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CPL Podcast: New 11-12 Science Syllabus

Host: Carly Boreland
With: Jim Sturgiss, Tim Sloane and Emma Finlayson

INTRODUCTION:
You're listening to the JPL podcast from the Centre for Professional Learning.
Here's your host, Carly Boreland.

Carly Boreland:
Welcome to the JPL podcast for the New South Wales Teacher Federation, Centre for Professional Learning. I'm Carly Boreland and I'm the editor of the JPL. Today I'm talking about the implementing of the new Stage 6 Science Syllabuses and I'm chatting with Jim Sturgiss, Tim Sloane, and Emma Finlayson who are all presenters of the CPL course *Implementing the New Stage 6 Science Syllabuses*. Welcome!

So, we've got a suite of new syllabuses that have just come out; they're implemented for Year 11 and then for Year 12. Some of them are familiar to teachers in terms of the subject, for example, Chemistry and Physics, and some of them are a completely new though in their design, invention and intention. I wonder if you could begin by talking to us about why teachers might feel enthused about aspects of these new syllabuses.

Tim Sloane:
From my end, as a classroom teacher and a head teacher, I think it's an incredible opportunity to explore what we are currently doing within the classroom and as a faculty – to look at new approach to delivering that content with these new syllabuses. They are significantly different in terms of the language that they use from the syllabus that we are currently teaching from, so I think all aspects of what that new syllabus offer some really exciting opportunities for teachers.

Emma Finlayson:
I have to agree with you there. I think in terms of teachers being able to tailor the new syllabuses for their own situation, for their own school, for their own context, that's a really good opportunity. Now that the context is really being removed from the syllabus content, teachers can really tailor to suit their students.

Jim Sturgiss:
Yes, I think that's a very exciting prospect as well – to be treated like a professional where we can actually look at the interest of the kids and think about our own expertise. We can generate unique programmes to suit our situation and I think that's quite an exciting thing.

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Carly Boreland:
Something that I've heard before, with Science especially, is that it's often content driven (as with other HSC subjects are as well). What are the ways that that's been changed? Can you elaborate on that a bit more?

Tim Sloane:
One point that I would certainly make is that (it was an analysis by a colleague, so I'm not putting my name to it as such but as mentioned in the CPL presentations) the 2002 syllabus has approximately over 110 syllabus dot points as compared to the new syllabuses about to be introduced which is around 30 to 40 of them, so that has significantly changed and has, I guess, really freed us up to actually explore ways in which we're going to deliver this more open enquiry - based syllabus.

Jim Sturgiss:
Yes. It's going to a bigger challenge because (talking about the same analysis that Tim was discussing where you can do a word frequency analysis) it turned out in the 2002 syllabus, the most frequently word used in Biology was "identify" and the most frequently used word in the syllabus today is "investigate", so it's a huge leap in cognitive load. It's going to change the way we teach because we are now expected to unpack what it means to "investigate". The lead dot point in every syllabus inquiry question is "investigate" and so we need to have a very good handle on what that means. Now, the syllabus does give us a lot of guidance around that, because it does break it down into questioning, predicting, conducting experiments, and so on, but that's the big change – that it's "Science by doing" almost.

Carly Boreland:
So then, it's not as straight forward as "more time to do less" because there's actually going to be a lot involved in the programming and planning to do this "investigation" all the time.

Emma Finlayson:
Yes, I'd agree with you there! In terms of the outcomes and syllabus dot points, I agree there's definitely fewer. But in terms of the time that you're going to spend unpacking those, exploring them, and letting the students drive the content that way, the time taken will be the same as in the current syllabus. There may be fewer outcomes, but the actual content within them, I think, is about the same.

Jim Sturgiss:
In days gone by you could actually look at the syllabus and you could almost have a teaching sequence just by looking through the focus questions and things like that. But no longer! [Now] you actually have to programme what it is you're going to do. If you're going to fit all this "investigation" in, if you're going to fit the depth study through, you have to integrate these into your teaching of all the facts and figures of Science (Chemistry, Physics and so on) and that's a big change! And so it's going to require a lot of preparation; a lot more thought. But I think it's going to be much more rewarding in the end.

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Carly Boreland:
And have you had a chance yet to play around with something you're looking forward to trying out? Maybe there's a sequence of investigation for a particular course that you've already started to think "Oh, I'd really love to do that", now is my chance?"

