Developing a Growth Learning Data Mindset: A Secondary School Approach to Creating a Culture of Data Driven Improvement

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Abstract

While Learning Analytics (LA) have gained momentum in higher education, there are still few examples of application in the school sector. Even fewer cases are reported of systematic, organizational adoption to drive the support of student learning trajectories that includes teachers, pastoral leaders, and academic managers. This paper presents one such case — at the intersection of praxis, governance, and evaluation — from a practitioner perspective. The paper describes the added value of data-driven approaches to create a culture of improvement in students and teachers in a comprehensive coeducational independent day school in Sydney. Evaluating the work done over the past five years to develop LA dashboards, the authors reflect on the process, the inspirations coming from theory, and the impact of the dashboards in the secondary school context. The data presented is not experimental in nature but supplies tangible evidence for the systematic evaluation scaffolded using the SHEILA policy framework. The main contribution of the paper is a practical demonstration of how managers in a secondary school drew from existing literature and observed data to 1) reflect on the adoption of LA in schools and 2) connect the dots between theory and practice to support teachers grappling with the trajectories of student learning and development, thus encouraging students to self-regulate their learning.

Notes for Research

- Practice informed by solid theoretical principles is crucial in driving the agenda; practitioners do not have the time/resources to reflect on theory.

- Focusing on good visualization and design based on feedback has been very effective in better supporting all stakeholders and empowering them in their jobs.

- Systematic adoption requires a top-down vision as well as buy-in from stakeholders; the SHEILA framework is useful in explicitly articulating issues and actions and reflecting on the adoption/development process.

- Collaboration and reflection on processes are essential in making theory accessible to practitioners and using ideas to foster improvement.

- The involvement of stakeholders is essential in designing dashboards and developing effective processes to support student goal setting and self-regulation.

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1. Introduction

It is broadly acknowledged that improving educational outcomes is critical to economic and social growth and that education is facing increasing challenges at every level and in every nation, especially in the light of systemic changes brought about by the COVID-19 pandemic. In the Australian context, Goss and Hunter (2015) point out that the best schools "are those that enable their students to make the greatest progress in learning. […] Despite heroic efforts by many teachers, our most advanced

students are not adequately stretched while our least advanced are not properly supported. Many fall further behind over time" (p. 1). In the most recent review on how Australian schools can achieve educational excellence (Department of Education and Training, 2018), the review panel led by Gonski — echoing the US Department of Education report (Bienkowski et al., 2012) and the 2017 Horizon K–12 report (Freeman et al., 2017) — identified that good data about their progress through the curriculum is a prerequisite to providing better insights into student learning growth. Such data includes student assessment and performance data, but also richer student profiles and data sources describing learning as it occurs (termed learning analytics) and detailed information about the learning and teaching activities, the learning design, and the context for learning (metadata about learning). These offer rich opportunities to better understand the learning processes, predict learner outcomes, inform initiatives or curricular adaptations to improve teaching, or identify new pathways or strategies to improve student success (Freeman et al., 2017; Hattie, 2009; Hattie & Yates, 2014; Lodge et al., 2019).

Although in most countries teacher development frameworks explicitly include components of continuous development, reflection, and lifelong learning (OECD 2030), teachers and school leaders rarely step out of their context to integrate the latest research findings into their teaching practice. This results in a gap between scholarship about learning and teaching and its practice (Boyer, 1990), which can be exemplified in Bass's (1999) words: "In scholarship and research, having a 'problem' is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one's teaching, a 'problem' is something you don't want to have, and if you have one, you probably want to fix it. Asking a colleague about a problem in his or her research is an invitation; asking about a problem in one's teaching would probably seem like an accusation" (p. 1).

Hattie provided an excellent example of a researcher coming to the aid of practitioners, and his popular metanalysis on what impacts student learning has systematically organized research so that teachers can reflect on how evidence of impactful strategies could be applied in the classroom. However, as observed by Donoghue and Horvath (2016), there are nuances in the translation from research to praxis; the validation of how and whether a particular intervention is affecting educational practice remains to be tested.

The field of Learning Analytics (LA) positions itself at the intersection of "big data," educational data mining, learning sciences, and educational design (often going hand in hand with learning technologies, affording tracking of student activities) and has matured enough to begin to show impact, but there are several challenges to implementation (Knight et al., 2020). Because data in itself does not automatically provide insights, as observed by Merceron and colleagues (2015), understanding the range of applications and the evolution of the field from a theoretical perspective is important to contextualize problems, evaluate solutions, and move towards meaningful data. This is crucial when choosing appropriate measures to use and report on and when evaluating concepts such as engagement or time-on-task. Further, there is a common notion that LA needs to be grounded in pedagogy. Suthers and Verbert (2013) labelled LA the "*middle space*" since it lies at the intersection between technology and pedagogy. There is, however, a strong emphasis on the analytics rather than on the learning. Focusing on a learner-centred approach, it has been suggested that LA dashboards could be used as powerful learning tools for students, helping them to reason about the effort invested in the learning activities and outcomes (Charleer et al., 2014; Jivet et al., 2017; Matcha et al., 2020; Suthers & Verbert, 2013).

More specifically, LA dashboards enable a process model, moving from awareness, to reflection, to sensemaking, to impact (Suthers & Verbert, 2013), which can support self-regulatory processes. Jivet et al. (2017) showed that few dashboards are grounded in learning science, which "might indicate that the development of dashboards is still driven by the need to leverage the learning data available, rather than a clear pedagogical focus on improving learning" (p. 91). This research showed that there is little support for goal setting and planning since almost none of the 95 dashboards examined allowed learners to manage self-set goals. Moreover, tracking one's own progress over time was also not a common feature. Many dashboards displayed comparative data of a student's performance with others, which tended to foster competition. The paper concluded that learning and education should be about mastering knowledge, acquiring skills, and developing competencies. For this purpose, comparison should be used carefully in the design of a learning dashboard.

This overview provides several hooks for the work presented in this paper. Data is pervasive in the school sector as much as in the business world; however, capturing, organizing, reporting, and using the appropriate data is not a straightforward process. It requires not just the right leadership and vision, but also the buy-in from both teachers and students, as well as their support staff, to successfully adopt a data-driven culture. It could certainly benefit from closer interaction between scholars and practitioners.

This paper, positioned at the intersection of praxis, governance, and evaluation, describes the added value of data-driven approaches to create a culture of improvement in students and teachers in a comprehensive coeducational independent Anglican day school in Sydney (SACS). It offers a practitioner perspective, articulated through the journey of the development of an LA dashboard. Similar to the presentation/analysis approach used in Vigentini et al. (2020), a retrospective, auto-ethnographic evaluation is used to systematically analyze LA adoption in the school. This leverages the SHEILA policy framework

(Supporting Higher Education to Integrate Learning Analytics) developed by Tsai et al. (2018), which provides a scaffold to gather data from stakeholders and organize it in stages. Several theoretical concepts are used in this process; others are used "post-hoc" as interpretational tools to contextualize the work in the broader fields of LA and educational improvement. Further, a critical appraisal and reflection from the authors' perspective is provided as a lens for the evaluation.

The paper is organized broadly into three parts: 1) a presentation of key theoretical concepts to contextualize the work; 2) a description of the journey leading to the development of LA dashboards, and 3) a reflective analysis based on the systematic evaluation of data collected from stakeholders, the adoption of the SHEILA framework, and anecdotal evidence collated by the authors.

2. Theoretical Drivers

Three key streams of research are the drivers behind the case presented: 1) self-regulatory processes in student learning; 2) motivation and goal setting; and 3) use of feedback as "visible learning" and goal statements. Before providing more detail about the theory, the SHEILA framework (Tsai et al., 2018) is briefly introduced since it provides the methodology and core evaluative material used to reflect on the process.

2.1. Understanding Adoption Through the SHEILA Framework

Adoption of LA has been widely discussed in the literature, with particular focus on the higher education sector (Dawson et al., 2018; Ferguson et al., 2014; Herodotou et al., 2020; Hilliger et al., 2020; Tsai et al., 2021) and more specifically on LA dashboards (Sahin & Ifenthaler, 2021). A well-accepted framework to better understand both policy and adoption is the SHEILA framework (Tsai et al., 2018). At the core of SHEILA is the ROMA model (Rapid Outcome Mapping Approach), initially suggested by Young and Mendizabel (2009). The ROMA model (Figure 1) begins by defining an overarching policy objective, followed by six steps designed to provide policy-makers with context-based information: 1) map political context, 2) identify key stakeholders, 3) identify desired behaviour changes, 4) develop engagement strategy, 5) analyze internal capacity to effect change, and 6) establish monitoring and learning frameworks.

