

Using business principles to provide education solutions: On-demand exams supported by the progression pipeline

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This paper examines the journey from education literature to business principles to enable new ways for looking at an unsolved problem. This has resulted in the development of a highly scalable on-demand assessment model. Overall, results improved student acquisition of accounting skills as measured by grades.

Key words: Assessment, On-Demand Assessment, Progression Pipeline

Introduction

Each Saturday morning, I get up early so I can be at the start line of Parkrun by 8:00 am. This is an organised 5km run that happens every Saturday morning all over the world. When running in Armidale, it is typical that 20 minutes after the start, two or three people are finished, by 25 minutes this number would be up over 40, and by 30 minutes there are probably about 80 finishers. Over the next half hour or so another 80 people will finish. You're probably not surprised that people take different amounts of time to complete the 5km run. After all, we each come with different skills, levels of fitness, motivation, health, background, etc. People are different and so they are likely to take a different amount of time to complete a similar task.

Context

I coordinate an introductory accounting unit and, like many first-year units, we give students a start date, we set the assignment deadlines along the way, and the unit ends for all students on the day of the final exam. However, just like the Parkrunners, our students bring a rich tapestry of skills and experiences into the learning environment and this means we need to personalise their learning journey to enable them to successfully acquire the necessary accounting and thinking skills. We also need to do this in a way that is sensitive to effective resource utilisation. We call this 'scalable personalisation'.

Over the years, I relied on a wide range of educational literature. This includes attrition (back to Durkheim 1895 as quoted in Tinto (1975); Behaviourism (back to Pavlov (1940); and, Watson (1925)), Constructivism (back to Piaget and Vygotsky, as quoted in Pass (2004)); and Flow (Csikszentmihalyi, 1991). These frameworks help to develop excellent solutions for my representation of the typical student. After a decade of developing interventions that have significant benefit for some, but no benefit for others, I appreciated that a new way of thinking was needed to solve previously unsolved problems. The new way of thinking was, in fact, an old way. I moved to a business framework to help guide me towards developing an environment that would support a wider range of students. I have relied more heavily on business principals for four key reasons:

1. As a business school, part of our teaching should involve demonstrating business principals in action;
2. Substantial innovation often occurs when learnings from one sector are transplanted into another sector;
3. The solution to my problems require a holistic approach and I need to play to my strengths. My pre-academic career was spent researching and implementing strategies for business owners to increase their business returns. I apply this understanding, developing a learning environment that can cater for an increased range of needs; and
4. In simple terms, the role of accounting is to make things visible so that effective decisions can be made. I have worked on solving the problems that were visible to me. Now it is time to make the next level of issues visible so that these problems can be solved.

What I hoped to bring to higher education was an understanding of applying principals of improving business performance to improving student performance. My goal was to develop a scalable personalised learning ecosystem where students are put in situations that provide the opportunity for learning and the capacity to contribute to society through this learning. The focus of the learning would have a particular emphasis on making decisions that were sustainable long run and so have the capacity to add value to society. When people add value to society, they have a right to a share in that value.

I adopted one of the basic tools of innovation: chunking thinking to higher level of abstraction, and finding solutions there. The specific problem was helping students that were not engaging with the material because my solution did not fit their needs. When I chunked up to a higher level of abstraction, it led me to satisfying a range of needs. And, there were many solutions for this in a business context.

Relevant Literature

The key relevant literature from business relates to client segmentation and value propositions, and, more specifically, work related to understanding your customer. So, as I survey my library from my pre-academic life, I discovered the tattered books that survived the various culls. These books are survivors because they contained material that was successfully implemented. They were used and found relevant. These books contained not only lessons that I adhered to, but also lessons that I had failed to properly internalise. Two important examples that provided clear signposts to the necessary actions were Stephen Covey's (1989) 5th Habit – seek first to understand and then to be understood, and Whiteley and Hessian's (1996) guidance on moving from listening to hardwiring the customer voice. These habits provided a focus to better implement lessons so that I could build a value proposition for distinct student segments and then support them through the progress pipeline.

