School Based Research Project

Final Report

Aiming for student
and teaching excellence

Knox Grammar School

KNOX GRAMMAR SCHOOL

SCHOOL BASED RESEARCH PROJECT

FINAL REPORT

Aiming for Student & Teaching Excellence

School: Knox Grammar School

Project Leader: Karen Yager

Project Team Members: John Weeks, Andrew Weeding, John Nelson, Ann Prentice, Matthew Robertson, Tracey Clarke

Mentor/Critical Friend/s: Geoff Masters, Linda Darling-Hammond & John Fischetti

Table of Contents

Executive Summary

The school improvement strategy was to build a school-wide culture focused on improving student learning outcomes grounded in the discerning use of quantitative and qualitative data to inform targeted teaching practice, and to enable teachers to work collaboratively to be far more effective in the classroom. Thus, this report is an investigation into whether the implementation of a new approach to professional learning that will improve teacher collaboration, can make a difference to student learning outcomes. It examines how focusing on enriching pedagogical content knowledge and improving the discerning use of quantitative and qualitative data to inform targeted teaching practice could potentially make the greatest difference to student learning.

Although the initial research was to focus on the Year 4 team in the preparatory school and one department in the senior school, the decision was made to scale and diffuse the research to encompass the entire senior school beginning in 2016 and all staff at Knox Preparatory School in 2017. This was possible because the School Council and the Headmaster believed that the approach had the potential to make the greatest difference to student and teaching performance. The new approach to professional learning involved teachers forming Learning and Research teams in each department in the senior school, or Year grade in the preparatory school, based on identified targets generated by assessment and external test data, such as NAPLAN or the Higher School Certificate. Each team used the action research model that promotes collaborative inquiry to target, implement, evaluate and reflect on their interventions.

A plethora of tools were used to inform the research, including teacher surveys, video interviews with teachers, and NAPLAN and school assessment data. The Learning and Research teams used formative and summative assessment data to inform their research.

An analysis of the data related to teacher collaboration and agency revealed that teachers working in the Learning and Research teams accessed and analysed the data together, planned intervention strategies and developed teaching resources collaboratively. They reviewed the effectiveness of these interventions, jointly analysing student work, identified effective pedagogies, and learned from each other's practices. In terms of student learning outcomes, it was noted that many of the Learning and Research teams in the senior school and the preparatory school targeted the whole school focus of student writing. Thus, it was relevant and valid to use the 2017 NAPLAN data for writing for Year 9 students to determine if the new approach made a discernible difference. In the senior school, in particular, there was an improvement in the results for Year 9 students in writing compared to the 2016 cohort.

The research into the impact of the new professional learning model will continue. To date, the evidence has affirmed the positive impact of the new model; however, as with all quality research, there needs to be more longitudinal data generated before the impact of this approach can be reliably evaluated, and more time for reflection. There is a long-term commitment to implementing, measuring and evaluating this approach to professional learning. It is evident that if schools are to make a difference to the learning outcomes of their students, then they need to be committed to continuous measured improvement.

Introduction/Background

Knox Grammar School is a K-12 day and boarding school located at Wahroonga on Sydney's North Shore, with more than 3,000 students. We are a Uniting Church school that has always been committed to ensuring that every student and teacher is supported to flourish. The *Aiming for Teacher and Student Excellence* project grew out of a need to develop confluence between professional learning, curriculum and teacher and student performance. Since 2010, we had invested energy and capital into an innovative approach to professional learning that had fostered the beginnings of a culture of collaboration and transparency. Data continues to be used extensively to track students, measure performance, design intervention strategies and inform teaching and learning programs. These approaches and programs have been highly effective; however, we needed to know if we were making a measurable difference to the learning and performance of our teachers and students.

The research demonstrates that teacher collaboration "the sharing of effort, knowledge and resources in the pursuit of shared goals – plays a central role in the achievement of student

learning outcomes"[1] (Bentley & Cazaly, 2015), and that "Collaborative Cultures Schools and systems that foster highly collaborative practices and purposefully build social capital are places where new pedagogies thrive"[2] (Fullan & Langworthy, 2014). Therefore, we did not want to compromise the culture of collaboration that had been cultivated. Rather, we wanted to strengthen the collaboration through action research inquiry and enrich and deepen our approach to professional learning.

Few studies have attempted to measure the impact of professional development on student learning outcomes. Research has consistently demonstrated that the quality of teaching has a powerful influence on student learning outcomes and engagement (Barber and Mourshed, 2007; Hattie, 2003; Rowe, 2007). A unique aspect of the project is that we are investigating whether a focus on enriching pedagogical subject knowledge in Learning and Research teams working collaboratively together will make a discernible and measurable difference to the learning outcomes of the students. There has been a swing away from this approach by many systems based on the belief that teachers only need to be pedagogy experts, not subject experts. However, according to the research (Coe, 2014; Darling-Hammond, 2014; OECD, 2013) the highest performing schools in the world improve teaching and learning by focusing on enriching subject-specific pedagogy. The research has demonstrated that successful professional learning programs immerse teachers in the art of teaching the content and provide research-based knowledge about how students learn that content. Through the implementation of a professional learning model focused on enriching pedagogical content knowledge, and grounded in the discerning use of quantitative and qualitative data to inform targeted teaching practice, we aimed for measurable improvements in teacher and student performance.

[1] Bentley, T. & Cazaly, C. (May, 2015). "The shared work of learning: Lifting educational achievement through collaboration", p.9, Mitchell Institute research report No. 03/2015.
[2] Fullan, M. & Langworthy, M. (2014). "A Rich Seam How New Pedagogies Find Deep Learning", p.53, Pearson, http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf

Literature Review

Cohesive whole school approach to improving teaching and learning

Masters (2016) stated that the centre of all teachers' practice must be a commitment to ongoing student growth and development. Essential to this practice is the "belief that every student is capable of successful learning if they can be engaged, motivated to make the required effort and provided with well-targeted teaching and learning opportunities"[3]. All schools must be committed to ensuring that students improve their learning outcomes and flourish so that they can take their place in the world as "successful learners, confident and creative individuals, and active and informed citizens"[4]. It is evident from the research (AITSL, 2012; Fullan, 2010; Masters, 2016) that this will not eventuate if schools do not adopt a cohesive whole school approach to improving teaching and learning. Fullan (2010) asserts that one of the reasons for failure of systemic reforms is fragmentation: "Fragmentation occurs when the pressures - and even the opportunities - for reform work at cross purposes or seem disjointed and incoherent"[5]. AITSL (2012) asserts that performance and development must tie together the various activities that a school is involved in and states that "alignment to school plans and school-wide approaches to professional learning are particularly important".[6] Furthermore, whole school system reform will not work without the entire school community and its leaders working together for the collective good (Fullan, 2010; Masters, 2012).

Moreover, the literature indicates that for any performance and development system to work it has to be seen by teachers as a process, which supports their practice (Bruniges, 2012; Darling-Hammond, 2014; Figazzlo, 2013). Bruniges (2012) concludes that the only real chance for significant and sustained school improvement lies in what goes on in the classroom. Teachers

[3] Masters, G.N. (2016). Learning to Improve: Schools as learning organisations. Australian Council for Educational Research, p. 3.
[4] Melbourne Declaration of Educational Goals for Young Australian. (2008). P.7.
[5] Fullan, M. (2010). All systems go: The change imperative for whole system reform P.20.
[6] AITSL. (2102). Australian Teacher Performance and Development Framework, p.4.

must have faith and trust in the process. By instigating an approach that unifies all that we are currently doing at Knox and where a culture of the close analysis of student data and collaborative professional learning already exists, this transformative approach has a strong chance of making a difference.

Teachers make a difference

The literature has demonstrated consistently that the quality of teaching has a powerful influence on student learning outcomes (Barber & Mourshed, 2007; Hattie, 2003; Rowe, 2003). Hattie's 2003 analysis concluded that teacher quality accounts for 30 per cent of the variance in student performance. He states candidly "It is what teachers know, do, and care about which is very

powerful in this learning equation."[7] Sammons, Sylva, Melhuish, Sammons, Siraj-Blatchford, Taggart, Toth, Smees, Draghici, Mayo & Welcomme (2008) in their study of more than 2500 children aged 3-11 in the United Kingdom concludes that a teacher's classroom practice makes a significant difference to children's academic and social/behavioural progress. Chetty, Friedman and Rockoff (2011) found that achievement gains can be seen even as late as three Years after exposure to an effective teacher.

Dinham (2013) presents an interesting perspective on what he refers to as the increased and persistent battering of the teaching profession[8]. He claims that there has been a growing criticism of teacher education, teachers and school performance. He asserts that no solution has been proffered that recognises the need to provide effective professional learning for teachers to enable them to grow and improve their skills and practice. Dinham's research and the work of Linda Hammond-Darling (2011; 2014) have informed the approach to new professional learning that is grounded in collaborative practice and shared learning opportunities.

The challenges of implementing a performance and development approach

Australian schools have been using an appraisal and feedback system for a number of Years. This system, like the one currently used at Knox Grammar School, usually involves goal setting, a meeting with a member of the school management team, self-assessment, and classroom observation, and in some cases, feedback related to student performance on assessment. The system implemented at Knox is based on professional learning and research hubs. The teachers' goals, drawn from the Australian Professional Standards for teachers, inform what is observed in the classroom.

[7] Hattie, J. (2003). 'Teachers make a difference: What is the research evidence?' Paper presented at the Australian Council for Educational Research Conference, 19-21 October. p. 2.
[8] Dinham, S. (2013). The quality teaching movement in Australia encounters difficult terrain: A personal perspective in the Australian Journal of Education. p.92.

According to Freeman, O'Malley and Everleigh's analysis of the 2014 OECD Teaching and Learning International Survey (TALIS) conducted in 2013 with 34 OECD countries, including Australian schools across all sectors, there are three main issues in regards to the current appraisal and feedback system in Australia: 61.8 per cent of Australian teachers believed that the current appraisal and feedback systems were only undertaken because of administrative expectations; only 29.1 per cent of teachers agreed that feedback was based on a considered review of their teaching practice; and the general view was that the feedback was not linked to any resulting application. Furthermore, the analysis concludes that the "majority of teachers also question the appraisal process, deeming it an inaccurate assessment of their skills and practice."[9]

The appraisal of teachers' performances linked to students' learning outcomes has been instigated in countries such as the United States (US) and the United Kingdom (UK). The appraisal system in the US and the UK has been controversial and sensitive. The international PISA and TIMS tests, have in fact, indicated that the performance of students from the US and the UK in mathematics, science and reading was outside of the top twenty countries and in some cases had steadily declined (OECD, 2012). Reviewing a number of teacher appraisal systems used in the US it became obvious that the focus was on using student performance value-added data to assess a teacher. Classroom observation was only required to happen at least once a Year for 30 minutes. In all of the systems reviewed, such as the Fairfax County Virginia and the Pinellas County Schools, a teacher's proficiency rating was only superficially linked to professional development. On page 24 of the Pinellas County Schools Teacher Appraisal Manual it states that the professional learning program is available for teachers "who could benefit from short-term support". Darling-Hammond (2014) in a frank review of the current US appraisal system states that 'Existing systems rarely help teachers improve or clearly distinguish those who are succeeding from those who are struggling'.[10] This assertion is supported by Figazzolo (2013), Robertson-Kraft (2012) and Peterson (2000). In the United Kingdom, the Department of Education Teacher Capability and

[9] Freeman, C., O'Malley, K. & Everleigh, F. (August 2014). 'Australian teachers and the learning environment: An analysis of teacher response to TALIS 2013 Final Report', p.xix.
[10] Darling-Hammond, L. (2014). *One Piece of the Whole: Teacher Evaluation as Part of a Comprehensive System for Teaching and Learning*. American Educator. p.2.

Appraisal Policy does more explicitly state that professional development will be linked to the review of performance but the form that this takes is left up to the school administrators.

Professional development and improved teacher performance

The message that is evident in the research literature is that improving teachers' pedagogical content knowledge is the most effective way to improve student achievement (Hattie, 2009; Hill & Rowe, 1996; OECD, 2014). The purpose of any performance and development system must be to ensure that teachers are supported to perform at their best and flourish to enhance student learning. However, it is evident from the literature focused on teacher professional learning programs that when teachers experience traditional forms of professional development and

attempt to apply their learning to their classroom practice there is minimal transference of learning (Joyce & Showers, 2002). Calvert (2016) observed that for many teachers, professional development had been for too long an empty exercise in compliance and rarely improved professional practice.

Further research, such as that conducted by Hattie (2009), Masters (2012) and Jensen (2012) asserts that the best way to ensure that there is transference is through professional learning programs embedded in the school context that seek to continually improve classroom learning and teaching and are informed by a plethora of data.

The OECD report (2014) recommended that student learning outcomes should be an essential component of teacher appraisal. An international study by Timperley, Wilson, Barrar & Fung (2007) found the greatest effects for professional learning occurred when it challenged teachers' thinking and conceptions about student learning and engaged them sufficiently to develop their knowledge and skills in ways that improved student outcomes. To this end, student learning outcome data has been generated by summative and formative assessment performance, external tests such as NAPLAN, Allwell and the HSC examinations. However, the OECD report warned that when student test results are used to drive high-stakes decisions the results will be counterproductive and could result in teachers focusing explicitly on tests without increasing students' mastery and narrow the curriculum. The recommendation was that a range of evidence of student progress must be used to inform an effective appraisal and feedback system that leads to better teaching.

One of the major stumbling blocks for teacher performance and development systems has been the focus on identifying poorly performing teachers rather than on how all teachers can work together to improve their teaching to make a difference (Bustami, 2014). A significant component of effective professional learning that promotes student learning is collaboration. In Finland, another high performing country, the focus is on collective and collaborative learning. Darling-Hammond (2014) presents a compelling example of teachers working together to achieve their

goal of improving student writing. The teachers at Santa Clara Unified School District observed each other's lessons on writing, compared their approaches and developed collaboratively more effective strategies to improve their students' writing. Darling-Hammond concludes that teachers must work together with a "shared sense of intellectual purpose and a sense of collective responsibility for student learning".[11] Masters (2012) affirms this view in the *National School Improvement Tool* stating that schools must develop a collaborative culture of learning and continuous professional improvement.

Masters' research into improved teacher and student research has been a driving force behind the design of the new approach. In 2012, Masters asserted,

> improvement depends on a commitment and belief that performance can be further improved; a clear understanding of what improvement would look like; a way of establishing current levels of performance as starting points for action; a familiarity with evidence-based, differentiated improvement strategies; and ongoing processes for monitoring progress and evaluating improvement efforts.[12]

[11] Darling-Hammond, L. (2014). *One Piece of the Whole: Teacher Evaluation as Part of a Comprehensive System for Teaching and Learning*. American Educator. p.13.