The framework was primarily designed to help stakeholders on their journey towards the adoption of LA, with a comprehensive list of adoption actions, relevant challenges, and policy prompts. Tsai et al. grouped the action points, challenges, and policy questions by common themes — including capabilities, culture, ethics and privacy, evaluation, financial and human resources, infrastructure, internal and external support, management, methodology, purpose, and stakeholder engagement — that help to identify prevalent issues and the focus of action in each ROMA dimension. The framework has also been used retrospectively, however, as an approach to record and analyze the process of adoption at different points in time (Vigentini et al., 2020) and as a way to systematically step through the evaluation of LA adoption. By encouraging stakeholders to report and reflect on the key requirements at various stages, the framework helps to establish a meta-analytic tool to compare the adoption process at different institutions and a scaffold to reflect on implementation (the translation from theory to practise).

Figure 1: The SHEILA policy framework structure (reproduced from Tsai et al. 2018).

2.2. Self-Regulation and Learning

The literature on self-regulation in learning is very rich. Several models have been suggested that can be classified according to three broad theoretical lenses: socio-cognitive (Zimmerman, 1990), emotional regulation (Boekaerts, 1997), and information processing (Hadwin et al., 2018; Winne & Perry, 2000). The latter has seen a broad consensus, particularly in relation to computer-supported and adaptive learning. The key element across all models is the involvement of cognitive, meta-cognitive, and emotional (or motivational) components with a goal driving the interaction between components. Several works demonstrated the effectiveness of external interventions that put feedback at the centre and target student self-regulatory learning as a means of improving their development and thus their learning outcomes (Henderson et al., 2019; Panadero et al., 2016). According to research, feedback for self-regulation encourages self-monitoring, provides direction, and guides or regulates action (Hattie & Timperley, 2007); it was shown to be one of the highest effects impacting student learning (Hattie, 2009).

The purpose of feedback is to have students stop, reflect on their progress, and change their strategy in some way. Regarding adjusting goal intentions versus implementation intentions, however, Gollwitzer (1999) observed that people tend not to stick to their intentions. External tools — like a dashboard to enable learners to formulate simple plans — was therefore shown to help in furthering goal attainment (Gollwitzer, 1999). Coupled with *data nudges*, dashboards may enhance further learning and engagement. Nudge theory was popularized by Richard Thaler and Cass Sunstein (Thaler & Sunstein, 2009; Thaler, 2018). For example, a positive correlation was shown between encouraging email or SMS nudges, either aimed at vulnerable first-year university students based on predicted performance drawn from log data behaviour (Corrigan et al., 2015) or at specific student groups offering targeted help (Goh et al., 2012). In these cases, the nudges did not push students towards particular decisions, but subtly influenced decision-making processes. Successful examples of specific interventions expose data to students, elicit a reaction, or provide specific guidance (Arnold & Pistilli, 2012; Lim et al., 2019**b**; Pardo, 2018). These led to motivational changes or created calls to action (also termed "Personalized Learning Support Actions"; Pardo et al., 2018), which ultimately improved learning.

2.3. Motivation and Goal Setting

Goal setting is a central construct for motivation and self-regulation in personalized learning (Bray & McClaskey, 2015). It is well established that implicit theories of learning influence self-regulation (Dweck & Leggett, 1988), with strong evidence that an incremental theory of growth (i.e., a growth mindset) contributes to successful self-regulatory processes (Nussbaum & Dweck, 2008). When self-regulatory processes such as goal setting occur in supportive contexts that emphasize mastery rather than performance or competition, goal achievement is more likely to occur (Burnette et al., 2013). Small-scale qualitative studies have found that goal setting has positive effects on adolescent learners in middle-level settings, suggesting that academic goal setting may increase student engagement and achievement (Catlin et al., 1999). As well, a highly structured approach that includes personal, social, and academic goals may produce positive outcomes for at-risk students (Pincham, 2006). A case study of goal-setting processes embedded in a school-wide portfolio initiative in which students partnered in the assessment process was viewed positively by teachers and students (Cruz & Zambo, 2013).

2.4. Closing the Loop and Co-Design Principles

Applying an iterative design process can enable the designer to create a continuous feedback loop so that the development process can solve an authentic need (Preece et al., 2015). In the context of higher education, Dollinger and Lodge (2018) stressed the importance of continued stakeholder involvement in the creation of LA dashboards. This was also supported by Jivet and colleagues, proving that student involvement when making dashboard design decisions as sense making is intertwined with goal setting and self-regulation (Jivet et al., 2020). Further, in order to obtain early feedback from learners, prototypes, mock-ups, and technology immersion techniques (e.g., software simulations) can be used to give a feel of the functional and aesthetic aspects of the system being designed (Prieto-Alvarez et al., 2018). One approach to gathering stakeholder feedback for co-design is focus groups, which are effective for collecting ideas and popular opinions from learners. More flexible than surveys or scales, they allow for questions, clarifications, and follow-up questions to probe vague or unexpected responses (Krueger, 2014).

West et al. (2019) argued that successful development and leveraging of LA capability/capacity requires a combination of positional (relying on a formal position or role) and distributive leadership (drawing upon expertise and knowledge rather than position). Success, above all, requires a coherent, consistent whole-institution approach to overcome the many challenges, which include the following: 1) complexity of the learning experience; 2) coherence around accountability and role; 3) communication; 4) potential exclusion of teaching staff; and 5) potential exclusion of student voice. Strong and effective leadership has the potential to address these risks to varying degrees. Most importantly, however, applying LA in a meaningful way that is applicable in the classroom requires people with different types of expertise and knowledge to work together, which in turn is significantly aided by strong and effective leadership.

3. The Context, the Process, and the Methodology

This case focuses on work carried out over the past five years in a comprehensive coeducational independent Anglican day school of 1500 students in the heart of Sydney. St. Andrew's Cathedral School (SACS) is well known for its innovative approach to education. The school's vision not only drives the identity of staff and students, but aligns well with the principles and ambitions in the Gonski and Grattan reports mentioned earlier: "Our vision is to inspire students to be passionate, creative learners who engage with the message of Christ and fully develop their gifts and abilities in order to serve in the world."[1]

	Stakeholders	Key elements	Evaluation
2016	Deputy head and management team	Basic MS Excel dashboard with benchmarks	Technical goodness, informal conversations in leadership team
2017	Leaders (academic and pastoral) and teachers; external academics	Performance and behaviours; more details about the student	Technical goodness, informal conversations with teachers and coaches
2018	Coaches and students; external development	Students' characteristics and performance	Technical goodness, informal conversations with all stakeholders
2019	Coaches, teachers and students	Students' characteristics, performance, behaviours and goals	Formal conversations with leaders, teachers and coaches
2020	Coaches, teachers and students	Students' characteristics, performance, behaviours and goals	Formal surveys with leaders and students; formal conversations and training for teaching staff

Figure 2: An overview of the LA journey focusing on stakeholders
involved in the process, key aspects, and evaluation methods.

Figure 2 provides an overview of the case study with the focus of each phase and the approach for the evaluation used. The authors took an auto-ethnographic stance, describing the context and developments. The case is presented using a combination of 1) descriptive narratives reported by the Deputy Head of School, emerging from a systematic application of the SHEILA framework (Tsai et al., 2018); 2) formal data collected from students via surveys and conversations with staff with the aid of the external academic; and 3) anecdotal evidence collated from staff throughout the period, together with informal interactions with university academic staff and consultants with an interest in analytics, student motivation, and student learning. The university academic acted as sounding board/advisor throughout the process and provided an "observer" stance in helping to compile the evidence and write up the case.

The application of SHEILA used a similar approach to Vigentini et al. (2020), in which adoption in multiple institutions was observed at different times. In our case, two points in the adoption timeline were considered — the beginning of the process in 2016 and the current state in 2020 — thus providing a retrospective scaffold to identify key elements of the process and reflect on the effectiveness of the changes. The Deputy Head of School and the lead in learning analytics at SACS systematically mapped their reflections (see Appendix 1) and the action points required to move the LA project successfully into the future.

