A "MetroGnome" as a tool for supporting self-directed learning

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SESSION C1: Integration of theory and practice in the learning and teaching proces

CONTEXT Charles Sturt University introduced a new engineering degree in 2016, with a strong focus on self-directed and –motivated learning. The outcomes of the first year of operation show that while some students are able to thrive in such an environment, the majority required significant scaffolding to work effectively in a self-directed environment. A tool was needed to balance the need for supporting students to become self-directed learners, without providing so much support that they become reliant upon the scaffolding and thus do not develop the necessary independent learning skills.

PURPOSE The investigation was whether the introduction of a "MetroGnome" for the students to benchmark progress against would provide a sufficient balance of scaffolding to develop self-directed learning.

APPROACH Each week the students are given a progress update for the MetroGnome – a garden gnome who lives in the student learning commons. In this way academics can provide a gamified benchmark for minimum acceptable progress to the students, without having to produce competitive league tables of actual progress amongst the cohort.

RESULTS The progress of the MetroGnome very clearly emerged as the expected benchmark performance of the cohort, with most students calibrating their efforts to either keep up with or not fall too far behind the performance benchmark. There are issues with the intended perception of minimum performance vs the emergent perception of adequate performance that need to be resolved; however overall progress is much better for the MetroGnome supported cohort than the cohort without out. An unanticipated consequence was the significant ill feeling toward the MetroGnome on the part of the student cohort.

CONCLUSIONS Making progress benchmarks explicit has served to improve progress through the cohort; however the anthropomorphication of the benchmark into the form of a Garden Gnome has led to some unanticipated side effects that will need to be adapted for in future implementations.

Introduction

A key feature of the engineering course is self-directed and self-motivated learning (Knowles, 1975; Butler & Cartier, 2005). In order to complete the multi-session subject ENG271, student engineers must successfully complete at least 240 topics from the Topic Tree. The topics are presented to the students in a recommended order, but there are few fixed prerequisites – students can jump ahead and skip topics if they wish, but they must still accumulate a total of 240 earned topics (Sevilla & Morgan, 2016).

The students have three semesters in which to accumulate these topics. In addition they also have access to the materials over the non-semester break periods. Therefore in total they have around 64 weeks from the commencement of the subject to the deadline for completion; of these, around 36 are explicit teaching weeks.

The pacing is therefore very simple. Students who wish to only complete topics during semesters will need to complete around 6 per week; students who wish to complete topics continuously over the holidays need to complete around 4 per week. This pacing is made clear to all students at the commencement of their studies, and while intellectually this may be clear to them, their behaviours show that they have not internalised this expectation.

Slow early progression leads to a significant risk of non-completion by the end of the subject. The latter two categories introduced a substantial risk for the management of the program. At the completion of the first three semesters, all CSU student engineers move in to industry as Cadet Engineers. To be eligible for placement as a cadet, a student must successfully complete ENG271; however the process of allocating cadets to hosts has to be finalised three weeks before the results of ENG271 can be known. As a result, we are required to predict in advance whether a student is going to complete ENG271 successfully, and then manage this element of the placement process – balancing the risk of not placing a student who then successfully reaches the target against the risk of having to "un-place" a student who does not complete.

