**Project title:** Investigating the effectiveness of laboratory simulations and a content aggregated model of teaching in improving deeper learning of histopathology teaching

**Project leader:**
Name, title and school
Assoc Prof Janine Danks, School of Medical Sciences, Head of Histopathology

**Team members:**
Identify team members, school/s (or department/s, institution/s)
Assoc Prof Janine Danks, Ms Kristi Milley and Ms Syu Mi Sam

**Descriptor:** 50 words
This project aimed to address two problems within Histopathology courses. Students do not prepare for practical classes and struggle to acquire the skill being taught. This project will overcome the flow-on effect where problems with the integration of acquired theory with the practical class skills into the global learning concepts.

**Abstract:** 200 words
*(Consider writing your abstract in the format of your preferred conference)*
The aim was to design and evaluate the use of pre-laboratory simulations, post-laboratory evaluation videos and a pilot sharable content object reference model (SCORM) module as e-learning tools to improve student outcomes in histopathology.

**Background to project:** 250-300 words (e.g. context, current literature, similar projects).
Virtual laboratory demonstrations have been shown to improve students’ basic laboratory skills (1) as well as improving the quality of summative formal assessments (2). Despite this, there is very limited data on the effect of closing the learning loop by providing video materials following the laboratory class. This area has been neglected and is a clear knowledge gap in the field.

This project’s aim was to investigate the effectiveness of pre-laboratory simulations, post-laboratory evaluation videos, online assessment and a pilot sharable content object reference model (SCORM) module as e-learning tools to improve student outcomes in histopathology. These short videos, under 10 minutes, will outline the methods used in each practical, important theory and explanations and examples of practical results. The practical videos for one course topic will be integrated into a pilot SCORM module to evaluate the potential for SCORM based learning in Histopathology.

The use of these e-learning resources will provide a more inclusive learning environment for all students. They will allow students to better integrate theory and practical learning. In addition, our preliminary data suggests 24 hour access to these materials is an important aspect for students (unpublished). These resources should improve the student experience by reducing pressure during practical classes and creating an interactive environment to consolidate their learning at their own pace. This will provide a more engaging experience establishing a foundation for deeper learning.


**Project Outcomes:** 500 words

1. Provide a summary of the project impacts and outcomes.
2. Attach a list of the deliverables, such as pictures, presentation material, website links, etc.
3. Provide a summary of the anticipated impacts post-project.
4. How do the outcomes address the key objectives of your proposal.

Cumulatively we have filmed and edited 20 pre- and post-laboratory videos. In addition, we have created online pooled assessments for each topic covered in these laboratory videos. These assessments use images from the post-laboratory videos to further reinforce the student’s practical learning.

To evaluate the success of these tools we have carried out student surveys (Likert and open ended questions) to evaluate the effectiveness of the pre-laboratory simulations, post-laboratory evaluation videos and the online assessments for two successive cohorts. The final survey will be delivered at the end of Semester 2, 2016. Part of the survey results have been used to generate a working manuscript on the student’s perception of online learning and learning tools in general. Important outcomes from this survey include (data summary attached):

- Students do not feel learning online is easier than learning face-to-face
- Students feel it is easier to cheat in online assessments
- It is easier to get feedback from online classes
- Online learning encourages them to be active learners
- They felt they were able to concentrate well in online classes

In addition, we have used the statistics tracking within Blackboard to see how much the current second year students use the existing pre-practical videos. This has been carried out throughout 2015 and will continue until the end of 2016. We will also carry out student surveys with 2nd and 3rd year students to determine the effectiveness of this module.

Finally, we are completing the last element of this project: to create content aggregated SCORM compliant interactive module on immunohistochemistry (IHC). We are using Adobe Captivate (that is present in Adobe Creative Cloud) to aggregate the content. This module will integrate the videos we have made for IHC, Quality Assurance and Quality Control. The module incorporates formative and summative assessments. In addition, it also has additional voluntary learning tools included such as a glossary and jeopardy game (screen shots attached).

Based on the survey results both the pre- and post-laboratory videos have been well received by students. Anecdotally, their use has created up to 30 minutes extra time in practicals relieving pressure on students but also allowing our practical demonstrators more time to focus on discussing the results of the class with students.
The experience we have gained creating the materials for this project have allowed us to apply them in other courses. For example, we were able to use our experience filming the laboratory simulations to develop a final year Laboratory Medicine project that generated a student produced online staining manual. Furthermore, our experience with Adobe Captivate provides us with the potential to further develop content aggregated modules which would be of particular use in Histology where they could be used to summarize each organ system.

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<th>Project Process: 500 words</th>
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<tr>
<td>Evaluative reflection on the project, including performance, outcomes, challenges and impact.</td>
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<tr>
<td>Describe any aspect of the project that you found to be particularly satisfying or challenging.</td>
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<td>How did you address the challenges?</td>
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Overall, the project has been a valuable experience for our team. It has given us better insight into how we can further develop our courses in an online setting; which has been difficult given their hands on nature. We are still collecting both survey and Blackboard data but the initial survey data we have analysed has been very interesting for us. The data has really given us a better perspective on how our students feel about online learning and what elements is needs for it be engaging and high quality in their eyes. It has also given us a great foundation of knowledge to draw on when creating new online tools in the future.

