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Doing twice as much maths in half the time: Implementing scrum methodology in a Year 7 mathematics classroom

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Key words: scrum, teaching mathematics, motivation

The need

I have been teaching Year 7 Mathematics for three and a half years. I enjoyed Maths in high-school and took as many units as I could, but I did not study Mathematics or Mathematics teaching methods formally at tertiary level. Consequently, I started teaching ‘green’. In the beginning I taught directly from the textbook, but the more I taught, the more I began to realise that Year 7 Maths is frequently not about Mathematics at all. It’s not the complimentary angles and like terms that stump students; it’s their fear of failure, their inadequacy in organising themselves. “Sir, I’m not good at Maths and I never have been,” I hear from one boy who struggles to rule up his exercise book. “I’m most scared you’ll compare me to my older sister,” says another. The problems they bring to the classroom are not ones that can be solved with a calculator.

So Maths is often not about mathematics. It’s mainly about confidence and organisation, which relies on skills like mindfulness, initiative, bravery and stick-to-it-iveness. Consequently, I started wondering how I could actually break through; how I could teach these underlying skills in such a way as to enhance outcomes for students, while at the same time covering the curriculum and producing meaningful results at report time.

Scrum

Enter Jeff Sutherland’s book *Scrum: The art of doing twice as much in half the time* (2014), which I downloaded as an audiobook and digested over a few weeks at the end of last school year. Jeff Sutherland is co-creator of the Scrum method.

Scrum, or *Agile Scrum* is a project management

model that was first used by software companies to create working software very quickly. Participants are organised into Scrum Teams. Projects are tackled in ‘sprints’. A six-month project may be broken into six sprints, and at the end of each sprint, a piece of working software is ‘launched’ and delivered to the client. This means that after less than five weeks, the client can be using part of the software package they paid for.

A Scrum team works in this way: Project progress is depicted on what is known as the Scrum Board. The Scrum Board is divided into three columns and populated with sticky notes. As a team member takes on a part of the project, they move the corresponding sticky note from the Backlog column to the Doing column. When they get confused on a Monday morning and wonder where they’re up to, they can stand in front of the Scrum Board, look at their ticket in the Doing column and say, “Aha! *That’s* what I am *doing*.” They work on the task until it is finished: until it meets the Definition of Done, which is also posted on the Scrum Board. Then they move their sticky note from the Doing column to the Done column, perform a little dance of celebration, and pick off another sticky note from the Backlog.

Every day there is a short meeting called the Daily Standup, where team members give a quick update by answering three questions: “What have I done since last time we met? What am I working on now? What’s next?” At the end of every sprint is another meeting called the Retrospective, which focuses on process rather than product. Team members reflect on what they could do to work faster and more efficiently.

It’s best if all the members of the team have diverse skills. There is no hierarchy in the team. It’s as flat as a pancake. The only person who has a specific role on the team is The Product Owner, who leads the Daily Standup meeting, keeps the

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Scrum Board up-to-date, organises the Backlog, and checks product against the Definition of Done.

Jeff Sutherland, in his book, shows that the principles that govern scrum methodology result in a dramatic increase in both the quantity and quality of output. “Twice as much in half the time” is no idle boast. He tells how Scrum methodology was used by his team to overhaul the CIA’s record keeping system from a paper-based to an online database within a matter of months, when other experts said it was impossible. He examines how crack teams of US soldiers, freed from military hierarchy and empowered by Scrum were able to turn the tide of the Iraq war. (They were considered too dangerous by their superiors and were disbanded when the war ended.) Jeff Sutherland claimed that Scrum can be used across a wide range of contexts, and he even mentioned a small handful of teachers who are implementing Scrum in their classrooms. Willy Wijnands (2012) is a chemistry and physics teacher at Ashram College in Alphen aan de Rijn, Netherlands, while John Miller (n.d.) of Blueprint High School, Chandler, Arizona, is another. But, could I use it in mine?

The Setup

What did and didn’t work

A mistake that is regularly made by people who catch the Scrum bug is to think that buying a cube of sticky notes and turning a wall of the room into a Scrum Board is all that’s required. Sutherland is careful to reiterate that Scrum is a *way of thinking*. He actually gives very little space in his book to the Scrum Board, and spends most of it talking about the underlying concepts of team selection and power, minimising waste and understanding processes. Consequently, as I thought about how to adapt Scrum to the classroom setting, I realised it would take some deep changes in the way that we did our learning in the classroom.

So I created a really, really, really, good looking handbook for students that outlined the whole process of Scrum. I used some artwork from the movie *Kung Fu Panda* to capture their attention and bridge the gap from the known to the unknown. (Master Shifu was the Product Owner, for example). This, however, proved to be a general waste of time because I didn’t see a student ever open the handbook. (I guess making the booklet did help me get my own thinking in order, however!)

I also tried to create teams by using a very sophisticated survey of self-perception of skills and abilities. This didn’t work. What *did* work was to simply consult as a class at the beginning of a unit, and to create groups of 3-4 students that included

a person who “liked ruling up and making things straight.” This person became the Product Owner.

Am I assessing individual or team effort?

A Scrum Team exists to create ‘product’, which is easy when it’s writing software. Our Mathematics unit that I wanted to try Scrum on was *Decimals and Operations*. But what could I call ‘product’? I could get every team to produce a booklet showcasing the required mathematical skills. This would be not unlike a software team creating product. But in the classroom, we traditionally grade students as *individuals*. A team assessment opened the doors for weaker students to let their teammates do all the heavy lifting. I had to figure out a hybrid method to reward students for their individual effort, and for collaborating as a team.

