Enhancing the Online Study Experience in Postgraduate Medical Education

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ABSTRACT

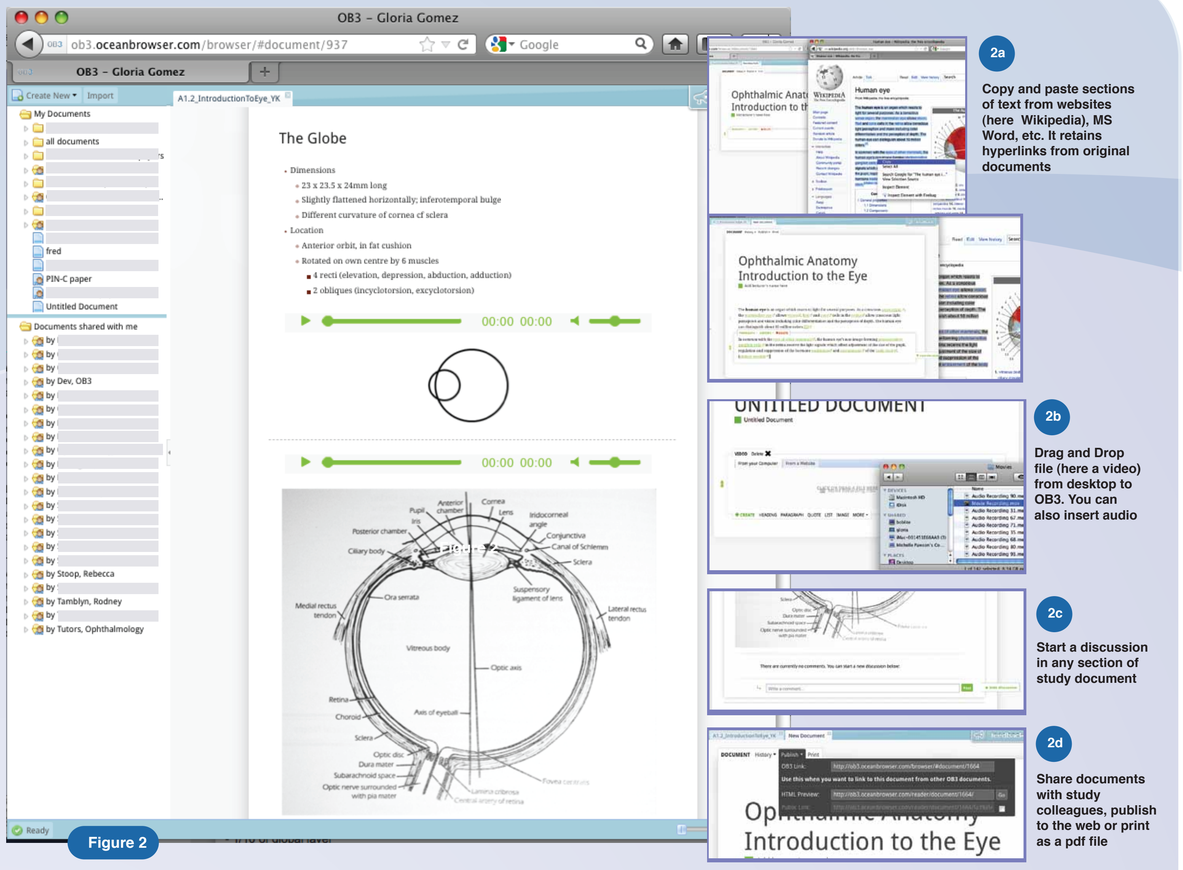
This poster presents OB3 - a web application for online study that makes the life of busy lecturers, students, and administrative staff easier. People who know how to use basic features of Microsoft Word, the Internet, and email can efficiently manage and author these processes with OB3:

- **Gathering** information of complex medical concepts, found in different places such as discussion forums, PDF and scanned documents, websites, videos, PowerPoints, Podcasts, Flash movies, etc.;
- **Editing and integrating** information gath ered into media-rich documents;
- **Publishing** integrated documents online as course materials or essay assignments; for
- **Sharing and discussing** them within a distributed learning network. See figure 2

Literature reviews on relevant topics (e.g. elearning and networked learning, distributed cognition, visual design, knowledge repre-sentation) were performed to understand the study context of the user community. The Bridging Design Prototype method informs product development. OB3 features are being implemented over progressive series of betas covering: authoring workflow, multimodal discussions and personal annotations, con-tent management and study summary docu-mentation. By multimodal we mean using audio and/or video recordings plus text to insert comments.

The authoring workflow and discussion fea-tures have gone live in a postgraduate medi-cal programme in March 2012. In the first two weeks, more than 100 messages were cre-ated as part of discussions taking place within a number of OB3 documents.

Discussions mainly focused on topics such as co-writing of study documents for exam and study preparation, identification of missing content from lecture notes, and distribution of tasks among a study group. A few discussions on technical issues occurred and we noted that students and lecturers helped each other by providing explanations for example on inserting images or creating a link within comments. Our technical team only took care of a low number of issues. The data collected so far on user interaction show that online study applications built on familiarity may speed up adoption and create more meaningful interactions.



2a Copy and paste sections of text from websites (here Wikipedia), MS Word, etc. It retains hyperlinks from original documents

2b Drag and Drop file (here a video) from desktop to OB3. You can also insert audio

2c Start a discussion in any section of study document

2d Share documents with study colleagues, publish to the web or print as a pdf file

Figure 2

The Bridging Design Prototype Method

The methodology of Interaction Design (ID) is being used to investigate suitable features for OB3 web app, and how these should behave, for a product aiming to facilitate lecturers, students, and administrative staff of postgraduate medical education (our niche market) to efficiently manage and author their online study and lecturing activities.