4. Beginning the Journey into LA with Dashboards

In 2016, the Deputy Head of School began a change process of data-driven school improvement, engaging stakeholders, data analytics development, resourcing, and policy development. At that stage, as in many other educational institutions, LA was an interest for the school, rather than a major priority (Arroway et al., 2016). While developments in LA platforms at the school

[1] https://www.sacs.nsw.edu.au/about-us/vision-mission/

improved analysis and expertise, the users (teachers and students) needed to develop basic data interpretation skills in order to change behaviour. Research has shown that this skill gap between needs and solutions is common in affecting organizational analytics capability (Norris & Baer, 2013; Siemens & Long, 2011).

The Deputy Head of School was motivated to answer the question, "What do we do when students fail?" It seemed to him that the curriculum was too full for teachers and heads of department to respond to student underachievement. Even if they could, it was often too late for the student to catch up. What was needed was a data system identifying lead indicators, rather than lag indicators, of student achievement, allowing for early intervention before students developed a pattern of underachievement. This was identified as a challenge in Dimension 1 (map the political process) of the SHEILA Framework (see Appendix).

The Deputy began working with a retired data systems analyst to develop a prototype dashboard system. This used Microsoft Excel Online to draw out academic data from the school administration systems with slicers to filter the data and conditional formatting to highlight changes to identify struggling students. Spark lines were introduced to show trends. Additional academic analytics showing performance and engagement were introduced to enhance the interpretations (Figure 1). As per SHEILA Framework Dimension 2 (identify key stakeholders), individuals and groups were considered and these initial dashboards were shared with *pastoral leaders,* who are responsible for the wellbeing, overall academic progress, and discipline of students. These include roles such as the Head of Senior College, Deputy Head of Senior College, Head of Middle School, Girls Coordinator, counsellors, Heads of Year, and Heads of House, all of whom were engaged to determine the usefulness of the emergent trends over time.

The pastoral leaders had, for the first time, the ability to observe and describe patterns: their feedback resulted in focusing particularly on metrics of behaviour and effort. Unsurprisingly, the data presented in the dashboard showed a strong correlation between effort, behaviour, and academic performance (see Figures 6 and 7). What was particularly revealing, however, was the consistency of patterns in every subject, in every year group, even when segmented by other factors such as gender and ability. While the initial focus was on the education provider for tracking and identifying necessary interventions, the strong correlation between a student's behaviour and their achievement became visible in the dashboard prototype (see Figure 6). This triggered further questions and prompted the Deputy Head of School to direct efforts towards building visualizations for students as well as teachers.

To build a dashboard for students, extensive consultation with student focus groups was required. This resulted in the data being simplified to Grade Point Averages (GPAs) for academic results and corresponding metrics for behaviour and effort. This approach particularly aligns with several examples in the literature (Jivet et al., 2020, 2017, 2018; Lim et al., 2019**a**; Sedrakyan et al., 2020), especially in the ways dashboards should be student focused in terms of setting and tracking goal achievement. Students should also be included in dashboard design to consider their goals and self-regulated learning skills and, in doing so, scaffold the development of data literacy skills. Additionally, only a handful of studies have explored student perspectives on their use of learning analytics (Gašević et al., 2015), yet differences in perception of LA among stakeholders can lead to distrust and unequal buy-in if concerns are not addressed (Tsai et al., 2018). An overview of the key elements, stakeholders, and evaluation methods is provided in Figure 2.

5. An Iterative Development Process: Towards a Data-Driven, Student-Centred Focus

The SHEILA Framework Dimension 3 (identify desired behaviour changes) relates strongly to the previous dimension of identifying key stakeholders. Not only did the introduction of LA require behaviour changes for teachers, but also for students. In so doing, it required changing the dynamics between teachers and students as well.

As Jerry Muller puts it in his book *Tyranny of Metrics*, "Not everything that can be counted counts, and not everything that counts can be counted" (Muller, 2018). Teachers can be quite skeptical about data since it can be seen as reductive. A student is much more than a sum of parts, and teachers value the social/emotional dimension of teaching as integral to a student's success. This is confirmed by Ali and colleagues who indicate that LA tools need to move from just identifying students at risk to providing pedagogically informed suggestions and plans (Ali et al., 2013; Macfadyen & Dawson, 2012).

It was important in these teacher and student behaviour changes to select a team of people who had great rapport with students. These highly relational people often distrusted the use of data. However, for the development of a data-driven culture in the school, relational people were needed to drive it. A key member of the academic executive was a strong advocate of Carol Dweck's (2012) research into the growth mindset. The school had been exploring the growth mindset since 2014 and had made it part of the language of the school. However, one executive member distrusted data, finding it confusing and threatening. She was invited in 2016 to visit another school to watch their data-based interviews with students. Students left these interviews with a plan of what they needed to do to reach their goals. The key relationship between behaviour and performance convinced her of the effectiveness of the student data driven interviews. The executive member had promoted

professional learning in Growth Coaching,[2] but now saw how this methodology could be extended to students as well by basing these conversations around data.

5.1. Iterations Over Dashboard Design

Since the beginning of the project, three elements have been present in the dashboards to provide hooks for the specific conversation between students and their coaches: 1) the performance and benchmarks (simple reference to data for the individual), 2) the "goal-setting" elements, showing which courses had a performance target set in the previous term and what has been achieved, and 3) the "personal characteristics" informed by the Flourishing scale data (Goodman et al., 2018). Additionally, Personalized Learning Plan templates were developed with student and teacher input for student interviews using the Growth Coaching method and the newly developed Excel student dashboards (Figure 3b).
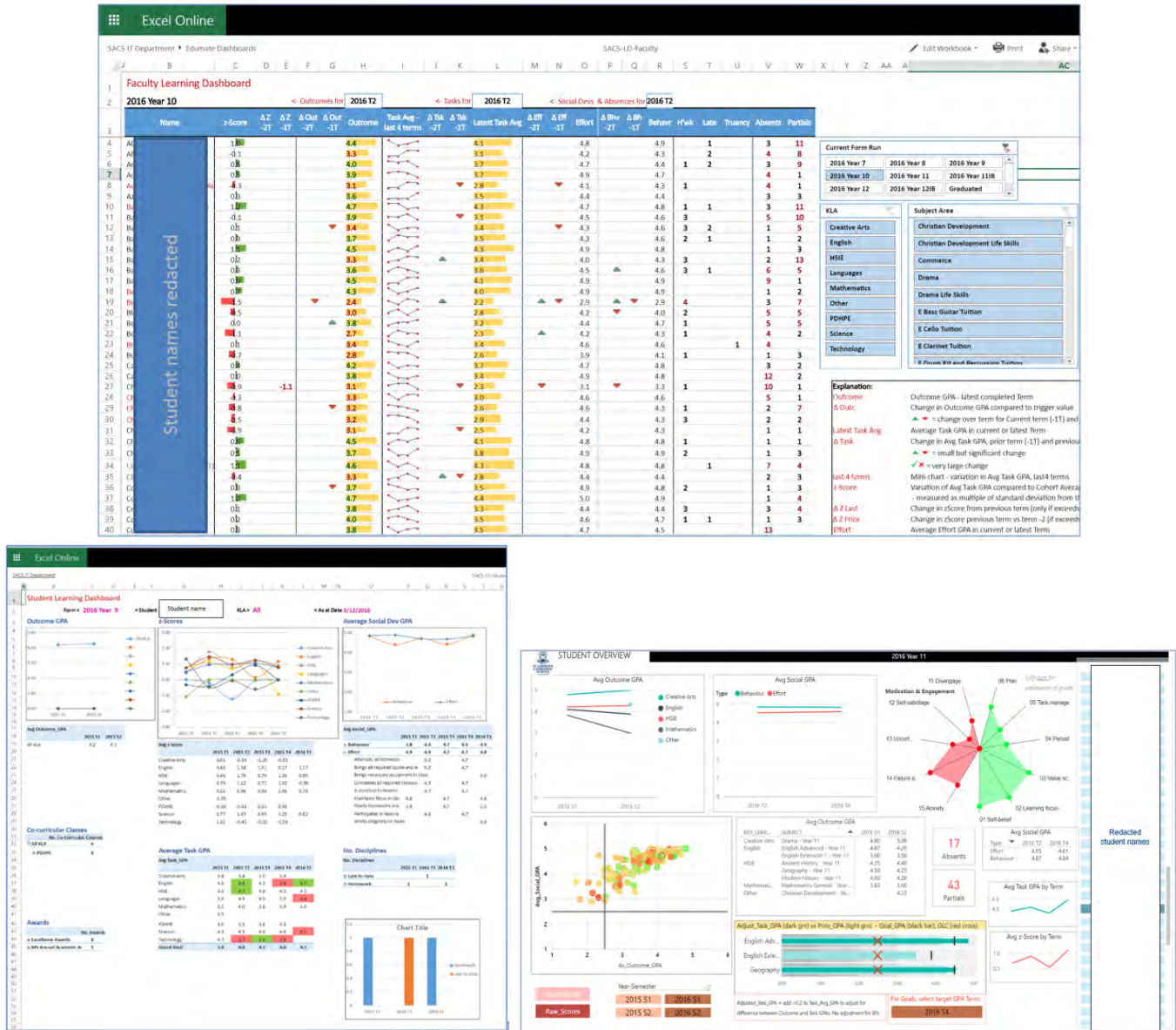
Figure 3: 2016 dashboard designs using Microsoft Excel Online; (a) the top panel shows the teacher view and the bottom panels show the student view. The bottom left (b) shows the overall view for a student's performance in different subjects and over time. The bottom right (c) is one of the first prototypes showing a combination of performance, goal setting against performance, and the personal development dimensions (spider chart) giving students an opportunity to reflect on personal characteristics.