[12] Masters, G. (2012). Continual improvement through aligned effort. Australian Council for Educational Research (ACER). p.3.

Learning and Research teams with a focus on evidence-based, targeted teaching

The drive for implementing the project was to improve the quality of teaching and learning. According to Masters (2012),

> The most effective strategy available to governments, schools and school systems for improving student achievement is to improve the quality of day-to-day teaching and learning. At a fundamental level, this means changing what teachers do. The challenge is to get all teachers doing what the best already do and supporting the best teachers to develop still more effective classroom practices.[13]

Based on the literature and the insights of researchers such as Masters and Darling-Hammond, the approach implemented was driven by the need to ensure that all teachers were data literate and had ongoing access to educational research that provided the evidence for best practice. It

[13] Masters, G. (2012). Continual improvement through aligned effort. Australian Council for Educational Research (ACER). p.3.

became evident from the literature that all too often the approach to teaching and learning is not informed by a solid research base. Masters (2012) states that "Learning is more likely to occur when teachers use teaching strategies and methods that have been shown through research and experience to be effective in practice"[14]. In 2006, Hempenstall's research concludes that teaching has suffered because of "its failure to adopt the results of empirical research as the major determinant of its practice"[15]. As a result, the teams formed in each department in the senior school and in each Year group in the preparatory school were referred to as 'Learning and Research' teams. Each team has employed the action research method to identify an improvement target informed by data, design and trial interventions, interrogate and question current teaching practice, and assess the impact through an analysis of the data. All interventions have been informed by evidence-based research. (See Appendix B & C)

Strategic intervention to improve teaching begins with a deep analysis of learning. The analysis should compare the current state of learning and teaching to where learning and teaching needs to be. The Australian Institute for Teaching and School Leadership (AITSL) has developed an Australian Teacher Performance and Development Framework underpinned by the assertion that a "performance and development culture is characterised by a clear focus on improving teaching as a powerful means of improving student outcomes"[16]. The framework defines student outcomes broadly to include student learning, engagement in learning and wellbeing, and acknowledges that these can be measured in a variety of ways. Goss and Hunter (2015) assert that "Working together, teachers should assess what each student knows now, target their teaching to what they are ready to learn next, and track each student's progress over time."[17] A professional learning approach that is focused on targeted teaching to achieve the shared

[14] Masters, G. (2012). Continual improvement through aligned effort. Australian Council for Educational Research (ACER). p.4.
[15] Hempenstall, K. (2006). What does evidence-based practice in education mean? Australian Journal of Learning Disabilities, p.1.
[16] AITSL. (2012). Australian Teacher Performance and Development Framework, p.2.
[17] Goss, P. & Hunter, J. (July 2015). Targeted teaching: How better use of data can improve student learning. Grattan Institute Report No. 2015-6, p.1.

purpose of improving student learning outcomes, is more likely to see improvement in teaching and learning (Stronge, 2006).

The whole school focus on improving student learning outcomes has been grounded in the discerning use of quantitative and qualitative data to inform targeted teaching practice, and enable teachers to work collaboratively to be far more effective in the classroom. Masters' work on the AITSL Performance and Development Framework and his research into using data effectively to measure student growth have been vital in forging the evidence-based approach. The literature has indicated that too many teachers lack the confidence in interpreting data, and in fact, are very apprehensive about it (Earl & Katz, 2002; Wildy, 2012). Informed by this research, from the start of the project in 2016, all teachers have been immersed in how to analyse and act on student learning outcomes. All relevant data is now easily accessible and transparent as recommended by the literature of Goss and Hunter (2015) and Masters (2012). The overarching message is that "We need to know our students' stories".

Too often attempts at collective action lead to forming groups, such as professional learning communities or networks of schools, but the focus of these groups is rarely on sharing evaluative evidence and thinking about what has been effective and even less on dependably identifying success and expertise and then privileging and sharing it. Too often, collaboration according to Hattie (2015) is about sharing resources, sharing anecdotes and war stories, rather than working together on a shared goal to make a difference to student learning outcomes.

Pedagogical content knowledge

The research has demonstrated that successful professional learning programs immerse teachers in the art of teaching the content and provide research-based knowledge about how students learn that content. In 1987, Shulman defined pedagogical content knowledge as teachers' interpretations and transformations of subject-matter knowledge in the context of facilitating

student learning. He referred to this knowledge as the art and craft of teaching; the blending of "content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction"[18]. Coe, Aloisi, Higgins & Elliot Major concluded in their 2014 research that "The most effective teachers have deep knowledge of the subjects they teach"[19]. King and Newmann (2004) observed that teachers must have deep pedagogical content knowledge so that they can anticipate student misconceptions and engage students in learning through a wide range of instructional strategies.

The OECD research (2009; 2014) demonstrates that the highest performing schools in the world, such as Hong Kong, Korea, Singapore and Shanghai use mentoring extensively over sustained periods of time that focus on improving teaching and learning and subject-specific pedagogy. Teaching is observed through the lens of improving student learning. Teachers regularly observe each other's classes, providing instant feedback to improve each student's learning. Feedback to the teacher by a subject specialist after the class focuses on how to improve each student's learning (Jensen, 2012; Steiner, 2010). Masters (2012) argues that effective teaching and improved student learning depend on teachers having expertise in the subjects they teach.

Furthermore, the literature focused on the connection between content pedagogical knowledge and improved teacher performance concludes that professional learning directly related to a teacher's subject area has a greater impact on teacher and student learning than general pedagogical topics (Bickmore, 2013; Garet, Porter, Desimone, Birman, & Suk Yoon, 2001; Miers, 2009; Van Driel & Berry, 2012). Wayne, Yoon, Zhu, Cronen, & Garet (2008) assert that when professional development is focused on the content of the subject that teachers teach, it is more likely to lead to improved teacher performance and student achievement. The research asserts that professional learning activities that were subject based, involved groups of teachers, and

[18] Schulman, P. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22.p.8.
[19] Coe, R., Aloisi, C., Higgins, S. & Elliot Major, L. (2014). What makes great teaching? Review of the underpinning research. Centre for Evaluation and Monitoring. Durham University, p. 2.

required teachers to be active participants in their own learning, were more effective in teacher learning than general topics taught in isolation with little active teacher engagement.

Collaborative focus on improvement

A hallmark of the approach adopted at Knox has been the formation of Learning and Research teams that are allocated time to plan and work together collaboratively to make a difference to teaching and learning. The teams are supported to share the evidence, resources and strategies in the pursuit of the shared goal of improving student learning outcomes. Bentley and Cazaly (2015) conclude that successful schools embed professional collaboration in their culture, and that teachers use "collaboration to access expertise, data and relevant practice is an essential part of their daily practice."[20] Hattie claims the "greatest influence on student progression in learning is having highly expert, inspired and passionate teachers and school leaders working together to maximise the effect of their teaching on all students in their care"[21].

[20] Bentley, T. & Cazaly, C. (May 2015). The Shared Work of Learning: Lifting educational achievement through collaboration. Mitchell Institute Research Report, No.03/2015, p.5.
[21] Hattie, J. (2015). What Works Best in Education: The Politics of Collaborative Expertise. London: Pearson, p.2.

The literature certainly supports the importance of collaborative practice. In the high performing Shanghai education system, teachers "share teaching experiences, discuss and solve challenges and problems they encounter in teaching, and find ways to facilitate students' development"[22]. The approach to a collaborative focus on improvement means that teachers working in their Learning and Research teams share approaches, strategies and resources, and observe each other's teaching practices in the classroom (OECD, 2014; Tucker, 2016; Zhang, Ding & Xu, 2016). The 2017 survey on professional learning by NESA concludes that over 80 per cent of NSW were excited to apply professional learning to their practice because "of the potential benefits to their students and to feeling encouraged to reflect on their practice and try new ideas"[23].

One of the barriers identified by the literature to the development of an effective learning approach is the lack of time for teachers to collaborate and learn together. According to Jensen, Sonnemann, Roberts-Hull & Hunter (2016) "Teachers simply do not have sufficient time in the day for taking up effective professional learning"[24]. Consequently, the Learning and Research teams have been allocated a regular fortnightly scheduled time slot to meet. These meetings are supplemented by dedicated Staff Development Days every term that address the identified targets for improvement. Knox's critical friends, Geoff Masters and John Fischetti have been keynote speakers at these conferences.

What is significant about the work of the collaborative teams is that the teachers are drawing upon the power of collective wisdom. They are focusing together on being strategic and targeted, and ensuring that all approaches implemented are evidence based. They are evaluating the impact of their intervention strategies, and inviting their students to share their perceptions of what is happening in the classroom. Hattie (2016) wisely concludes in his research that all too often,

[22]Zhang, M., Ding, X. & Xu, J. (January 2016). Teacher Quality Systems in Top Performing Countries: Developing Shanghai's Teachers. The National Center on Education and the Economy, p.16.
[23] NESA. (2017). Applying Professional Development, p.13.
[24] Jensen, B., Sonnemann, J., Roberts-Hull, K. & Hunter, A. (2016). Beyond PD: Teacher Professional Learning in High-Performing Systems. Washington, DC: National Center on Education and the Economy, p. 6.

attempts at collective action lead to forming groups, such as professional learning communities or networks of schools, but the focus of these groups is rarely on sharing evaluative evidence and thinking about what has been effective and even less on dependably identifying success and expertise and then privileging and sharing it.[25]

The 2016 and 2017 overview of all of the Learning and Research team action research projects provides a rich and informative indication of the depth and breadth of the teachers' work. (See Appendix E & F) The teams were working collegially together to improve the learning of the students.

Teacher agency

There is increasing pressure on teachers to be more accountable for the learning outcomes of their students; especially since the release of Hattie's (2003) research into the difference that teachers make to student performance. We were aware from the outset of this project that we wanted to ensure that the teachers did not feel that we were increasing their workload and questioning their performance. Rather, we wanted to implement a model that valued what they did, enabled them to enrich their performance and respected their need and right to have agency.

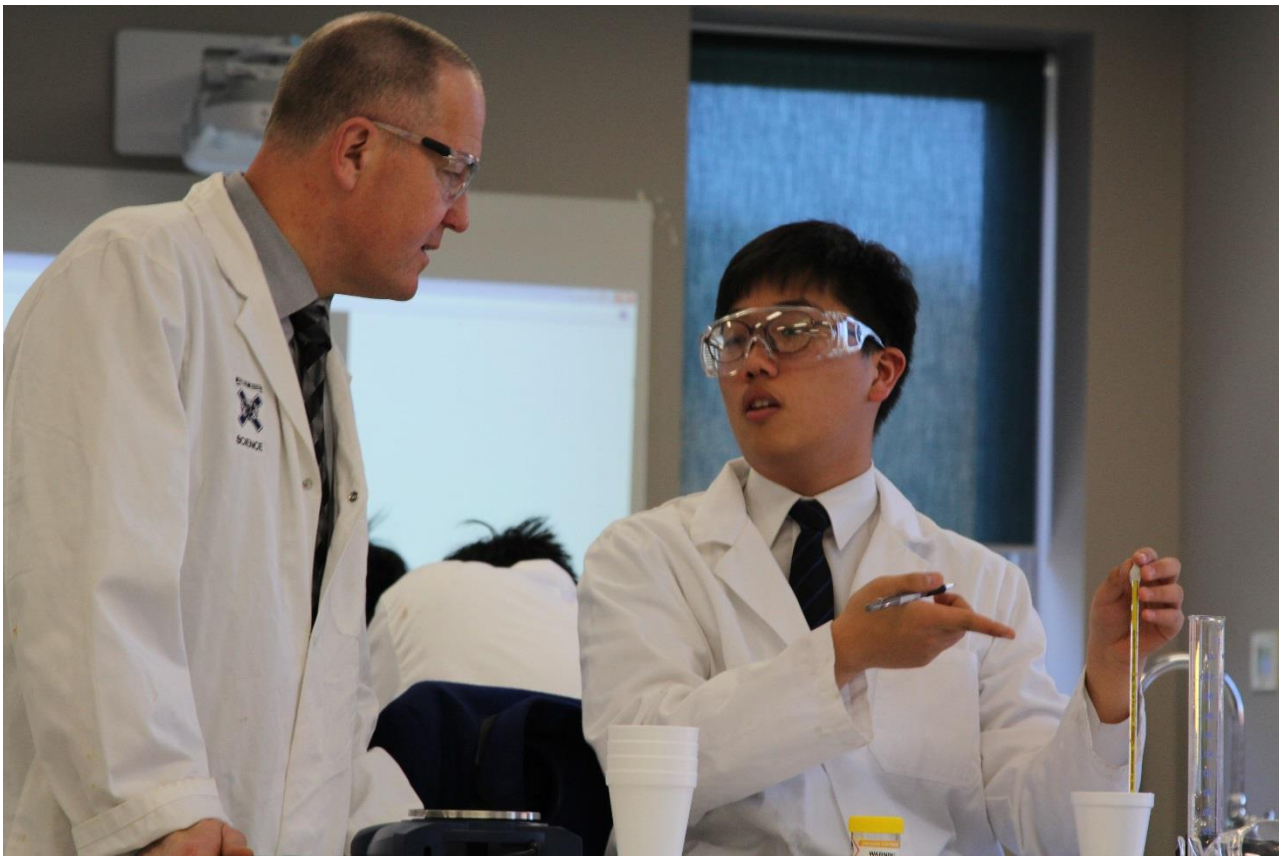
[25] Hattie, J. (2015). What Works Best in Education: The Politics of Collaborative Expertise. London: Pearson, p.23.

The literature indicates that successful teacher professional development programs are connected to practice and foster strong working relationships among teachers. The programs support teachers to practise the newly acquired skills in class. According to Chong and Kong (2012) these critical elements are embedded in collaborative learning structures. Collaborative contexts have an impact on teacher agency, an outcome that has according to the literature been empirically linked to improved student achievement. According to Calvert (2016), "teacher agency is the capacity of teachers to act purposefully and constructively to direct their professional growth and contribute to the growth of their colleagues."[26] A hallmark of the Learning and Research teams is collaboration.