Tim Sloane:
For me, personally, as a Biology teacher at the Stage 6 level, in the current 2002 syllabus, there's some Year 11 content that's a little bit dry, let's say. And [in the new syllabus] some of the Year 12 content (the interesting practicals and first hand investigations) have been moved into the Year 11 content, so I'm really looking forward to actually exploring student engagement through doing some of these more hands - on practicals within the Year 11 course.

Carly Boreland:
So which ones? Which hands-on practicals?

Tim Sloane:
Oh! Enzyme Activity! It's a big focus in maintaining a balance and it's going to be really rewarding, I think, for me (professionally and personally in the classroom) seeing the kids engage with that content in Year 11.

Carly Boreland:
Well, I'm going to confess (it's not a surprise to anyone listening) that I'm a History teacher and we don't do a lot of investigation of enzymes in History, so, how are they going to get their hands dirty and get stuck into this one?

Tim Sloane:
Simply it's bench work basically, so it's actually getting them to explore various factors that affect Enzyme Activity. And within the current syllabus, Year 12 content, it's quite explicit the way in which we teach that – looking at temperature, pH substrate concentration. There is room to continue to do those in Year 11 now but there's also opportunities (it's a bit more broad actually the syllabus dot point I'm thinking of) where we can do those and I guess, further it by exploring other options looking at Enzyme Activity as well. So, I certainly found it was more "bums on seats" with Year 11 content outside of the compulsory field excursion, and now I do think we'll have that opportunity for more bench work with Year 11 Biology students.

Jim Sturgiss:
Yes, I think it's quite interesting that you are a History teacher because often when I talk to some Science teachers and say "What is it to be Science?" and they say it was "evidence based learning", this, that, and the other. And I ask "How is that different from History?" They go "Hmmm?" So the distinguishing factor about what makes Science, Science, is the fact that we use first hand investigations

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to build knowledge. And this new syllabus is based on that foundation; and I think that's a really exciting prospect. We're no longer teaching common sense cookery book stuff, recipes on how to determine if there's a double bond in hydrocarbon. We're no longer just doing that sort of stuff; we're actually using the scientific process to do investigations and learn about things like the concepts about waves, and thermodynamics, and the like.

Carly Boreland:
Something about that scientific process that might be new? And you can explain this more to me. We talk about reliability in History, and I think in Science reliability has a particular meaning and approach as well, and maybe sometimes teachers mix that up a little bit?

Jim Sturgiss:
Correct if I'm wrong but I think "reliability" in History is what we might call "triangulation" in Science, where we need to get three different sources, if you like, coming up with the same sort of conclusion, and then we are confident that this is the way it was. That's definitely an important part of what we do in Science. But "reliability" is a "data" concept and so we're looking at how confident we are with these data points and it is quite, quite different. One clue would be to actually go to the Mathematics Syllabus, because it actually unpacked *statistics* better than the Science one does, and that will help teachers actually understand these concepts, and maybe do some "buddy" work with our fellow Mathematicians.

Carly Boreland:
Something I'm interested in too, and I don't know if you've had time to look at these two closely yet. But the new syllabuses for Stage 6 have a lot of common features with the Stage 5 new syllabuses and there's been a clearer deliberate attempt to link a lot of things through there. Have you had a look at the outcomes for Stage 5 compared to the outcomes for Stage 6? Because I know sometimes, at high school, we kind of imagine that Year 10 leave us, and all of the sudden they come back to school the next year and they become so much more sophisticated, and all these things. What's the jump up like from Year 10 into Year 11, and then Year 11 into Year 12?

Emma Finlayson:
In terms of the transition from Year 11 to Year 12, I think this is where really careful planning is going to come into play (really careful programming for the new syllabuses) to ensure that we're embedding the ideas that they need in year 11 that they're going to carry through with them to Year 12, especially when it comes to careful planning of the Depth Study to ensure that it's cohesive and coherent. In terms of the step up from Year 10 to 11, in terms of Chemistry, I'm not necessarily sure there's that big a difference between the content that is in a Year 11 course as it is now and what's going be there next year. Again, careful planning I think will overcome any difficulties in the transition between Stage 5 and Stage 6.

