Authentic assessment as the cement of authentic learning in labs
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Slide 1: Title slide
Authentic assessment and how this can be used as the cement of authentic learning in labs. This is a project that comes out of the science department and Monash Chemistry, the research group is the Chemistry Education Group and the project name is Transforming Laboratory Learning or TLL.

Slide 2: Authentic learning and assessment
What is authentic learning and authentic assessment? It has to be real, it has to apply the knowledge and the skills that you would be doing in a real world setting. We ask students to perform real world tasks that demonstrate meaningful application of their knowledge or their skills and we use the same skills, knowledge or attitudes that they would need in their real professional life in the future. This makes it very different from a traditional laboratory in most cases, at least in most areas of the life sciences. There's a similarity between the thinking required for the assessment task and the thinking required to succeed in a real world situation. This makes it a bridge to the workforce and this is why it's so applicable for work-integrated learning.

Slide 3: Mapping authenticity
Quickly looking at how we map authenticity. This comes from Lemanski and Overton if you want to follow it up. We have a range of assessment tasks within the higher education space and we can lay those out of the grid. Are they more or less academic? Are they more or less student- or teacher-centric? So when we talk about finding context, finding authentic experiences for students, we're talking about this upper-right quadrant here. In many cases, we're traditionally teaching or presenting activities that are in the lower-right space - they're generally academic, they're generally teacher-centric. And we are moving towards that being the norm in the sciences. What I'm here today to present is the fact that if we add some context, if we add some assessment that's authentic to the work the students will see in the future, that matches the science they're being presented with, we move from this very traditional space into a work-integrated learning space within the classroom. That can be very valuable for the students and it can add a lot to the teaching. It can also be a really straightforward approach so this means it's accessible to people who are busy with eight million other things. So what might this look like?

Slide 4: Principles of authenticity
Let's first cover the principles of authentic assessment or authenticity. It has to be aligned with the instruction. That's reasonably straightforward – you can't be assessing something you're not instructing and hopefully you're not.

Students will need to demonstrate their competencies through significant and meaningful tasks. Now this is where the task or activity you set may start to vary. The significance and the meaningfulness, the meaning has to be obvious to the students. It also has to be obvious to the teaching staff. Often we forget this level, or it's easy to hope that everyone is on board and coming for the journey with us. But it's vital that teaching associates or lab demonstrators understand and can present these tasks appropriately.

Authenticity is also very subjective. The students have to be able to see the authenticity but students often, after many years of relatively straightforward, routine laboratory classes, are easily excited and easily engaged by a small amount of context. For example in our food chemistry subject we have

a prac where they're looking at different milks. The fact that we actually just give them the milks – light milk, regular milk, coconut milk, chocolate milk, breakfast milks - and they see that in the pack in the laboratory and they go 'oh I'm actually testing something that means something in the real world.' As academics or as educational developers and designers, we have to always keep in mind that it's the student lens that's important here when we're talking about authenticity and context. And as I mentioned earlier, teaching staff must be able to see it too.

Slide 5: From Claisen-Schmidt synthesis to developing sunscreen

Here's a quick example for you. We had a traditional lab that everyone quite liked because it made shiny beautiful yellow crystals. It was Claisen-Schmidt chemistry, a straightforward 'A + B = C'-type synthesis. It worked well, it ran in second year but it didn't have any context. Everyone did the same thing, there was no team work, there was no competitive angle, there was no extra layer – this was just a standard student lab. So we went out and looked for a context. I had seen this group of chemicals previously used as coatings. The context that I discovered in that patent literature was actually sunscreen. These are patented for use in sunscreen. They're actually not used in sunscreen because they're highly coloured probably but they're definitely patented.

I went further and looked into the educational literature and what do you know, somebody's actually discovered this beforehand and there's a JChemEd paper on this. Now we changed a few things but the rough approach is the same. There's the compound there, or the group of compounds, that we make.

