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Transcript of teacher reflection interview

Peter Lelong with Lance Coad, Glenn Carmichael and Andrew Jones of St Michael's Collegiate School, TAS

Peter Lelong: I'm with Lance Coad, Glenn Carmichael and Andrew Jones from the St Michael's Collegiate School to discuss the illustration of practice project that the school has been undertaking for three years now.

So, we're just going to go through a bit of a discussion and a follow-up on what's happened in the last three years and towards the end we'll have a look at the future projections of what you might think will happen with that. So what happened after the project? The sustainability of this project, and did it continue and, if yes, how did that go and, if no, what stopped you?

Glenn Carmichael: It has continued but it has evolved from the initial plan. We do still have a STEM elective for coding but it has changed reasonably considerably over the last two years on how we actually run it. Initially, the whole class worked on a project together and we've now split it down to smaller groups where smaller groups work on a project together; still developing an app and still using the same Xcode programming language but it has evolved now to more of one where they decide what's important to them and go down their own track of interest rather than us saying, "This is what we want you to create." So, there is still app development. At the moment the Year 9 course isn't running, but it is happening in Year 8 at the moment.

Andrew Jones: What's happened, we started off trying to do a highly collaborative project, linking our maths classes, our science classes and our STEM classes. But because we've shifted more to student-centred stuff, going to where the students want to investigate and build apps, we've lost that link that we were trying to develop –

specifically between the maths and the science. So while we still teach the same stuff of 3D trig and geopositioning and those sorts of things, that ties in with what we're doing in earth science, we don't explicitly try and link that to what they're doing in their elective because it's not as pertinent in particular to that task.

Lance Coad: For example, we have a STEAM club that operates in the middle school – that's an extracurricular activity. One of the main things that's going on at the moment, though, is the entire elective offering is under review. There's a bit of a movement now to design new subjects that take some of the barriers away. So, for example, we're trying to break down barriers between year groups – there's no reason why grade 8s couldn't do a subject with grade 9s, and 9s with 10s and so on. We're trying to get more cross-curricular subjects going as well. So looking at some involving the arts, for example, involved in some way that might look at ethics of scientific engagement in the community.

These things for us are ongoing. I think one of the bigger differences, and Andrew touched on it, is the movement towards more independent, project-based learning. So, getting students to engage in a topic where they can immerse themselves to some extent rather than just us dictate: “This is a curriculum, you must study.” That takes managing and we're still in a fairly embryonic stages of doing that.

It's probably also worth mentioning at this stage that we've just completed redesigning the entire building. So we're on the edge of moving into an entire new facility, which even in its very architecture is now geared towards this kind of approach that we're talking about. It's trying to break down the notion of ‘a classroom is four walls where you do what you're told’ into a more collaborative workspace.

Andrew: What we've done is we've moved a long way from that project; that was like a starting point for us, to try and get the S, the T and the M together within our existing timetable structure. That had limited success, trying to link all those things together. So we're almost at a point now of throwing away that structure in our electives and trying to basically make teachers available at those times, rather than the other way around.

Just so you know, the concept for the STEM part of our new building is three interlinked rooms: one where students are taught stuff; adjoining that is a room where students are

collaborating; adjoining that is a room where students are building. So we've got these three rooms where we're expecting students to flow through them, possibly running two classes at once. Where there's all these specific collaboration spaces, specific building spaces, but also breakout spaces in relation to all those. We're trying a different approach completely.

Peter: And that's for grades from 7 through to 12?

Andrew: Yes, into the primary probably down into 5. We've got grade 5 and 6 are pretty much on site here. So we'll be doing that in some form from 5 up. The problem is 11s and 12s, we're still stuck with the external exam system. So that's where we don't have a lot of flexibility there. I can certainly see a lot of scope and we're looking at our electives from 5 through to 9; 10 is more of a lead-in into 11/12. We've got lots of flexibility below that.

Lance: It's tricky because we're dealing with a kind of a mixture of ideas. On the one hand, we still have all those traditional structures which involve the syllabus. So we have certain requirements to get students through a certain course, let's say grade 10 to 12 where that really dominates. So we can't walk away from that but at the same time we're fully aware that different kids have different interests and different abilities at different ages too. So trying to build ways that students can access knowledge and learning when they're ready for it rather than when their age traditionally might have dictated.