For too long professional development has been "done" to teachers rather than done by teachers. The Center on Education Policy (CEP) after conducting a national survey of United States public school K-12 teachers in 2016, suggest that teachers lack agency because their voices are not heard. Furthermore, Calvert (2014) asserts that "Teachers are in it for the autonomy and the mastery. They want to master their craft and be free to innovate."[27] Thus, we have implemented a professional learning model that is led and guided by the teachers who identify through an analysis of the data the improvement target and work collaboratively together to develop strategies and assess the impact on student learning outcomes. The approach we have developed values the work of teachers and listens to their voices.

[26] Calvert, L. (2016). *Moving from compliance to agency: What teachers need to make professional learning work*. Oxford, OH: Learning Forward and NCTAF. p. 52.
[27] Ibid., p. 53.

The Literature Gaps



The importance of this project lies in its potential to develop a performance and development system that could be used beyond Knox Grammar School. The literature reviewed to date has demonstrated that very few countries have measured holistically the impact of a professional learning approach on student learning outcomes. According to Cole (2012) "Relatively few studies have tracked the impact of professional development to outcomes for students.[28]"

With this on mind, we will continue to research the impact of this approach across the three campuses. This includes three teachers making it a focus for their PHD research at the University of Newcastle.

[28] Cole, P. (2012). Linking effective professional learning with effective teaching practice. AITSL. http://www.ptrconsulting.com.au/sites/default/files/linking_effective_professional_learning_with_effective_teaching_practice_-_cole.pdf. p. 5.

Aims and Research Questions

Aims

1. Shared responsibility for the targeted improvement of teaching and learning**:** This will be achieved by the following approaches:

a. Supporting all teachers to become data literate and committed to evidence-based, targeted teaching.

b. Teachers working with their Team Leader or Head of Department or Assistant Head of Department to develop a Performance and Development Plan that includes teaching goals connected to their Learning and Research team's target.

c. The appointment of Directors of Professional Learning in the Senior School leading an Arts, Humanities or STEM Hub and one in the Preparatory school to provide support for the Learning and Research teams, and observe and video teacher practice.

d. Teachers being open to their lessons being videoed and self and peer-critiqued with the relevant Director of Professional Learning.

e. Providing time for departments and preparatory school teams to work together collegially in Learning and Research teams supported by a Director of Professional Learning, and taking collective responsibility for student learning outcomes. This will be achieved by:

- Teachers being supported by Analytics personnel to arrive at a shared understanding of the implications of internal and external student achievement data for teaching and learning programs.
- Identifying colleagues whose students are performing well in the Learning and Research team's targeted area.
- Developing collegially teaching and learning resources and strategic interventions that target lifting student outcomes.

2. Development of a culture that values transparency and open dialogue.
3. Nurturing teacher agency by supporting teachers to direct their professional growth and contribute to the growth of their colleagues.
4. Improved student learning outcomes and engagement in the classroom.

Research Questions

1. Will professional learning, focused on the discerning use of student data, inform and enhance targeted teaching practice?
2. By developing an approach to professional learning that is focused on enriching pedagogical content knowledge, will there be greater collaboration between teachers?
3. By supporting teachers to direct their professional growth and contribute to the growth of their colleagues, will this lead to greater teacher agency?
4. Will this approach lead to a measurable improvement in student learning outcomes?

Hypothesis

The implementation of a professional learning model focused on enriching pedagogical content knowledge, and grounded in the discerning use of quantitative and qualitative data to inform targeted teaching practice, will lead to greater teacher agency and collaboration, and measurable improvements in student learning outcomes.

Methods and Data Collection Approaches

Methodology

This study is framed within the concept of teacher collaboration grounded in pedagogical content knowledge. This conceptual framework played a significant role in building in-depth knowledge by implementing a grounded theory approach. A robust literature review was very beneficial to informing this framework and the research.

The participants consisted of 265 teachers across two campuses ranging in age from 22 to 64 with a range of teaching experience. In the beginning, we were going to limit the scope of the project to the Year 4 team of five teachers in Knox Preparatory School and to a single Department in the

Senior School. However, it soon became evident that if we provided the resources, time and personnel for this project that we could scale and diffuse it to encompass the Knox Senior School beginning in 2016 and Knox Preparatory School in 2017. This was possible because the School Council and the Headmaster believed that the approach that we were researching and actioning had the potential to make the greatest difference to student and teaching performance. Furthermore, the teachers from both campuses expressed a keen desire to implement this new approach.

In each of the Learning and Research teams in the senior school and Knox Preparatory School the methodology of action research was utilised. Action Research as a methodology is empowering as it fosters active inquiry and continuous improvement. The site-based and shared practice methodology motivates teachers as researchers to acquire new skills, deepen their knowledge and understanding of quality pedagogy through research and action with the intended purpose of improving the level of engagement and learning outcomes of their students (Cresswell, 2003; Melrose, 2001; Zeichner, 2001). It is grounded in action, evaluation and critical analysis of practices based on collected data in order to introduce improvements in teaching practices, and it is facilitated by the collaboration of a number of individuals with a common transformative purpose. Thus, this research carries real responsibilities as the action has the potential to improve student learning outcomes.

The advantages of this design approach are that it can be used with qualitative and quantitative data, it is highly relevant to classroom practice and it can potentially enable the participants to gain an even deeper understanding of their students' skills and knowledge. However, the disadvantage is that is that there can be delays in completion of action research due to the competing demands of school.

The action research functioned on several levels in this study. The Learning and Research teams used the action research model to target an aspect of student learning that needed to be addressed according to the data, posed a research question, conducted relevant research into

how this could be addressed, collected baseline data from formative tasks and conducted student perception surveys. Once the targeted concept was ascertained, the team devised and implemented an intervention and analysed the impact of this intervention using assessment data. The research and the outcomes were then shared with the whole school and in the case of some of the teams, shared locally and nationally through workshops and papers.

This integrative methodology is consonant with the world-view of pragmatism - a leading foundation for mixed method research - where the focus is on multiple relevant forms of data collection to provide answers to the research questions and test the hypothesis (Creswell & Plan-Clarke, 2007)[29].

What sets action research apart from other design approaches is its cyclical nature. Our action research will not simply end upon the determination of findings and the formulation of conclusions. It will continue to instigate a renewal of the research process, and focus on striving to improve teaching and learning at Knox Grammar School.

Data collection, management and analysis

Four primary instruments were used in data collection: surveys conducted with teachers, professional development plans[30], teacher interview videos, and student assessment outcomes. The teacher professional learning surveys that related to the key research questions included quantitative and qualitative questions. 2017 NAPLAN data was used to ascertain student learning outcomes across the whole school and individual Learning and Research teams using the action research model, used pre and post formative and summative assessment task data. In 2018, after a more extensive implementation of the approach, this will be extended to include the HSC and whole school assessment data.

[29] Creswell, J. & Plano-Clarke, V.L. (2007). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.
[30] See Appendix C.

The teacher surveys developed by the Professional Learning Team used the Likert rating scale, allowing for degrees of opinion. Participants were invited to provide further open-ended feedback. This data was collected via Survey Monkey and as such, did not identify the participant. This meant that the validity of the data was in all probability not compromised by social desirability. Only the members of Professional Learning Directors responsible for each of the Hubs – Arts, Humanities and STEM - had access to the results of this data, ensuring confidentiality. The teacher surveys addressed five aspects of the Professional Learning approach:

1. The time provided for Research and Learning Teams was valuable.
2. The Research and Learning project provided an opportunity to use data to enhance teaching.
3. The Research and Learning approach improved teacher agency and collaboration with colleagues.
4. Effective teaching strategies and /or resources were developed as a result of the project.
5. The new model for professional learning was useful.

Teachers were surveyed on two occasions in 2016 and again in 2017 so that comparative data could be generated.

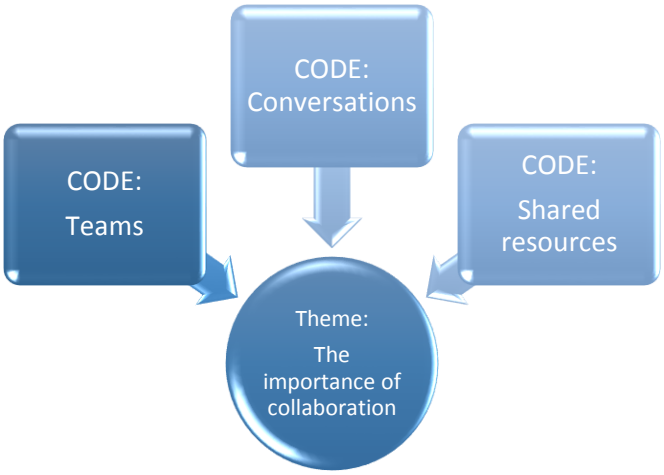
Teachers from a range of departments were interviewed and this was captured on video. Video data is a durable, malleable, shareable record that can be repeatedly viewed and manipulated to be viewed in slow or fast motion or freeze-frame. Goldman (2007) suggests that using video technologies provides an opportunity to garner diverse viewpoints[31]. Phenomenological inquiry, defined by Creswell (2013) as one that "describes the common meaning for several individuals of their lived experiences of a concept or phenomenon"[32], was the approach used. Video interviews with open-ended questions were conducted with 15 teachers across six departments in 2016 at the start of the implementation of the new approach and then again in 2017 at the end of

[31] Goldman, R. (2007). Video Representations and the Perspectivity Framework: Epistemology, ethnography, evaluation, and ethics. In R. Goldman, R. Pea, B. Barron & S. J. Derry (Eds.), Video Research in the Learning Sciences (Vol. 3- 37). London: Taylor & Francis, Inc.

[32] Creswell, J. W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches. (3rd ed.). Los Angeles: SAGE Publications, p.2.

semester one. The teachers reflected on their response to being part of a Learning and Research team, using data to improve student learning, teacher collaboration, their own teaching practice, the challenges and the impact of this new approach to professional learning.

The responses by the participants were coded descriptively and emerging patterns in relation to the focus of the research questions were recorded (Saldaña, 2013[33]). The following diagram illustrates the how the coding led to the identification of common themes.



Common themes were then noted in connection to the research questions and the literature review. The following common themes were evident:

- The need for a targeted focus on the use of data to improve student learning.
- The importance of a shared and collaborative approach to the improvement of agency and teaching practice.
- The importance of having time to work together.
- The importance of using the data to know each student's story.

The purposeful selection of these participants reflected and represented the homogeneity that existed among the sample pool. They were all members of a Learning and Research team from their departments and were focused on the targeted improvement of student learning outcomes.

[33] Saldaña, J. (2013). *The Coding Manual for Qualitative Researchers* (2nd ed.). Los Angeles: SAGE.

Creswell (2013)[34] states that it is essential that participants have experience of the phenomenon being studied.

The teachers' Professional Development Plans (PDP's) implemented in 2016 require them to identify a targeted improvement goal for their own teaching practice and an improvement goal developed with their Leaning and Research Team for one of their classes. The PDP's were developed in consultation with the Head of Department in the senior school or the Team Leader in the preparatory school. Classroom lesson observations conducted twice in 2016 and again in 2017 by the Directors of Professional Learning were used to focus on the identified teaching practice goals. Teachers were provided with a short video of the lesson and a debrief meeting was held in the days following. These conversations have provided an opportunity to celebrate strengths and to identify areas in which teachers would like to undertake some research to further refine their pedagogy. The data analysed for the purposes of this research was the stated Learning and Research team goal. As with the video interviews, the goals were coded to identify common focus areas.

Results and Findings

Discerning use of student data inform and enhance targeted teaching practice

The two primary instruments used in 2016 and 2017 to collect data that informed the findings regarding the use of data to inform and enhance teaching practice were surveys conducted with teachers and teacher video interviews. At the start of 2016, the first staff development day and all subsequent professional learning sessions were focused on supporting the teaching staff to become more data literate. Teachers were immersed for one semester in how to analyse and use

[34] Creswell, J.W. (2012). Educational Research: Planning, Conducting, and. Evaluating Quantitative and Qualitative Research, 4th Edition. University of Nebraska–Lincoln.

quantitative and qualitative data to inform teaching. They analysed NAPLAN, Allwell and the Higher School Certificate data and discussed the importance of z-scores. Ethnographic studies for two of their students were conducted by all teaching staff so that they discovered the significance of qualitative data to differentiate teaching. In Department meetings, the Heads of Department (HODs) shared the HSC results and required teachers to backwards map to Year 7 to identify the skills and knowledge that students need to perform well in the HSC. One HOD shared in the HOD survey that "There was a greater sense of pride that what they had done was measurable and had meaning to the students and teacher." The theme for the professional learning approach was "Knowing your students' stories".

To ensure that all teachers are supported to access and analyse the data, the school promoted internally three teachers to an analytics team. This team ensures that all students' NAPLAN and Allwell data is available to all teachers via the Learning Management System and is included in the teachers' mark books. They also provide a z-score and a grade point average for every student in all of their subjects. This commitment by the school to ensuring that teaching is data informed has been validated by the teachers' positive feedback in the teacher surveys and the video interviews.

Therefore, in regards to the teacher surveys, there was a discernible improvement in the percentage of teachers who stated that their teaching practice had been enhanced through the use of data. In 2016, 75 percent of teachers agreed that this was the case and eight percent disagreed. In 2017, 84 percent of teachers agreed that this was the case and four percent disagreed.

The teacher video interviews provided more personal qualitative responses to the use of data to inform targeted teaching practice. In the 2016 and 2017 interviews, the actual references to data were noticeable: 19 references in 2016 and 28 references in 2017. Insightful and informed connections were made between how the analysis of data had informed teaching practice by all participants in 2016 and 2017. An early career teacher in Music stated "Looking at our assessment

data we were able to target which area needed our focus more. Our musicology and listening areas had the wider range of results, which surprised us." The same targeted approach was echoed by a Geography teacher "We did a pre-literacy test and analysed the NAPLAN writing results of the Year 8 Geography students. Based on this we targeted spelling, vocabulary and grammar. It has really made us focus on how students learn and knowing our students." A Learning Enhancement teacher who worked with the stage 4 Mathematics Learning and Research Team observed "We used qualitative data to assess students' attitudes to Mathematics. We used formal and informal interviews and collected student work samples." In Physical Health and Personal Development, an early career teacher stated about his colleagues in his Learning and Research team that he was leading "They're gathering data on a weekly assignment basis looking how by targeting specific skills they can map improvement on those skills."

Focus on enriching pedagogical content knowledge leading to greater collaboration between teachers

Prior to the implementation of the research project, professional learning was inter-disciplinary. Using the Instructional Rounds model, teachers from different departments visited each other's classrooms to observe an aspect of teaching practice, such as effective literacy practice. Based on the research that links improved student learning outcomes to enriching pedagogical knowledge,

the new approach has been to form Learning and Research teams in each department in the senior school and Year group in the preparatory school.