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[2] https://www.growthcoaching.com.au/

Students completed a Microsoft Forms Survey and the data was then mail-merged into a Microsoft Word template (Figure 4). The Learning Support faculty were engaged to help trial the interviews. Before running the sessions themselves, the Learning Support teachers and aides observed the Deputy and executive member run dashboard coaching sessions with a Year 9 class to develop Personalized Learning Plans where students selected three subject goals from their dashboard to work on. The executive member then coached the students to work towards their goals. Almost every student showed greater improvement in their goal subjects than their non-goal subjects.
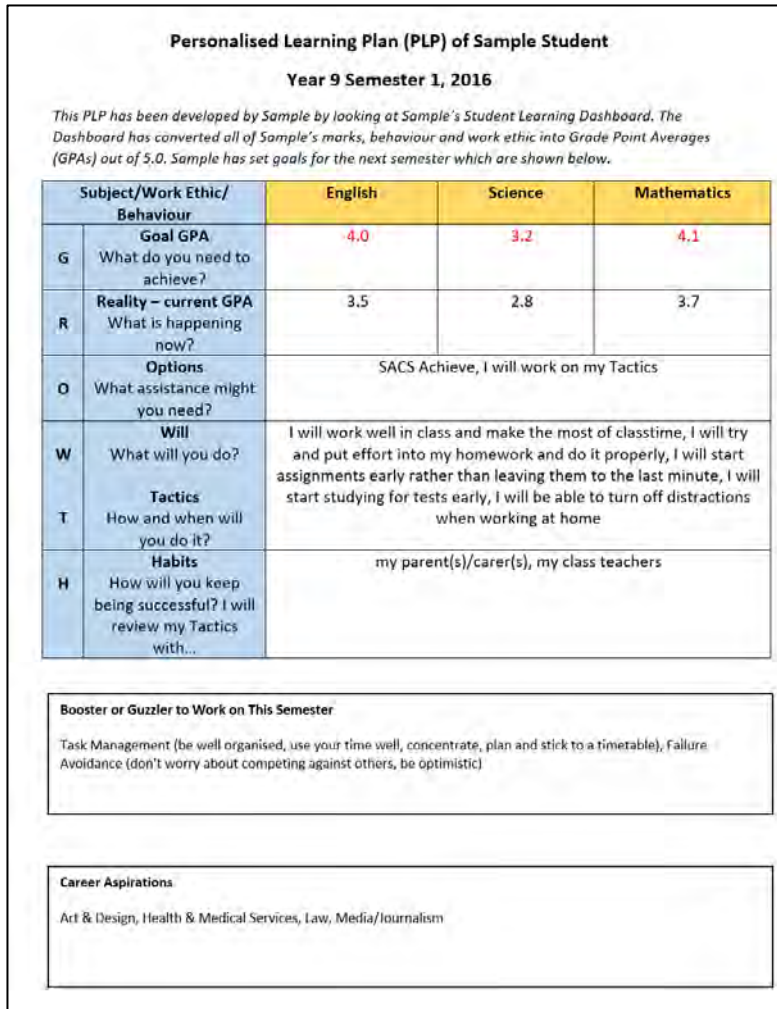
Personalised Learning Plan (PLP) of Sample Student

Year 9 Semester 1, 2016

This PLP has been developed by Sample by looking at Sample's Student Learning Dashboard. The Dashboard has converted all of Sample's marks, behaviour and work ethic into Grade Point Averages (GPAs) out of 5.0. Sample has set goals for the next semester which are shown below.

	Subject/Work Ethic/ Behaviour	English	Science	Mathematics
G	**Goal GPA** What do you need to achieve?	4.0	3.2	4.1
R	**Reality – current GPA** What is happening now?	3.5	2.8	3.7
O	**Options** What assistance might you need?	SACS Achieve, I will work on my Tactics		
W	**Will** What will you do?	I will work well in class and make the most of classtime, I will try and put effort into my homework and do it properly, I will start assignments early rather than leaving them to the last minute, I will start studying for tests early, I will be able to turn off distractions when working at home		
T	**Tactics** How and when will you do it?			
H	**Habits** How will you keep being successful? I will review my Tactics with...	my parent(s)/carer(s), my class teachers		

Booster or Guzzler to Work on This Semester

Task Management (be well organised, use your time well, concentrate, plan and stick to a timetable), Failure Avoidance (don't worry about competing against others, be optimistic)

Career Aspirations

Art & Design, Health & Medical Services, Law, Media/Journalism

Figure 4: Early 2016, student personalized learning plan produced using the Microsoft Word mail merge function.

5.2. Expanding the Trial and Focusing on Personal Development

The successful engagement of this group of students led to a wider trial with all of Year 11 in September 2016. Such expanding trials became part of an engagement strategy (see SHEILA framework Dimension 4). Feedback from the Year 9 trial group had resulted in further simplifying the student dashboard. Excel Online began to show its limitations so Microsoft Power BI, which allowed for advanced visuals and flexibility, was implemented. Even though the trial dashboard focused on personal bests, the students wanted to see their standing in the year. Additionally, the conversation with students that had the most impact was telling them that by changing their behaviour and their expectations, they could improve their performance. This reinforced the finding from Dweck's research on the growth mindset. A Motivation and Engagement Wheel from Martin (2010) was built into the dashboard using student survey data. This wheel was already part of the student pastoral program. The Personalized Learning Plan was renamed "Growth Learning Plan" to reflect the work on growth mindset and the Growth Coaching method used in the student data review meetings.

Over three days, all 170 Year 11 students were given *a growth coaching session* by learning support staff. Each student was then given a Growth Learning Plan naming three subject goals as well as strategies and supports to help achieve them. This was followed up regularly in pastoral classes by the students monitoring their engagement with their plans. The students'

goals were uploaded back into the student dashboards so they could check their progress. This embedding of academic goal setting and data within the pastoral program caused pastoral leaders and teachers to request involvement in future student data sessions. This occurred in February 2017, with all of Year 9 and Year 10 (approximately 340 students) having the same data coaching sessions. After three terms of engagement in this process, all groups (Years 9, 10 and 11) experienced a positive difference in their performance in goal subjects versus non-goal subjects.

Further development ensued, but a major change to the approach came in 2017 with a visiting deputy from England who had been part of the London Challenge. An initiative of the Blair government, the London Challenge used an evidence-based approach towards the most disadvantaged schools in London. Its focus was to raise academic achievement, create support and challenge through the development of expert leaders, and make strategic decisions when improvement was too slow. According to Ofsted (2010), the results were significant: the "London Challenge has continued to improve outcomes for pupils in London's primary and secondary schools at a faster rate than nationally. London's secondary schools continue to perform better than those in the rest of England." A culture of improvement based on collective teacher efficacy, student expectations, and staff expectations resulted in positive change for London schools. Its success between 2003 and 2008 was so remarkable, with several commissioned studies proving its impact, that the program was expanded to become the City Challenge. Unfortunately, with a change of government in 2011, the program was scrapped and an era of cost-cutting was introduced to English schools. The English deputy's visit in 2017, with her experience of the London Challenge, brought new insight into the dashboard development project.