Coming out of Gonski, for example, there was a recommendation that schools be developing online materials – tools to help students, particularly in mathematics, work along at their own pace. We've certainly taken moves to do that; we've implemented, or we're starting to implement, new programs now to create autonomy, you might say, where students can have their own learning paths rather than just stick to the curriculum. It's difficult though because at the end of the day if the kid's in grade 10 mathematics then you've got to get them through grade 10 mathematics. There's that tension between immersion in an area of interest and an exploration versus getting through the course. That's an ongoing tension.

Peter: It would be fascinating in a year's time to look back on this this particular period in education based on what you just said and how that might affect the way children continue to learn and whether this has been a successful transition. I mean it's a bit of a sideline to what we're doing but that's what you were just saying.

Lance: Well, yes and no. I mean one of the key things that I've been looking at over the last couple of years is the idea of self-regulated learning – getting students to take responsibility for their own learning. Provide them the tools so they can get involved in them for themselves. Now that fits in fantastically with the notion of that we're trying to build in a collaborative STEM environment because to make that work, the students have to have a deep amount of buy-in. They have to be committed to the project themselves. And if they're resistant then it's going to be very hard to get students to do what you think is good for them. All these things come together. Certainly, I think the current events will act as some sort of accelerant.

Andrew: The other thing is the Digital Technologies curriculum coming in – Glenn can probably talk more to that but that significantly changed the skill sets and opened up holes and – we're in a more regulatory framework with that.

Glenn: Certainly, Digital Technologies has embraced a lot of what the original project that we started off trying to do. I suppose where our school system is sitting at the moment, we've moved more to the current STEM classes that we're running with the Year 9s and 10s are really focusing on the areas that we saw was lacking in our school, which was the engineering and the technology. We taught the maths and the science exceptionally well and they were really well grounded in that, but we've tried to really draw out the engineering and the technology in that. Obviously, still touching on some of the other bits but not to the same extent. When we go down to the grades 7 and 8, the Digital Technologies allowed us to bring some of those elements that we were looking at that project in, into lower grades now. So, the app development is moving into grade 8 and they're starting to do some of those things including the engineering process, that design phase and all of that type of stuff with the engineering is now being addressed a lot in Digital Technologies.

Peter: Because I was working with Debbie Campagna. Do you remember Debbie from the Collegiate staff? She would have been with you a few years ago and she and the primary staff did the CSER MOOC at that time, that was the online course run by the University of Adelaide that I'm involved in. So you'd have primary school children and teachers in the primary school at least be a little bit more aware of that, which is an advantage to you in some respect, that the children are coming through, and I hope continuing to do so, with some understanding. I would imagine that makes a difference, having children in the early years coming through to secondary?

Glenn: It does. We're still seeing some gaps but that's starting to flow up now. It's been running for a couple of years now. So they haven't all hit grade 7 and 8 but we're starting to see that flow through where particularly the junior school had some really great stuff happening. We're still working on our 5 and 6 area at the moment, which did see a bit of a drop-off, I suppose. So we're looking at rebuilding that a bit and redesigning that this year as well and that way hopefully we'll then get that flowthrough where we can build on knowledge that's been taught in those previous years and take them to areas that we just couldn't beforehand.

Andrew: For this project, the specific project that we had running has sort of died in its structure, but it certainly informed a whole lot of our developments in where we're going with STEM in the school. So for us it's been more a stepping stone – what worked, what didn't work – and the whole environment has changed in the last three years. We're just going with that flow based on the stuff we've done already.

Glenn: I wouldn't say the whole structure died in the sense we're still running a STEM elective for grade 9, which is what this original project was, which does have a similar focus but it has changed considerably since that project. But the whole structure hasn't completely stopped.

Andrew: What I meant was we were initially trying to get really strong links between the maths, the science and the STEM class, where that was our real focus, and we've drifted away from that as our needs have changed.

Glenn: Yeah.

Lance: I'll add something to that too, though. I think whether or not the project was something we did, I think that our language has changed or evolved along a certain trajectory. So, the whole school now is talking about STEAM and the whole school is engaged in the process of trying to think carefully about how we do what has been done in the past. I think Andrew can take a lot of credit for that too, in terms of pushing the notion of STEAM. So whether or not the project died, I don't know, I think the project was just part of a process that we've gone through, and that's ongoing.

Glenn: And that's also flowed into the design of this new building that's been several years in the making but that's really been a pivotal point of this building was to really facilitate that type of learning which isn't just siloed: "This is the one classroom where we tell you what you need to know and then you go away". That thought process really helped design this new building. Which we now have keys to, we just don't have students to go to! I have teachers but no students. [all laugh]

Peter: How was your thinking around STEM changed and how has the pedagogy been impacted?