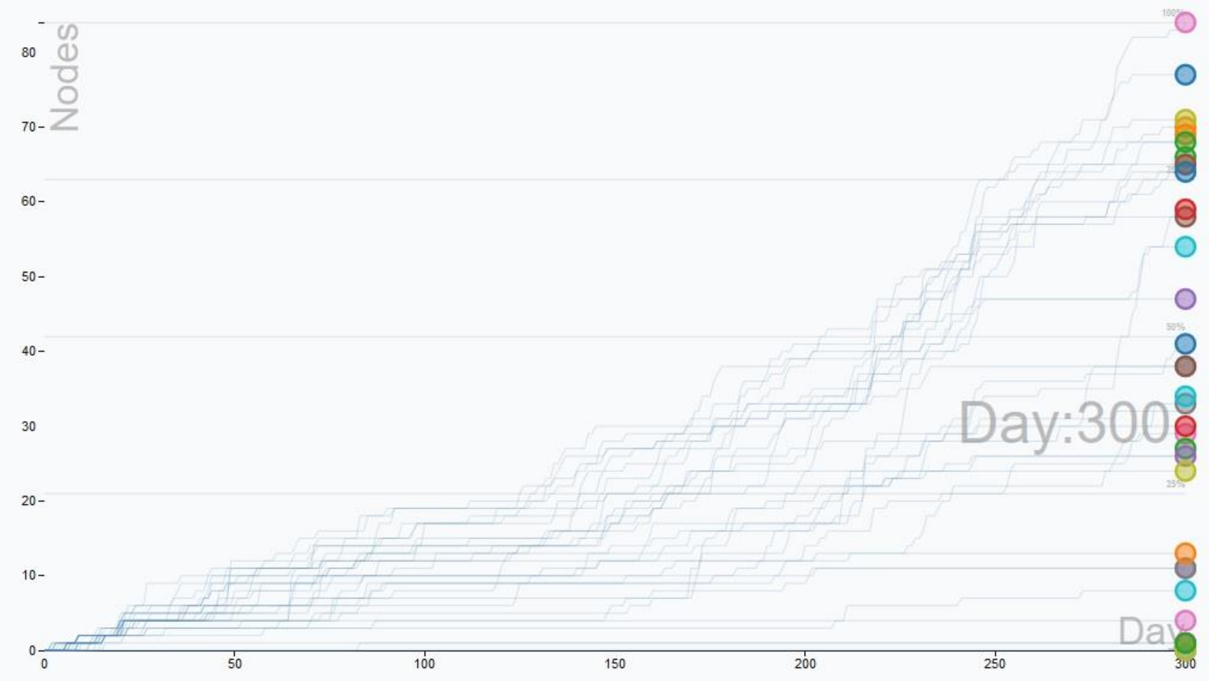

Figure 1: The first 300 days of Cohort 1.

Nodes in Figure 1 represent topics on the tree. Inspection of Figure 1 will reveal that all members of the cohort are short of the 80 to 120 topics *needed by week 20* (assuming need is defined as the 4 to 6 topics per week described above). As such, some kind of intervention was necessary to encourage earlier engagement with the 240-topic assessment item (even though it is not assessed until nearly 18 months after the start of the first session). The academic team discussed interventions such as posting a leader board (rejected because of the demoralising effect on the slowest members of the cohort); the Yellow line in the pool (although there was not a consensus for a 4 topic per week or 6 topic per week or world record movement of the line…); etc. A key concern was providing the appropriate scaffolding to allow them to work in a self-directed environment (Sevilla & Morgan, 2016). Eventually, a metronome was chosen to set the pace, and it was agreed that the metronome be set to the slowest *likely to success in going on placement* pace.

What's a MetroGnome?

It was clear from the behaviour of our first cohort that there was no immediate consequence for slow topic acquisition. There was an intellectual understanding that this mean that more work was being deferred and accumulating for their future selves; but there was no immediate now consequence for them to face. It was important to develop that immediate consequence without removing the self-directedness of their study. A coercive assessment target of weekly topic completion would absolutely have provided the motivation required; however that motivation would have been entirely extrinsic (Schunk, Meece & Pintrich, 2014), and would not have developed students' ability to plan and monitor their own work.

The solution that was chosen was gamification (Huang & Soman, 2013; Kapp, 2012). Rather than a coercive requirement, building a cultural expectation through a less threatening competition was chosen as the way forwards. Competition can be a strong motivator – if it is a competition you can win (Moore, 2014). We deliberately wanted to avoid establishing a situation where student engineers felt that they had fallen massively behind the leaders and would never be able to catch up. The fastest progressing students do not need more motivation (Ryan & Deci, 2017); we needed a mechanism to help the backmarker move forwards.

There is a range of learning styles amongst any cohort, and their response to deadlines varies. Three archetypes were identified within the cohort: Turtles, who plod along at a constant pace each week and reach the goal steadily and inevitably; Frogs, who make a series of small hops to get to target; and Kangaroos, which make infrequent large hops to reach the target. The individual progress for each student engineer in cohort 1 is depicted in Figure 1. All behaviours are clearly evident amongst members of cohort 1. Some student engineers stay true to form throughout, whilst others exhibit all three behaviours at time during their first 300 days. And some roos are still waiting for their first big jump even 300 days into the session.

Turtles vs frogs vs kangaroos

From a risk management perspective, it is the turtles that provide the lowest risk. Students who are progressing in a steady, consistent manner are the most predictable; combining a strong history of good weekly progress with the progress already made are the lowest risk, as they are the least likely to suddenly not reach the goal. From this perspective the ideal student would be one who proceeds every week in a lockstep cadence – essentially ticking away like a metronome. This musical metaphor was a potential option that was explored, due to the large number of students in the cohort for whom music is an identified hobby or interest.

The origins of how a metronome became “the MetroGnome” idea are lost in the mists of time; however the choice to anthropomorphise our cadence comes with significant advantages. Making the MetroGnome a person (see figure 2.) allowed us to provide variability, personality and agency to the cadence that we wished to set.

Figure 2: The MetroGnome, a proud member of the Bravo cohort.