In early 2017, the school also involved an academic working in LA as a critical friend, enabling the Deputy Head to reflect on the latest trends and bringing in theory-driven approaches and evaluation practices. This enabled the move to SHEILA framework Dimension 5 — analyze internal capacity to effect change.
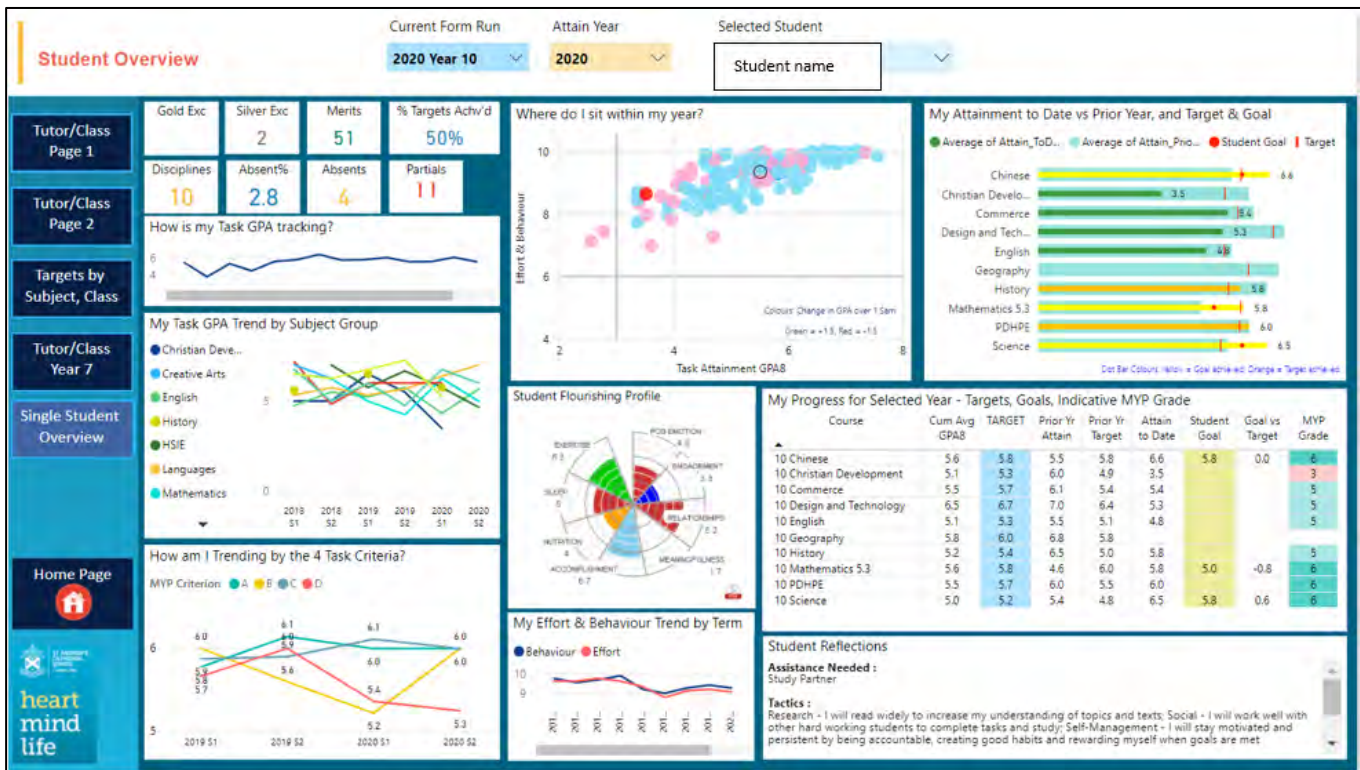

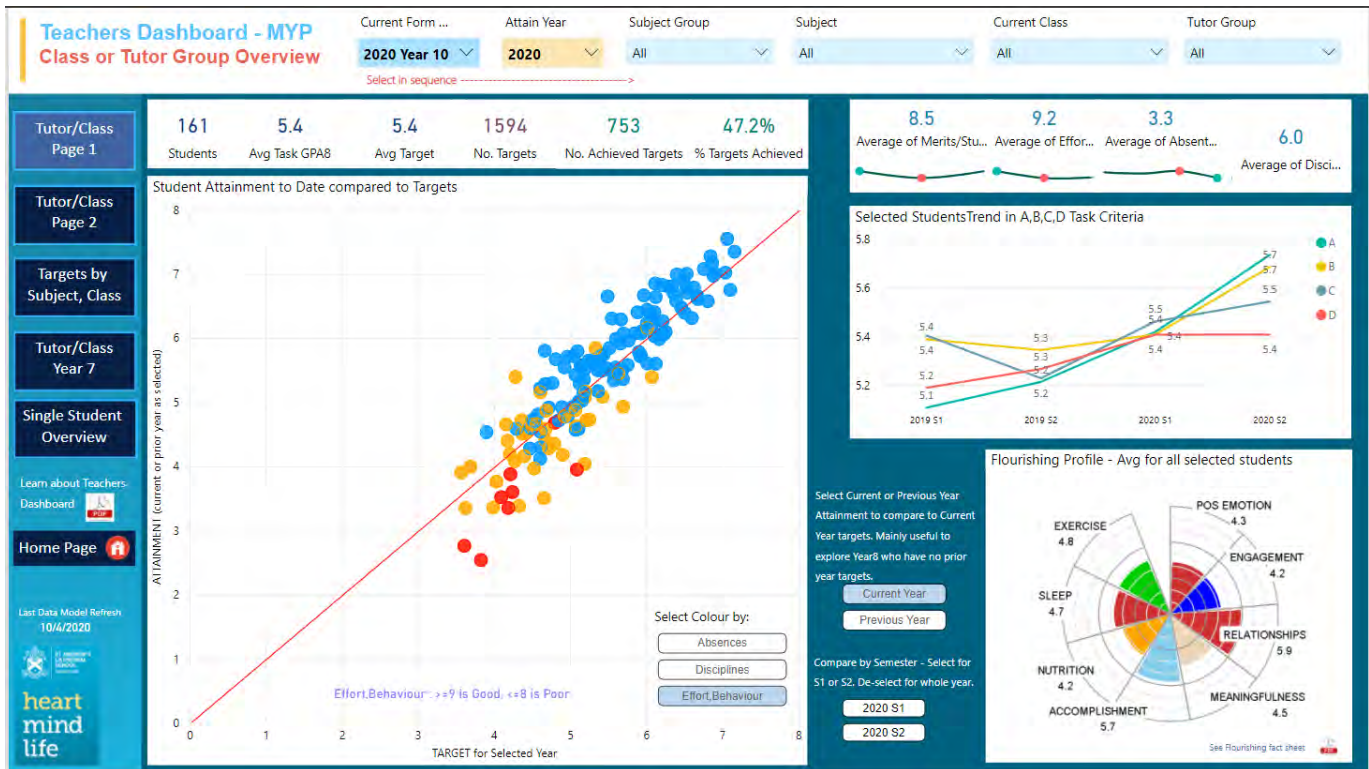**Figure 5:** 2020 student dashboard using Microsoft Power BI.

Figure 6: 2020 teacher academic dashboard using Microsoft Power BI.

5.3. Data-Informed Growth Learning Plans

In the analyze internal capacity to effect change phase, the focus on *Growth Learning Plans* was found to be good for students but limited for classroom teachers. Instead, what was required was to show teachers the students' potential. It was not goal setting that was important but target setting. Student targets for every subject were calculated based on analysis of past subject performance, NAPLAN, and standardized test performance and then displayed in the student and teacher dashboards. Predictive analytics were also introduced to dashboards for Year 11 and 12 HSC and IB Diploma students. The growth coaching sessions were widened to include all Year 8–12 students and most teaching staff. Students worked with their pastoral teachers to evaluate trends in performance, behaviour, effort, attendance, and wellbeing. They examined the system-developed targets and selected three subjects for which to set specific goals, strategies, and supports.

In late 2019, the project moved into SHEILA Framework Dimension 6 (establish monitoring and learning frameworks). The Growth Learning Plans were automated to embed in the student dashboard (called "Student Reflections") after the coaching session. The personalized dashboard was made readily accessible to students via the student portal. Pastoral programs focused more systematically on the student dashboards, giving students time to reflect upon and adjust their strategies. As part of the induction program, all new teachers were trained by Learning Coaches over a 10-week period to analyze their own teacher dashboards and to develop improvement sprints to help students meet their targets. Pastoral leaders used specific dashboards to track students at risk and put in place interventions (Figure 6). Further, a new Head of Learning Analytics position was created to support staff and oversee biannual LA reports submitted by school academic leaders (e.g., Heads of Department and Directors of Learning) and pastoral leaders (e.g., Heads of Year, Heads of House, and Heads of School Divisions) tied to their appraisal process. Dashboard nudges were introduced to communicate student achievement in reaching their targets and to alert staff of students showing poor achievement and behaviours (Figure 5). In 2020, the LA program was embedded into the school's new strategic plan, Teaching and Learning Model, and Learning Coaching Policy.