Glenn: I think one of the dangers with Digital Technologies, in changing that, is that we run the risk of – the original thought process was to give them something tangible; that students could see a tangible link to the science, to maths, to engineering in the real world. With the Digital Technologies we do risk making it content bound and losing some of that real-world application. So, for example, going, "We've got to get through this element of coding or this element of understanding a network system or this element of doing that." Unless people are really careful about grounding that in the real world, it becomes purely an academic exercise and defeats the whole purpose of what the original concept of, "Let's actually integrate things to give them real-world applications to students and some meaningful knowledge."

So I think we need to be careful with that. When we're developing these new courses and things like that, constantly thinking about how you can make it relevant and real to students is a very important concept. How can we teach these ideas that we want to get through in digital technology and even in just STEM as well? How can you do it in a way that actually engages students to see, "Well, how could I use this in a career in the

future?” or “How does this impact my life now?” and we've lost that a lot with lots of subjects including maths and science to some degree and we don't want to do that with Digital Technologies as well. So that's going to be something that we're going to need to keep a bit of a close eye on.

Peter: There's a question here about the industry connections, which would tie in with that, wouldn't they? Did you sustain or improve? Or did it impact on the quality of the learning if you had those industry connections?

Glenn: We didn't have huge industry connections. The ones that did work better was actually the years after the project, when we went into the students developing their own apps. They went through a project where they were paired up with other females in the IT industry and they mentored them in developing those projects. That worked really well because the girls were able to see people in the industry doing their careers and that was actually really successful. So they got to meet with like the head of marketing of Twitter in Australia and they would meet once a week over Skype to talk about their app development, things like that. That was really useful for those girls but again this was just an elective so it wasn't a school-wide development. However, one thing our school has done this year has employed a head of project-based learning and experiential learning and part of his role is to try and make links between what's going on in the classroom and in the curriculum to what's happening in the real world. Getting people who are engineers or whoever it is to actually link in. Obviously, his role has been disrupted quite a lot over the last little while [with building works for the new STEM facility and school planning] but that's been a real aim of the school, I suppose, was to employ someone in that field.

Peter: Did you work with Jennifer Hemer from the STEM Professionals when she was at the CSIRO?

Glenn: No.

Peter: STEM Professionals works really well in matching schools with the students and teachers; for example, the gentleman who was doing the bee backpacks worked with Mount Carmel students and putting the digital technologies, the little sensors, on the backs of bees – watching where they went in the data for the maths to see where they

would travel to. So the STEM Professionals group is quite good with the CSIRO. What connection still exists between the learning areas then in the school? Has that still sustained?

Andrew: We obviously talk a lot [laughs] about all this stuff within what we're doing. The formal connections that we tried to develop between the subjects – we're not pushing that to the same extent because the structure has changed and because the students are doing more their own projects – linking it specifically to a unit in science; that's the part I was saying has fallen off but it's certainly a lot more awareness of what technology can do for the science teaching and maths as well, I'm assuming, is that we were saying that people are 3D printing this stuff or whatever it might be; that there's much more understanding of how the technology would be used within the scientific realm. It's much more informal and it's much more embedded and natural. We're drawing on these ideas all the time but not in a specific learning – it's a hidden curriculum – has now embraced STEAM. I think that's the best way to describe that.

Lance: There is enthusiasm out there, though. We had a meeting not so long ago in the maths faculty. We were looking at possible offerings, possible design subjects we could offer, and the kinds of things people – this is the teachers – were coming up with was things where an issues-based subject where we can bring in the geography class or the geography teacher, we can bring in the ethics teacher, we can bring in the textiles teachers. The intention or the ambition is there; the question is: how do we actually physically do that? So we've got a timetabler and she's fantastic! We've left it all up to her to solve all these problems of getting all these people together at just the right time and place to make this all work. [laughing]

But that's kind of where the rubber hits the road – how to actually make these things happen in a constructive way. Which again is why I'm really, really, really interested in seeing what comes out of this experience with online learning.