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Jim Sturgiss:
I think there's a lot of similarities in the outcomes because the *working scientifically (*which is strong in the new junior syllabus) are virtually identical. There's been some bifurcation of some of the outcomes around the *processing* and *analysing* data. So they've been separated into two things because NESA sees them as being significantly important unto themselves and we need to be aware of this and careful when we're teaching these things. If there's no reason why we couldn't do depth studies-like things in Year 10 and Year 8, and actually practise these things earlier. We should be then inculcating the kids with these ideas of *scientific methodology* so that when it gets to Year 11, it won't be a big deal at all!

Tim Sloane:
Yes, to just jump in. One of the big focuses is on the *working scientific* outcomes within the new Stage 6 syllabuses. Let's talk about *backward mapping* - the Stage 6 courses will be having a focus on the "working scientifically communication outcome" and we've intentionally mapped backwards into the junior years, so at Stage 5 & 4 (also 7 through 10) we actually have oral presentations where kids are required to present and demonstrate their ability to *communicate scientifically* so there is a clear continuum from Stage 4 through to Stage 6. And not only in the *knowledge and understanding* component, but in the *working scientific* outcomes, which there is a clear focus on in the new Stage 6 syllabuses.

Carly Boreland:
Okay, I want to talk to you a lot about *depth studies* because I think that's a big new thing and it sounds like there are some things that you might start thinking about for your juniors because of this new development. What's the *depth study* all about? What's good about it? What do teachers need to look out for, do you think?

Emma Finlayson:
I think what's really good about it is that it's something that you can build up throughout the course of the year, in Year 11 and in Year 12. It's not one gigantic project that's suddenly going to eat 15 hours of your course at the end of Term 2, or something – like finishing off half of the course in time for your midcourse used to. I think it's actually really, really exciting prospect where teachers who have programmed, who are prepared for the introduction of the new syllabuses, will be able to build up to a really authentic rich task at some point during Year 11 and 12.

We've got our ideas in place for what we want to do in Year 11 Chemistry and for what we want to do in Year 12 Chemistry, and I think it will provide our students with an ability to be working like scientists before they perhaps go on to University and are actually able to use those skills in the real world. But again, it'll be preparation. If you are suddenly looking at jamming 15 hours in at the end of your Term 3, Week 10, you're not going to be able to do it and it won't be worth your time, and the kids won't get anything out of it. Again, I think preparation and planning is what's going to differentiate good depth studies from depth studies that aren't depth studies.

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Jim Sturgiss:
I think one of the nice things about the *depth study* is that it will give the kids a chance to have a consolidated body of work that actually leads to something. There are some things that we do really "bits and pieces" at the moment and kids have fragmented notes about everything. They don't write continuous bits of writing for extended amounts of time. They don't necessarily have a complete code of thought because we just get them to do one sentence answers and I think this is going to change with this *depth study*. I think a focus on *communicating* will be a positive thing. I think there's a lot of need for developing "What does it mean to be *communicating scientifically*?" that's [currently] not well understood. There's a lot of overlap; people thinking that graphing is *communicating scientifically*. In a way it is, but are you not going to use it as evidence for analysing the data when processing the data? So, I'll be looking at other things like how well they're using the language to communicate to a particular audience. I'll be interested to see the *mode* and how well they handle the *mode* of communication; Is it an oral presentation? How well they're handling the slides that go up? Are they putting 150 words in every slide and reading it to us? Or, are they much more sophisticated in their use slides by putting up an image and then just talking to it and being captivating? That's the sort of thing that I'm interested in, *communicating scientifically*.

Carly Boreland:
I know that with a lot of other subjects, where they've got these kind of student projects, it can be tricky to programme the timing out in a way that maintain student interest all the way through. Sometimes that whole free research time can become a bit long and languid, and sometimes not very interesting. Especially if you're doing your research *depth study* (and you are doing a few different science subjects and they all are on at the same time) and you can be spending two or three hours a day researching. What are some ideas? Have you thought about how you are going to actually manage the timing of this and how you'll put it within your programmes?