6. Analysis and Evaluation on the Dashboard Implementation and LA Adoption

The themes identified in the mapping exercise show the range of factors to consider in future LA policy development: purpose, methodology, stakeholder engagement, management, evaluation, and policy management. This mapping process shows how the SHEILA framework can be used to evaluate past and existing practices and refine strategic planning for LA. As Tsai et al. (2018) argue, "As identified in the literature, stakeholder engagement and buy-in has a direct impact on the scalability and sustainability of LA, which need to be supported by strategic planning, led by institutional leaders, and informed by

pedagogical knowledge possessed by teaching professionals" (p. 328). The policy framework provided a necessary evaluation of the school's LA change management and future direction for policy and training development. The SHEILA mapping exercise revealed that the school had come a long way in its implementation efforts of a complex change process that continued to grow in alignment, resourcing, and impact over the five years from 2016 to 2020.

6.1. Validating the Analysis Through Systematic Surveys and Individual Feedback

Throughout the period, staff and students were engaged to evaluate the relevance and impact of the dashboard through custom surveys. In September 2020, Year 8–12 students (N=225) were surveyed with three closed questions and two open-ended questions. The closed questions asked the following:

1. How many times have you looked at your dashboard this term, either by yourself or with your tutor?
2. Have you found the dashboards helpful for you to work towards your goals? (Yes, No, Maybe)
3. Has looking at the dashboard caused you to change your attitude/behaviour/tactics towards your schoolwork this year? (Yes, No, Maybe)

The open-ended questions were "Which graph do you find the most helpful on the dashboard?" and "Is there any part of the student dashboard that could be improved/changed?"

At the same time, eight academic leaders and seven pastoral leaders were asked two open-ended questions: "How has your use of the dashboards enhanced student outcomes (e.g., learning and/or behaviour)?" and "How has your use of the dashboards helped you in your role?"

6.1.1. The Student Perspective

Of the 265 Year 8–12 students surveyed, 57% had accessed their dashboard within the last two months one to three times and 37% more than three times. When asked whether looking at their dashboard was helpful for them in working towards their goals, 33% said yes and 40% said maybe. When asked whether the dashboards caused a change in behaviour and attitude towards their schoolwork, 32% said yes and 39% said maybe. Of the two open-ended questions, Table 1 shows the most common responses.

Table 1: What Students Said About the Dashboard

Which graph do you find the most helpful on the dashboard?	Is there any part of the dashboard that could be improved/changed?
• Seeing how Grade Point Average (GPA) is tracking in each subject over time (35%) • Seeing progress towards their targets and goals (9%) • Seeing how effort and behaviour is tracking (9%) • Seeing current merit tally (7%) • Comparing themselves in the cohort (3%)	• No (45%) • Making the layout clearer (5%) • Not sure (4%) • Making the wellbeing wheel easier to understand (3%) • Using grades rather than percentages in certain courses (1%)

6.1.2. The Views of Pastoral Leaders

The seven school pastoral leaders all said that the dashboards were helpful in their role and contributed to raising student wellbeing. They reported that the dashboards helped them "identify trends and patterns" and "create initiatives to improve student learning and behaviour." The dashboards "enable the pastoral leader to not only monitor but encourage students." Reflecting on the functions, pastoral leaders observed that dashboards have been a "valuable tool in identifying students at risk" and the data has been "useful during student meetings to understand negative behaviour patterns," allowing students to "take responsibility in their learning."

The process of data-driven conversations with parents and students "can be applied for all the key welfare issues seeking to benefit the student to not only reduce the statistics against them but to develop/learn behaviours to assist them." The dashboards enable the pastoral leader to "have more polished conversations. The pastoral leader is equipped with information, helpful statistics and student history to bring forth to students when discussing welfare issues." The use of analytics in practice has "helpfully shift[ed] my role to be less reactionary and to be more proactive and preventive in practice."

As possible improvements, staff observed that it would be useful to show in the dashboard a view of "wellbeing progress over the years" on both the student and pastoral leader dashboards, but also noted that a simpler (more focused) view of the dashboard could help learning coaches work with teachers who may have "data anxiety."

Figure 7: 2020 pastoral leaders dashboard using Microsoft Power BI; the focus is on the ability to identify students diverging from expectations by enabling filtering and data selection to make discrepancies obvious.

6.1.3. The Views of Academic Leaders

The eight school academic leaders reported that the dashboards helped them in their roles and helped improve student academic outcomes: "the student data dashboard has enhanced the way in which students reflect on their level of achievement and plan for their future study" enabling "students to see their predicted results and have conversations to improve." Presenting the dashboards at parent–teacher evenings "allows the parents to capture their child's strengths but to also narrow down specific techniques for individual subjects." For educators, the dashboards have helped "target specific students and provide specific strategies to grow them academically, improving their results." Differentiation can be planned by analyzing a class dashboard "to identify clusters of students that I can group together to learn." As a faculty leader, dashboards are used "to work with teachers to set goals based on underperforming students and identifying strategies to enhance academic achievement, identify which classes are working below average, and work with the teacher to develop their pedagogical strategies." For learning support staff, the dashboards enable them "to identify students who have not yet been identified as having a learning difficulty and are experiencing difficulties. This often means the difference between the need for short-term intervention compared to long-term intervention." For learning coaches, "The dashboard is used to identify underperforming students or students who are most likely to improve from high impact pedagogy." As areas for improvement, staff noted that "joint ownership of data responsibility" and "more regular and consistent professional development in data literacy, analytics, and dashboard" would be particularly useful to maintain a high level of effectiveness.

6.2. Objective Validation of Student Outcomes

All Year 8–11 students review their dashboard progress with their Tutor teacher at the beginning of the year using a Growth Coaching approach. Often the student's parents also attend this meeting. For Year 12, this review is held twice a year, at the beginning of their courses and after their mid-year examinations. At these meetings, students select three subjects with specific performance goals and strategies to support achieving those goals. These reflections are then embedded into the student's dashboard and the goal achievement grades are identified as markers on their respective subject performance graphs. These graphs change colour when the goal is reached, and a congratulatory "nudge" email is sent to the student.

Performance of goal selected subjects versus non-goal selected subjects was positive for the last three years in all grades, particularly among medium- and low-ability students. In 2020, Year 8–12 students experienced an average 6% growth in goal subjects vs. 1% growth in non-goal subjects. Goal subject growth was more than non-goal subject growth for every year group and every ability group. A multivariate ANOVA determined that the change in performance was significant, thus providing

strong evidence of the impact of goal setting. Main effects were observed between goal and non-goal courses ($F_{(1480,1)}$=83.438, p< .001), and year/class ($F_{(1480,12)}$=15.458, p< .001), but no significant interactions were observed. The data provides strong support for both the approach used to enable students to set goals and the value of dashboards to make the data visible to students, teachers, and coaches.

Another useful source of evidence represented in the dashboards is the apparent correlation between teacher-rated effort, behaviour, and actual performance. These seem evident across all years and subjects and a regression model of performance showed that behaviour scores, effort scores, and whether students set goals yielded strong predictions (R^2=.301, p<.001, AIC=14193, RMSE=13.6).

7. Concluding Reflections, Discussion and Future Directions

This paper presented a case of LA adoption focusing on learning analytic dashboards at a comprehensive school in Sydney. The process iterated through the development and implementation of dashboards for management, teachers, students, and their parents to support a holistic approach to personal development and progression tracking. The authors' experience and observations reflect the finding in the literature that using dashboards enables students to stop and evaluate their progress (Panadero et al., 2016). The work done with stakeholders led to outcomes very similar to the adoption of LA in higher education, both in terms of the development trajectory for adoption (Ferguson et al., 2014; Hilliger et al., 2020; Tsai et al., 2021) and from the observations of academic and university administrators (Herodotou et al., 2019, 2020; Molenaar & Knoop-van Campen, 2017; Teasley, 2017; West et al., 2020) and students (Dollinger & Lodge, 2019; Kennedy et al., 2014).