The three primary instruments used in 2016 and 2017 to collect data that informed the findings were surveys conducted with teachers, surveys conducted with the seventeen Heads of Department (HODs) and teacher video interviews. Once again there was a discernible increase in teachers stating that collaboration has increased in their departments. In 2016, 85 percent of teachers agreed that the Learning and Research project had increased collaboration with their colleagues and six percent disagreed. In 2017, 91 percent of teachers agreed that the Learning and Research project had increased collaboration with their colleagues and zero percent disagreed. Thirteen of the HODs agreed in the 2017 survey that they had witnessed greater levels of collaboration. One HOD stated in the open-ended section of the survey "The most valuable and enjoyable part of this was having time to discuss and design teaching strategies and resources with my colleagues. Unlike a lot of PD it gave us time to apply what we were learning."

The teacher video interviews conducted in 2016 and 2017 affirmed this finding. In 2016, the word "collaborate" or synonyms was repeated ten times by all teachers and in 2017 this occurred fifteen times. One English teacher interviewed stated "It gave us time to work together, to reflect on what resources we need to make a difference and that has helped in the English classroom." He added "I think it was those collective conversations as teachers that has ensured that we are

now more equipped to give feedback…the biggest success was the quality of the conversations and the feedback that students were getting." The Head of Science who spoke at length about the increased collaboration evident in her faculty and its perceived benefits for the students stated:

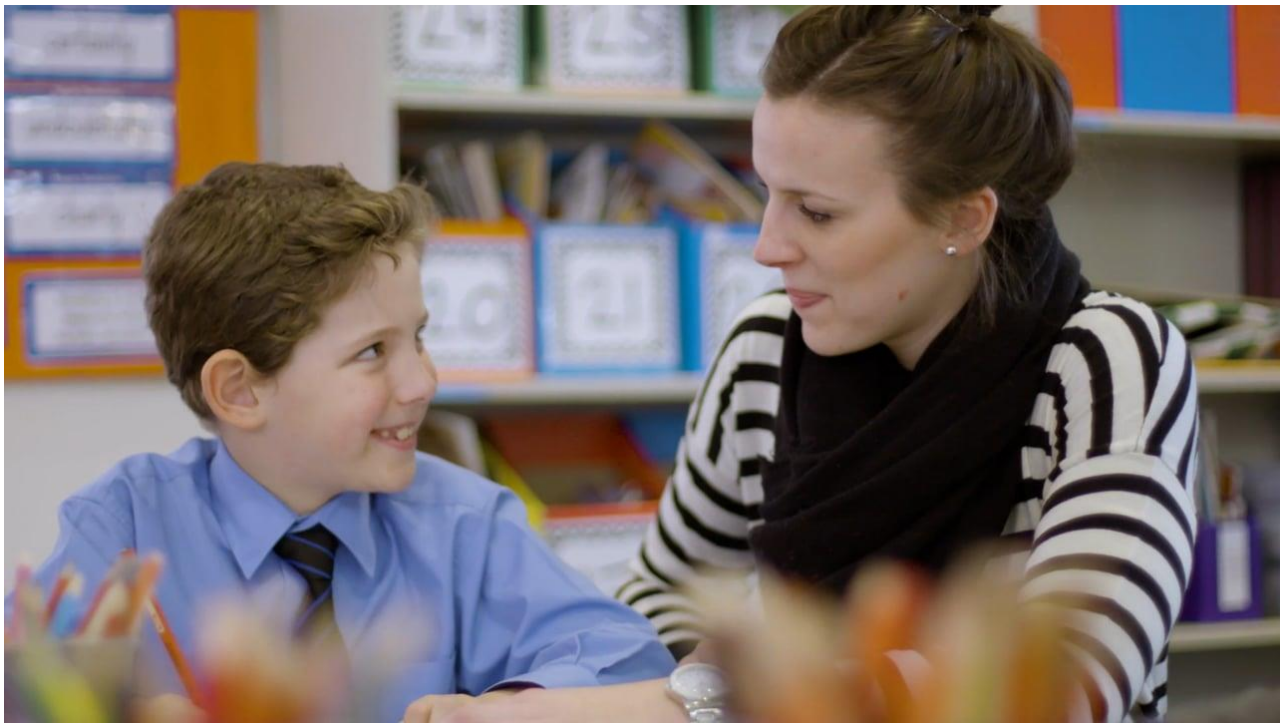
> Getting teams to collaboratively work together and observing each other's classrooms means that they're providing different pedagogical approaches, they're helping each other, they're team teaching and that is the most beneficial thing that can happen. They're not isolated, they're working in teams. The buzz even in the staffroom…Oh, I've used this strategy and it is really working. There is also the development of a common language.

Greater teacher agency

Although the findings from the teacher surveys in 2016 and 2017 demonstrated that the majority of teachers believed that the professional learning approach had improved their teaching practice, and the teacher video interviews featured teachers who are normally reticent speaking confidently about their improved teaching practice, we need improved instruments to measure whether there has been a positive impact on teacher agency. It does need to be acknowledged that the number of teachers applying to do the AIS Experienced Teacher accreditation has jumped in 2017 from five to twelve in 2018. Three of the 2018 cohort have opted to do the action research approach because they now feel more confident with this method because of the work they have done in the Learning and Research teams.

However, it needs to be acknowledged that the literature demonstrates that working collegially and collaboratively together positively influences teacher agency. Chong and Kong (2012) conclude from their study of teachers in a Singapore high school that collaborative learning structures are instrumental in enabling teacher agency. With this in mind the 2017 survey results with 91 percent of teachers agreeing that the Learning and Research project had increased collaboration with their colleagues, and the affirming comments recorded during the teacher video interviews, suggest that there has been a lift in teacher agency.

A measurable improvement in student learning outcomes



The 2017 NAPLAN data was used to ascertain student learning outcomes across the whole school and individual Learning and Research teams used formative and summative assessment tasks to measure student learning outcomes. Although the 2016 cohort performed well beyond predicted expectations in the HSC, this data will not be used as evidence.

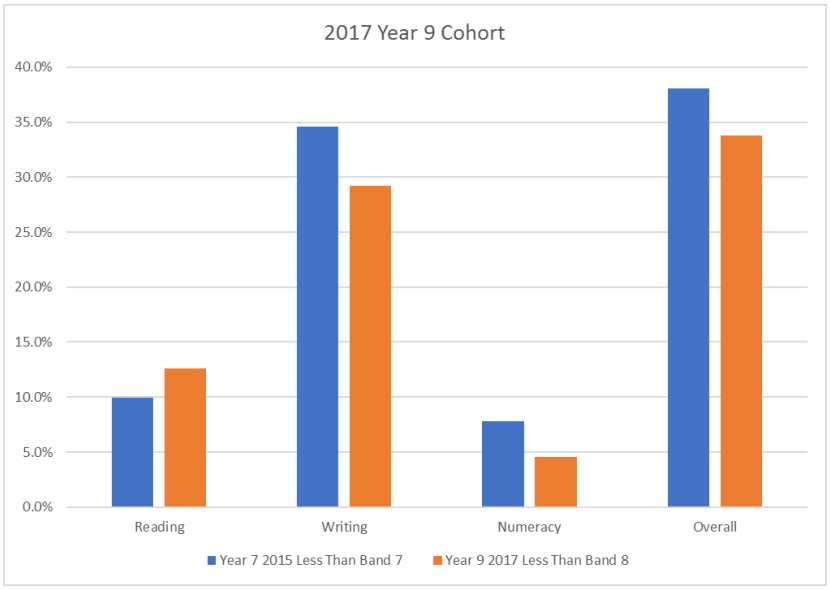
The teacher video interviews revealed the perception supported by evidence that the collaborative approach informed by data had made a measurable difference to student learning outcomes. The early career Music teacher stated proudly that “There was an 85 per cent improvement from Term 1 to Term 3 assessment results in my Music class.” A PDHPE teacher observed that “We have seen our students improve their results in assessment tasks, in particular in our target area, of understanding the demands of the verbs in different questions.” He continued “It’s given us the opportunity to extend the students and target any areas of weakness, and set individual learning goals for every single boy that allows them to see greater success.” The Heads of Department survey data affirmed the evidence provided by the teachers. Six of the

HODs stated that there had been a discernible improvement in assessment results and explicit teaching. One HOD stated that their "Commerce students in Year 9 increased 85% in performance from task 2 to task 3 after the explicit literacy interventions that were collaboratively developed."

There was a marked improvement in the Year 9 performance in NAPLAN for 2017 for Numeracy, Reading and Writing compared to 2016 and 2015. This was especially evident in Writing that was a whole school improvement target for 2016 and 2017, and a target for many of the Learning and Research teams. In 2016, 61 percent of the teams targeted writing and in 2017, 36 percent targeted writing. The following graphs demonstrate a significant decrease in the percentage of students not accessing a band 8 or higher between 2015 and 2017.

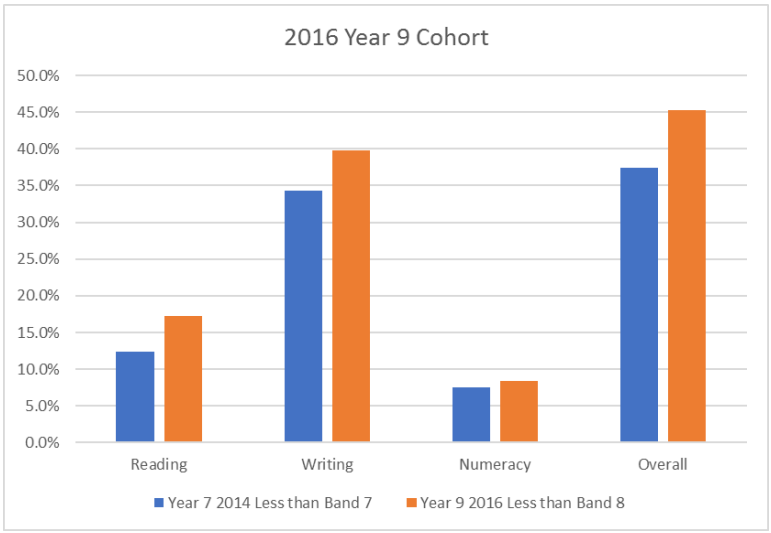
Graph 1: 2017 cohort

Area	Year 7 2015 Less Than Band 7	Year 9 2017 Less Than Band 8
Reading	9.9%	12.6%
Writing	34.6%	29.2%
Numeracy	7.8%	4.6%
Overall	**38.1%**	**33.8%**



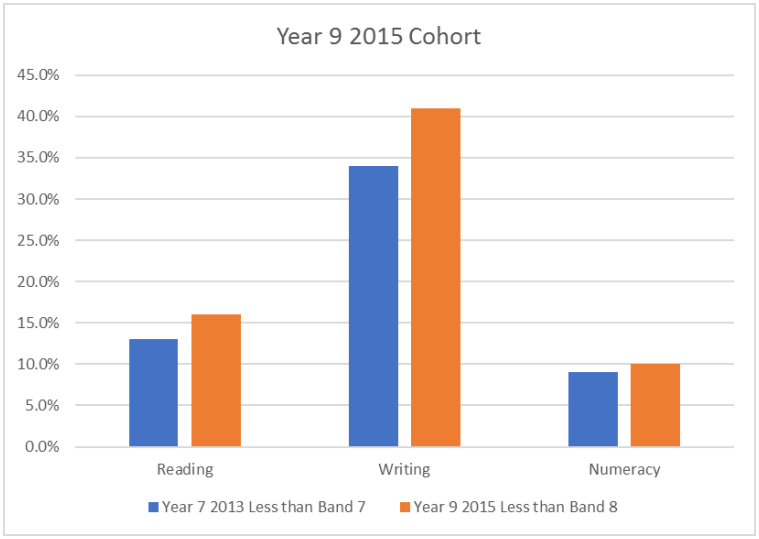
Graph 2: 2016 cohort

	Year 7 2014 Less than Band 7	Year 9 2016 Less than Band 8
Reading	12.4%	17.3%
Writing	34.3%	39.8%
Numeracy	7.5%	8.4%
Overall	**37.5%**	**45.2%**



Graph 3: 2015 cohort

	Year 7 2013 Less than Band 7	Year 9 2015 Less than Band 8
Reading	13.0%	16.0%
Writing	34.0%	41.0%
Numeracy	9.0%	10.0%



The quantitative data provided by each Learning and Research Team for the impact on student learning outcomes indicated similar improvement in performance. In 2017, 18 of the 36 Learning Research teams provided evidence that improved student learning outcomes had been recorded. The remaining teams have targeted improved HSC performance in this Year's examinations. The evidence of a stage 4 Mathematics Learning and Research Team focused on improving the results for low performing students has been included.

Stage 4 Mathematics Learning and Research Team

Team: Four Year 7 classroom teachers and one Learning Enhancement teacher

Target: To lift the performance of low achieving Year 7 Mathematics students by increasing executive functioning skills.

Reason for choosing this target: As a pilot study, twelve low performing Year 7 mathematics students were identified based on past assessment and standardised testing results. The students were targeted for an intervention program aimed to increase executive functioning in Mathematics. The executive functioning skills targeted, had a mathematical aim to increase the specific organisational skills, which enable the students to record their mathematical thinking in a logical and mathematically acceptable way. Of particular concern was the fact that as mathematical content increased in difficulty, students' results would become adversely effected due to a lack of engagement in recording their mathematical thought processes.

The Patterns and Algebra topic is studied as part of the Australian Mathematics curriculum from pre-kindergarten. Students develop their understanding of algebraic patterns moving from observable manipulative patterns to those that are more abstract. The concepts presented in solving algebra at Stage 4 level become more abstract, requiring multiple steps to determine the correct solution. These more abstract concepts require students to move beyond solving equations by substitution and begin to accurately apply inverse operations. Teachers have noted

that students are reluctant to record working and when working is recorded often it is illogical and lacks acceptable mathematical rigour.

Why are these skills important?

1) Students are not maximising marks in exam questions that are worth more than one mark.
2) Students need to be able to communicate mathematically.
3) Some examinations are not awarding marks for the answer unless valid working is evident.
4) Student self-efficacy is built as the process helps students to organise their thoughts and engage with the question.

Why are students reluctant to show mathematical working?

1) Previous mathematical experiences have taught students that a guess and check approach to solving equations is suitable to find the solution.
2) The questions previously presented only required one step to find the solution.
3) The questions previously presented had integer answers.

