held view that bright students were capable of dragging up the performance of less capable students. Another important factor was that by making sure classes were balanced from a teaching perspective, it tended to get rid of the “problem classes”. Those classes that had significant extra needs compared to other classes were the ones that many teachers reported as being far more difficult to teach effectively. Ironically what this sort of manipulation may have been doing is merely making each class homogenous to the extent that none of the classes were particularly good or bad. In the years that a class “from hell” was unfortunately formed it seemed to be counterbalanced by the “perfect class”. It is highly probable that the mixing of classes to form homogenous average classes is not educationally the best option. The class that provides all the behavioural challenges is potentially
simply a class of students where many are being challenged by an inappropriate curriculum for their needs and so behaviour becomes a real issue. If students are presented with curriculum that is more suited to their needs negative behaviours are less likely to be instigated from students frustrations of lack of achievement or loss of endogenous motivations due to lack of success. Classes containing more than one student are always going to have mixed ability, but the range of ability is what becomes the real issue for teachers and students. The need for educators to differentiate their approaches according to the requirements of individual students has recently become a focus at St Joseph’s. This in part has originated from the move towards better management and use of data that is allowing student needs to be more easily identified and hence addressed.

8.7.4 Acknowledging and Catering for Student Diversity

This study was able to clearly demonstrate that although the range of student ability was recognised as important very few people were actually aware of the extent and range of student variability. The testing regime that was developed during the course of the current study was able to clearly show that with regards to literacy and numeracy skills the students beginning at St Joseph’s had levels that ranged from an average Year 2 student to an average Year 10 student. Effectively this meant that in any Year 7 class it was potentially possible that a Mathematics or English teacher, for example, may be dealing with students that had a range of developmental skills that spread over nine years. It is unrealistic to expect a student with the skills of a Year 2 student to be able to learn effectively in a class room where the general expectations for performance are based around an average student that is approximately five years ahead in skill development. Many teachers are very good at differentiating a curriculum within a class room to assists learners of many levels, but spanning upwards of
ten years in range is not practical nor in the students’ best interest particularly
in the context of a class of around 26 students which is the average size of the
Year 7 classes at St Joseph’s. With such a large range the amount of extra work
to accommodate all students in such a class is not only unrealistic but highly
counterproductive. A single teacher covering such a range of levels would
require not differentiating a curriculum but writing a number of different
curriculums. A student operating at a Year 2 level does not need a “dumbed
down” Year 7 curriculum, they need a curriculum that is centred on their current
abilities and is designed to move them forwards towards Year 3 level and
beyond.

Deciding what range of student ability within a class is optimal is not an exact
science but nor should it ever be regarded as simply a naturally occurring
phenomena that is too hard to deal with. It would be relatively easy to set a list
of objective criteria, based on numerical results, that could be used to pigeon-
hole students into various categories and hence classes, but this removes the
personal elements that needs to be incorporated into any type of system that
takes into account the idiosyncratic needs of the person. Identifying students
with abilities far removed from the median of the cohort is the first step in
accommodating students. Social, personal and emotional needs must be
considered in concert with the academic needs of the individuals. With
parental consent, students that are very weak can be given the option of
undertaking consolidating programs and extra literacy and numeracy classes.
In small schools with limited classes differentiating curriculum within the
actual class may be the only option.

Fortunately, at St Joseph’s with at least 10 homeroom classes for each incoming
cohort of Year 7 students there is quite some scope for setting up programs to
allow students with particular needs to be accommodated for in a far more
profound way than simply intra-class differentiation. Developing the format of
the various pathways for students with varying needs is dependent on the
accuracy and reliability of the information that is used to identify student abilities. St Joseph’s has always collected information from the schools of primary students that have enrolled in Year 7 at St Joseph’s. Some of the information is consistent amongst the more than forty feeder schools but much is highly labile and eclectic in nature. An important feature of any process for identifying students as being suited to a particular class must recognise that data alone should never be given sole credence. Students interact and behave in ways that can, at times, be unpredictable. Student behaviours, especially in terms of learning, are not driven by data, no matter how comprehensive.