Unfortunately, team member Kristi Milley left RMIT at the beginning of 2015. This has affected the efficiency and progress of the project significantly. In particular, as Kristi was the team member with film editing and Adobe Captivate skills. Kristi is still engage with the project but in a more limited capacity.

Together we found creating the pre-laboratory simulations very rewarding. In particular, as it also involved our technical staff which provided a rare opportunity to all work collaboratively together to produce something for our students.

Finally, the project has been well received by our students who enjoyed the opportunity to directly engage with staff to help improve the course. They liked seeing their input develop into a tangible outcome they could use for their learning.
**Dissemination:** 500 words

1. Outline your plans for dissemination of project outcomes. This should include both within RMIT and externally.
2. Attach dissemination materials (if applicable).
3. Comment on the likelihood of wider implementation of outcomes and their sustainability.
4. Describe the potential for further development of the project content or process.

Part of this project has already been disseminated and is available both internally and externally. The featurette video can be viewed through the following link: [https://www.youtube.com/watch?v=qNO4ysixvbQ](https://www.youtube.com/watch?v=qNO4ysixvbQ)

In addition we plan to run a workshop within the School of Health and Biomedical Sciences to demonstrate the potential of using lab simulations and how to adopt the materials produced and technology in other courses. As part of this we will also create a template for other educators to replicate the developed resources which will be available from Google sites as part of the RMIT Model Activities for Inclusive Teaching (MAIT). Syu Mi Sam and Kristi Milley have already contributed two activities to the model.

We currently have a working manuscript from our initial survey results for submission to Higher Education. Based on current results we should also have enough data to generate a second manuscript based on the use of laboratory simulations and post-laboratory videos and their effectiveness.

There is the potential to use the materials we’ve generated along with creating new content aggregated modules to develop parts of our courses into online courses that could be delivered for RMIT Vietnam students. In addition, our ability to develop both technical and result interpretation videos also provides the potential to create additional content that could be integrated into our Laboratory Medicine Master’s degree; providing more appeal to potential students and creating a foundation for more online learning in Laboratory Medicine.

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**Project Endorsement by Deputy Dean (Learning & Teaching)**

This section is to be completed by the Deputy Dean L&T OR the Dean of School if the Deputy

Confirm the schools formal endorsement of the final report, tick as appropriate:

Yes [ ] No [ ]
Dean L&T is a project member.

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Signature (electronic accepted):

Send as an email attachment to rick.ryan@rmit.edu.au
Deliverables

1. Initial survey results from students about online learning and online learning tools:

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<tr>
<th>Online learning items</th>
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<th>M</th>
<th>SD</th>
<th>d</th>
<th>p</th>
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<td>Learning online is easier than face-to-face classes.</td>
<td>148</td>
<td>2.628</td>
<td>1.025</td>
<td>0.18</td>
<td>0.1299</td>
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<td>It is easier to cheat in online assessments</td>
<td>146</td>
<td>3.342</td>
<td>1.053</td>
<td>1.13</td>
<td>&lt;0.0001</td>
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<td>It is easier to get feedback from online classes or online assessment than a physical</td>
<td>148</td>
<td>3.338</td>
<td>1.134</td>
<td>1.05</td>
<td>&lt;0.0001</td>
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<tr>
<td>Online learning is often stimulating</td>
<td>147</td>
<td>3.014</td>
<td>0.929</td>
<td>0.78</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Online teaching encourages me to be an active learner</td>
<td>151</td>
<td>3.517</td>
<td>1.025</td>
<td>1.40</td>
<td>&lt;0.0001</td>
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<tr>
<td>Online learning helps develop my problem solving skills</td>
<td>150</td>
<td>3.18</td>
<td>0.990</td>
<td>0.97</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I am able to concentrate well in online classes</td>
<td>148</td>
<td>3.122</td>
<td>0.982</td>
<td>0.90</td>
<td>&lt;0.0001</td>
</tr>
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Figure 1. The pros and cons of both online learning and face-to-face classes identified by students.
Figure 2. The features of a high quality online learning tool or assessment identified by students.

2. Flipped class video:

https://www.youtube.com/watch?v=qNO4ysixvbQ
3. Immunohistochemistry pilot module - The home screen for students using an adapted image from our Pathology Laboratories (Figure 3). It provides the students with a familiar scene to work from. Each icon is a button that directs students to a particular part of the module. For example, the Histopathology Manual takes them to content that discusses how to troubleshoot specific problems in Immunohistochemistry. While the request slips take students to case studies that help them work through both the theory of how immunohistochemistry works but also how to interpret its results. The module also includes additional features such as a glossary which includes all new language covered in the module (Figure 4).
Figure 3. The homepage of the immunohistochemistry module.
Figure 4. The glossary available within the SCORM Immunohistochemistry module.
Figure 5. The Jeopardy main page available as a formative element in the SCORM module to consolidate learning.