The SCARLET Project: Augmented Reality in special collections

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Introduction

In 2011 the University of Manchester and Mimas were awarded funding under JISC's Learning and Teaching Innovation Grants programme to develop an augmented reality (AR) application for special collections. The SCARLET project (Special Collections using Augmented Reality to Enhance Learning and Teaching) addresses one of the principal obstacles to the use of special collections in teaching and learning – the fact that students must consult rare books, manuscripts and archives within the controlled conditions of library reading rooms, such as those at the University's John Rylands Library. The material is also isolated from much of the secondary, supporting materials and the growing mass of related digital assets. More often than not, this is an unfamiliar experience for students accustomed to an information-rich, connected wireless world, and consequently is a barrier to their use of special collections. SCARLET is key to the library's strategic

objectives to improve resource discovery, with innovative ways of enhancing teaching and learning, as well as widening access to the extensive resources in Special Collections. The three-way partnership of the library, the academic community and Mimas emphasises the unique collaborative approach to addressing these challenges. By using Augmented Reality, SCARLET hopes above all to add value to the students' learning and create a more immersive research experience. The SCARLET project will provide a model that other special collections libraries and archives can follow, making these resources accessible for research, teaching and learning in the form of a transferable toolkit. In turn, this methodology will be adaptable to other disciplines and subject areas where separation exists between the primary and secondary material (e.g. history of art, science, medicine).

Dante & Beatrice
A late 14th-century illuminated manuscript of Dante and Petrarch, Rylands Latin MS 1.

Promoting access to special collections

The University of Manchester's John Rylands Library, a spectacular neo-Gothic building in the heart of the city, houses one of the world's great collections of rare books, manuscripts and archives. They span five millennia and six continents and are written on virtually every medium that has ever been used for human communication, from cuneiform clay tablets to emails. High-

lights of the collections include spectacular medieval manuscripts from across Europe; a wealth of Arabic, Persian and Turkish manuscripts; an outstanding collection of fifteenth- and sixteenth-century printed books; Bibles printed in over four hundred languages; an array of Nonconformist archives, including the world's greatest collection of Wesley family papers; archives representing Manchester's pivotal role as the first modern industrial city; and an internationally significant constellation of modern literary archives, with an emphasis on recent and contemporary poetry.

The library has a firm commitment to promoting these resources for use in research and learning, both within the University of Manchester and to the wider academic community, and indeed among other audiences such as local and family historians, life-long learners and anyone with a potential interest in the collections. Like all special collections libraries, there is an inherent expectation to demonstrate relevance and value to the university and other funders. It is therefore an imperative to increase the use of the collections, both in situ and remotely. Strategies to achieve this include enhanced promotion of special collections, through the website, e-newsletters and social media, as well as the traditional methods of print media, conference presentations and word-of-mouth; an ambitious digitisation programme led by the library's Centre for Heritage Imaging and Collection Care (CHICC); improved documentation of the collections via online catalogues and subject guides; and improving the experience of researchers and learners while they are in the library (such as the recent introduction of self-service photography for most categories of material).

The University of Manchester's John Rylands Library and collaboration with academics

Members of staff in the library's Special Collections Division have a long tradition of working with academic colleagues at the University of Manchester to make the collections more accessible to students at every level, from freshers to taught-course postgraduates and research students. Special Collections staff do this in several ways: giving presentations to groups of students on campus, taking part in seminars and masterclasses, offering first-visit support to individual students and delivering what are typically called 'close-up sessions'. These typically involve a curator and an academic selecting up to a dozen items to show to a group of students; these items are generally set out on tables and everyone gathers round for a discussion. It is a real thrill for

students to see special collections materials up close, and in some circumstances to handle the items themselves. The material might be papyri from Greco-Roman Egypt, medieval manuscripts, early printed books, eighteenth-century diaries and letters or modern literary archives, to choose just a few examples of material used in recent months.