Andrew: I went to a conference last year with basically digital tech and IT people. It was a 3I conference, I think it's called, and Dr Genevieve Bell spoke there, and she's a professor at ANU, and starting up a course basically to try and teach a whole new branch of engineering. To match, we've gone beyond systems engineers in IT, we need

to manage the data, look at who makes the decisions for AI, how do we manage AI, all that sort of stuff. And I spoke to her afterwards. They're trying to get a school program in the very early stage of being developed and I volunteered us to book along with that. That hasn't come to any fruition yet because she then backtracked a little bit because they didn't have the time, but we're hoping to get something running for next year or the year after with these new electives to try and pull those ideas of, What do we design? How to design it? Who makes the decisions about those and how it operates? There's a whole new world out there which is just developing, which we don't have any control of at the moment because everyone's doing their own little things and it needs that ethical framework. Kids know how to code and they need to know how to design and they need to decide what are the implications of what I'm building? and how it's affecting people and I think that's something that the girls in particular will really hook into.

Glenn: A perfect example of where the discussions are leading things is that Andrew talked to me about that a couple of months ago and since then we've been using that with our Digital Technologies grade 8 class and we've been talking about how is AI changing the job market? What jobs will exist in the future? They've been researching that but then we've been developing, look, how do you actually develop AI? How do you use machine learning? We've linked that into the apps and we got them to develop their own machine learning code, which is now relatively straightforward, to recognise the difference between photographs, and they were training their computer to recognise the difference between a formal school uniform and a sports school uniform.

The good things that came out of that was we were able to talk about metadata and really, we can give 10 photos and the computer is not going to be very accurate. If we give 100 photos it will get more accurate. If we give 10,000 photos it's going to get more. And they were just able to see that in a real-time manner, to actually go, "I can see how the photos we're giving is too small a scale but the more we give, the better it's going to get at making these predictions and the more we can actually train things to do what we want." They were able to do that just in a double lesson, really, which was quite good, because some of the machine learning is fairly easy to manipulate now to do basic stuff like image recognition and things like that.

So, I suppose that's where the conversations are being had and people are keen, and it's just being weaved into some of the subjects that are being taught at the moment.

Peter: Do you feel you have the skills and knowledge to plan or develop your own units in STEM?

Lance: You can always have more skills and more expertise, but that's just wishful thinking. You've got to work with what you have so you do the best you can and reach out where you don't have what you want.

Glenn: And again, it comes back to that time; to actually learn the skills. So, the school has been very generous and given some time allowances to try and develop new stuff, which has been great. So they're actually putting their money where their mouth is. They're keen to see these things develop and they've been prepared to give some allowances, which has allowed people like myself to actually go away and study, how do you train machine language? So then I can bring it into a classroom. So that kind of thing comes down to giving teachers time and space to learn it and then bring it into the classroom and that's often the biggest hurdle, is actually finding time to develop those new things and learn them to a degree that you're confident enough to be able to be in front of a class. Not necessarily knowing everything but at least confident enough to go, “let's learn it together”.

Peter: Glenn, are you following the CSER Adelaide MOOC? They just put some new AI modules up for teachers.

Glenn: Oh, okay.

Peter: So the CSER.edu.au, they've just put two AI learning ones up: AI/AR and VR, and they're free online courses for teachers, which you get a certificate at the end of. They're there to provide the sorts of things you're talking about – machine learning and it's at a level for students – in the levels you're teaching at the moment – to provide teacher support. So it's well worth having a look at while it's still there.

Glenn: Definitely.

Andrew: Glenn touched on the really important point: that the school's having to invest a lot of resources. So I think we've probably got three or four teachers having three or

four lessons, or three lessons, set aside to do this study. So what you're talking about for a school the size of 1,000 kids, you're talking almost a half a teacher load across the school that the school has put aside to say we need to upskill in this, and that's not insignificant at all. As well as the building! There's this ongoing commitment which, unless that happens, you're relying on individual teachers with their own ideas. You've got to give them time and even all the online resources – they need time to do it – and space, mental space to do it.

Peter: So, did you run the project and what's changed?

Glenn: Yeah, well, I suppose we've covered a lot of that to some degree. Yeah, we did end up running the project. They ended up developing the app. They launched it on the iTunes store. And the changes were fairly significant.

Peter: What's the app called, Glenn?

Glenn: It was called St Michael's Collegiate. But we pulled it off because we then launched our learning platform that had a similar name and all the parents were downloading the wrong app and getting confused. [all laugh] Our marketing asked us to remove it because it was causing too much angst with parents! [all laugh] They thought they were getting their learning portal, but they were getting an app designed by grade 9s instead.

Peter: So that's the current situation. The future – looking into what we've got coming up, which is a bit difficult at the moment – connection to Digital Technologies? There's a question I've got here: opportunities, strengths, weaknesses and threats. Do you want to discuss the future, about how it is for Digital Technologies in your school into the future?