In reality, no student is ever going to maintain an exact cadence for sixty-five consecutive weeks; and establishing an expectation that this is possible, or even healthy, is counterproductive. By humanising the cadence, we give the option of varying the number of topics expected each week. Certainly the clear average is sufficiently large so as to ensure adequate progress overall; but the MetroGnome has good and bad weeks, the same as the students do. This allows us to show that variability of performance is acceptable, provided it is managed. It also allows us to show that we are aware of the competing demands upon the cohort’s time by having the MetroGnome slow down in a week when we are aware that all of our students would also be slow – examples of impedance include: residential games, state of origin, grand finals, mid-session and summer break get away with mates from back home, etc. It is not important that progress during a particular week is slow, even slower than the MetroGnome. What is important is that increasing the average topics per week during some other period of time compensates for slow weeks.

The MetroGnome has personality in a way that a ticking clock does not. We are able to ascribe emotions and desires to him; he is able to be a part of the cohort, rather than simply an appliance. The original intention was that he become somewhat of a mascot for the cohort, and thereby a potential avenue for introducing cultural messages into the student body. As a “person” the MetroGnome has agency. While not self-mobile, he can be moved around the Engineering building. He can attend meetings and events; he has a tangible presence within the building, rather than being just a number in a weekly email.

Paper topics Patterns of Topic Acquisition – before & AFTER

The topic progress of the cohort 1 and cohort 2 are depicted in Figures 3 and 4 respectively. Both cohorts began university studies at the end of February, so the figures depict their topic progression over the first 6 weeks (approximately one month of session, plus the first mid-session break). Whilst not all attributable to the MetroGnome, you will see in the figures, both the number of topics being attempted, and the number of student engineers attempting these topics has significantly increased between cohorts 1 and 2.

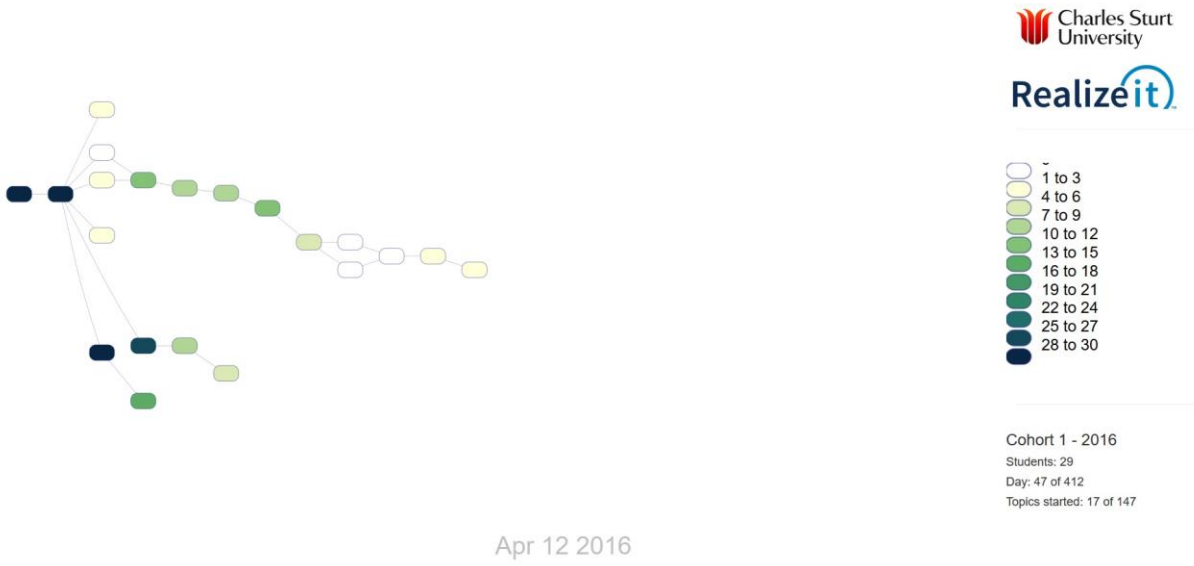

Figure 3: Topic progress on the first April 12th for cohort 1.