Tim Sloane:
Yes, certainly we have. One of the mandatory requirements still, for Biology and Earth and Environmental Science, is a *field trip*. And so the approach we'll be taking as a faculty is to embed that field excursion (approximately 5 hours) into the 15 hours and use that as a "case study" where they'll go out and look at various relationships within the ecosystem: then also a really clear focus on human impacts on the ecosystem; and attempts that are being made to restore that ecosystem. We'll then actually have class time to explore/research further, where the students will actually use the information gained from that field trip to research another ecosystem with an Australian focus (is my current thinking) and then present to the class (obviously as *oral communication*).

So of those 15 hours, 5 hours is spent on a field trip. There will be in class time dedicated to researching an ecosystem of their choice, and then followed by a formal oral presentation to the class on which they will be formally assessed. That will certainly engage, and the kids will maintain that focus

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because they'll be working towards that end goal of presenting to the class. I think (I'll let the other guys speak to Physics and Chemistry) there are opportunities for fun outings on that front.

Jim Sturgiss:
The 15 hours that's mandatory work on *depth studies* in class, that time can be broken up into a number of different stages. So typically, you might be learning "What is a hypothesis?" and you give the kids a context where they practise doing a hypothesis in the first topic, if you like, and that can be half an hour towards the *depth study*. Then the next one might be "How do you operationalize the variables?" and you go through the process where you teach the kids how to do that, and that's actually working on a *depth study* as well. Then, as Tim suggested, you might go to a *field study* and do a group work, so you're going from a modelling stage to a *group construction*, and, it's only in the last thing where the kids go off and do a *depth study* that's individual to themselves.

Carly Boreland:
In talking with both of you, I like that what you're describing sounds like good teaching to me. It doesn't sound like anything where the *depth study* makes so much of a difference; it's just that that whole cycle is kind of just happening. It sounds like, as the teacher, you can pinpoint where there could be a problem, so that you can kind of control for that and set your class up for success. So, rather than them going off and collecting some kind of data set that then is going to be problematic and make the whole thing really difficult, you control the data set and then let them have the inquiry, conclusion and communication experience rather than having everything sort of free and free form, which could mean that students end up not having a good experience because of something that really probably could have been avoided.

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Emma Finlayson:
One other thing I'd like to add on those subjects of *depth studies* is I think a lot of teachers are already going in with that misconception that a *depth study* equals research and that's all there is to it. You give your students a research question and off they go and they spend 15 hours in class, on their computers, researching. Well that's not how the Sciences work and you don't find the answers in Science purely by researching. It needs to incorporate some form of *data collection* (whether they're primary data, secondary data, but they should be together). In terms of the *depth studies* that we're working to design in Chemistry, How do we find out information in Chemistry? We conduct experiments – we don't just sit on a computer necessarily and see what other people have done. So I think that's one way that it's going to integrate really naturally into what we're already doing because that's what Chemistry's about; it's

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about experiments, ergo they will form part of our *depth studies* and that's something really important to remember.

Carly Boreland:
Well I think we've got a pretty clear understanding of what the *depth study* is, and ought not be, and probably, like programming the first time around, it's a bit of a draft run so time spent on reflection is always good. We're kind of worried when you get those big programmes at the beginning of the year and it's like - "here's my programme for the whole term, or the whole year," and it's 15 feet thick. And often that means that teachers won't change it because it's been so hard to make it the first time around. It might be a bit of a "trial and error", working together to begin with, and then getting some more ideas as we go along.

Emma Finlayson:
Well that's why I think, Jim, you've been suggesting so strongly that teachers working on this collaboratively and doing it electronically because that way you can be adding those changes as you encounter them. When you find something does work, or something that works brilliantly, or doesn't work at all, you can be adding or updating that in real time – it doesn't have to be sit down at the end of the topic, at the end of the module, and go back and try and think what worked and what didn't.

Jim Sturgiss:
I think that when you're working on a Google doc looking at the programme and you're looking for resources, if there's something there that you don't have, you just find it and then you just add it to the document. It's a very simple process but it doesn't add weight to the size of the document. The document should be fairly short so we can actually get through it and understand it.

Carly Boreland:
Yes, so that's the next thing I want to come then. Have you got suggestions for teachers as they begin programming? What are you thinking might be a good way to approach that work?

Tim Sloane:
Certainly; as Jim mentioned earlier, many faculties use the current syllabus as their registers and sort of work through them because they really do sit in a nice chronological order. But, those days, I think, are well and truly gone. You simply cannot do that with the new syllabuses; so, you really need to engage with what each of those enquiry questions, outcomes, and each of those syllabus dot points means to you as a faculty (and I guess as a team if you've got several teachers within the one faculty teaching the same course).