For context, the work discussed in this paper is built on previous interventions that relied heavily on feedback literature and are reported in a paper for the 2014 ASCILITE conference (Gregory, Uys & Gregory, 2014).

Reflective practice

My journey to deeply understand the mind of my students draws heavily on reflective practice. For me, this has always been built around the collection and analysis of data to identify opportunities and attention areas. For more than a decade, I have collected, collated and analysed data to see where the students were strong and where they needed help. I have analysed their learning styles and their mathematical skills to predict where they may need assistance and developed resources that will help them overcome deficiencies or cater for their preferred way of learning. As my reflective practices have matured and expanded, I have devoted increasing amounts of time to putting myself in the shoes of a varying cohort of students, not just what I had imagined as the typical student. As a result, over the last two years, I have placed more emphasis on understanding what students are thinking and especially identifying where their thinking is not supportive of their learning. The catalyst for this expansion of reflection activities was a result of feedback I received in a meeting with students at the end of Trimester 1, 2016, stating that I would benefit from developing better empathy for struggling students by learning something that I found challenging.

I took up this challenge by learning to play Pokémon Go. This seemingly simple journey was an education (see Gregory, Gregory & Gregory, 2016). It provided an example of how a business strategy was evolving and provided insight into one path large businesses are structuring themselves (Niantic, the creators of Pokémon Go are part of the Alphabet stable of companies) and it also showcased strategies for increasing engagement. In the context of reflection, it alerted me to two important lessons. Firstly, a student is not always ready to learn something the first time they encounter it. Secondly, the value that having a mentor or a fellow traveler brings on the learning journey. Significantly, the Pokémon Go journey crystallised that I did not have sufficient empathy or understanding for all of my students. I had been developing a learning environment for the students that I thought I had, but each student cohort was becoming increasingly diverse and not fitting the skill matrix that I had expected. The Pokémon Go journey helped me appreciate that while the content was important, not all students were getting access to that content. I needed to learn strategies to help them break through the blockages. I have put in place a series of strategies such as a personal background questionnaire and progression pipeline so I can identify exactly where a student hits a blockage.

This exploration process resulted in the introduction of On-Demand exams for Trimester 3 this year. On-Demand exams enables a student to sit their final exam (online) at any time during the trimester, or indeed in the following trimester provided that they have completed all gateway tasks. The gateway tasks include four assessable quizzes, plus other quizzes that helps the student appreciate if they are ready to go forward to the next level. In effect, the students travel through a knowledge pipeline that culminates in the final exam. They travel through the pipeline at their own pace, but with guidance and encouragement on the way. After all, many students need a deadline so that they will complete a task. I needed to provide motivation other than the deadline.

The existence of this pipeline has another major benefit. The teaching team can determine where any student is in the pipeline and if the student has hit a blockage. In some instances, the student can be directed to appropriate

resources to help get through the blockage. For other instances (e.g., ineffective approaches to study), I needed to develop tools to help students.

On-demand assessments

This exploration process resulted in substantial change to the delivery of the unit. We now operate under a model we call on-demand assessment supported by a progression pipeline.

The unit has two streams. Firstly, there is the theoretical stream and students work through a number of scaffolded cycles. Each cycle comprises the core materials (topic notes and exercises) followed by a gateway task (tutorial quiz worth one mark). All tasks are automatically marked in the Learning Management System (LMS). If students achieve the required grade in the gateway task, the next set of resources opens for them. If they do not achieve the required score, they are directed to the support resources (topic videos, lecture videos, supporting PowerPoint presentations, online exercises, downloadable exercises, accounting triangle website for Cycle 1, forums). Students can then reattempt the gateway task so that the next set of resources will open for them. Many students who pass the gateway task will still use the supporting resources to strengthen their knowledge. At the end of the first four cycles is a summative assessment task (Assessable quiz). The exam is at the end of the 5th cycle. Students can move through the materials as quickly as they like. There are deadlines for the four assessable quizzes. The first iteration of this model was conducted without deadlines and this highlighted the importance of deadlines for student motivation. There is flexibility with the deadlines. Each day the progression pipeline report is produced and this reports how far each student has progressed through the progression pipeline. When a student falls sufficiently behind, an intervention kicks into place.