From the library staff's point of view, it is really rewarding and enlightening to work alongside enthusiastic teachers, such as Drs Guyda Armstrong (Italian), Roberta Mazza (Classics) and Jerome de Groot (English and American studies). The ideal scenario is a close partnership between the academic and the curator. Curators know the collections well and can discuss with students the materiality of texts, technical aspects of books and manuscripts, the context in which texts and images were produced and the afterlife of the objects – the often circuitous routes by which they have ended up in the John Rylands Library. Academics bring to the table their in-depth subject knowledge and their pedagogical expertise. Sparks can fly, especially when students challenge what they are being told, and lively debate often ensues!

Students on some third-year undergraduate and MA courses are required to select an item or small group of items and undertake extensive original research on it. They make the transition from learners, whose access to material is mediated through their tutor and the special collections curator in the context of a seminar, to independent researchers, 'let loose' on their own with primary sources in the reading room. This can be a thrilling, if somewhat daunting, experience, akin to making your first parachute jump after learning the theory in a classroom! Handling an eleventh-century manuscript or editio princeps of Dante for the first time can be terrifying, even with a friendly member of library staff on hand to provide guidance and reassurance.

AR AND SPECIAL COLLECTIONS

As already intimated, digitisation is a powerful tool for promoting and broadening access to special collections material. The library has an extensive digitisation programme, and University of Manchester tutors can apply for internal funding to have complete books and manuscripts digitised for use in their teaching.

However, it is essential that students also experience original materials during their studies, in order to confront the materiality of objects, to be inspired, and to prepare them for solo research. Many tutors recognise that exposing their students to original special collections material, even on a limited basis, can spark their enthusiasm for and engagement with wider classroom-based and remotely-taught courses. On the other hand, students are constrained by the fragility and unfamiliar formats of the material. It isn't easy for them to study an object in a seminar context, where several students are examining the same object. Student feedback shows that while they are inspired by the objects they encounter, they can find the traditional pedagogical experience frustrating. In addition special collections are often seen as fusty, old-fashioned and hidebound by arcane rules.

The SCARLET project is addressing these issues directly, bringing special collections into the age of the app. AR enables students to experience the best of both worlds: to enjoy the sensory delights of seeing and handling original materials, while enhancing the learning experience by 'surrounding' the object with digital images, online learning resources and information on the items before them and on related objects held in the library and elsewhere. AR makes the sessions more interactive, moving towards an enquiry-based learning model, where students are set real questions to solve, through a combination of close study of the original material and by downloading metadata, images and secondary reading, to help them interrogate and interpret the material. One of the benefits of the project is that it makes it more feasible to host 'taster' sessions for first- and second-year students, enabling them to engage with special collections materials without requiring extensive handling of the original books and manuscripts, and thus addressing conservation concerns about the over-exposure of fragile objects. It will also help more advanced students across that difficult transition from mediated learning to independent research. Students are being encouraged to use the SCARLET app in the reading room while they are undertaking detailed research on a particular object or group of items from the collections. The app is not intended to spoon-feed them with information in order to answer research questions; rather, it can prompt lines of enquiry and help students to contextualise the objects in front of them and to compare them with related material elsewhere in the world.

AR has never previously been used to enhance the experience of using special collections material for teaching and learning nor to overcome the major

constraints inhibiting their use. It has potential to revolutionise teaching and learning in this field, helping students engage with primary source materials and linking fragile and rare objects with online resources. An additional, unexpected benefit of the SCARLET project is that it is changing perceptions of special collections among library and IT colleagues: once perceived as somewhat staid and conservative, special collections are now regarded as being at the leading edge of information technology and pedagogy, setting an example for colleagues in other areas to follow.

La Commedia
Page from the 1481 'Landino' Florentine edition of Dante's Divine Comedy, with engravings after Sando Botticelli. 17280.

Teaching, learning and special collections: a case study

Since 2007 the Italian Department has worked in close collaboration with the Special Collections Division of the John Rylands University Library, teaching Italian literature and culture via the hands-on use of books, journals and archives held in the collections. The library has one of the finest collections of printed books in the world, with notably rich holdings in early Italian material. It holds over 4500 incunabula (books printed before 1501) and has the largest collection of Aldines (books published by the Venetian printer Aldus Manutius) in the world. The magnificent Dante collection contains more than 6500 primary and secondary works and is especially rich in those areas of the library's historic strengths. The library has all but four of the editions of Dante printed to 1600, as well as several manuscripts of Dante's works from the fourteenth to sixteenth centuries.