Key actions: The aim was to develop a set of success criteria (Hattie, 2009) to aid executive functioning in Mathematics. This success criteria would apply to every lesson and every question and would work in tandem with the success criteria presented by the teacher at the beginning of each individual lesson. Students would receive the success criteria as a checklist of essential steps for success in mathematics.

Some discussion was undertaken pertaining to the core steps that would be provided for students to work towards. The team were keen to minimise the number of steps to ten. While the teachers felt that these Steps for Mathematical Success were central to the success of all students, as a pilot study, the students in a low achieving Year 7 class were targeted. The class was beginning the topic on solving algebraic equation, the class was small (only 12 students) and it was felt that the intervention may have a timely effect on this particular class.

Evidence of improved learning outcomes: Quantitative data was collected for the class on three assessment tasks prior to the intervention. Class averages are shown below for each assessment task.

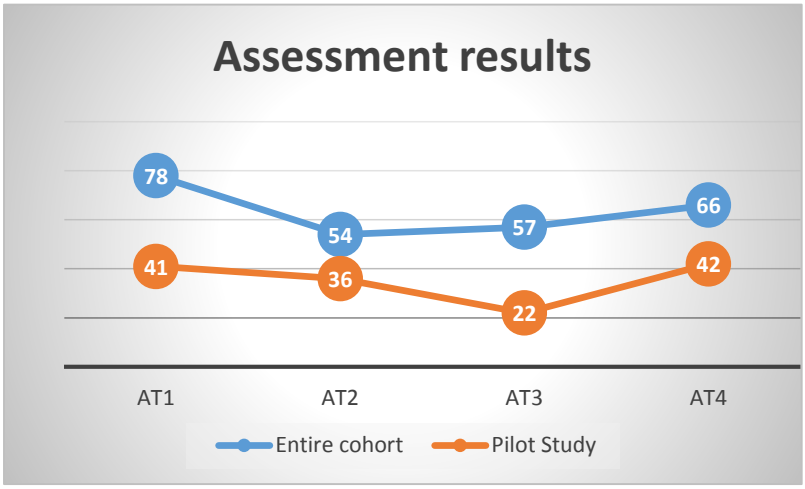
Table 1

	Assessment task 1	Assessment task 2	Assessment task 3	Intervention	Assessment task 4
Pilot Group Average	41%	36%	22%	10 steps to mathematical success introduced	42%
Standard deviation	14.6	10.8	11.7		21
Year group Average*	78.2%	64.4%	57.7%		66.4%
Year Group standard deviation*	14	19	19		19

* NB Year group statistics removed the Da Vinci cohort.

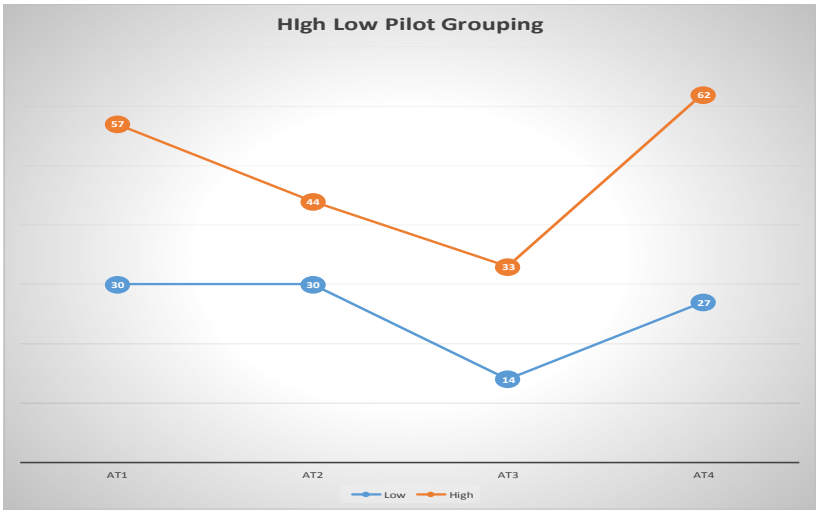
Task 4 after the intervention for the pilot study group had the highest average for all tasks. While Task 4 for the Year group had a lower average than Task 1 and only a slightly higher average than Task 2.

Table 2



Statistical analysis

Table 3



	P values		
	AT 1 VS T4	AT2 VS AT4	AT3 VS AT4
High ability regroup (n=5)	0.26	0.033**	0.002**
Low ability regroup (n=7)	0.23	0.29	0.001**

** indicates significance at α =0.05

The investigation was undertaken with a null hypothesis that there would be no difference between assessment results after intervention and an alternative hypothesis that the assessment results after intervention would be higher, hence one tailed paired sample Ttests were conducted.

The one tailed paired sample Ttests indicated there were statistically significant differences for the high ability group for Task 2 vs. Task 4 as well as Task 3 vs. Task 4. For the low ability grouping only there was a statistically significant difference between Task 3 vs. task 4. (It should be noted these tests were performed on small n.) Task 4 after the intervention for the pilot study group had the highest average for all tasks. While Task 4 for the Year group had a lower average than Task 1 and only a slightly higher average than Task 3.

There was a significant difference for high ability students between T2 (M=44.00, SD=9.86) and and T4 (M=62.08, SD=19.90) conditions; t(3)=2.52, p=0.03. There was also a significant difference for high ability students between T3 (M=33.33, SD=10.10) and and T4 (M=62.08, SD=19.90) conditions; t(3)=5.86, p=0.002. There was a significant difference for low ability students between T3 (M=13.99, SD=4.77) and and T4 (M=27.38, SD=5.82) conditions; t(3)=5.21, p=0.001.

Interviews – qualitative data: Three students were interviewed by the support teacher who had been in the classroom and another member of staff. The interview questions were not set with an aim to have students articulate any advantages or disadvantages the implementation of the 10 steps may have had. All three interviews used the student workbook as the stimulus for questions, (in the hope that this would provide a level of security and comfort for students.) A form of the Constant Comparative Method (Glaser, 1965, 1969) was applied to categorise responses; however, no coding or data comparison was undertaken due to the small group size. Full interview recordings and transcriptions are available. A sample interview is included:

Concept	Question/Stimulus
Change in bookwork	Your bookwork now is very different
	B: It used to be messy at the start of the Year.
Advantages All interviewees agreed it had been helpful	Does it help you? Is it easier to follow now? Tell me how?
Neatness	A: It's more neat A: and easier to read A: I do it without thinking now A: I guess instead just writing across, writing down, is more mature and more reasonable, I guess. B: Well it just made my work look neater ad I also corrected it at the end so… I knew what I was doing well at and what needed work *The student then agreed that in the past he had not been correct any of his work.*

	B: Because it's neater and I can understand what I'm writing and how to do things.
Ease of revision	Teacher: Is it easy for you to go back and revise your work when it looks like that? A: Yeah Teacher: Is it making more sense to you the Mathematics? A: Yeah
Automation	A: I do it without thinking A: I think I've done better than I have ever before
Most useful step	Can you remember some of the steps that were on that sheet?
Interesting to note that the steps recalled by students were organisational steps not the ones directly related to mathematics.	A: Probably dividing the page in half and labelling it, working down the page and answers on its own line B: Like… folding the page in half, writing dates and questions out and then at the end marking it. C: Um… Dividing the sheet in half and dating it and putting the title.
Revision	Does this make it easy to go back and revise your work?
	B: Yeah C: Yep
Confidence/ Progress	
	Teacher: And how do you think you've gone in Mathematics? A: I think I've done better than I have ever before Teacher: So are you feeling a lot more confident in your Mathematics now? A: Yeah definitely Teacher: So you feel a bit more confident about your Mathematics now? B: Yes I feel a lot more confident.
Discussion of a mathematical question:	Each student discussed the steps involved in a 3 step equation which was recorded into their book.
	All students were able to articulate the steps required.

Evaluation: The 10 Steps to Mathematical Success had a significant impact on the assessment results for the pilot group when compared to the previous assessment task. Work samples indicated that the students were producing working in a format that clearly communicated their mathematical thoughts and processes. It was interesting to note, that two of the work samples covered content from the measurement topic, which was not the topic taught during the implementation phase, thus it could be inferred that the 10 Steps had continued to be applied to topics beyond the topic during which the intervention took place. There was a clear improvement in the logical way the working was set out and students were more able to revise the work recorded in their workbook. During the interview process, the three students indicated that they felt they had improved mathematically and that the 10 step process had been helpful. Interestingly, when questioned two of the three recalled dividing the page in half as being the most useful step, these students were able to readily explain the steps involved in a higher order three step equation question that they had recorded in their book. Interviews also indicated that the students felt more confident in Mathematics as a result.

Discussion

The one significant thing that we have learned from the literature and our research is that there needs to be a shared and optimistic school-wide commitment to an improvement agenda (AITSL, 2012; Fullan, 2010; Masters, 2016). The expanded focus of the research to encompass all of the senior school and Knox Preparatory School is a testament to this commitment and the understanding that communities need to be receptive to change and actively participate in a process of continuous learning and improvement. In 2018, Wahroonga Preparatory School will be implementing the professional learning model.

Furthermore, it is evident from the research and the literature that the quality of teaching has a powerful influence on student learning outcomes (Barber & Mourshed, 2007; Hattie, 2003; Rowe, 2003). However, unless schools focus on improving what goes on in the classroom there will be no significant and sustained school improvement (Bruniges, 2012). This accounts for the whole school focus on implementing an approach to professional learning that has the potential to enrich the performance of teachers by deepening their pedagogical content knowledge and ability to use data to know their students and strategically inform targeted teaching (Hattie, 2009; Hill & Rowe, 1996; OECD, 2014). This focus has been whole-heartedly supported by our teachers who according to the data from the teacher surveys and teacher video interviews appreciate the time that is provided for them to work collaboratively in subject-focused or Year-focused teams to address specific student learning targets. The Science HOD stated that she "likes subject specific PD, as it enables us to work collaboratively as a department and it is highly relevant to my everyday teaching." This view was supported by 91 percent of teachers in the 2017 teacher survey.

Moreover, the level of collaboration has not only increased in each Department in the senior school and the stage teams in the preparatory school, it has extended to include whole school practice. We have held four major staff development day conferences since embarking on this research project in 2016. Prior to 2016, we found it challenging to get teachers to offer to deliver workshops. For all four conferences, we have been able to offer at least 22 teacher-led workshops that were evaluated highly by their peers. Our teachers have delivered numerous NESA teacher accredited workshops during lunch times and after school that targeted areas identified by the teams, such as how to improve student writing, strategic questioning and quality feed-forward. (See Appendix G)

Although the new approach to professional learning is only in its second Year in the senior school and its first Year in the preparatory school, there is evidence that it is having a positive impact on student learning outcomes. Hattie (2015) and Stronge (2006) attest to the significant impact on student learning of inspired and passionate teachers who adopt a targeted approach to teaching.

The 2017 NAPLAN results demonstrated a marked improvement in all areas. In fact, they were the best NAPLAN results ever achieved by Knox students in Years 7 and 9. The Writing section, which continues to be an issue for Australian students, in particular boys, was handled impressively by Knox students. Associate Professor at the University of Canberra, Misty Adoniou asserts,

> This Year, a staggering 16.5% of Year 9 students across Australia were below benchmark in writing. Back in 2011, when those students were in Year 3, only 2.8% of them were below benchmark. Somehow we dropped the ball for thousands of those kids as they progressed through school.[35]

Yet, Knox managed to reverse the trend. This affirms the work of the Learning and Research teams as many of them targeted improving the writing of their students.

Across many of the Learning and Research teams in each department and in the preparatory school, improvements were noted in student performance in school based assessment tasks. All teams used baseline data and pre and post data to assess the impact of their targeted teaching interventions. These interventions developed using the action research approach were evidence-based and supported by valid research. The collaborative work of the teachers and the ensuing positive results affirmed the influential 2015 research of Goss and Hunter that supports targeted, evidence-based teaching.

In 2018, we aim to extend the scope of the research to encompass student engagement and strengthen our focus on measuring teacher agency. We have trialled school developed Student Perception surveys in 2016 and 2017 across both campuses with mixed success. Our questions were more focused on student self-regulation than engagement. However, they did provide informative data about the need to develop greater student agency. In 2018, we will implement the Colorado Student Perception Survey[36]. According to the Measures of Effective Teaching (MET)

---

[35] Adoniu, M. (5 August, 2017). **"**NAPLAN results show it isn't the basics that are missing in Australian education". The Conversation. https://theconversation.com/naplan-results-show-it-isnt-the-basics-that-are-missing-in-australian-education-82113. Retrieved 10 September, 2017.

[36]The Colorado Initiative. http://www.coloradoedinitiative.org/studentsurvey/. Retrieved September 2017.

project report (2012) “no one has a bigger stake in teaching effectiveness than students”.[37] Goss and Sonnermann (2017) assert that “many students are consistently disengaged in class: as many as 40 per cent are unproductive in a given Year”[38].

The school is committed to supporting professional learning that can have make a measurable difference to teacher and student performance. The literature (Joyce and Showers, 2002; Calvert, 2016) focused on teacher professional learning programs concluded that there was minimal transference of learning from the programs to the classroom and asserted that professional practice rarely improved. Knox is determined that this will not be the case. We have already collected early evidence that we are making a difference and we believe that we will continue to do so. We are implementing a professional learning approach that is grounded in the findings of quality literature and is informed by our own ongoing action research.

Conclusion

With the paucity of research on the impact of teacher professional learning on student learning outcomes, our research can contribute significantly to the wider educational community. We have developed a professional learning model complete with a plethora of resources that is transferable to any sector, context or location.

With the opening in 2018 of the Research Institute of Professional Learning (RIPL) at Knox Grammar School, schools will be invited to participate in a communities of practice project where they will be supported to implement the professional learning approach. We already have five schools registered to join us, including an international school in China.

[37] MET. (September 2012). Asking Students about Teaching: Student Perception Surveys and their Implementation, .p.2, http://k12education.gatesfoundation.org/wp-content/uploads/2015/12/Asking_Students_Practitioner_Brief.pdf. Retrieved August 2017.
[38] Goss, P. & Sonnemann, J. (May 2017). Engaging Students: Creating Classrooms that Improve Learning. Grattan Institute, p. 3.

Research to Practice Impact

The action research methodology that is used by all Learning and Research teams fosters active inquiry and continuous improvement. It ensures that all teachers value and are immersed in accessing important research. Already, teachers are demonstrating through their maintenance of accreditation for Proficient Teacher that they are accessing and engaging with research papers.