Data use is by all means a useful tool for dealing with many students in most situations, but there is far more to all students than the information recorded in some files accessible by educators. St Joseph’s students’ data is being incorporated more and more into the decision making processes, as an example, in developing class groups for new Year 7s. This progress in grouping Year 7s in fact may eventuate into a major project resulting from changes in approach to data that have developed. This move towards data driven decision making is closely linked to some of the recommendations that developed out of this work but it is also being tempered by the recommendation that the student perspective must also always be considered.

Although the primary aim of the study was concerned with student data, the increased focus on informed decision making and available data considerably improved the awareness and perceived importance of data in general. Student data is fundamental to providing feedback to students and teachers but the increased focus on the use of data had some wider repercussions which were unforeseen at the beginning of the study. The increasing use of data particularly in a longitudinal sense had a significant effect on more than just using data to benefit student learning. A knock on effect resulted in major changes to maintaining staff data. Better data storage and access for staff professional learning and goal setting was implemented as a direct result of the
improvements and gains made in terms of student data. It followed as a natural consequence that if improving access to student data was able to have positive effects on students learning then improving storage and access of staff data may logically have some type of positive influence.

8.7.5 Improving Data Accessibility

St Joseph’s is typical of many secondary schools in that the importance of relevant student data has always been seen as being an important tool that has the potential to seriously, positively, impact on the learning process that students experience. The historical reliance on non-standardised numerical as well as the more subjectively graded assessment results has always been a weakness in any system that attempts to improve the outcomes achieved by St Joseph’s College. The focus of this study, in part, was to assess the data being collected, investigate the processes of data use and then to develop strategies to more fully utilise the information for the benefit of the students. It was apparent from the early investigations that although the school may have practices in place to “use” data, on closer examination, the manner in which this use actively impacts on the learning outcomes of individual students is generally a tenuous link at best. The development of the Real Time Student software has begun the process of allowing data to be far more accessible to all parties and with continued development in this direction, whether the actual program is Real Time Student or some other similarly directed software, it is foreseeable that such a program could form one of the most important tools at the disposal of any educator, student or parent at St Joseph’s.

8.7.6 Optimising Intervention Strategies

Some attempts at using averaged assessment data to track cohort performances are relatively common, particularly in the senior secondary classes where VCE
data often forms the basis for school performance monitoring. VCE student data, though a useful bureaucratic tool, has significant limitations for improving student outcomes.

The number of students from a cohort that perform over a certain threshold is interesting but it does not really provide any indication as to what was the fundamental cause of those results. As an example, St Joseph’s have used the comparisons of VCE performance with estimated abilities from the GAT testing (Richardson 2005) for a number of years and this was used to interpret the results to indicate that literacy performance seemed to be below expectations. Now this information was to form the basis of concerted efforts to improve literacy results but the consequent actions could be described as a somewhat scattergun approach. Many initiatives were taken and using the same measures there was an improvement in the apparent performance of St Joseph’s students in terms of literacy results. The improvements that were seen could not be attributed to any particular cause as staff changed, student cohorts changed, management expectations changed, more resources were directed at literacy at all year levels along with many, many other changing variables. The improvement in literacy results is obviously a very good outcome from the monitoring process, but for the purpose of developing monitoring performance indicators to clearly identify what factors are having a major impact on student performance needs to be examined a long time before the students are in the last year of secondary school.

Active intervention should be initiated as soon as there is an identifiable drop in student performance and the last year of secondary school is preceded by five years of opportunity to maximise student performance. Therefore it is essential to minimise the reliance on final year performance analysis and to more actively monitor performance at all year levels and instigate intervention as soon as possible.
8.7.7 Developing Student Perspective Data

Another very clear aspect of student assessment that was identified as being critical is the input that can be gained from interviewing students to collect student perspectives. This approach then allows a process where it becomes possible to gauge the performance of teachers’ pedagogical approaches, the curriculum and any factors that students identify as being important to them. In the past St Joseph’s has displayed a characteristic of instigating programmes to improve student performance based on a multitude of data sources without any regard to the actual opinions and preferences of the students that will experience the program. It may be a situation where many teachers, administrators and even parents often make the assumption that they will know what is best for the student. This may be often the case, but to exclude a significant input from the actual “users” of any process would on face value seem to be ignoring a very valid and useful resource.