The presence of such extensive holdings in premodern Italian books and manuscripts was the major driver for the development of Guyda Armstrong's final-year Italian course, 'Beyond the text: the book and its body'.[1] This course is dedicated to exploring the technological and cultural history of Dante's *Divine comedy* via an exploration of the material forms in which the text has circulated since its composition at the beginning of the fourteenth century. Beginning with manuscripts, and moving through early printing, mass production, to new digital media, students study how the material form reflects and affects the text's status and readership. With its focus on book technologies of the past – and future – the course offered an excellent environment in which to pilot the SCARLET project.

SCARLET and the student learning experience

The pedagogical aim of the 'Beyond the text' course is to guide students in their own independent research on historic book-objects. Every student is assigned a specific edition from the library's collections on which to work, for an assessed case-study; this extended research work allows them to produce a kind of 'biography' of their book, based on the physical and textual features of their volume, from its original production context to its afterlife with subsequent readers and owners. From student feedback on previous years of the course, it is clear that students particularly value the encounter with the historic object and the opportunity to carry out independent primary research, which is unusual at the undergraduate level.

The SCARLET content was therefore designed to support the primary pedagogical aim of the course (i.e. independent scholarly research), and to reinforce the unique student learning experience of going 'beyond the text'. While Dante is taught in virtually every Italian department in the country, only a few institutions worldwide could offer such a range of pre-modern manuscripts and editions of the text to enable this kind of specialised study. The course therefore inculcates a powerful sense of ownership and pride in the students in their capacity as University of Manchester

undergraduates working on Manchester books – an identity which is reinforced by their status as the experimental population for the SCARLET project, another University of Manchester flagship initiative.

SCARLET content development process

It was important that the SCARLET content acquisition process should adopt a systematic approach that could be adaptable to other disciplines in the future. Initially a learning design template was created where academics could record their objects (e.g. manuscripts and printed editions) and the digital assets (the learning design template) that surrounded them. The fact that the pilot course, 'Beyond the text: the book and its body', focuses on the Dante's *Divine comedy* as 'object', meant that the students and academic staff were already attuned to notions of materiality which are central to the wider aims of the SCARLET project.

For the SCARLET project, digital content was collated for ten editions of the poem, which are particularly important in terms of its publishing and or/intellectual history, published between 1472 and 1555. The secondary resources consisted of reading lists, LUNA-digitised images (a process internal to the University of Manchester) and scholarly Dante websites and journal articles. In addition, short video commentaries were recorded by the academic course lead – in this first instance Dr Guyda Armstrong – to provide students with an overview of the editions and establish context.

NEW TECHNOLOGY AND PEDAGOGY

The choice of software for content delivery, namely AR browsers, was limited by the environmental conditions inside the John Rylands Library. The traditional format of augmented delivery – POIs (Points of Interest) mapped to GPS co-ordinates – was problematic. Mobile devices would struggle to detect accurate location-based data with their inbuilt GPS, or in some cases would not work at all due to compass interference.

At the time, Junaio was the only AR browser to harness optical-tracking functionality, linking 3D models, videos and information to images in the form of 'GLUE'-based channels. This ability, coupled with an open API and compatibility on Android, iOS and Nokia devices, proved decisive. Although other AR browsers have since released similar image-recognition functionality, the tech-

nology in Junaio is far more mature, having been available to developers for over a year.

As a consequence of the cutting-edge nature of AR, a set of accepted standards has yet to be ratified by the World Wide Web Consortium (W3C). It is hoped that by the end of the project the application of base-level standards will be ubiquitous across most AR browsers, enabling the outputs to be interoperable regardless of delivery choice.

For the supporting 'web app' we implemented the jQuery mobile framework to promote interoperability. Instead of tying the content to a proprietary device (iPhone, Samsung Galaxy), content would be optimised for all popular smartphone and tablet platforms regardless of operating system or browser type. Indeed, the content would equally be accessible on a standard desktop or laptop computer.