The research project has instigated a partnership with the support of Professor John Fischetti with the University of Newcastle. Five teachers are now enrolled to do their Doctorates of Philosophy and three to do their Masters of Philosophy. Their research will be grounded in what they are doing at school. Three of the teachers are focused researching further the impact of the new professional learning model.

Several members of the research team have been invited to present papers at state, national and international conferences, such as the International Boys Schools Coalition Conference in Baltimore and the Australian Council for Educational Research Conference in Brisbane.

References

AITSL. (August, 2012). Australian Teacher Performance and Development Framework. Education Services Australia.

Barber, M. & Mourshed, M. (2007). How the world's best-performing school systems come out on top, McKinsey and Company.

Bickmore, D. L. (2013). Professional development and the middle school concept: A reciprocal relationship. In P. G. Andrews (Ed.), *Research to guide practice in middle grades education* (Vol. 4, pp. 717-749). Westerville, OH: Association for Middle Level Education.

Bentley, T. & Cazaly, C. (May 2015). The Shared Work of Learning: Lifting educational achievement through collaboration. Mitchell Institute Research Report, No.03/2015. http://www.mitchellinstitute.org.au/wp-content/uploads/2015/05/The_shared_work_of_learning_lifting_educational_achievement_through_collaboration.pdf. Retrieved 10th July, 2017.

Bruniges, M. (2012). Developing and implementing an explicit school improvement agenda. Australian Council for Educational Research (ACER).

Bustami, G.A. (October, 2014). Improving the Teacher's Evaluation Methods and Tools in Abu Dhabi Schools - Case Study. Athens Journal of Social Sciences. https://www.atiner.gr/journals/social/2014-1-4-3-AlBustami.pdf. Retrieved 10th May, 2016.

Calvert, L. (2016). Moving from compliance to agency: What teachers need to make professional learning work. Oxford, OH: Learning Forward and NCTAF. https://nctaf.org/wp-content/uploads/2016/03/NCTAF-Learning-Forward_Moving-from-Compliance-to-Agency_What-Teachers-Need-to-Make-Professional-Learning-Work.pdf. Retrieved 10th June, 2017.

Carrington, S., Deppeler, J. & Moss. J. (2010). Cultivating Teachers' Beliefs, Knowledge and Skills for Leading Change in Schools. Australian Journal of Teacher Education.

Stark Rentner, D., Kober, N. & Frizzell, M. (May 2016). Listen to Us: Teacher Views and Voices. Center on Education Policy. file:///C:/Users/yagerk/Documents/AIS%20Action%20research%20Project/final%20report/RentnerKoberFrizzell_Report_TeachViewVoice_5.5.16.pdf. Retrieved 17th September 2017.

Chetty, R., Friedman, J. & Rockoff, J. (2011). The long-term impacts of teachers: Teacher value-added and student outcomes in adulthood, Working Paper No. 17699, National Bureau of Economic Research.

Chong, W.H., & Kong, A. (2012) Teacher Collaborative Learning and Teacher Self-Efficacy: The Case of Lesson Study. The Journal of Experimental Education Vol. 80, Issue 3.

Coe, R., Aloisi, C., Higgins, S. & Elliot Major, L. (October 2014). What makes great teaching? Review of the underpinning research. Centre for Evaluation and Monitoring. Durham University.

Cole, P. (2012). Linking effective professional learning with effective teaching practice. AITSL. http://www.ptrconsulting.com.au/sites/default/files/linking_effective_professional_learning_with_effective_teaching_practice_-_cole.pdf. Retrieved 17th September 2017.

Cresswell, J.W. (2003). Research Design: Qualitative, Quantitative, and Mixed Method Approaches, (2nd Edition). California: Thousand Oaks.

Creswell, J.W. (2012). Educational Research: Planning, Conducting, and. Evaluating Quantitative and Qualitative Research, (4th Edition). University of Nebraska–Lincoln.

Creswell, J. W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches, (3rd Edition). Los Angeles: SAGE Publications, p.2.

Creswell, J. & Plano-Clarke, V.L. (2007). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.

Darling-Hammond, L. (2014). One Piece of the Whole: Teacher Evaluation as Part of a Comprehensive System for Teaching and Learning. American Educator. http://files.eric.ed.gov/fulltext/EJ1023870.pdf. Retrieved 4th June, 2015.

Darling-Hammond, L., Amrein-Beardsley, A., Haertel, E.H. & Rothstein, J. (2011). Getting Teacher Evaluation Right: A Background Paper for Policy Makers. American Educational Research Association.

Department of Education. (May, 2012). Teacher appraisal and capability: A model policy for schools, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/282598/Teacher_appraisal_and_capability.pdf. Retrieved 7th June 2015.

Dinham, S. (2013). The quality teaching movement in Australia encounters difficult terrain: A personal perspective published in The Australian Journal of Education, http://www.vit.vic.edu.au/SiteCollectionDocuments/PDF/Circular%20to%20principals%20

2013/Attachment%20message%20from%20the%20chairperson%203-2013%20AJEDinham.pdf . Retrieved 8th June 2015

Earl, L. & Katz, S. (2002). Leading schools in a data-rich world. In K. Leithwood and P. Hallinger (Eds). Second International Handbook of Educational Leadership and Administration. (pps.1003-1022). Dordrecht: Kluwer Academic.

English, D., Burniske, J., Meibaum, J. & Lachlan-Hache, L. (June 2016). Using Student Surveys as a Measure of Teaching Effectiveness. American Institutes for Research, https://education.ohio.gov/getattachment/Topics/Teaching/Educator-Evaluation-System/Ohio-s-Teacher-Evaluation-System/Alternative-Components/Student-Surveys-in-Teacher-Evaluation-FINAL-for-Ohio-060816.pdf.aspx. Retrieved August 2017

European Commission Education and Training. (July, 2013). Supporting teacher competence development for better learning outcomes, http://ec.europa.eu/education/policy/school/doc/teachercomp_en.pdf. Retrieved 7th June 2015.

Fairfax County Public Schools Department of Human Resources. (2013). Teacher Performance Evaluation Program Handbook 2012-2013, http://www.fcps.edu/hr/epd/evaluations/teacher/PDF/TeacherHB2012-13.pdf. Retrieved 6th June 2015.

Figazzolo, L. (January, 2013). The Use and Misuse of Teacher Appraisal: An overview of cases in the developed world. Education International.

Freeman, C., O'Malley, K. & Everleigh, F. (August 2014). Australian teachers and the learning environment: An analysis of teacher response to TALIS 2013: Final Report. Australian Council for Educational Research. http://research.acer.edu.au/cgi/viewcontent.cgi?article=1001&context=talis. Retrieved 10th June 2016.

Fullan, M. (2010). All systems go: The change imperative for whole system reform. Thousand Oaks, CA: Corwin.

Garet. M.S., Porter, A.C., Desimone, L., Birman, B.F. & Suk Yoon, K. (2001). What Makes Professional Development Effective? Results from a National Sample of Teachers: American Educational Research Journal, Vol. 38, No. 4, pp. 915-945 Published by: American Educational Research Association Stable. http://www.jstor.org/stable/3202507. Retrieved 30th September 2015.

Goldman, R. (2007). Video Representations and the Perspectivity Framework: Epistemology, ethnography, evaluation, and ethics. In R. Goldman, R. Pea, B. Barron & S. J. Derry (Eds.), Video Research in the Learning Sciences (Vol. 3- 37). London: Taylor & Francis, Inc.

Goss, P. & Hunter, J. (July 2015) Targeted teaching: How better use of data can improve student learning, Grattan Institute Report No. 2015-6. http://grattan.edu.au/wp-content/uploads/2015/07/827-Targeted-Teaching.pdf. Retrieved 10th May 2016.

Goss, P. & Sonnemann, J. (May 2017). Engaging Students: Creating Classrooms that Improve Learning. Grattan Institute. Report No.2017-01. https://grattan.edu.au/wp-content/uploads/2017/02/Engaging-students-creating-classrooms-that-improve-learning.pdf. Retrieved 18th June 2017.

Hattie, J. (2003) Teachers make a difference: What is the research evidence? Paper presented at the Australian Council for Educational Research Conference, 19-21 October.

Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. London, UK: Routledge.

Hattie, J. (2015). What Works Best in Education: The Politics of Collaborative Expertise. London: Pearson. https://www.pearson.com/content/dam/corporate/global/pearson-dot-com/files/hattie/150526_ExpertiseWEB_V1.pdf. Retrieved 17th May, 2016.

Hempenstall, K. (2006). What does evidence-based practice in education mean? Australian Journal of Learning Disabilities, 11(2), 83-92. https://www.parliament.vic.gov.au/archive/etc/Submissions/prof_learn/Hempenstallappendixa030608.pdf. Retrieved 18th August, 2017.

Hill, P. W. & Rowe, K. J. (1996). Multilevel modeling in school effectiveness research. School Effectiveness and School Improvement, An International Journal of Research, Policy and Practice. Vol. 7, 1996, Issue 1, 1-34.

Ingvarson, L. & Rowe, K.J. (2007). Conceptualising and evaluating teacher quality: Substantive and methodological issues. ACER. http://research.acer.edu.au/cgi/viewcontent.cgi?article=1007&context=learning_processes. Retrieved 12th May, 2016.

Jensen, B. & Reichl. J. (2011). Better Teacher Appraisal and Feedback: Improving Performance. Grattan Institute. https://grattan.edu.au/report/better-teacher-appraisal-and-feedback-improving-performance/. Retrieved 10th June, 2016.

Jensen, B., Sonnemann, J., Roberts-Hull, K. & Hunter, A. (2016). Beyond PD: Teacher Professional Learning in High-Performing Systems. Washington, DC: National Center on Education and the Economy.

Jensen, B. (2012). Catching up: Learning from the best school systems in East Asia. Grattan Institute. https://grattan.edu.au/report/catching-up-learning-from-the-best-school-systems-in-east-asia/. Retrieved 10th June, 2016.

Joyce, B.R. & Showers, B. (2002). Student Achievement through Staff Development, 3rd Edition. Washington DC: ACSD.

King, B. & Newmann, F. (2004). Successful professional development must consider school capacity. Journal of Staff Development, 25(1), 26-30.

Masters, G.N. (2012). National School Improvement Tool. Melbourne: ACER.

Masters, G.N. (2012). Continual improvement through aligned effort. Australian Council for Educational Research (ACER). http://data.dbbcso.org/uploads/1/3/0/4/13041637/acer_conf_proceedings_2012.pdf. Retrieved 10th June 2017.

Masters, G.N. (2016). Learning to Improve: Schools as learning organisations. Australian Council for Educational Research. https://www.acer.org/files/Schools-as-learning-organisations.pdf. Retrieved 21st September 2016.

MCEETY. (December, 2008). Melbourne Declaration of Educational Goals for Young Australian. http://www.curriculum.edu.au/verve/_resources/National_Declaration_on_the_Educational_Goals_for_Young_Australians.pdf. Retrieved 20th September 2016.

Meiers, M. & Buckley, S. (2009). Successful professional learning. The Digest, NSWIT, 2009 (3). http://www.nswteachers.nsw.edu.au. Retrieved 30th September 2015.

Measures of Effective Teaching (MET) Project. (September 2012). Asking Students about Teaching: Student Perception Surveys and their Implementation. Bill & Melinda Gates Foundation. http://k12education.gatesfoundation.org/wp-content/uploads/2015/12/Asking_Students_Practitioner_Brief.pdf. Retrieved August 2017.

Melrose, M.J. (2001). Maximizing the Rigor of Action Research: Why would you want to? How could you?, Field Methods, Vol. 13, No. 2: 160-180.

NSW Educational Standards Authority. (2017). Applying Professional Development. https://educationstandards.nsw.edu.au/wps/wcm/connect/da249229-913b-435c-acbe-

3f7d3227dcf5/applying-professional-development.pdf?MOD=AJPERES&CVID=. Retrieved 15th August 2017.

Nexus Strategic Solutions. (2009). The Performance Management and Development of Teachers in Australian Schools: Report to the Teacher Quality Steering Group, http://scseec.edu.au/site/DefaultSite/filesystem/documents/Reports%20and%20publications/Publications/Teachers%20and%20teaching/The_Performance_Management_and_Development_of_Teachers_in_Aust_Schools.pdf. Retrieved 8th June 2015.

OECD. (December, 2009). 'Teacher Evaluation: A Conceptual Framework and examples of Country Practices', http://www.oecd.org/education/school/44568106.pdf. Retrieved 5th June 2015.

OECD. (2014). TALIS 2013 Results: An International Perspective on Teaching and Learning. TALIS, OECD Publishing.

OECD. (2013).Teachers' Pedagogical Knowledge and the Teaching Profession Background Report and Project Objectives, http://www.oecd.org/edu/ceri/Background_document_to_Symposium_ITEL-FINAL.pdf.

Peterson, K. D. (2000). Teacher evaluation: A comprehensive guide to new directions and practices. Thousand Oaks, CA: Corwin Press.

Robertson-Kraft, C. (April, 2012). How Does Performance Management Affect Teacher Motivation? American Educational Research Association.

Rowe, K. (2007). Educational effectiveness: The importance of evidence-based teaching practices for the provision of quality teaching and learning standards, in D McInerney, S Van Etten and M Dowson (eds) *Standards in Education, Information Age Publishing*, Charlotte North Carolina: 59-60.

Saldaña, J. (2013). *The Coding Manual for Qualitative Researchers* (2nd ed.). Los Angeles: SAGE.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., Taggart, B., Toth, K., Smees, R., Draghici, D., Mayo, A. & Welcomme, W. (2008). Effective Pre-School and Primary Education 1-11 Project: The Influence of School and Teaching Quality on Children's Progress in Primary School, Research Report. London: Institute of Education, University of London.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22.

Steiner, L. (2010). Using Competency-Based Evaluation to Drive Teacher Excellence: Lessons from Singapore. Public Impact, Chapel Hill, NC.

Stronge, J.H. (2006) Teacher Evaluation and School Improvement: Improving the Educational Landscape. Sage Publication, http://www.corwin.com/upm-data/7808_Stronge01.pdf. Retrieved 3rd June 2015.

Teacher Appraisal Manual. (2009). Pinellas County Schools, http://www.nctq.org/docs/18-07_6670.pdf. Retrieved 7th June 2015.

Teacher Education Ministerial Advisory Group. (February, 2015). Action Now: Classroom Ready Teachers. Australian Government Department of Education and Training.

Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007) Teacher professional learning and development: Best Evidence Synthesis Iteration. Auckland: Ministry of Education.

Tucker, M. (2016). Building Blocks for a World-Class Education System. Washington, DC: National Center on Education and the Economy. http://ncee.org/wp-content/uploads/2015/07/9-blocksv011217.pdf. Retrieved 15th June 2016.

Van Driel, J.H. & Berry, A. (2012). Teacher Professional Development Focusing on Pedagogical Content Knowledge. Educational Researcher, *41*, 26 – 28.

Wayne, A. J., Yoon, K. S., Zhu, P., Cronen, S. & Garet, M. S. (2008). Experimenting with teacher professional development: Motives and methods. Educational Researcher, 37(8), 469–479. http://journals.sagepub.com/doi/abs/10.3102/0013189X08327154. Retrieved 17th September, 2017.

Wildy, H. (2012). Using data to drive school improvement. Australian Council for Educational Research (ACER). http://data.dbbcso.org/uploads/1/3/0/4/13041637/acer_conf_proceedings_2012.pdf. Retrieved 10th June 2017.

Zanderigo, T., Dowd, E. & Turner, S. (2012). Delivering School Transparency in Australia: National Reporting through My School, Strong Performers and Successful Reformers in Education. OECD Publishing, Paris.

Zeicher, K. (2001). 'Educational action research', in P. Reason and H. Bradbury (eds.) *Action Research - Participative Inquiry and Practice*. London: Sage.

Zhang, M., Ding, X. & Xu, J. (January 2016). Teacher Quality Systems in Top Performing Countries: Developing Shanghai's Teachers. The National Center on Education and the Economy. http://www.ncee.org/wp-content/uploads/2016/01/DevelopingShanghaiTeachersWEB.pdf. Retrieved 10th May 2016.

Appendices

Appendix A: AIS Research Team Biographies

Professor Geoff Masters is Chief Executive of the Australian Council for Educational Research (ACER). In this role he maintains his professional interest in educational assessment and school improvement, and has been invited to undertake numerous reviews for governments. Professor Masters is an Adjunct Professor in the Queensland Brain Institute, University of Queensland, and has served on a range of bodies, including terms as founding President of the Asia-Pacific Educational Research Association; President of the Australian College of Educators; Chair of the Technical Advisory Committee for the International Association for the Evaluation of Educational Achievement (IEA); Chair of the Technical Advisory Group for the OECD's Programme for International Student Assessment (PISA); member of the Business Council of Australia's Education, Skills and Innovation Taskforce; member of the Australian National Commission for UNESCO (and Chair of the Commission's Education Network); and member of the International Baccalaureate Research Committee.

Professor Linda Darling-Hammond, President of the Learning Policy Institute, is Charles E. Ducommun Professor of Education Emeritus at Stanford University where she is Faculty Director of the Stanford Center for Opportunity Policy in Education. She is a former president of the American Educational Research Association and member of the National Academy of Education as well as the American Academy of Arts and Sciences. Her research and policy work focus on issues of educational equity, teaching quality, and school reform. She has advised school leaders and policymakers at the local, state, and federal levels. In 2008, she served as director of President Obama's education policy transition team.

Professor John Fischetti is Head of School at the University of Newcastle. In addition to his role as Dean, Professor Fischetti has extensive senior leadership and senior faculty experience across several American universities. He served as Department Chair and Doctoral Program Coordinator

at the University of North Carolina at Wilmington and as Professor and Program Coordinator at the University of Louisville, Kentucky, as well as at the University of Massachusetts at Amherst. Professor Fischetti's key research interests include: School Reform Preparing Leaders for New Roles/Responsibilities Secondary Teacher Education Global Educational Issues Curriculum, Instruction and Assessment Technology and Education Research in Teaching and Learning.

John Weeks is the Headmaster of Knox Grammar school and has had over twenty eight Years of experience in leadership. He was the Founding Head of Hunter Valley Grammar School (1989-1996) and former Head of The Illawarra Grammar School (1997-2003). John is an experienced educationalist with a demonstrated commitment to academic excellence, proven leadership skills and management expertise. His strong track record of leading schools and their communities through periods of significant growth has served Knox well. John has completed his Master of Educational Leadership at Newcastle University, and he is a member of the Australian College of Education (ACE), the Australian Council for Educational Leaders (ACEL), the Association Heads of Independent Schools Australia (AHISA) and a previous Chairman of the Committee of Associated Schools (CAS).

Karen Yager is the Deputy Head 7-12 and Head of Student and Teaching Excellence K-12 at Knox Grammar school. She is a teacher of English and a lecturer at the University of NSW. Karen is also president of NSW English Teachers Association and Vice President of the Professional Teachers Council. She has had over 25 Years of experience in public education and was Supervisor of HSC Marking for Advanced English. She has published three English text books; one received the National Publishers' award. She has presented papers nationally and internationally. Karen has been a recipient of the NSW Premier's Teachers' Scholarship, the State Library Fellowship, Singapore's Ministry of Education Fellowship and the Australian Professional Teachers' Association award for outstanding contribution to the profession. Karen is committed to being a life-long learner and as such, is now a PHD candidate with the University of Newcastle.

Tracey Clarke is the Director of Professional Learning (STEM) at Knox Grammar school. She is a teacher of Mathematics and Technology and has teaching experience in all three educational sectors. Tracey's work includes syllabus development, the publication of teaching materials and academic papers. She has a passion for professional learning, in particular the inclusion of effective technology rich teaching into all STEM subjects. Tracey is now a PHD candidate with the University of Newcastle.

Matt Robertson is currently Director of Professional Learning (Humanities) at Knox Grammar School in Sydney. He has over 25 Years teaching experience in Catholic and Independent secondary schools in Sydney. His interests include professional learning, curriculum and assessment. He has presented papers at AIS, EBE and ACER Conferences and convened the NSW CSSA Trial HSC Business Studies Paper from 2010-2012. He has a Masters of Commerce from Western Sydney University and will complete a Masters in Education from Macquarie University at the end of this Year.

Patrice Brady is the Director of Professional Learning at Knox Grammar Preparatory and Wahroonga Preparatory Schools. She has over 25 Years teaching experience and 17 Years leadership experience in Catholic and International schools. In 2016, she was involved in a collaborative research and teacher professional learning project with Monash University that focused on the teaching and learning of Mathematics. Patrice has presented at conferences for AAMT, MERGA and ACER. She is passionate about improving student achievement through data analysis, professional learning and best practice.

Andrew Weeding is the Head of Knox Senior Secondary Academy having previously had the roles of Stage 6 Director of Studies, Stage 5 Senior Academic Master, Head of Science and Head of House (Boarding). He is a passionate teacher of Chemistry and is accredited as Lead Teacher. Andrew has presented at numerous conferences both nationally and internationally and has a particular interest in Action Research Projects. Andrew is now a Masters of Philosophy student with the University of Newcastle.

John Nelson is the Dean of Operations at Knox Grammar School. His role is to create workflows and processes to ensure the school operates in an efficient manner. Part of his role is to track the progress of students. His passion is to make sure every student is receiving the best possible care and teaching. His team gather, analyse and create visual representations of data to create the story of the student. The goal is to have every teacher know their class as well as indicate particular areas of weakness/strength for individuals.

Ann Prentice is the Director of Learning at Knox Grammar Preparatory School. She has had over 30 Years of experience in public education. Ann has been a syllabus writer for NESA and a key presenter to early career teachers and experienced teachers for Northern Sydney Region. Ann is passionate about gifted education and writing.

Appendix B: Learning and Research teams Reflection and Evaluation Report

Please use the template below to report the findings and outcomes from your research and learning teams in 2017.

KNOX GRAMMAR SCHOOL	Subject:
Area of Focus/Project name	
Stage / Year groups	
Team Members	
Why did you choose this area of focus?	
Describe key actions taken (400 words) What did you implement? What resources were created? What steps were involved?	
What evidence/data did you collect Pre and post test Student surveys Markbooks etc….	

Outcomes (300 words) Was there an effect on student learning evidenced (how do you know..qualitatitive/quantitative evidence) Is there evidence of improved student learning outcomes?	
Evaluation What worked well in this project? What might you change next time? Students/Staff – what was effective	
Suggestions/comments	

Project Resources

Please include a sample of the documents and resources that were prepared as part of the project. For example:

- Worksheets
- Booklets
- Assessment documents
- Power-points
- ICT resources

Evidence Collected & Data Analysis

Please include a sample of the data you collected during the entirety of the project. For example:

- Initial data such as RAP analysis or NAPLAN
- Student markbooks
- Excel spreadsheets
- Qualitative student surveys

Appendix C: Learning and Research teams Area of Focus Plan Example

KNOX GRAMMAR SCHOOL	**Economics**
AREA OF FOCUS What topic, issue or concern related to student learning do we want to address?	**Priority** ● Design a series of formative assessments to be used for course segments that are tested and marked, comparisons made b/w classes, feedback provided to students to help identify issues
How do we know that it is an issue, i.e.: what data do we have to indicate that it is an issue for student learning? (see attached Sources of Data sheet)	**Sources of Data** ● RAP analysis: M/c questions on eco policy, BOP, Multiplier & cash rate below state average. ● Last four Years have seen an average diff of 3.5 v State. In 2010/11 we had 7.36 diff.
STUDENT LEARNING OUTCOMES AND BENEFITS What specific, syllabus based student learning outcomes are we seeking to address?	**Syllabus links** H1 – economic terms, concepts and relationships H 10 – communicates economic information, ideas & issues in appropriate forms H11 Applies mathematical concepts in appropriate contexts
What teaching and learning benefits do we want to achieve?	**Teaching and Learning Benefits** ● Improvement in the students' ability to respond to a range of multiple choice and short answer questions, particularly those involving mathematics and linkages ● Increased awareness amongst staff of ongoing student understanding and opportunities for intervention where required
COLLABORATION Which team members will collaborate on this project?	List of team members…(up to 5 people) MR, VC, NP
Areas of responsibility and timeline	Session 1 and 2: decide on goals and begin to formulate formative assessments for Term 4 Session 3: undertake PD in formative assessment workshop

	Session 4: continue to create formative tasks Session 5: Prepare spreadsheets to allow comparison of mean & SD amongst the classes. Prepare short answer homework questions to be implemented in an ongoing cycle. Session 6: Interpretation of the data. What does it tell us? How has it informed our teaching? Who is struggling/achieving? What changes would we make?

Appendix D: Professional Development Plan Template

PLAN – Performance and Development Plan (PDP)

Knox Senior School Performance & Development Plan

KNOX GRAMMAR SCHOOL

TEACHER'S DETAILS	SUPERVISOR'S DETAILS	ANNUAL PERFORMANCE AND DEVELOPMENT CYCLE	
NAME	NAME	FROM	TO
NSW TES STATUS	**SUBJECT/S TAUGHT**		

Professional Goals – Record at least three linked to the current student data, professional learning focus for the semester and the NESA Teaching and Educational Standards (Must include Standard 6 and at least one descriptor from Standards 1, 2, 3, 4, 5 and 7.)

1	
2	
3	
4	
5	

Professional Learning – Record the activities and resources needed to support the achievement of your professional goals both internally in the Learning & Research teams and externally. (100 words maximum)

Evidence – Record the types of evidence to be used to indicate progress towards achieving professional goals. (100 words maximum and no more than three pieces of evidence)

The teacher and supervisor are to sign below to indicate that the PDP has been sighted and the original has been retained by teacher and uploaded to the teacher's Y-Drive Professional Learning Folder.

Teacher signature	Supervisor signature
Date	Date

IMPLEMENT

The performance and development cycle is a dynamic process characterised by ongoing feedback, reflection and refinement. Record any adjustments made to the PDP to meet your professional learning needs. (100 words maximum)

REVIEW

Self-Assessment

A self-assessment is to be conducted by teachers, executives and principals mid-way through the annual performance and development cycle. It provides for reflection on teaching practice, assessment of progress towards achieving professional goals, evaluation of professional learning, and for the PDP to be refined and adjusted if necessary. (200 words maximum)

The teacher and supervisor are to sign below to indicate that the self-assessment has been sighted and the original has been retained by teacher, executive or principal.

Teacher signature	Supervisor signature
Date	Date

Optional comment for Teacher or Supervisor

Annual Review

At the end of the annual performance and development cycle, teachers participate in a structured discussion with their supervisor to facilitate a review on progress towards achieving professional goals. This will include an agreed written assessment, informing the next performance and development cycle. (200 words maximum)

The teacher and supervisor are to sign below to indicate that the Annual Review has been sighted and the original has been retained by teacher and uploaded to the teacher's Y-Drive Professional Learning Folder.