8.7.8 Incorporating Adaptive Models of Assessment

This study would indicate quite clearly that any utilisation of data to improve student performance must have a significant longitudinal component that tracks the performance of the student measured against previous performance of that particular student, moderated in some way by an attempt to rate the performance of that student as a function of their estimated potential. In general terms, it is important to be able to estimate the value added component that the school is responsible for in terms of the development of the student. Consistently producing cohorts of students that perform close to their potential is a far more important monitoring tool than concentrating on the raw number of students that have achieved over some arbitrarily selected study score result. This need to accurately estimate the ability of the student emphasises the need to continually improve the estimate of the ability of the student, and the adaptive
testing model that has begun to become embedded in curriculum at St Joseph’s is clearly the most suitable means for accurately and consistently identifying the level at which students are operating. Adaptive testing must be considered the most appropriate form of testing to produce quantifiable measure of performance. Clearly it is important not only to continue with the use of adaptive testing but to also continue to pursue the improved version of this type of testing. The currently used system “On Demand” is now over a decade old and has not had any significant updates to the component banks of questions nor the range of subject areas, so steps must be taken to identify and potentially acquire improved versions or even new adaptive software. Ideally the adaptive model would not only be used in a benchmarking type process but incorporated more fully into the general curriculum and routine assessments that from part of monitoring students within all courses of study.

8.7.9 Embracing a Culture of Change

Collecting data is only the first step in a process that enables data to have a positive influence on learning outcomes. Even when assessment data is accurate and reliable with poor storage and access protocols the likelihood that it will be used by most teachers is remote. As a consequence, if the quality of the data is good and it is regularly used to inform students and teachers of the student progress then the data undoubtedly exists as a tool for learning. The development of suitable protocols for the use of data at St Joseph’s has been an evolutionary process punctuated by a number of bifurcating pathways. The initial phase was to identify what data existed and determine the quality of that data. In the process of determining data quality it was found that student consultation should be considered as a major factor in developing a more holistic approach to data collection.
Attempts were made to develop a database that could be used to store and analyse students’ data, as had been observed in the system that was being employed at Fitzroy High School. This endeavour was quickly determined to be very difficult and resulted in a further investigation into the types of data that would provide the most amount of insight into student learning whilst still allowing meaningful tracking of all students’ performances in large schools such as St Joseph’s. The difficulty in coping with large amounts of data resulted in an approach that sought to minimise the difficulty of collection and collation but also simplified the analysis. Thus the process headed towards a system that utilised current adaptive models of testing and automated delivery and correction of assessment. This approach is currently biased towards generalised literacy and numeracy skills of junior and middle school, but with further development it is likely that the testing will be extended to not only include skill development but also a slightly content driven approach that will be particularly useful as the students specialise in their senior year subject selections.

The movement towards an approach that tended to concentrate on literacy and numeracy skills was prompted by a number of factors, particularly the need to minimise extra workload for teachers, whilst striving to optimise positive acceptance by teaching staff and also allowing rapid feedback. Most of the staff resistance to the system was primarily technology based. A minority of staff did not feel confident in running assessments via the web based means. Interestingly, the small amount of resistance was to the actual procedure and not to the concept of widespread standardised testing of literacy and numeracy skills. Much of this trepidation was lost once the teachers concerned had taken classes through the process a couple of times. The acceptance of the testing by students was far more straightforward and no doubt due to the students being natives in respect to the technology.
Learning and teaching can be considered as a very organic type of process and to try and simplify observations of learning to a simple or for that matter a complex algorithm to allow predictions of performance is a somewhat purposeless pursuit. It is far more productive to take a heuristic approach that in many ways could be considered analogous to the biological evolutionary process. Trying to optimise curriculum for instance is dependent on so many variables that the ultimate causative parameters will invariably exist beyond any simple identification process. Not being able to clearly identify all causes and their relative importance at all times is somewhat comparable to the way in which species are thought to evolve in Neo-Darwinism. The development and reinforcement of optimal adaptations are not specifically monitored and assessed but when the overall outcome is favourable these combinations of traits are reinforced. In the same way pedagogies, curriculum or any other changes in the learning environment of students can be considered as an evolving being. To be able to actively monitor improvements of learning the most important ability is to be able to determine when positive changes have occurred. This ultimately requires some type of objective measure, but this then returns us to the meaningless pursuit of some type of an algorithm that could be used to predict performance. As is often the case theoretical and practical ideas must be resolved to reach some compromise and in this case some objective measure must be made to determine success. But this must be moderated with an understanding that simple measure of performance on even very reliable accurate assessments cannot fully account for all progress made by learners.
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9.1 Impact on Student Learning at St Joseph’s College