St. Andrew's Cathedral School iteratively improved the existing feedback processes, grounded in conversations between students and coaches, by developing a holistic strategy informed by theory. Key ideas such as the impact of feedback (Hattie & Timperley, 2007), a growth mindset (Dweck, 2012), motivation and self-regulation (Gollwitzer, 1999; Hadwin et al., 2018; Martin, 2010; Zimmerman, 1990), and growth coaching (Allison & Harbour, 2009; Stober & Grant, 2010) all pointed to a need to better understand and use data to inform decision-making and student support. The field of LA is ripe with inspirations and practical examples, especially in higher education (Gašević et al., 2015; Siemens & Long, 2011). The developments in dashboard design and data aggregation at the school benefitted greatly from direct interaction with academics in the field.

These technical developments were supported by a conscious effort to focus on the potential of data-driven approaches and the impact that these had, and will have, in supporting student development and teacher ability to coach students in becoming the best version of themselves. This helps students not only in keeping up with their studies but in shaping their future as citizens of a challenging and unpredictable world. To achieve this, based on the school's philosophy and mission, students must learn more about themselves, what motivates them, and what drives their performance. In line with research carried out by Dweck (2012), fostering a growth mindset is a key development for children and teenagers. Embedding data into the conversations with coaches and pastoral leaders provides a tangible starting point for these conversations. The approach developed in our school distills behavioural and performance data into a simple dashboard used by pastoral leaders and teachers to help students make critical decisions about how they approach learning.

As indicated by Verbert and colleagues (Suthers & Verbert, 2013; Verbert et al., 2013), the use of dashboards supports a process model — moving from awareness, to reflection, to sensemaking, to impact — with the potential to aid behavioural changes. With goal setting as a key element in developing a broad sense of agency, the dashboards provide data to better understand student patterns of engagement with learning and teaching and discuss their current performance and potential (with a clear relation to goal setting), grounded in a reliable modelling of students on similar trajectories. These have proven invaluable in existing research, predominantly in higher education, which uses "nudges" to keep students on track (Henderson et al., 2019; Liu et al., 2017; Matcha et al., 2020; Pardo et al., 2018) and in modelling performance and outcomes against behavioural patterns. Empowering students to choose the goals they focus on — providing them with data generated over time showing the alignment of what they do and what they want to achieve — offers a very powerful set of tools to facilitate goal attainment and self-regulation, enabling them to take responsibility for their own learning trajectories.

While *good* data is at the centre of this implementation, the definition of what *good enough* data means in relation to the goals set by the project raised interesting questions along the way, especially about technical developments and the necessary integration of different sources and systems. This also implicitly raised questions about the ethical standards for using data, the governance and policies around acceptable uses, and several critical issues about the explainability of the prediction models presented. These are all essential to support the daily work of teachers and pastoral leaders, who can provide more effective coaching to students to develop their potential.

The SHEILA policy framework (Tsai et al., 2018) has been used to compare the early adoption of this LA change project with its mature implementation. The framework helped identify the dimensions and themes needed for LA policy as well as continued needs in LA implementation. These include identifying success criteria for evaluation, strategic alignment with other

change efforts, governance, communication channels, data integrity, project management, identifying stakeholder responsibilities, privacy, and continued integration with academic and pastoral programs.

Quantitatively, when focusing on the subjects in which students were asked to articulate their goals, growth was higher than in "non-goal" subjects across all ages and ability levels. Qualitatively, students, pastoral leaders, and academic leaders gained great benefits from using LA in a range of ways. While supporting the research about the direct involvement of students in dashboard design, and the creation of simple plans aided with the naming and recording of specific goals — which in turn helped to develop a coaching framework supporting self-regulated skills and assisting student learning — the key outcome of the work presented in this paper is a shift towards an effective set of policies and actions to foster a data-driven culture in the school.

This was a "naturalistic" case study, not a systematically designed experiment, so there are several limitations in transferring or scaling the success. For example, the evaluation included students, leaders, and teachers, but not parents, who often have very strong voices in their children's development. A systematic set of interviews with coaches could be included for completeness in future iterations. Several examples and lessons were learned from the presentation and analysis of this case that others can consider, implement, and reflect upon in their own contexts. The data generated by our use of the SHEILA framework can also be used for meta-analysis. We believe that this will provide further opportunities to better understand adoption of LA at the school level, beyond the context of the case presented here.

Our findings also point to further work in the development of school policies and processes to better align the pastoral, academic, and pedagogical goals of the school with LA goals, management, and methodology. We believe that the effective use of data will pave the way for further improvements. Several novel and interesting issues for both praxis and research regarding capacity building in the stakeholders involved (academic and pastoral leaders, teachers, parents, and students themselves) could also be pursued. In addition, a range of issues and questions have yet to be resolved or fully addressed around the ethical aspects of the use of data, including the responsibility and agency afforded by a comprehensive understanding of student capabilities and behaviours. These require further work and present challenges that we may not have fully grasped or examined in detail.

Finally, we must acknowledge the relevance and consistency of national educational frameworks and standards in supporting or hindering innovations brought in by teachers in their day-to-day activities. We must always be conscious of how data and analytics can foster their ability to better support students. The key success of our project is the clear alignment between the mission of the school and the potential impact for our students. This can only be achieved with a coherent involvement of stakeholders and an objective understanding of scholarly work about what works and what doesn't, helping to focus efforts and the investment of resources.

Declaration of Conflicting Interest

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Appendix

Dimension 1: Map the Political Context

The school did not have a strategic plan or educational context for LA adoption when pioneering the program in 2016. Since then, the development of LA has aligned with other policies, the school's new strategic plan, a new Council subcommittee, and a new evidence-based Teaching and Learning Model. This policy, strategic, and governance alignment, as well as support from key leadership, allow for a productive environment to develop LA policy to support implementation and continue alignment of school initiatives and programs. Below we provide the full case using the SHEILA template so that others may re-use it as data for evaluation and meta-analysis.

ROMA step	SHEILA component	2016	2020	Theme
Map the political context	Action	The internal driver was to increase teaching quality and learning motivations by providing teachers and students with data to inform teaching and learning related decisions. There was no external driver.	The internal driver is still the same but is now aligned and embedded within the school strategic plan's objective of "outstanding evidence informed teaching and learning." The external driver is to supply data for audits of wellbeing and academics to report to executive and the Council Academic Improvement Board.	Purpose
	Challenge	No LA policy or guideline documentation. There was little school interest in LA either within or externally. There was some emerging interest in evidence-based teaching, but without significant government adoption. The school strategic plan did not focus on evidence-based teaching. Lag measures were analyzed of past HSC and IB exam results but little analysis of lead measures. Concern about the lateness of interventions and difficulty in developing a growth mindset culture without data.	While there is now a school LA guideline, there is no specific policy on LA. It is hoped that the SHEILA framework will aid in this policy development. There is still little work in other schools on comprehensive LA strategies. Growing literature on evidence-based learning from academics (John Hattie) and government interest from reports (Gonski) and academic think tanks (Grattan Institute) provide a context of growing interest in analytics among schools. Although improved, still not complete buy-in from all primary stakeholders.	Purpose
	Policy	What are the benefits and purpose of LA? How can LA bring about changes in teaching and learning behaviours?	Same questions are still open; in addition, How can LA complement and strengthen the school's pastoral and academic programs?	Purpose

Dimension 2: Identify Key Stakeholders

Mapping Dimension 2 showed that the adoption of LA required many stakeholder groups. A key implication for policy is to consider the rights and responsibilities of everyone involved and the impact upon them in an ethical manner. As more stakeholders are engaged, the nature of implementation varies as the project becomes more standardized, further training is needed, and project timelines become more structured.

ROMA step	SHEILA component	2016	2020	Theme
Identify key stakeholders	**Action**	The primary internal stakeholders were the Deputy Head, one academic executive, her pastoral group of students, pastoral leaders, and the Learning Support faculty. The external stakeholder was one casually employed retired data analyst.	The primary internal stakeholders now include all Year 8–12 students and their parents, all teachers, leadership staff, IT officers, and school executive. Head of LA oversees communication and training in LA. External stakeholders include a university academic and an LA service provider that offers warehousing, analytics expertise, and LA standardizing. NDAs have been developed to protect data privacy.	Stakeholder engagement
	Challenge	Lack of understanding from pastoral staff who saw LA as contrary to pastoral support, faculty heads who lacked data literacy, and some parents who were skeptical of LA with students due to their own business backgrounds. The data analyst's approach was iterative and experimental, which affected long-term sustainability.	While significant training has been undertaken with staff, and information sessions with students and parents delivered, there is still a lack of understanding of LA by some students and teachers. Despite annual staff training, low data literacy exists among some staff, affecting uptake in LA. Despite moving to an external firm to manage dashboard development, this has slowed responsive development due to increased project management.	Management
	Policy	How will LA platforms be standardized for ease of use? How will primary stakeholders be educated on the benefits of LA? How will privacy concerns be addressed?	How will responsibilities be defined for each stakeholder? How will privacy policies be applied to the processing and presentation of data? How will LA capacity of internal stakeholders be improved?	Data management; stakeholder engagement

Dimension 3: Identify Desired Behaviour Changes

Mapping Dimension 3 showed that as stakeholders became increasingly involved in LA use, behaviour changed. As behaviour towards LA changed, this required changes to the dashboards as well as reporting. As found by Tsai et al. (2018), it is important that policy guide decision makers to focus on goals, but also on a range of indicators that reflect changes in the organization's context. The latter could be defined as success indicators, as set out in Dimension 6.