The theoretic stream is supported by the practice stream which comprises an Instant Feedback Accounting Practice Set (IFAPS) and 26 supporting videos. The IFAPS contains over 1,000 cells where students enter data. The cell turns green when the student makes a correct entry and their percentage complete will increase (for the task and the practice set as a whole). The IFAPS is designed to provide students with a vehicle to see how all items fit together from the start of the accounting cycle until its completion.

The IFAPS is a computerised formative assessment task that provides realism by simulating a business scenario through an Excel spreadsheet. Students are provided with a suite of videos to guide them through the tasks they need to undertake in the IFAPS spreadsheet and they receive immediate feedback on every entry they make into the practice set workbook. This was a very positive innovation for a large portion of the students that completed the unit and enabled many students to excel. The particular value of this for some students is highlighted by a comment in an end of trimester interview; “I thought we have already done topics because I knew what to do, but realised it was done in the practice set”.

What did we learn?

The on-demand assessment model is best suited to calculation type subjects that can be automatically marked within the learning management system. The model can still be operated for other types of subjects, but when human intervention is required for marking, the scalability advantages diminish.

Their learnings so far include:

- Because students were required to master the material in order to graduate to the next level of material, they understood the key concepts far better and this resulted in a much stronger knowledge as indicated by the higher proportion of students that excelled in the unit. Because of the strong base, students also tended to complete topics in the second half of the unit much more quickly than expected. See the section on results summary.
- A significant proportion of students found this a motivating environment. For instance, the first student to complete the unit said if there was another unit like this, he would have enrolled and started immediately. Students also appreciated the personalisation as indicated by the following comment; “Brent really understood that we as students all learn in different ways and so he catered to that.”
- Automation improved the capacity to provide targeted feedback aimed at each student's needs and student evaluations highlighted that students were impressed because “the levels of feedback that Brent provided was amazing.”
- Repeat students tended to engage far more with the material in the learning management system to a much greater level than on their previous attempts.

- There are many students that need a deadline for assignments to provide them with the motivation to complete the task and so having totally flexible due dates is likely to result in less completions.
- It made visible problems that were previously not obvious.
- We are much more informed about our students and the issues they face. This was because we had early identification of ‘at risk’ students and engaged in a dialogue with those we could contact. We did find that for many of our students there were limiting factors not related to the structure of the unit. Commonly occurring factors included health of self and others, change in employment situation and change in domestic situation. Also, many students enter university without the necessary skills or mindset. We do need to find a way to support these students.
- We needed to ensure that students had some level of competence over the foundation material before they moved onto more complex material. While this has the appearance of putting blockages in a student’s path, it does mean that they will much more rapidly progress in later parts of the unit. A comment from the student evaluations displays this from the student perspective; “The unit was structured very carefully to guide me through the steps to be able to grasp the basic concepts and carefully guide on to more challenging concepts.” This is a strength that needs to be fine-tuned.

Results summary

To condense a complex journey into one image (Figure 1), students from the off-campus cohort in the first teaching period each year were allocated to three groups: Excel (High Distinction or Distinction), Pass (Credit and Pass) and Not Pass (N – Fail, NI – Fail Incomplete, and NC - Fail compulsory element). The performance profile has been reported at three key moments: Prior to the Instant Feedback Accounting Practice Set being introduced (average from 2011 and 2012); Prior to the direction change commencing in 2018 when business principles were overlaid with the academic literature to provide a solutions that better catered for the increasing diversity in the student cohort (2017T1OL – [2017, Trimester 1, OnLine]) and the current situation (2019T1OL). The current situation includes on-demand assessments and the Progression Pipeline.