The development of changing data use at St Joseph’s College is an ongoing journey with no ultimate destination. It is an evolutionary process that is driven by a desire to improve the learning experiences of students. Keeping this in mind there is also no predetermined specific or natural endpoint to summarise the work of this project. There will always be work that has been accomplished, work that is being undertaken and work that is yet to take place. The way forward for data use at St Joseph’s College will continue, but perhaps the present is as an appropriate juncture as any to consider what implications that my contribution to this work has for the future of St Joseph’s College.

Data acquisition is fundamental to any approach that can be used to accommodate the learning needs of students. When accurate and reliable data is routinely collected from students, teachers have the greatest opportunity to personalise the learning experience for individual students. Personalising learning has become an ever more common approach in the last decade and ensuring the benefits of personalised teaching can be achieved through the adoption of strategies that all teachers can access has been discussed by previous authors (Zbar 2011). The concept of personalised learning has been often misrepresented or misinterpreted by teachers. Many teachers respond to suggestions about personalising teaching as being an unrealistic and impossible request to provide the same number of teaching programs and plans as there are students. A class of twenty requires the equivalent of twenty programs. Although at some levels this may, in fact, be an ideal situation for an ideal world, this is not the approach that personalised learning in the classroom context intends. If teachers were being required to produce a unique teaching program for each student this would be highly unrealistic and impractical.
Personalised learning is more about providing effective inclusive teaching that provides support and intervention for all students in the class. In fact, the approach can be neatly summarised as “one strong, inclusive teaching plan which allows as much room as possible for individual engagement, targeted support, a degree of choice and respect for the range of abilities and interests in the class” (Gilbert 2006), p16).

The performance of students on any form of assessment is dependent on the quality of the assessment. The assessment can take a variety of forms and may be considered as formative or summative, as objective or subjective or as indicative or definitive. No matter what the form of the assessment, if it is not able to be comparative then using data to monitor performance is not possible. The experiences of this project have led to the realisation that there must be a certain amount of compromise in the selection of particular assessment methods. It is then necessary to make some generalisations and use these as a way to monitor performance. Monitoring is a very different function compared to developing a method of summative assessment of student performance such as the VCE. Ultimately the rationale for monitoring performance is to ensure that students’ progress at rates that approach their potential. This will always vary from student to student and demands that the monitoring process must at some fundamental level measure the individual progress as a function of their potential. Ideally, this measurement would be empirical and not merely as a comparison to other individuals or cohorts. At St Joseph’s College the adoption of using a testing protocol that began to utilise adaptive testing was a significant step towards this goal. As stated earlier, there is no end point to the pursuit of improvement, so although adaptive testing has been a step forward it is important to remain vigilant in the pursuit of potential change that can result in further gains or refinements.
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Determining the appropriateness of assessments was a major pursuit of this project. The need to compromise efficiency for accuracy, and accuracy for cost, reflected the difficulties associated with instigating a system to measure and monitor students’ performance in a timely and beneficial manner. The fundamental motivations for any assessment ultimately relates back to being able to determine where improvements can be made. With students’ assessment, data should form the basis for all future strategies to develop the students’ skill set, but the important functions of reporting must always be considered. In primary and secondary schools there is a legal and moral obligation to accurately report on the progress of the students to parents and guardians. This reporting must be based on evidence that can be supported independently by accumulated data. The more accurate the data the more reliable, and consequently constructive, the reporting will be. For a parent or guardian to be informed accurately about their child careful consideration must be given to the types of assessment that are conducted.