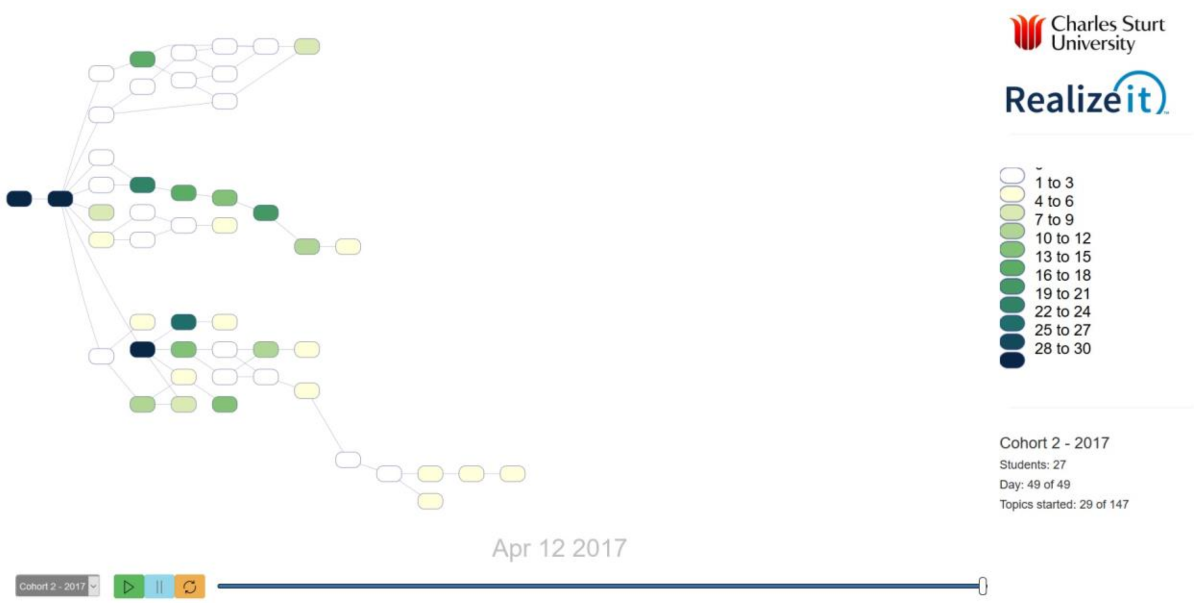

Figure 4: Topic progress on the first April 12th for cohort 2.

Anecdotal observations

The progress of the MetroGnome was intended as a clear signal as to the minimum acceptable progress level for the cohort; that any student who was not keeping up with the MetroGnome was at risk for non-completion, and thus could be targeted for intervention and support. This was not how his progress was perceived. Rather than being a minimum threshold, his progress was normalised as the acceptable or expected performance – the yellow line (target) in the pool, rather than the back of the peloton (as intended by the academic team).

The presence of the MetroGnome made the progress issue visible where it had previously been silent; however the conversations were largely missing the point. All students understand that they need to be "ahead of the MetroGnome"; but rather than embracing this and progressing, we found them haggling over whether the official count was correct, and obsessing on it being unfair that topics submitted but not yet marked couldn't be counted towards being ahead of the MetroGnome.

A significant number of our students struggle to keep up with the MetroGnome; there is the possibility that constant reminders of this are serving to demotivate rather than to encourage (Pajares, 1996). While at a certain point students need a realistic self-appraisal of their progress, we must not discourage them from learning. What is clear is that the MetroGnome is deeply unpopular amongst a subset of the cohort. He has been found placed in a corner facing the wall; he has not become the cherished mascot that we had hoped he would be. In short, the student engineers began to dislike the MetroGnome, exclude him from meetings, etc. In other words, he absorbs much of the blame and anger formerly reserved for the course director…

One incidental side effect of the introduction of the MetroGnome was a decrease in emphasis on the project based learning (PBL) portion of the curriculum, i.e., the engineering challenges, that ran in a parallel subject. By strongly emphasising each week to students the importance of topics, and by updating them with their progress and comparing that to the MetroGnome, the teaching team sent a clear signal as to what was valued. The flip side to this signal was that the other parts of the curriculum, which were not the subjects of weekly updates and sans MetroGnome, must therefore have been less important. This led to a decreased emphasis on, and performance in, the Engineering Challenge subjects. Whilst emphasizing the importance of what had been neglected by the first cohort, the MetroGnome also deemphasized the importance of what had been the most visible success of the CSU Engineering program.

Conclusions

Making progress benchmarks explicit has served to improve progress through the cohort; however the anthropomorphication of the benchmark into the form of a Garden Gnome has led to some unanticipated side effects that will need to be accounted for, and adapted for in future implementations. Achieving the perfect balance between emphasis on topics and performance in the PBL subjects is an ongoing challenge. The MetroGnome as a member of cohort 2 has achieved the desired effect, and it is likely that a new MetroGnome will join each future cohort. That said, the CSU Engineering teaching team will continue to explore brave new ways of dealing with the unintended consequences – most notably restoring the balance between projects and topics. Both are cornerstones of the CSU Engineering model (Morgan & Lindsay, 2015)

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