The students now work in a group, they make slightly different compounds, each one in the group making a different compound and they do a comparative study. And what they're looking at is the UV absorbance, very simple, very straightforward, very accessible in an undergraduate lab. So they're making a solution and each student has their own solution and they do a comparative study of which UV absorbance profile best fits what they are told about a sunscreen profile. And then they make a recommendation.

We've been lucky enough to already have contacts with a personal care company in Melbourne, a small local company called Rationale. They supported us by making sure and agreeing that it made sense and was contextualised for their industry. They also added a few comments and were prepared for us to include some of the background of their company in the pre-lab. This is obviously great but it allows us to not just have a contextualised lab but have something to point at – these are these people, just down the road, and this is what they're doing. They're not actually producing these chemicals but here are the chemicals they are using and you can see from the science, you can see from the chemistry that these molecules feature many of the same characteristics as your molecules that you're making. Rationale was a great partner and one of our most successful partners. We were able to directly assess the properties because they are looking at these UV profiles. We even were lucky enough to have Rationale come in, and the good thing about commercial partners is they can bring in photographers and give you great photography to use like you might have noticed in the first slide here.

So we also added an executive summary. Most of you would know what an executive summary is: the succinct summary that you give to your boss or your boss's boss or further up. Students don't know what these are, although they understand the point of them when it's explained obviously. We're introducing things like these simple summaries as a way of getting students to think about other ways of presenting science. It's not a traditional student report, it is added to the student

report. It's only about one paragraph so although they're learning something additional it's not a large body of work. They're just looking at how you communicate science to the busy executive who just wants the Cliffsnotes. In this case, we gave them an example to use as a starting point. We would give a lot more in the future, they were given a brief description of what an executive summary is too and they could ask whatever questions they want. We had lots of students giving the executive summary a good shot but they mostly missed the mark. So in the second semester we gave them an example of a poorly written executive summary and we gave them an example of how you could fix that executive summary and highlighted the pieces that needed repair. In that particular unit, also a second year unit, when we did that, they were much more successful.

Slide 6: Not everyone appreciates the change
Not everybody appreciates when you are this successful in communicating something like a commercial element of a lab. This feedback is from the sunscreen prac unit and it clearly refers to the sunscreen prac. I guess I love the use of the word 'horrible'. To me, this shows that we were actually highly successful. This student definitely understood that we were trying to get students to understand the commercial elements that they might be dealing with in the workplace. However they didn't appreciate it, and that's perfectly ok. That's my response to that, I wasn't entirely sure what else to think.

Slide 7: Importance of writing assistance
Back quickly to the writing instruction. We did give instructions and we got very mixed results with the sunscreen prac. The students obviously gave it a go but they really did miss the mark generally. With the protein content in milks prac that I briefly mentioned before, the students work in groups of three. They each have a different technique that's analogous: they're using different dyes, different coulometric assays to test the protein content in their milk. They do nine milks each, all the same of course. They were able to present these quite well in general so we were very happy with how the reinforcement of the writing skills went there. That's going by anecdotal feedback from the demonstrators that more students grasped what an executive summary was. We're going to try and roll out more exemplars in 2018 and we hope that will solidify it.

Slide 8: Students feedback: Food Chem
The food chem example is a good one, the lab based on milks. We have a feedback session at the end of each semester and a very interesting conversation was captured between two students and I'll let you read that there.

The students are obviously getting some element of real world or work-integrated learning aspect out of these experiences. Just to remind you that this activity is only a four-hour practical so the students were able to capture something that they feel is almost a work experience type situation but they were able to do that within their classroom with it all assessed and controlled and within the traditional classroom space.

Slide 9: In summary
In summary, authentic assessment has a huge role in how you can deliver great work-integrated learning lab experiences for students. It can inform modifications of a prac; it can make students aware of workplace considerations; it can increase engagement quite a lot as well too. Authentic assessment doesn't have to be difficult. Students do need support and the teaching staff are also likely to need support but if it's done in this manner it really can be done step-wise, one at a time and doesn't have to be a massive effort.

Slide 10: Thanks

Thanks to the Monash Science faculty for funding the Transforming Laboratory Learning project and to our research group, the Chemistry Education Research group for support.