Parents and carers of students have far greater personal knowledge of a particular student in their care compared to a teacher. Parents and carers are the most significant adults in the life of the child up until they begin school. In the vast majority of cases they will remain the most constant and significant adults in the lives of students as they progress throughout their experiences at school. They have a far more prolonged exposure to the talents and attributes of the child and have the benefit of years’ worth of observation and experiential data to draw on. A teacher cannot compete with this “experienced knowledge” of the student but the teacher has the advantage in most cases of being unbiased and relying on testing data. That said objective assessment data still has associated problems. How often should students be assessed? Many short assessments could be used to develop a formative approach but care must be taken to not then assume these could then be used cumulatively to give an accurate overall picture of progress. Each assessment has associated error and inaccuracies, if these results are simply added to give an overall assessment this
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also leads to the accumulation of all those errors and inaccuracies giving a summative value with a very much larger likelihood of error as compared to a smaller number of larger assessments. Determining the optimal number and methods of analysis for assessments of students is an extremely difficult task. Clearly too few assessments and the accuracy of any overall impression is likely to be susceptible to distortion, too many assessments may increase accuracy but they also significantly increase resource use. Logically a process of compromise must be trialled and assessed progressively.

Teachers often present as a very varied and complex group of individuals, not unlike the students that they work with. As a result the variety of pedagogical approaches that are actually used in the classroom is enormous. No study could hope to provide a system of accurately assessing the efficacy of every possible pedagogical approach. The most logical system is one that gives the teacher an efficient means of monitoring their own performance. Although it was beyond the scope of this project to fully investigate all the possible practical application that the monitoring mechanisms would allow, some insight can be gained from the results of the student interviews that were undertaken during the course of this project. It would be highly contentious to rate teacher performance solely on student assessment results no matter how reliable the testing procedure and consequently the data may be. Teachers are an important component in the student learning equation, but to determine the abilities of teachers based only on the performance of their students on a very small number of test results is intensely problematic.

There are no algorithms that can accurately predict the future performances of a teacher and to assume that previous performances can be simplified to a comparison of a few numbers is merely unsubstantiated conjecture. Student performances can of course be used as a preliminary tool to identify if certain classes have achieved their expected results, and in a well-managed school this would then be part of a more thorough exploration of each situation. Interviews
with the teacher and the students would be required to identify any particular aberrations and this would then begin a process of improvement. It should be noted that this process would ideally take place whether the unexpected results were positive or negative. Many schools would appear to concentrate of identifying poor performance and attempting to remediate such problems. I strongly believe that just as many resources should be directed at identifying outstanding performances and taking steps to implement better practices. There is a very relevant analogy of assessing student learning at St Joseph’s College. Currently, an extraordinary amount of resources are directed at identifying and assisting students with lower than expected abilities. By comparison, the amount of focus on high performers or even those operating within the median range are relatively low. This inequitable use of resources is largely due to the difficulties in tracking student performance at all stages and levels of development. This clearly represents a challenge in ensuring that students of all standards and abilities are fairly represented in resource expenditure.

Very low achieving students are universally easy to identify even with very rudimentary testing and data analysis. High achieving students can generally be identified with satisfactorily designed testing regimes, but the performance of the middle band of students are the ones that pose the most difficulty in determining whether the student is performing at expected levels or not. This can only really be overcome through adaptive testing that is monitored regularly in a longitudinal manner. Ultimately, this became the most important aspect of this entire project. The development of a reliable longitudinal performance indicator was clearly the keystone to any approach that would have a significant impact on guiding and improving student learning at St Joseph’s College. Once the benchmarking process was clearly established this would then allow subsequent utilisation of data that could enable changes to curriculum, pedagogies, learning environments and almost anything related to student performance.
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The input of student perspectives can also increase the power of data to be used as a tool for improvement. The inclusion of student perspectives can be considered analogous with the theory supporting student centred learning. The value of a student centred approach has been demonstrated to be a generally positive experience for students (Edwards 2001). The value of a student centred approach is very much dependent on the concept that students as learners are capable of driving the learning process. Students have a unique perspective on what they already know or can do and have obvious insight into what they are interested in. When this knowledge and perspective of the student is considered in developing pedagogical practices and curriculum there is invariably an increase in the efficient use of educational resources. The perspectives of students therefore represent a resource that needs to be more fully explored, coupled with data to give rich and reliable insights into developing students to reach their potential.

9.2 Summary

This study was developed to examine three primary research questions.

- Does the data collected at St Joseph’s College accurately reflect the learning journey of students at the school?

- Can data be used more effectively to enhance the learning outcomes of students at St Joseph’s?