Jim Sturgiss:
Where the syllabus content starts or finishes seems hard to find out because when the first verb is *investigate* and what it really means is " let go; let the kids play". It doesn't mean "tell them the answer".

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That's the big difference. So the whole approach is trying to get the kids away from rote learning a book; just swallowing it and then regurgitating it. That's what we want to try and get away from. I think the syllabuses are a very clever attempt to change our practice (as Science teachers): to think much more about a constructivist way of thinking about the world; where students actually learn within themselves. So we can't actually just tell them the answer of things; they've actually got to come up with that response themselves. And so, we need to have experiences where they can play with these ideas and come up with a relationship of their own. And we can then challenge their ideas about things before we move on – rather than "recall this", "identify that", "explain this". I think those days are gone.

Carly Boreland:
The syllabus gives us a lot of direction and opportunity to do that but I know in a big busy high school the practicalities of actually sitting down and creating time to talk together about how we're going to change our practice can always be tricky. What are you thinking of doing in your schools to make that happen?

Tim Sloane:
Hitting up the principals for lots of financial support to have planning days because [teaching the syllabus] is our "bread and butter"; to have some quality sit down time with members of the same course and actually put brains together to come up with ideas on how we're going to going to approach each of these outcomes, I think is absolutely vital, and certainly the technology [also]. You'll never be given enough time (it's the nature of the beast in the high school environment) and the technology does provide us with opportunities to work in a collegial manner from afar…

Carly Boreland:
…But, just got to lobby, and it takes money, and just got to make it happen.

Tim Sloane:
I would say if I was flying solo on a course I would be very nervous approaching some of these new syllabuses, so that opportunities like this offered by CPL and other professional development opportunities, are, I think, very needed.

Emma Finlayson:
Courses like [the ones offered by CPL] are really important, [especially] for teachers who don't have the luxury of having maybe three or four people within the same KLA (maybe even in their faculty) with whom they can be bouncing ideas around and getting feedback and evaluating. So, courses like this are really important: to come together and talk to people who have different ideas, similar ideas, and just get feedback on whatever you are thinking. This is a great opportunity for people to be collegial with people from other schools.

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Jim Sturgiss:
I think that's one of the characteristics of this particular course is that it will be working collaboratively through Google docs on a programme, and although they may not have had enough time to complete them [during the course], they've started thinking about and have been talking to people from different schools about things. They're going to go away and have a shared doc which they can look at, develop, and continue the communication with those people with whom they've been working at these courses.

Carly Boreland:
Some of our participants at CPL (and members at the Federation) might be the only Science and Maths teacher in their central school and so they might be doing all of this on their own. A few good places to start, in addition to coming along to the courses when you can, is getting in touch with other schools, where people who are doing it by themselves, or just reaching out to other schools in general. The NESA website has got some resources on there too. Have you had a look at these units there and their scope and sequences?

Jim Sturgiss:
NESA has got two sample modules for each of these courses up there already and one of the nice things about them is that they're short.

Carly Boreland:
Well that's true; it's good isn't it?

Jim Sturgiss:
I think it is good, I really do! However, I'm a great believer in using the technology and making these programmes three dimensional so that if you have a resource, you just hyperlink it to the original document. [That way], the original document doesn't get cluttered – it's a very clean thing that gives you a trajectory to teach a particular series of concepts.

Carly Boreland:
Something that's come up in History (I don't know if it's the same for you in Science) is when we're making up those assessments schedules and thinking about assessment task weightings, we've noticed that because you're shifting some things around that it can sometimes mean that you end up with an assessment that's got quite a high weighting early on, especially for Year 12. I know we're a little bit away (a year or two away from having to think about that too much) but we've noticed that once you start moving something you can quickly find that you've got a 40% assessment task straight up, and it has, in the past, been best practice to have a gradation that has a smaller weighting when they're new in Year 12 and a heavier weighting when they're at the end of Year 12. So, I know in History, we're talking a lot about keeping an eye on that (Year 11 there's grading so it possibly matters less). What do you think for Science?