The decision to adopt the Apple iPad2 for user testing was a logical move, given its large screen real estate and ease of use. The tablets were made available in designated study areas where students had access to the Dante editions. AR software could then be preloaded and bundled user support made available.

Student interaction with physical Dante editions was supplemented with access to reference materials via visual triggers (e.g. augmented 3D models that overlay the physical image and require user touch gestures to proceed) preparing them for solo research. AR maximises the opportunity for interaction, encouraging critical response and the adoption of new perspectives and positions. Users tend to learn most effectively when they become actively involved in an experience as opposed to one-way delivery, thus retaining the majority of the information that has been presented to them. Using AR to meld the experience of engaging with primary material and secondary digital assets, users become less aware of the divide, the boundaries between the physical and electronic becoming increasingly blurred. Although the technology is presented through a new delivery mechanism, traditional learning methods are still prominent in the pedagogical approach.

FOCUS GROUP EVALUATION

As part of the evaluation for the SCARLET project, a focus group was organised and run on 16 November 2011 for Dr Armstrong's course. Eight of the nine students in the class were on hand to

answer questions and to be involved in a conversation about their work to date with the iPads, the app and AR. Although questions, such as 'Do you find the mobile device to be easy to use?' and 'What are some suggested improvements which would make it more likely you would use this technology?' were prepared in advance of the session, the discussion remained informal, with the intention that students would participate in a natural and relaxed way. Their responses provided some useful information regarding their expectations, as well as use of the app. Initially, they responded with some resistance to using the technology, but even the self-proclaimed 'technophobe' in the group made some particularly interesting comments about what she felt the project can do, including the thought that the app and the use of the iPads were a logical inclusion in their study of the Dante editions. In particular, she commented that being able to see links between book objects was one of the most enjoyable aspects of the course, and the value of the iPad was that it allowed her to compare objects directly. The students did stress their wariness of anything that might take them away from the experience of the physical object; to them, the tactile experience with the text is vitally important. One student did point out that 'The technology can help to collate and create links and interact with the book more', which underscores the intention of the development of this module, namely that the technology is meant to add value to the experience of the text, not to replace the experience of using the library or conducting primary research. They all commented that it was fairly easy to use the iPad with the app and acknowledged that it was a good part of the module. Interestingly, many of the students, when asked whether they would recommend a similar module to their friends or colleagues, said that their recommendations would have to be contextualised by the type of module being run; they thought that it would be most useful in courses in art and art history, but that other disciplines might not benefit from this type of research. They warned that technology for its own sake can easily become a distraction and merely add another layer, as opposed to enhancing the intellectual engagement. At its close, the students did all agree that they felt the use of this kind of technology and methodology was vital to their own studies and highlighted that they felt that the SCARLET project is part of the future of education.

CONCLUSION

While other implementations of AR have stopped short of engaging with the pedagogic agenda, SCARLET aims to exploit the diverse academic expertise to integrate these methods into the finished outputs. Placing the user (student) central in terms of project design, evaluation and review will help inform an iterative development cycle where the deliverables will have more relevance and focus.

The ultimate aspiration for SCARLET is to leave an enduring legacy – a catalyst for the proliferation of AR experiences throughout education in special collections and beyond; adding inherent value to the student experience while working in parallel with traditional teaching tenets. A cautionary note: as the students underscored, becoming too conscious of the technology can inevitably lead to dissatisfaction and resistance. Although AR can be an effective option, enabling a richer learning experience, pedagogy must always remain the principal driver. Therefore, it remains imperative that the technology be transparent and supportive of the familiar pedagogical methodology.

LINKS

SCARLET project blog: http://teamscarlet.word-press.com
JISC: http://www.jisc.ac.uk
Mimas: http://mimas.ac.uk
John Rylands University Library: http://www.library.manchester.ac.uk
University of Manchester: http://www.manchester.ac.uk

NOTE

1   Beyond the Text: The Book and its Body': see http://courses.humanities.manchester.ac.uk/undergraduate/module.html?code=IT3432