- Can strategies be developed to build longitudinal, accurate records of student assessment that could be used effectively by teachers to assist with ongoing student learning?
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In pursuing these questions evidence was collated and disseminated that created an environment within the wider school community at St Joseph’s that enabled significant changes to be instituted. Some of the changes were systemic procedural changes, but importantly many were related to attitudinal changes in students, staff and parents/guardians. While the research questions were initially posed separately, in the carriage of the study there was significant overlap between them. In essence, the study sought to determine what data was best to collect and use in the progress of student learning, within a framework that was practical and sustainable. To this end, the study focussed on data that could readily be collected from students and the systems and processes that would enable the translation of that data to improve teaching and learning at St Joseph’s. One of the early cautions that emerged through this project was the need to acknowledge the limitations of any data source. No assessment data can ever be completely accurate, and the implications for positioning or characterising particular learners on the basis of such tests needs to be undertaken with extreme caution. Such tests can only ever be an approximation of certain idiosyncratic characteristics of the student at the particular time of testing.

During the course of this project/study the use of data became more widespread at St Joseph’s. This was overwhelmingly seen as a good thing as teachers became increasingly informed about the learning capacities, needs and experiences of their students. However, the more teachers began incorporating data into their strategic teaching considerations the greater became the need to moderate and temper the amount of importance placed on such data. While some staff were inclined to largely ignore the new adaptive numeracy and literacy testing, others were enthusiastic about the results. Some staff drew on the results in a range of ways, including identifying the learning needs of particular students and using it to moderate information which was recorded on school reports. It became apparent that improving access to student information and results was only one component in the pursuit of improving student
Chapter Nine Folio Conclusion

learning outcomes. Developing better understandings of the learning needs of students can obviously be enhanced by access to more data, but productive and purposeful student-teacher relationships can only be formed through the personal interaction. If improving data, and access to the data, was to cause student-teacher relationships to be negatively influenced by preconceived biases the value of improved data flow would ultimately be counterproductive. To counteract this possibility a lot of effort was expended to educate teaching staff in the prudent use of data as an adjunct to the relationship forming process.

This work was undertaken as a professionally focused doctorate and in contrast to a more traditional PhD the objective was to make significant and original contribution to the workplace practice within St Joseph’s College. The Folio chronicles the research and development of systems and practices that have significantly altered across the duration of the study. In the beginning the aims were developed that related primarily to my interests as a science teacher within the school. I was primarily concerned with the students in my classes and my desire to ensure that these students were supported by me, and the school systems, as well as I could manage or control. This pursuit was quickly widened to include all students undertaking science subjects and then, as quickly came apparent; the implications of my work could be felt by every student within the school. The focus on improving student learning not only had implications for students but staff too would need to be incorporated into the study as well. Given the scale of project I needed to better understand whether the inadequacies of data practices at St Joseph’s were merely idiosyncratic or were more widespread across the schooling sector. To be sure that I was not merely setting out to re-invent the wheel I looked outside of St Joseph’s to explore how other schools were dealing with the problems/issues that I had identified. It was somewhat comforting to know that the problems I was seeking to address were widespread and, whilst nuanced, they were in many ways probably in a more advanced state of practice at St Joseph’s compared to the other examined schools. Armed with this insight and
knowledge I set about my project knowing that the implications of what I did would ultimately have reach beyond my particular locale.

The reflexive nature of my efforts to develop better practices is indicative of the ever changing environment of schools like St Joseph’s. Although there may be some consistency over short time periods within a school environment, annually large changes occur as a whole new cohort of students start in Year 7 and a corresponding one leaves Year 12. On average, St Joseph’s turns over between 5-10% of its teaching staff each year. Even senior management and organisational structures vary from year to year as restructuring occurs and new appointments are made. From the outside, Government mandated testing, regulatory demands and curriculum and organisational requirements change periodically. Perhaps the biggest changes of all that occur are the developmental, physical, psychological and emotional changes that occur in the students across the six years that most of them spend at St Joseph’s College. All this means that processes that occur within the school are maintained within what could be described as a very fluid and dynamic environment. To this end, the underlying patterns of performance of students and teachers are clearly susceptible to a myriad of influences.