Glenn: Digital Technologies is really starting to take off a bit now, which is great. We've got the 7 and 8 program pretty much locked in. We're working with the grade 5 and 6 teachers this year to try and upskill them a bit more and give them some more confidence in teaching that because that's, as we said, that's a big ask for teachers that haven't experienced any of this and it's never been on their radar to suddenly start

teaching it. So that will actually require some upskilling of them, and some time spent with them to teach them how to implement that.

The way we're looking at doing with grade 5s and 6s is in more of an integrated manner. So instead of them doing a Digital Technologies time, they're going to be linking it in with, for example, I think grade 5, they do space. So it's going to be an integrated-type course where we're going to be linking in with their science class where they're looking at space. They're going to be looking at, “Okay, if we had a mission going to Mars, what types of things would we need to construct?” So, they'll look at – we've done some geodesic domes, which Andrew did before; that’s going to integrate in – but then communication demands: how do we send messages? Looking at the speed of light, looking at sending data using on-off switches, and pulsing light and things like that.

So I suppose that's where the integration is really coming in a bit more, is working with our primary school and we've found that's a bit easier than actually going, “You've got a standalone subject teaching something you're not confident with. But here's a subject you are confident with, let's bring in the digital technology into that”. So they're going to build Mars rovers and things like that, and talk about data representation and sending data in binary and stuff like that. All linked to this idea of life on Mars. So that's where Digital Technologies is going for the primary school and that's got, I suppose, a lot more chance to be integrated than often this high school subject, simply because the time factor is a bit more flexible.

Andrew: It's really interesting to note though that that's where we started. Lance and I started trying to develop STEM ideas through 5, 6, 7, 8 and we had them building stuff, designing stuff and building stuff with 5s and 6s where we had the most success, I think it's fair to say, because they had that time. So what Glenn's been able to do is to throw in the Digital Technologies into that from a fairly solid basis that all the teachers were happy with from an actual built design and hands-on build.

So we're now getting the digital side into the already, reasonably strong, hands-on design-build stuff. We had students building or making animal adaptations and kids were building puppet-type things with different beak sizes and picking up … whether they could get marshmallows or if they could pick up rice, depending on their beak sizes

and whether they survived or not. All those sorts of things that were involved in that. So mechanical control of beaks and whatever to bring that STEM stuff into the science and now we're taking the next step with the digital stuff on top of that.

Peter: Okay, challenges then, what are the challenges for you into the future?

Lance: The challenges – you can take it from what Andrew and Glenn have been saying – that the easiest place to do this work is in the younger grades because the structures are in place to incorporate that. So when you've got one teacher teaching a group of kids for much of the day it's not such a great difficulty to introduce or integrate other learning areas all at once. But when you start to get a curriculum that suddenly breaks into timetables again, it's that structure that really makes it difficult to do a lot of good integration. So when Glenn has to teach grade 8 science at 2pm on Thursday afternoon, he's not available to go into another classroom to do something else.

So in a way, I think the elective review that we're undergoing at the moment is almost like a bridge between the junior years where you can integrate readily into the senior years where it's very difficult to integrate readily. But really, really loosening up the electives so that kids can have much more flexibility there I think is a stepping stone towards meeting some of those challenges to do with curriculum structures, classroom structures. But they're not going to go away; those structures are going to stay. As long as we have mandated course requirements – and we will continue to have that – those challenges will remain. You can't have a teacher being in two places at once, at least at least not physically. Virtually, maybe. That's where the asynchronous component might become quite important.

Peter: So, Lance and Glenn, look, the question's then, just to finish off, really, is: what's next?

Glenn: Well, I suppose for us it's quite exciting. This is where I suppose we can see some success of – it's not really just this project – but the discussions of Lance and Andrew, myself and our new principal and other people around the place looking at how this can happen has really shaped the new building, which will be very exciting to get into. That we're hoping to reshape a lot of our education. So we're encouraging staff, or we will be once we get in, to think about how they can use this space for their classroom

in a more integrated and free-flowing type educational way. And the actual redoing of all of our electives, which is just being reworked through this year. So there's just been applications put forward at this stage, but they've all been encouraged to be more integrated and looking at cross-curriculum and things like that.

I think that's where there's a lot of excitement at the moment for us and seeing how these things will play out. But we're still in the early days – this is a fairly big change for us – this is a timetable change, which will hopefully allow a lot of those freedoms, the abilities that Lance was talking about, to actually come through into the senior school.