ROMA step	SHEILA component	2016	2020	Theme
Identify desired behaviour changes	Action	Small groups of teachers started use LA to see how students perform over time and to identify needed interventions. Students worked with teachers to engage with their dashboards to develop Personalized Learning Plans.	Teachers better understand student learning and wellbeing problems and work with supervisors and learning coaches to develop interventions. Students are automatically nudged and can access their own dashboards at any time to reflect on how they learn and to make Growth Learning Plans (Student Reflections) accordingly. The school can make better decisions to support learning and teaching based on analysis of learning effectiveness. Successful target achievement in subjects will increase. Students are provided with the tools to use self-regulated skills to improve motivation and achievement. Greater stakeholder engagement has resulted in learning coaches using LA to train teachers in interventions, pastoral leaders advising students on behaviour changes, and academic leaders analyzing lead measures to align teaching approaches and design training to meet identified needs.	Purpose
	Challenge	Some stakeholders mistrusted the data. Process not transparent enough and analytical model sometimes too complicated. LA revealed what was happening and predicted what was likely to happen, but did not explain the observed phenomenon or provide a direct solution.	Despite consultation with students and staff to promote the benefits, standardize and simplify the look of the dashboards, more work needed with students and staff (co-design) to evaluate the effectiveness of communications and data dashboards. Can *teach* students self-regulated skills, but need to motivate them to use them and have this meta language embedded in teaching. Head of LA works alongside key leadership staff and learning coaches with teachers, but this requires cultural change, which takes time.	Methodology
	Policy	How will the purpose and benefits of LA be communicated to primary users?	What positive changes will LA bring to the current situation (e.g., learning and teaching)? Why are these changes important to us? Who will benefit from LA?	Stakeholder engagement; purpose

Dimension 4: Develop an Engagement Strategy

The implication for policy is to encourage meaningful selection of data so that LA will not be driven by data itself but by educational goals. It is important that LA aligns with other school policies to contextualize data and increase the reliability of LA. It is important that policy states the responsibilities of LA governance, particularly their role in ensuring that LA remains well aligned through different areas of the organization (e.g., academics, pastoral, coaching, training).

ROMA step	SHEILA component	2016	2020	Theme
Develop an engagement strategy	Action	As the dashboard design and pilot work developed, increasing engagement was made with key staff including pastoral leaders, academic executive, and learning coaches through widening trials. Showcased to stakeholders cases of good practice as supporting evidence. Some school visited and many schools came to visit to learn about the LA used.	LA is now embedded in the school's Strategic Plan, Teaching and Learning Model, Learning Coaching Policy, Appraisal Policy, and Pastoral Program. Set up a governance board chaired by Head of LA to engage with research activities, develop institutional strategies, promote LA among teachers and students, and communication strategies with various stakeholders. Review existing LA strategies and visits to other schools to learn from best practices. Align LA with wider educational strategies in the school.	Management
	Challenge	Much time required by a small working group to design changes and stabilize the data model to ensure reliability and bug management. This impeded engagement with staff on a wider scale. Annual training and engagement with students widened every year to involve Years 8–12 looking at dashboards with a pastoral teacher (and parents) to develop individual Personalized Learning Plans.	Some disengaged academic/pastoral teachers and students remain hard to reach. Focus on identifying students at risk may overlook curriculum design or teaching efficacy for students. Peer comparison, especially for underperforming students, may demotivate them altogether. Over-reliance on data may fail to consider the experience and knowledge of teachers about students. Inconsistent application of LA among teachers.	Management; methodology
	Policy	What are the objectives for LA? How do they align with the school's vision for education? How will primary stakeholders be engaged regularly and effectively?	How will objectives of LA avoid being just a deficit approach targeted at supporting students at risk of failure? How will the results of analytics be communicated in a way that motivates learning? How will regular LA usage by primary stakeholders be embedded?	Management

Dimension 5: Analyze Internal Capacity to Effect Change

Mapping Dimension 5 showed that risk evaluation is important. An ongoing challenge is to maintain data integrity to ensure that stakeholder confidence in LA is high. The key for policy is to ensure that staff communication, training, and resourcing are supported. It is crucial that policy provides quality control guidelines to ensure infrastructure integrity.

ROMA step	SHEILA component	2016	2020	Theme
Analyze internal capacity to effect change	Action	The driving force for LA had been the Deputy Head of School. Introduction in 2017 of academic critical friend prompted internal analysis and reviews. Some changing membership of the LA working group occurred 2016–2018. In 2019 Head of LA, Leader of Character and Wellbeing, and Senior Learning Coach appointed to assist in the development and implementation of LA.	Risk evaluation performed to analyze internal, technological, human, and financial capacity. Alignment of LA and evidence-based teaching practices in the new Teaching and Learning Model and Strategic Plan. Champion LA pioneers. Agree who is doing what, when, and how. Establish indicators of data quality and system efficacy.	Management
	Challenge	Some data was unreliable. LA developments are costly and need project management to ensure long-term sustainability. Changing attitudes to disengaged students and teachers with LA processes. Training can be difficult to deliver when staff lack time. Skills to understand and interpret visualized data needed to be instilled in teaching staff. LA only includes summative assessment data and few external assessments so data points are limited.	Some data still unreliable — e.g., historical target calculations particularly of Year 10 into Year 11 IB and language phases. Cultural development of Head of LA working with leadership staff. Alignment of various senior staff with LA responsibilities needed. Integration of incoming standardized tests and development of value-added metrics to improve teacher confidence in LA.	Methodology; stakeholder engagement
	Policy	What training will be deployed to scale up data literacy and incorporate LA into daily practice? What communication channels or feedback mechanisms will be in place? How will data integrity be achieved? How will the implementation address the problem of time-poor teaching staff? Will the design of selected LA tools address teaching and learning needs?	Questions remain the same; need to continue to work in building stakeholder support and consensus to continue.	Methodology; stakeholder engagement

Dimension 6: Establish Monitoring and Learning Frameworks

Mapping Dimension 6 showed the need to develop key success criteria and defined monitoring procedures for LA in the school. This is particularly important due to the objective of "outstanding evidence informed teaching and learning" in the new school strategic plan.

ROMA step	SHEILA component	2016	2020	Theme
Establish monitoring and learning frameworks	Action	Many visits made to pastoral and academic classes, focus groups with students and teachers, and key meetings with senior staff to determine LA development needs and evaluate LA efficacy. Introduction in 2019 of biannual LA reports submitted by academic and pastoral leaders, tied to appraisal.	Set up measurable milestones. Establish qualitative and quantitative indicators of success. Seek feedback from primary users through various channels. Measure changes to student self-regulation of learning. Provide feedback to give an improved sense of accomplishment in teachers and students. Establish sustainable support processes to advise teachers on LA practices.	Methodology
	Challenge	Metrics to measure LA effectiveness have been difficult. Low participation of primary stakeholders in top-down consultations (e.g., surveys and meetings). Difficulty in determining causal relationship between learning outcomes and interventions or engagement patterns.	While developing metrics to measure LA effectiveness has been difficult, goal vs. non-goal subject achievement was positive each year. Development of master dashboard in process since 2017 — this will enable benchmarking of schoolwide metrics. Automation processes implemented in 2020 and rollout continues, which will assist with monitoring dashboard use. The impact of implementation needs to be measured more effectively.	Evaluation
	Policy	How will success be measured? What are success indicators? How does LA complement evidence-informed teaching? When will evaluation take place? Who will carry out the evaluation of impact? How often will the policy be reviewed and updated and by whom?	Questions remain the same; need to continue to work in building stakeholder support and consensus to proceed.	Evaluation; policy management