

SCORE Fellowship Final Report **By Paul Hatherly, The Open University**

The Practical Sandpit

Paul's project ran from 1st October 2010 until the 30th September 2011, the aim of the project was to examine and develop means by which virtual laboratory resources can be rapidly created by HE practitioners, permitting such resources to be truly open. <http://www8.open.ac.uk/score/fellows/paul-hatherly>

Activities

- Exploration of development methods, with the key requirements of: accessibility (in terms of end users obtaining and using a development environment); cross platform performance and ease of use (i.e., short learning curve, intuitive use).
- Development of trial resources using a range of environments
- Evaluating personal experiences
- Study of literature and experiences of others
- Study of requirements and limitations for different classes of platform (e.g., normal computer, laptop, tablet, smartphone etc.)

Outputs

- Reports to SCORE outlining progress, developments and conclusions
- Evaluation of the Jorum repository and initial testing of the LiLa (Library of Laboratories) portal with a view to these resources being suitable locations for sharing of content
- Establishment of collaboration with University of Hertfordshire (in parallel with a STEM funded project), promoting and developing effective virtual laboratory resources.
- Creation of prototype online components and experiments and their testing with LiLa and Jorum.

Findings

The actual implementation of the practical sandpit is still a little way off, due to the discoveries and insights gained during the project. Primary amongst these are the need to ensure a shallow learning-curve for end users, whilst at the same time not requiring extensive supporting infrastructure. My work on exploring various production platforms has thrown these matters into focus, and is now guiding production strategies for online experiments in the science faculty. The exploration of technologies is also inspiring discussions on future research projects on the implementation of virtual laboratories and their perception and implementation.

I anticipate that the benefit to the wider SCORE programme will come through facilitating the concept of end-user-generated open resources as a desirable end.

Reflection

The fellowship has assisted my thinking on virtual laboratories by bringing into focus the issues surrounding their production, perception and use. This has assisted me in my parallel role of developing resources for the new second level online practical science module, and has hence had a significant, positive impact on colleagues and the faculty. With regard to the wider HE sector, my work with SCORE has been recognised with requests for presentations and collaborations with other institutions, so although the “practical sandpit” is still in development, the outcome of widening and opening up production of virtual laboratories has been achieved through improved personal contacts. I aim to continue the work of the fellowship, connecting with the recent Wolfson funding and other bids being considered and explored.

Dissemination

- Conference presentation: “Interactive Experiments in Online Learning”, LiLa 2011, Selwyn College, Cambridge, 11-12 April 2011
- Conference poster: “An interactive approach to the filament bulb crisis. The effectiveness of Interactive Screen Experiments”, LiLa 2011, Selwyn College, Cambridge, 11-12 April 2011
- Planning for a seminar on approaches to virtual laboratories (in progress)

Conclusions

As a general outcome of my SCORE fellowship, the profile and reputation of virtual laboratories has been raised by my advocacy of the concept. Aspects of the design and psychology of virtual laboratories have been informed by my work, and these matters will be key to the future work I wish to pursue.

500 Word Summary

The primary motivation for the “Practical Sandpit” derived from my work within the Physics Innovations Centre for Excellence in Teaching and Learning (piCETL), developing innovative, photo-realistic online experiments (Interactive Screen Experiments, or ISEs) and the subsequent JISC sponsored “Skills for Scientists” project where I created open resources for the JorumOpen repository under Creative Commons licensing.

During these projects, I realised that making resources “open” does not mean they will be used, and my personal experience as a laboratory coordinator suggested that academic creativity in practical learning is vital. I therefore aimed to address the problem that although “open” in terms of being accessed, virtual experiment OERs are “closed” in the sense of creative re-use.

To ensure any resource for OER creation is suitable for use by third parties, it needs to satisfy the following conditions:

- Be accessible. Users must be able to access the resource easily, and with no issues of cost or institutional policies on use of software
- Be cross-platform. The software and hardware configurations of computers varies widely. This must be transparent to any resource, during installation, use and deployment.
- Be easy to learn. It is desirable that those creating resources use their time well and creatively. This will not be the case if a significant amount of time needs to be spent learning to use a development environment.

A major part of the project was therefore a critical investigation of a range of development platforms, ranging from freely available on-line development tools to proprietary packages. The conclusions for a representative set are shown in Table 1.

Table 1. Capabilities of a range of development environments with respect to Virtual Laboratory OERs

Package	Accessibility	Cross-platform	Easy to use	Comments
Tersus	High	Yes	Moderate	Java based, entirely drag-and-drop graphical development, free download. More geared to database handling, but some potential.
Scratch	High	Yes	High	Excellent package for rapid development of fairly simple applications. Possibly too limited for virtual laboratory use. Free download
Flash	Low	Incomplete	Moderate	Proprietary software, platform limitations and issues of on going support for some mobile devices
BoaConstructor	High	Yes	Moderate	Graphical application development environment based on the widely used python language; possibly no longer supported
Eclipse	High	Yes	Moderate	Flexible and widely used Java development environment. Can be tricky to configure, and fairly steep learning curve.

It was clear from the investigation that no one package satisfied completely all criteria, taking into account additional criteria such as on going support and the ability to generate complex resources. However, as a general observation, Java-based packages seem to offer the best route.

The project was clearly timely, given the range of related virtual laboratory activity across the wider HE sector. As an example, I was invited to contribute to the EU-funded LiLa (Library of Laboratories) project, presenting my progress at the launch meeting in Cambridge and participating in pre-launch evaluation of the on line laboratory portal. Additionally, the SCORE project has suggested and inspired connections through STEM to advise and guide practitioners in HE wishing to develop their own virtual laboratories – fulfilling to a large extent the motivation of the original proposal. The first of these is now coming to fruition with colleagues at the University of Hertfordshire, with students involved in both the production and use of virtual laboratories, gaining educational and professional experiences, ensuring a full understanding of their issues and potential is carried into future generations of educators.