Teacher signature	HOD or AHOD signature
Date	Date

Appendix E: Humanities, STEM and Arts – Research & Learning Teams' Targets Semester II, 2016

Department/Team	Learning & research team's areas of focus	Data driving project	Targeted outcome/s
Prep Year 4 Team	*Spelling Mastery and narrative writing:* Implementing a spelling mastery program and focusing on narrative writing Year 4 students.	Quantitative data: NAPLAN data and class spelling tests, formative and summative narrative writing tasks	Improved performance in spelling and narrative writing of Year 4 students.
Economics	*Formative assessment*: Using past HSC questions on specific topics to formatively asses students and compare to previous school v state means.	Quantitative data: RAP analysis of M/c questions on eco policy, BOP, Multiplier & cash rate below state average. For example: average in Multiplier questions last 5 Years = .75, .89, .56, .68, .43.	Improved performance in multiple choice and short answer questions based on the Economic Issues topic
Commerce/Legal	*Differentiation*: Differentiating instruction for the writing of extended responses and instructing teaching methods and creating diverse resources to capitalise on diverse student ability.	**Legal Studies**: Quantitative data: Range of results from AT2 indicating range of ability for extended responses + RAP data for extended responses for HSC 2013-2015 **Commerce**: Quantitative data: Pushing up middle to low end (Semester 1 data for Year 10 AT1 combined with formative T4)	Improved extended response writing across the entire cohort of students catering for the full range of abilities
Business Studies	*Short answer questions*: Structure, sentence structure,	Quantitative data: Short Answer: 2015 - 28.8, 2014 - 28, 2013 -	Improved ability to respond to short

	techniques and content.	31.78, 2012 - 29.15. This compares to essay averages over last two Years of 30.4 & 29.	answer questions in Stage 6
Geography	*Year 7 & Year 9 programming*: Explicit literacy and directive verb instruction using workbooks.	Quantitative analysis: NAPLAN data indicating writing is the most problematic area for Stage 4/5 students.	Enhanced literacy skills of students and improved ability to write Geographical responses
History	*Source Analysis*: Techniques and skills for Modern and Ancient History (looking to develop a 7-12 faculty wide strategy).	Quantitative analysis: RAP Data: Source question average: 18.15 - other essays averaged 18.4. 2014 source average: 17.6 others essays 18.6.	Improved outcomes in source analysis responses for Stage 6
History (side project)	*Content warehousing:* Creating an online space to enable students to access source materials, past papers, exemplars, readings etc…	Quantitative data: Data as above – also based on feedback (feed up) work of Timperley and Hattie (students understanding criteria and quality examples)	Improved outcomes in source analysis and other responses for Stage 6
WLF	*Conceptual programming:* Using this programming technique to build deep knowledge, empathy and literacy skills	Qualitative and quantitative data: Deeper engagement with ethics and society needed & NAPLAN & Allwell data indicating lower writing results than numeracy. Student perception surveys to generate quantitative and qualitative data.	Updated programs that enhance spirituality, ethics and literacy of students.
PDHPE	*Improving student responses to written questions:* Specific targeted teaching of action verb responses	Quantitative data: Analysis of past assessment tasks and NAPLAN and Allwell literacy data.	Improvement in student responses to written questions. Assessment tasks rewritten to specifically identify areas requiring intervention for

			student growth. Individual delivery of a remediation package to each student based on identified weaknesses.
Design and Technology	*Improving responses to written algorithm questions in IST/SDD:* Leading to the development of targeted teaching resources along with formative feedback.	Quantitative data: Analysis of past assessment results and HSC RAP analysis of previous HSC results.	Improvement in KGS performance in algorithm questions in comparison to State average in future HSC examinations.
	Using Topic Case Studies to improve understanding and extended higher order responses: By expending student vocabulary through the research and collection of relevant content examples.	Quantitative data: Analysis of past assessment task results in extended responses Stage 4.	Students are able to link the relevance of real world case studies and draw on these examples to improve extended written responses.
Agriculture	*Using formative feedback to improve extended response questions:* Targeting teaching of the use of formative feedback to further improve extended responses.	Quantitative data: Analysis of past assessment task results and HSC RAP data.	Students will more actively engage in the formative feedback provided by teachers prior to undertaking written examinations.
Mathematics	*Improving student responses to Multiple Choice questions:* Explicit targeted teaching strategies will be developed to assist student engagement in answering multiple choice questions.	Quantitative data: Analysis of past HSC RAP data. KGS mark books for past examinations 2014/2015 HSC KGS Trial examination	Improvement in HSC responses to Multiple Choice questions. Improvement in student vocabulary, formative peer and teacher feedback. Understanding of HSC question setting guidelines.

	Improving competency in Extension 1 topics of weakness: Specific topics including inequalities with the pronumeral in the denominator and auxiliary angle method will be addressed	Quantitative data: RAP data identification from past examinations and KGS assessment data.	Raise the level of understanding of all Ext 1 students, aiming for no E2 grades in 2016 HSC. Provide a sound foundation to access marks on the more difficult HSC examination questions.
	Lifting the performance of Stage 6 mathematics: by providing a structured approach to the required working for mathematical success.	Quantitative and qualitative data: Analysis of Allwell and NAPLAN data, and teacher anecdotal evidence.	Increased performance in examinations based on clearly identified guidelines for answering mathematical problems.
	Improving student responses to "prove" and "show" questions: Through the implementation of a structured program including the identification of questions, explicit teaching of the techniques and explanation of the solutions and marking guidelines	Quantitative data: Stage 6 RAP analysis and Stage 4/5 assessment data	Increased performance in the targeted question style in assessment task and external examinations.
Science	*Increasing practical methodology*: Including written component and subsequent application to scientific method questions in examinations	Quantitative data: HSC RAP data and KGS assessment results.	Targeted teaching and the implementation of KGS Knowledge and Skills manual. Improvement in HSC Physics and Chemistry results and Year 11 practical skills.
	Increasing scientific literacy in Stage 4/5: Through the	Quantitative data: Year 9 SRP data	Stage 5/6 improvement in stimulus questions

	implementation of targeting teaching, differentiated teaching using specifically designed worksheets. Skills to be targeted include graph analysis, identifying trends, outliers, extrapolation and limitations of practical models.		requiring analysis and the application scientific literacy skills.
	Improving graphing and scientific skills in Stage 6: Through targeted teaching strategies using Practical skill questions from unseen practical lessons.	Quantitative data: Year 11/12 Practical assessment results and RAP analysis of Year 12 physics results	Improved responses to specific questions requiring the construction of graphs, application of gradient and analysis of algebraic models of practicals.
Language and Cultures	*Short answer questions:* Improving skill development in the Reading and Responding (Part B) section of the HSC Written paper though explicit teaching strategies and backwards mapping.	Quantitative data: HSC RAP data and Stage 5 assessment data.	Improved achievement levels in Reading and Responding (Part B) section of the HSC Written paper in language courses.
	Differentiation: Development of resources and teaching strategies in Stage 4 language courses.	Quantitative and qualitative data: Assessment data, NAPLAN and analysis of student elective numbers in junior language courses. Student perception surveys.	Evidence of improved results in Stage 4 and 5 assessment data and increased enrolments in elective language courses.
Visual Arts	*Formative assessment:* Design a series of formative assessment tasks to strengthen student writing and	Quantitative data: NAPLAN and assessment data from 2015 and 2016 markbook.	Evidence of improved skill development in Art history writing and literacy skills in Year 8 cohort.

	literacy skills in the Year 8 course.		
English	*Imaginative writing:* Explicit teaching of strategies and development of teaching resources for Year 12 to strengthen quality of extended responses in narrative writing.	Quantitative data: HSC RAP and assessment data	Improved performance of student writing in HSC writing task.
	Analytical and essay writing: Design and development of scaffolds, resources and teaching strategies for effective essay writing skills across Stage 4 -6 of English curriculum.	Quantitative data: HSC RAP data and assessment data	Evidence of high levels of achievement in student essays and design of a Stage 4-6 essay writing continuum.
	Improved writing through reading: Development of resources and literacy strategies for Year 8 cohort.	Quantitative data: Allwell, NAPLAN, assessment data and library data and student borrowing rates.	Evidence of student growth in writing for extended written responses.
	Targeted literacy and skill development: Development of teaching resources and explicit teaching of literacy strategies for Year 8 cohort.	Quantitative data: NAPLAN, Allwell and school assessment. Need to target audience engagement for narrative writing.	Evidence of improved structure and control of language and audience engagement in Year 8 narratives for Gothic fiction unit.
Music	*Differentiation:* Targeting the development of explicit teaching strategies in Stage 4 and 5 music curriculum as a means of extending gifted musicians.	Quantitative data: Assessment data, analysis of student elective numbers in junior and senior music courses, student participation rates in AMEB and co-curricular music programs.	Improved results in course performance at Stage 4, 5 and HSC courses - especially for high potential learners. Evidence of increased enrolments in elective music courses, again

			especially from high potential learners
Drama	*Essay writing skills:* Enhancing the quality and structure of student essay writing through use of visual stimulus.	Quantitative data: HSC RAP and assessment data	Evidence of improvement in quality of Drama essays for written component of HSC drama examination (Weighting 40%).
Library	*Creating effective reading cultures:* Develop and implement successful initiatives to improve student reading and literacy skills with Year 7 students.	Quantitative data: NAPLAN Reading data and student borrowing rates from library data	Evidence of increased library borrowing rates with current Year 7 cohort as a tool to develop literacy and reading skills.

Appendix F: Humanities, STEM and Arts – Research & Learning Teams' Targets Semester I, 2017

Department	Area of Focus	Data driving project	Targeted outcome
Finance & Legal - Economics	Formative assessment: practice essay questions under timed conditions marked Faculty wide. Including feedback, peer review and exemplars.	RAP analysis: Essay questions have traditionally been one of the best performed responses in comparison with State average but are still lower on average when compared to other sections of the HSC exam. Student surveys indicate a desire for formative assessment. Decreased average in policy essays relative to other types of essay.	Improved performance in essay questions in economic policy and global economy topics.
Finance & Legal – Business Studies	Formative assessment: practice questions, some under timed conditions. Mastery approach – high volume of questions separated by sub topic Including feedback, peer review and exemplars.	RAP analysis: Essay questions have traditionally been lower on average when compared to other sections of the HSC exam. Further focus on short answer questions with a 4 – 6 mark value which yield typically lower averages for Knox students.	Improved ability to respond to short answer style questions worth 4 – 6 marks and extended response style questions as well.
Finance & Legal – Legal Studies	Objective questions: building knowledge of the way in which objective questions are set and assessed in addition to drill and practice and peer	Rap Analysis: Data indicates lower performance of students in multiple choice section of the exam over past few Years.	Improved results in multiple choice style questions in Year 11 and 12.

	marking and explanation.		
History – Essential Literacy Program	Literacy and writing: building history based literacy skills from Year 7-12 through targeted skills assistance for all assessment tasks	NAPLAN Data: over 30% of students achieving below Band 8 in writing at Year 9. Students indicate that extended forms of writing are the most difficult.	Increased historical literacy and gradual gains in writing across the subject. Perhaps evidenced in average marks across Year groups and at HSC.
History – Source Analysis	Source Analysis: building history based source analysis skills from Year 7-12.	Rap analysis: the source analysis sections of both History exams are typically the weakest or one of the weaker areas. Difference to State is often lower than other sections.	Increased difference to State means and overall increase in mean for this section of the exam.
History – Year 7 differentiation	Differentiation: targeting support classes with differentiated tasks and activities to improve access of weaker students to the course	NAPLAN and Allwell Data: A range of students achieving low scores on NAPLAN and Allwell are placed in three support classes in History. Their teachers are working on a project with Learning Enhancement to differentiate material, target literacy and improve outcomes.	Gains in writing and knowledge measured pre and post assessment. NAPLAN improvement measured in Year 7 and again in Year 9.
Geography – Short answer & extended response writing	• Question deconstruction • Effective application of directive term • Depth of content knowledge • Provision of	Rap analysis: evidence bears out that these sections have lower averages and differences to State than other section of the HSC. Student surveys also indicate need for more	HSC results and improvement in both areas of the exam.

	relevant examples and data • Ability to write a cohesive response • In-class formative tasks under exam conditions	scaffolding and practice in these areas.	
Geography – Year 7 Differentiation	Differentiation: targeting support classes with differentiated tasks and activities to improve access of weaker students to the course	NAPLAN and Allwell Data: A range of students achieving low scores on NAPLAN and Allwell are placed in support classes in Geography. Their teachers are working on a project with Learning Enhancement to differentiate material, target literacy and improve outcomes.	Gains in writing and knowledge measured pre and post assessment. NAPLAN improvement measured in Year 7 and again in Year 9.
Geography – PQE teaching approach	Map and Graph Analysis: Year 9 focus PQE Analysis is a method used to analyse the spatial distribution of geographical phenomena. The analysis revolves around the identification of the Pattern; to then Quantify the pattern with examples and/or data and then to provide Exceptions to the general pattern.	RAP Analysis: The short answer section of the HSC required map and graph interpretation and presents problems for students each Year. Anecdotal staff evidence suggests that these skills are an ongoing source of difficulty for students. This method attempts to provide a scaffold and build ability in this area.	Improved results in Year 9 testing using this method. In the long term, enhanced results in the HSC where students interpret maps and graphs.
WLF – mindfulness and literacy	Improving mindfulness: WLF seeks to promote	NAPLAN Data: over 30% of students	Improved self - awareness, efficacy,

	greater self-awareness and spirituality within students. Increased opportunities to create this state of mindfulness will be created during the Year across the Year groups. As part of this, student literacy opportunities will be provided to enhance writing skills.	achieving below Band 8 in writing at Year 9. Students indicate that extended forms of writing are the most difficult.	mindfulness and literacy of students.

Appendix G: Example of Inter-disciplinary workshops by Knox Teachers

	Week 6 Professional Learning Workshops 26/8/2016
Below is a list of the Professional Learning sessions in Week 6. These workshops have been designed to meet the needs indicated by the teams on the Research and Learning Proformas completed in Week 4.	
Literacy Skills	
Short answer skills	The BOSTES Results Analysis Package highlights that questions with a mark range of 4-8 is an area that our students can do much better in. In this workshop we will look at some of the RAP data across a range of subjects and discuss strategies that we can use to improve the writing in these types of responses.
	This session will look at how to craft and develop quality short answer questions and create reliable and valid marking guidelines. Additionally, it will examine the skills needed by students in order to respond effectively to short answer questions.
	Writing short answer responses in the Social Sciences. Some analysis and strategies to improve student outcomes.
Imaginative writing	This workshop will provide students with a range of creative writing strategies for Stage 6 English.
Scientific Literacy	Scientific literacy and graphing skills: A discussion forum of the essential scientific literacy skills required by students at Knox Grammar School.
Creating a personal writing profile for each student	This workshop will demonstrate how to break down assessments and then use data from the results to create individual writing goals for students.
Comprehension /communication	Reading for understanding and helping students to communicate effectively.

Source Analysis	This workshop will provide insight into developing student skills in Source Analysis specifically for History across Year 7-12.
Pedagogy	
Differentiation	Differentiating instruction for writing extended responses. The provision of teaching resources to assist with peer feedback and student approach to multiple choice questions.
Differentiation	Techniques for differentiating student activities in subjects with vastly differing levels of student prior understanding will be explored.
Technology	
Pre and Post Testing	Using technology to pre and post-test. Demonstrations of i.e. Quia, Kahoot and Edmodo will be given to aid the creation engaging, self-marking, pre and post multiple choice questions.
Please contact a member of the Professional Learning team if you would like to present a workshop in Week 6 that is not currently listed.	

Acknowledgement

We wish to thank the AISNSW for their financial support of this project. The support has made a phenomenal difference to the way we approach professional learning and to the learning outcomes of our students. The work of Tiffany Loos, Lesley Wright and Le Tran is also acknowledged. Their ongoing support and the quality workshops they provided enabled us to have a clear understanding of where we were going.

Furthermore, we would like to our critical friends Linda Darling-Hammond, Geoff Masters and John Fischetti for the provision of insightful literature, the sage advice and for being so inspirational.

Finally, a special thank you to the School Council, the Headmaster, the senior management team and the teaching staff at Knox Grammar School and Knox Preparatory School. Their faith and trust in our new approach to professional learning and their willingness to embrace the collaborative processes of the Learning and Research teams are valued.

Copyright