At the beginning of this journey, I was convinced that despite all the confusing variables the underlying quantitative patterns of student learning and performance would surely be discernible, if administered and interpreted correctly. Further, that these fundamental patterns could then be used to monitor the performance of all students, and potentially their teachers. Through my involvement in this project, I now have a much more tempered view of the merits and contribution of such data. Indeed, I have come to realise that relying too heavily on any data, qualitative or quantitative, is fraught with danger. Shallow interpretations of data, stripped of their context and contingency, can lead to artificial conclusions on which rash and unproductive responses can be made. Caution is required when using data of any form that relates to profiling
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students’ potential within an educational system. Students are individuals that have innumerable sources of motivations for their behaviours. Trying to reduce individual performance to a simple algorithm that accurately recognises past performance, estimates current ability and can accurately predict future outcomes is an ambitious endeavour. A far more reasonable approach to such an undertaking is the pursuit of measures that are reasonably reliable and consistent and generally reflect the performance and ability of the student at a particular point in time. These measures can become a record of past performance and form a valuable ‘trend’ resource for future teachers of students.

As a result of the work undertaken in this project I concluded that any generalised predictor of future student performance is only of limited value. This is particularly so when seeking to predict VCE outcomes. It became apparent that performance on VCE is a combination of innate ability but also very much influenced by the effort and motivation demonstrated by the student. The Dissertation component of this work clearly showed a positive correlation between early performance on assessments and the subsequent performance in the VCE subjects. This correlation though is not strong enough to be specifically predictive other than to suggest that mid to high performing students in lower secondary levels tend to do well in VCE subjects, and low performing students in lower secondary levels tend to perform less well in VCE subjects. In terms of implications for teachers, these results strongly suggest that encouraging students to work hard during their VCE studies will be of substantial benefit to improving their individual results.

The testing and assessment regimes for students in Year 7-10 were the factors most influenced from the outcomes of this work. Before this study, pre-testing of each new Year 7 cohort was a somewhat haphazard undertaking. Testing was conducted routinely, but the data was utilised in very stochastic ways. Some results were used to identify the learning profiles of a few weaker
students. Similarly, sometimes higher achievers were identified and offered short term interventions but overall there was no coherent approach to using that data would benefit students of all abilities. Data was not archived in any meaningful way and once a Year 7 cohort moved to Year 8 all previous data was virtually dismissed or lost. The data that was collected was not made available to staff for any type of systematic use. My interactions with staff revealed that the majority of teachers were not even aware of what type of testing data was collected, let alone where it was archived or what use it might have. Obviously, trying to encourage the effective use of testing data to guide student learning was not possible under these conditions. Therefore, one of the initial improvements introduced through this project was to raise the profile of assessment data amongst teaching staff. From this incremental change, over the course of this work, further developments propagated to the point whereby at the end of the study period all teaching staff were well aware of the data collected and had virtually unlimited access to data stored for all of the students they taught.

Significant gains were made in terms of the reliability of reporting on student performance and development, particularly with literacy and numeracy through the government mandated VELS. Before the adoption of regular adaptive testing, teachers generally guesstimated the VELS progression points for their students and were very conservative in giving any student any result other than one very close to the expected level for that student. Having objective, regular assessment results from the adaptive testing gave staff the confidence to more precisely and accurately report the performance of students. The objective data enabled teachers to have empirical objective evidence to support their professional judgements. This was achieved primarily by identifying the strengths and weakness as well as economic efficiencies of a varied selection of testing regimes. The adaptive ‘On Demand’ testing and NAPLAN assessments were ultimately identified as the most suitable to produce a longitudinal, objective, performance record for students at St Joseph’s.
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consultation with similar Catholic secondary schools, it was recognised that the testing methods being implemented at St Joseph’s could readily be transposed to similar schools without much fuss.

The student perceptions that were collected from student interviews and considered during the course of the Dissertation, provided valuable insight into the factors influencing student motivations and performance. These insights provided clear evidence that students’ self-perception and assessment should form an integral part of any assessment protocol. These observations were to directly impact in a variety of ways but were particularly valuable when considering unexpected student performances. Management began to realise the importance of the student input and so investigations into cohort performances now include substantial student opinion and survey responses. Previously, well intentioned decisions were made without any direct student consultation.