These results highlight how, in the initial period, the percentage of students who did not pass fell noticeably (42% to 35%) and the percentage of students who excelled increased by a similar proportion (31% to 39%). This was despite a significant setback when teaching periods were reduced in length in 2016 due to trimesterisation. The introduction of the Progression Pipeline since 2017 has provided the environment where students make more progress through that pipeline. The measures taken to improve student performance mean that a significantly increased number of students are gaining the skills necessary to excel in the unit and add value to their career potential. For context, while this is for one student cohort, the story is similar for on-campus students and students in trimester 2.

Within the online cohort, there are a number of sub-cohorts, including accounting students, business students and pathway students. Improvement occurs across all cohorts and is more pronounced in the cohorts that typically underperform (e.g., pathway students), but this is as would be expected because it is more designed to cater for students that have not been performing. This is significant because much of the growth in student numbers is coming from traditionally underperforming groups. An indication of this changing composition can be gained by looking at result for other large cohort first year calculation type subjects. In 2019T1 this group achieved 25.7% of students in the excel group, 27.1% in the pass group and 48.7% of students in the Not Pass group and this represented a deterioration on the five-year average (28.3, 40 and 31.8). This indicates that the actual improvement achieved was in fact greater than the reported numbers because of the increasing diversity of the students.

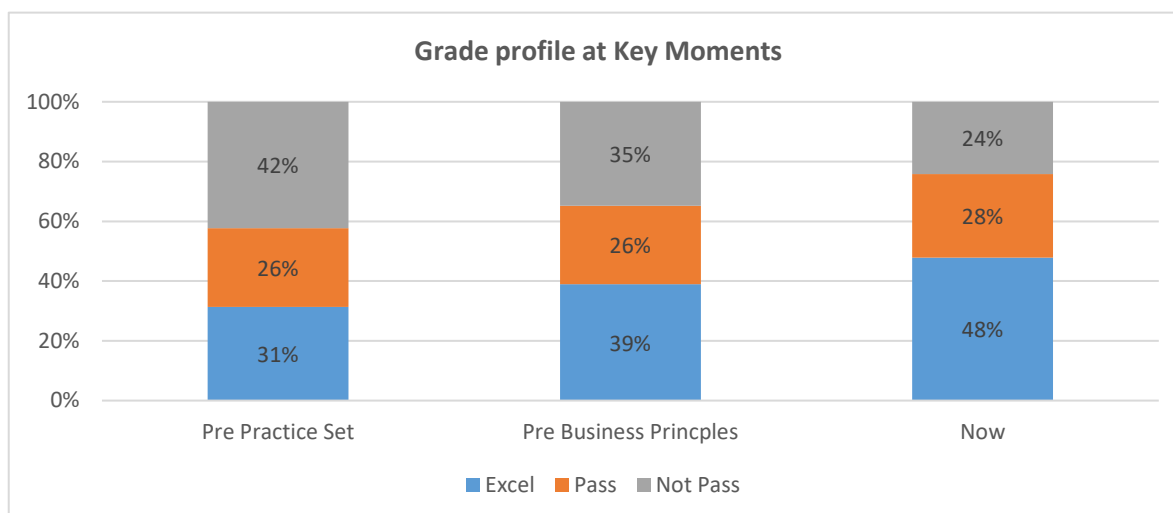


Figure 1: Grade profile at key moments 2011/12, 2017 and 2019

A comparison of the final exam for 2019T1 suggests that it is no easier than the exam for any comparison period. This approach was also applied to another similar unit that had a large cohort of international students enrolled. Of the 277 initially enrolled 262 students ultimately passed and while there is no historic group to compare with, this is a high pass rate for our international cohorts.

Conclusion

The model of on-demand exams, supported by a progression pipeline, is an attempt to marry business principles with the academic literature to build a scalable personalised learning environment that supports students learning of accounting skills. The great appeal of such an approach is that innovation often comes when an approach from one discipline can be integrated into another. This can provide a new way of engaging with challenging problems. In this case, it provided the leverage to increase the impact of previous interventions.

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