After a few days of agony and cold sweat, I came up with something that worked.

I broke the unit down into about 15 different skills. Some skills were foundational, and others were more complex. Generally, a chapter of a mathematics textbook will break a unit down into about 10 exercises, or 10 skills. I added a few more, both at the ‘bottom’ and at the ‘top’. For example, being able to stack decimal numbers in columns was not something taught in my Year 7 textbook, yet it was absolutely crucial for the rest of the unit. I printed up a set of 15 sticky-note sized cards that had the name of the skill and a mathematical example.

The next thing I did was to assign each sticky note what Sutherland calls a ‘Dog Score’ - a

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Source: <http://thenerdstash.com/trailer-kung-fu-panda-3-official-trailer-debut/>



Moving fast doing maths!

“students could rush ahead and score ... big numbers and then were still ... rewarded by assisting their weaker teammates.”

number that corresponds to the effort required to master the skill. The term ‘Dog Score’ came about when a scrum team were trying to get a handle on how difficult their project was to complete: Some parts required Chihuahua sized effort. Some problems were as difficult as Saint Bernards. Sutherland translated the size of the dog into a number from the Fibonacci sequence: 1,2,3,5,8,13. He used the Fibonacci sequence because those numbers are easier for the human mind to compare relative to each other.

Consequently, stacking decimal numbers in columns had a Dog Score of 1, while long division of decimals had a Dog Score of 13.

I solved the individual versus team problem by printing out a set of different coloured cards for each person on the team. This meant that each team member had his or her own complete set of sticky notes. I told students that the aim was for the team to move the maximum amount of Dog Points from the Backlog column to the Done column. The little trick to enhance collaboration was that when a task, such as stacking decimal numbers, was Done by the entire team, their score for that task was **doubled**. So, if all four members of the team could multiply decimal numbers (8 Dog Points), their team

could get a total of $8 \times 4 \times 2 = 64$ points.

This scoring system meant that more advanced students could rush ahead and score some big numbers, and then were still handsomely rewarded by assisting their weaker teammates.

Creating product – The ‘Definition of Done’

A team member created product by demonstrating that they could solve a randomly generated problem on the sticky note *under test conditions*. The ‘Definition of Done’ was that a test had to be a) completed on grid paper, b) ruled up, c) named, d) numbered, e) completed neatly, f) marked, g) signed off by a peer and h) placed in the ‘Product Box’ at the front of the room. Students were free to attempt a test whenever they wanted. They did not have to complete the entire test; only the questions that they chose to. The only stipulation was that they were not allowed to practice that particular type of problem on the day of the test. They had to do it from long-term memory. In order to fuel this on-demand testing, I created a test in Excel that had 15 problems: each problem corresponded to one of the 15 skills. The numbers were randomly generated for each problem, so I could generate a new test at the press of a button. The solutions

to the test problems were printed on the test page, and students were shown how to hide the solutions by folding over the test page, and how to self-mark their test. (Curiously, under these conditions, students generally took the tests quite seriously, and cheating didn't happen.) I also generated a Practice Sheet that had sets of questions and answers that students could use to rehearse their responses.

Results

It is not easy to say whether Scrum method improved the scores of my class, because I did not have a control group to test them against. However, judging from the general 'buzz' in the classroom, the way that we implemented Scrum added value to what we were doing.

What worked well

- Students appreciated being able to genuinely work at their own pace. They could do a test whenever they wanted; they could choose what problems they were going to work on next.
- The entire class got through the material very quickly, which enabled us to enjoy the reward of watching *Kung Fu Panda* during Maths, (which I did *very* educationally; pausing the movie to discuss the learning process-failure and success, confidence, team dynamics etc.)
- Many students did actually work in teams, helping each other with their weaknesses.
- Generally, students were motivated to create product and most needed little guidance. It seems they liked coming to Maths lessons, judging by the sounds they made as they entered the classroom.
- Sticky note movement across the Scrum Board and product creation meant that it was obvious when students were falling behind and needed extra support.
- As students got used to the process, their Scrum Boards were neat and tidy, demonstrating feelings of pride and care in their work.

What didn't work well

- Students did not see value in "The daily stand-up meeting" and had to be regularly prompted to discuss, "What I've done/what I'm doing/ what I'm doing next."
- Calculating a running total of Dog Points and graphing their progress on a chart was too complicated for the students to do independently. They were quite happy to just keep track of their work by moving tickets from one side to the other.

- One group in particular could not organise themselves to get through sticky notes efficiently. I think this was due to the overall chemistry of the group rather than their individual abilities.
- The students lost heart when I was absent for a week due to my participation in a school camp. The substitute teacher who covered my classes was not familiar with Scrum methodology, so the instructions I left were not followed. This resulted in a loss of momentum. When I returned, we finished out the unit, but I could see that students were tired of the method. The way we were implementing Scrum was no longer *fun*, there was no *game* to it.

Reflection

It's been about 4 months since I last used Scrum formally. Firstly, the units since then have not lent themselves to creating randomly generated tests. Secondly, the pace of school life picked up considerably, and I didn't have the time to prepare the necessary materials. Thirdly, I thought the students needed a break from the method, so they could come at it fresh next time, instead of jaded.

What I find most interesting is that this leap, way out of the comfort zone, has transformed the way I do business in my classroom. I now have a greater capacity to invent simple, creative ways to get students to take ownership of their learning journey, to learn quickly, and to reflect on their own learning. **TEACH**

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