The use of data to inform learning is potentially the most important outcome of all that has been achieved through this workplace-based research project. A paradigm shift has been achieved in terms of the attitudes toward and use of data. Rather than collecting data and using it simply for reporting processes, data is now actively collected and analysed to improve the learning outcomes of students. To this end, data is now routinely used to substantiate feedback to students, guardians and colleagues. Importantly, student data has begun to be shape the curriculum design for some students and staff regularly use the data as a diagnostic tool. As with any development process in educational settings, change is generally achieved incrementally and the process has no real endpoint. Striving to continually improve the use of data to inform teaching and support students to develop towards their potential is now part of the overall school agenda.
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One of the important goals for this study was to develop systems that could be self-supporting and not require the constant input and momentum from any particular individual. The systems that have developed are primarily based on commercially available software programs. These systems do not require any particularly highly skilled administrator and with a small amount of training any teacher could comfortably continue to oversee this process. Coupled with this was an acute realisation that the introduction of any system that would significantly increase the workload of teachers would be doomed to failure. By utilising NAPLAN results that have to be undertaken as part of the regulatory educational environment in Victoria and introducing adaptive tests that do not require any teacher correction was integral to the success of this project. Through a simple in-service program the majority of staff were able to clearly understand the processes for accessing student data and recognise the usefulness of the resources available to them without significant increase to their workload.

Although this investigation did not arrive at definitive and simple outcomes in response to the original research questions, what follows is a brief statement of response to each of the questions.

How does the data collected at St Joseph’s College accurately reflect the learning journey of students at the school?
The first aim could not be answered in a meaningful way at the beginning of this study. The initial data available, some of questionable reliability, was collected haphazardly and wasn’t utilised with any systematic analysis. Whereas now the answer would be that the data has clearly begun to far more accurately reflect the learning journey of students and is continually developing.

Can data be used more effectively to enhance the learning outcomes of students at St Joseph’s?
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The second aim has unequivocally been addressed with significant improvements in data use. Measuring the actual change to learning outcomes will take more work than was accomplished within the framework of this study, but processes have now been set in place that, with time, will provide a more definitively positive response to this question.

Can strategies be developed to build longitudinal, accurate records of student assessment that could be used effectively by teachers to assist with ongoing student learning?

The final aim of this project is potentially the one that has been able to effect the most positive change. Accurate, longitudinal records of student assessments are now routinely collated and archived for all students. The effective use of this data is now under a continual process of reflection, refinement and improvement.
Appendices

Please complete the following questionnaire and save it as a Microsoft word document. Once completed please return as an attachment via email to mailto:vincentb@sjc.vic.edu.au

INSTRUCTIONS
For responses to multiple choice questions click the box (□) to indicate your response. If you wish to change a response simply re-click the box.

To respond to open ended questions, click on the box (      ) and it will expand as necessary to accommodate your typed response.

1. Does your school utilise any type of statistical analysis of AIM Testing, VCE (or equivalent), VET results or GAT results?
   □ YES
   □ NO

2. If answer NO for Question 1 go to Question 3. If answer YES please specify the data sets used and the type of analysis used?

3. Does your school store student data obtained from any type of standardised testing apart from AIM Testing Results, VCE (or equivalent), GAT or VET results?
   □ YES
   □ NO

4. If answer NO above go to Question 9. If answer YES, what type of testing is carried out? Please name the tests that are utilised.
   □ Literacy
   □ Numeracy

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- Learning preferences
- Cognitive abilities
- Other.

5. How is the data stored?
   - Electronically
   - Hardcopy
   - Both electronic and hard copy

6. For what period of time is the data archived?
   - 0-2 years
   - 3-4 years
   - 5-6 years
   - More than 6 years

7. Is the data used in any type of benchmarking, student performance monitoring or any other type of application?
   - YES
   - NO

8. If NO go to question 9. If YES briefly explain the application.

9. How do you regard standardised test data in terms of importance?
   - High importance
   - Important
   - Useful
   - Little importance
   - No importance

10. Please explain your response to question 9?
Appendices

11. Would you be interested in further involvement in the study such as participation in an interview to discuss your school practices in more depth?

☐ NO
☐ YES Please provide contact details.

Thank you for completing this questionnaire. Please return at your earliest convenience to the above email address.

Appendix 1. Survey distributed to schools.
## LITERACY

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### Appendix 2. Example of student database entries
Appendix 3. The above graph illustrates the relationship between the results students achieved in their pretesting GSPAT cohort ranking in year 7 compared with the results they achieved six year later in Year 12 VCE ranked within the cohort. Only students in the cohort that begun in Year 7 and completed year 12 at St Joseph’s College were included, n=142.
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