Lance: Yeah, I agree with everything Glenn said there. One of the other elements that we probably shouldn't neglect to mention is – we shouldn't fail to mention – is the psychological commitment of the staff. I mean, to take something that you've been doing for a long time and to remodel your own mind about what it is to teach and how you engage with students, that's coming. That's an important part of this and that's going to be a great challenge for a good number of teachers, I would think, to really reconceptualise what it means to have a class. That's fairly radical in some ways. We're going to have to confront that and I don't quite know exactly how that will transpire. I don't know exactly how we'll manage that. It's possible that we'll find certain personalities that lend themselves more freely to being relaxed about changing modes of thinking.

The students themselves, coming through from the younger years, they're going to carry certain expectations with them. So, in a sense, what we'll be trying to do is not mould them into a stereotypical past but keep them opening up into a more modern future.

Peter: Well, we'll see the primary children coming through in the next five to six years, who have been doing a Digital Technologies curriculum. They will come to you with a skill set around Scratch and ideas around coding; they'll have done a bit of AI, perhaps, in their primary years, depending on their teachers, of course. So the challenge for the secondaries, if they're not ready for those children, is that they can't go back and say: "Well, we're going to just introduce you to Scratch now" because they'll say: "No, we've been doing that for two years." So that does push where you can actually take your

students then, doesn't it? So, the primaries are really crucial to the sorts of things you can achieve, I imagine, going forward into secondary.

Glenn: Very much so! And that's actually meant that we've had to rewrite the digital curriculum course for our 7s and 8s. Really, we've completely rewritten it three times over the last three years, really, because we've got a different flowthrough coming up. And going: “Well, we should expect more. We should be adjusting.” Things like that. And hopefully as these primary schools continue to come through, feeding into that, we'll be able to take each of those classes that bit further. But that of course means rewriting curriculum; rewriting what we're doing and retraining teachers, which is again another time commitment.

Peter: So, have you been looking at the scope and sequence on the Digital Technologies Hub, and does that fit with what you're doing through the Australian Curriculum?

Glenn: Yes. We've used that quite heavily but there's still quite a bit of flexibility in there, which is good. For example, we’ve tweaked our grade 7 class considerably. Originally, we actually jumped too far ahead, and we went straight to Arduino coding using C Sharp, things like that, and then we went, “Actually, no. We need to wind that back a bit.” So we've gone back to micro:bits this year, but we're looking at pushing the micro:bits down to the grade 5s and then building them up to Arduinos once they've got to that point. So, it's still very much – we are continually changing elements – but we're working out, “What are we hoping our kids will come to us with? and what can we take them to?” and that's changing continually at the moment.

Peter: The micro:bits are very good for the primary. Have you been using the GROK Learning platform as well?

Glenn: Yes, and particularly at the moment. Obviously, with being at home, where we've got them on GROK Learning. They're doing the micro bits but we've also sent the actual physical micro:bit home with them over the holidays. So they can do the GROK Learning but also do it on a physical machine as well.

Peter: Fantastic!

Glenn: Because we did find when we first got onto GROK Learning, they got a bit oversaturated with it, and they lost a bit of that – it just became another thing that was too much. So we needed to make sure that it was – we did a bit of that but with some practical, hands-on building, construction – and that's where having the physical micro:bit is really helpful as well.

Peter: Yeah, they've been very good. Look, there's just one final question: how's your thinking changed in this period of the project?

Glenn: Well, I suppose it's continually changing, is the key, and as a school we're constantly looking at where we take this. It's actually been really pleasing to be part of a school that's driven by a principal that's really passionate about seeing those changes and he's prepared to back people by – there's grants going to staff, to go, “You can do this uni degree in teaching STEM,” and things like that. He's prepared to invest in it and a lot of people are getting on board with thinking about how they can start thinking about these elements in their own classroom and their own courses. So a lot of staff are really starting to embrace, “How does my classroom change because of this?”

Andrew: When you ask us a question about how has our thinking changed, you can break it down in several ways. The overall mode of thinking, if you like, is to be flexible and creative and to be investigative – in a sense that hasn't changed. That's actually guiding the process. But what does change are the facts. So the next steps are always contingent upon the previous steps. So we acquire more information – it's almost like the engineering cycle writ large in our own brains. So we adapt the circumstances, we modify ideas as we trial things but the overall approach that we're applying – no, I don't think that's changed – because our overall approach is to be flexible and creative.