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Jim Sturgiss:
I really think one of the most sensible things we can do is align our Reporting Frameworks and our Assessment Frameworks. Because there is some complexity in the syllabus where there are seven *Working Scientifically* Outcomes and then there is another *Knowledge and Understanding* Outcome for each of the modules. My advice would be to call a strand *Knowledge and Understanding*. It doesn't matter what you're doing is *chemical reactions* or you're looking at the *periodic table*, what you're doing it still *Knowledge and Understanding* and you just report against the thing called *Knowledge and Understanding*. There might be ways of combining the *Working Scientifica*lly Skills, for instance, you might have *Communication* unto itself but you might combine *Processing and Analysing Data*. You might then have *Questioning, Predicting and Conducting* as something you might keep together as well, and you just keep them as your Assessment Strands but you also make them your Reporting Strands so that the data you collect against those [assessment] strands goes straight into your report. This means there's less angst at reporting time and it also means it allows us to plan our assessments against some sort of grid, in a way, that feeds directly into the reports as well.

Carly Boreland:
So, there's more logical connection between your *programming* and what you're *assessing* and actually doing in class, and that thing you send home to parents a couple of times a year.

Jim Sturgiss:
I think we do everything backwards. You should think about what's important - what we want to report to the parents? And then redesign what we're going to assess and then what we're going to teach.

Carly Boreland:
And presumably that we've decided what we want to report to the parents because we've decided that that's the really important things about what we're teaching.

Tim Sloane:
We've talked about the *Course Performance Descriptors*. Broadly speaking, for mine, they can be broken into what Jim's talking about in terms of *strands* – the *Knowledge and Understanding*, the *Working Scientifically* (which can be teased apart further) and *Communication* – so it's one of the core documents that all teachers should get their brains across (the *Course Performance Descriptors* and how it aligns with the syllabus). With that in mind, you can actually start to set up your reporting framework and work backwards through your assessment, and I guess you're teaching practices as well. I'm all in agreement with Jim - in terms of setting up that reporting cycle around *strands* and having your assessment tasks each feed through into one of those *strands*.

Carly Boreland:
Jim, Tim and Emma, thank you so much; it's been good fun chatting with you – always feel a bit outnumbered when I'm one historian with three scientists but it's truly been my pleasure and I have

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learned a lot to about my own thinking about what to do with these new syllabuses as they come in. So, thank you and look forward to more CPL courses with you.

Tim Sloane:
Thank you kindly and I just like to say to everyone listening, this is a really exciting opportunity to explore what we do and how we deliver that content as we move forward into the new syllabus.

Carly Boreland:
You've been listening to the JPL podcast for the Teachers Federation's Centre for Professional Learning. I'm Carly Boreland, and I'm the Editor of the JPL. I've been talking with Jim Sturgiss, Tim Sloane and Emma Finlayson about the new Stage 6 Science syllabuses. And to find out more and to listen to further podcasts, you can go to our website at cpl.asn.au/podcasts

CONCLUSION:
The JPL Podcast is produced by the Centre for Professional Learning and the New South Wales Teachers Federation. All opinions expressed in this podcast are those of the individual speakers only, and do not necessarily represent the views of their employer or associated organisations. The host was Carly Boreland; technical direction by Jason Nicholas.

Jim Sturgiss **is an educational researcher and independent educational consultant. A recipient of the NSW PTC Distinguished Service Award for leadership in delivering targeted professional learning to teachers, he works with schools to align assessment, reporting and learning practice. He has been a DoE Senior Assessment Advisor where he developed many state-wide assessments, (ESSA, SNAP, ELLA, BST) and as Coordinator: Analytics where he developed reports to schools for state-wide assessments and NAPLAN. His MEd (Hons) thesis concerned the evaluation of a genre-based literacy program used in the Science classroom. 'Do improved literacy outcomes lead to improved science outcomes?'**

Tim Sloane **is Head Teacher, Science Concord High. He is an experienced HSC Biology marker. He has presented for STANSW 'Meet the Marker' and 'HSC Study Days'. Tim Sloane has the breadth of experience and working knowledge of teaching the Stage 6 science courses attempted by the vast majority of students.**

Emma Finlayson **is a chemistry teacher at Sydney Girls High School. She has a special interest in EAL/D education in science and is an experienced teacher of GAT students. She has contributed to Stage 4, 5 and 6 text books and presents on various topics. Her latest workshop is on Modelling in Science.**