University of Sussex

Technology Enhanced Learning

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Innovation Scheme Case Study

Title of project: DIY Digital Microscope

School/Department: Life Sciences

Project lead(s): Jonathan Bacon and Harry Kent

Learning Technologist: Nick Botfield

Project Brief

Outline the key aims and objectives of your project and summarise how this was delivered and/or supported.

We aimed to produce a low cost, robust, portable teaching device which would provide a novel and stimulating method of teaching aspects of animal (tardigrade) locomotion. This could provide a means for University Life Sciences students (and keen school pupils) to integrate their learning of biological principles and computer coding.

In our original plan, we aimed to build two observation devices and optimise viewing performance. During the summer, we ended up producing only one unit due to different (and more expensive) hardware, which became available between submitting the application and the end of Harry's exams. The new set up is much smaller, and the computer is incorporated in a portable HD monitor. The new hardware is much more powerful, and is able to run a host of programmes locally, which makes it a much more useful piece of equipment.

In our application, we also described our intention to publish the work in a suitable educational journal, such as S*chool Science Review*. Currently, the second draft of the paper has been finished and we are working on edits before submitting it to review. As part of the paper, we have included basic commands for the use of the camera module, and suggest ways to include coding to incorporate some computer science and further uses of the hardware.

Support from TEL

Describe your experience of working with TEL and the support which you received from your assigned learning technologist.

We found the initial meeting to be both interesting and informative, and a great way to interact with people from other disciplines.

Nick Botfield subsequently met with us to see the DIY digital microscope in action, and to help go through some ideas and catch up on current progress, and was always willing to offer advice. We also appreciated being invited to the Mobile Technology Week to demonstrate the microscope in action.

Impact on the student experience and/ or professional practice

Summarise the effect and impact that your project had on the student experience and/or your professional practice.

As a student, Harry has enjoyed getting the chance to spend more time working on his project. As a result of receiving the funds, he had a number of opportunities to speak about the project as part of the summer schools and outreach visits. We've also had the microscope out during some summer school sessions, which has got students talking about it and asking lots of questions. In addition, we shall be demonstrating the microscope, and tardigrade biology, to year 7 and 8 pupils, at Lancing Prep School on 11th September.

Harry has also really enjoyed the experience of trying to condense the work down into a paper,

which we aim to submit to *School Science Review* in the next few months. This project has also led Harry to make new contacts with several members of staff and has led to him successfully applying for an MPhil here at Sussex.

Evaluation of project outcomes

Evaluate whether your project met the aims and objectives supported by any feedback, comments or statistics to measure the success of your project.

We decided to use a Raspberry Pi 2 due to the increase in processing power. We also used the HDMI Pi HD 9inch DIY monitor. Using new technology meant that we didn't stick to the original plan or budget, but we feel that the final product is a substantial improvement on our initial model used for the final year project.

One clear indicator of the success of this project would be to get out paper published in *School Science Review*.

Conclusion

Outline the successes of the project, what you have learnt from the process and any plans for future development/continuation of the project

Overall, we feel that the project has been a success. It has received very positive feedback from several academics and staff members when they have seen it, and students from ranges of years (year 10-12) have engaged with the project during summer school sessions.

The project was a lot of fun, but there were some challenges. Working with new technology has led to several technical issues, such as the memory card corrupting and issues connecting to Eduroam, despite following the Sussex ITS FAQs. Although we are now past these issues, they initially took a lot longer to fix than expected. This means that the Pi is now able to be operated remotely and transfer images wirelessly, a huge improvement over the old manual method which involved transferring the images to a Linux computer before having to transfer them to the computer on which the image analysis was performed.

We now intend to develop the microscope further and spend some time learning more about computer vision and real-time tracking tools. Harry is going onto his MPhil based in LASI and aims to use the microscope to look at tardigrade and ant locomotion, in addition to further developing demos for use as an outreach and teaching tool for new students.