ID's methods and instruments are varied and can be easily adapted according to the specifics of a context studied (see http://www.ixda.org/conference). Originally developed by the author 1 to work in preschool settings (Gomez, 2009), the Bridging Design Prototype (BDP) method has been further evolved, to investigate a product experience in the community of online postgraduate medical education.

It facilitates the gradual identification and implementation of a product's features (or "a system image") that all the members of a user community can understand and quickly adopt, with little or no training, into their activities because its features are found

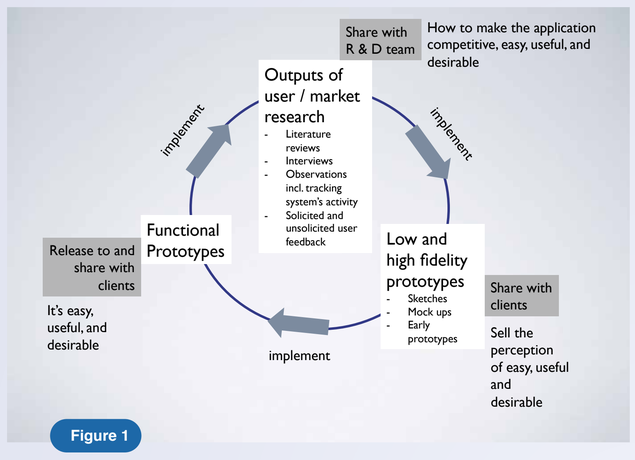


Figure 1

easy to learn or operate, which implies, they can perform their work more efficiently. For instance, the students and lecturers (all medical profes-sionals) of our client universities are distributed globally. Many have limited computer skills, little or no time to learn new skills, plus some lectur-ers can be younger and more computer literate than some students and vice versa.

The Six Principles of the BDP Process enable to investigate product experi-ences in difficult-to-access and technologically disinclined user communities (Gomez, 2012).

Organising Participation:
1st principle MULTIDISCIPLINARY TEAM AP-PROACH TO RESEARCH THE MARKET:
seven-step iterative approach of the Human-Centered Product Development process (Norman, 1999).

Shaping the Product or Application:
2nd principle MAKING ACTIVITIES SIM-PLER: the seven-steps for transforming complex tasks into simple ones (Norman, 2002).
3rd principle BROADENING PARTICIPA-TION: countering exclusion and accessibil-ity (Keates and Clarkson 2003).
4th principle SIMILAR MENTAL MODELS: a designer's mental model for the system image of a product must be equal to the users' mental model (Norman, 1999)
5th principle PRIOR KNOWLEDGE AND FAMILIAR INTERACTIONS: the learner must have prior knowledge and the learning must be prepared with familiar languages --- conditions for meaningful learning (Ausubel, 1968).
6th principle PARTICIPATING IN DESIGN: by applying 1st to 5th , the user community becomes a design participant (Schuman 1993) in the process.

Figure 1 shows the iterative development cycle. BDPs can bringt members of a user community into the development process early; first as commentators of low fidelity prototypes (mock-ups), early demos, alpha versions, and later as users of high fidelity prototypes (beta and released versions). Users who choose to incorporate BDPs into their work further facili-tate the research team to perform observations.

Background Literature

The online study experience has been investi-gated and the data gathered using different approaches which have informed the decision-making process of what features should be ap-propriate to implement. The main researched areas were educational design as it relates to academic study strategies, metacognition and visual design, and networked learning. These have provided concepts to guide the develop-ment of an application that enables busy dis-tance medical lecturers and students, with varies levels of computer skills, to use their time more efficiently when studying and collaborat-ing online.

Educational Design also called instruc-tional design is an area dedicated to the devel-opment of effective approaches and identifying suitable tools for people to learn concepts within a formal or informal learning setting. Spe-cifically, we are interested in educational design that supports the efficient use of university study skills. These include elaboration, organi-zation, and rehearsal strategies, which distance and on-campus students employ throughout their undergraduate and postgraduate study. According to Bandura (1986), these necessary sub-skills are part of the three aspects that con-tribute to academic success. The other two are effective self-efficacy beliefs and appropriate social and physical conditions.

The features of OB3 - our online study app sup-ports the performance of university study skills (Figures 2a to 2d). Passive highlighting will be supported once annotations features have been implemented. Features for inserting images or videos of maps or diagrams (Figure 2b) devel-oped with other software applications can be uploaded. We are investigating drawing and diagramming features for the next release.

Metacognition and Visual Design
Kirsh (2005, p. 148) claims "good visual design can facilitate learning" and is cognitively effec-tive. For example, he continues, the following visual supports, distributed in our work environ-ment, are there to help us manage our work, our thought: annotations made in documents, to do lists we make, study plans, among others, check lists we tick off to mark progress. Fur-thermore, these study skills or strategies are classical tools for improving metacognition.

> Metacognition in education… is associated with the activities and skills related to planning, monitoring, evaluating and repairing perfor-mance. Sometimes these do take place entirely in the head… But, as often as not, there are external… structures in the environ-ment … [that] help us track where we are, understand what remains to be done, offer indicators that we do not understand some-thing, and so on. (Kirsh, 2005, p. 148)

Kirsh continues, the use of good pedagogy in the design of learning environments hopefully may be able to trigger metacognition - an adaptive learning behavior "… the manner of displaying cues, prompts, indicators[, hints, and reminders to students] has an effect on how and when students notice them, good design-ers need to present those cues in cognitively effective fashion. They need to shape the affor-dance landscape" to improve metacognition in online learning (p. 10). He uses newspapers and magazine layout design as examples, and ex-plains they can be a good way to start under-standing how good visual design is cognitively effective, and therefore, facilitates learning.

OB3 visual design is inspired in magazine layout and textbook design. If learning materials are displayed tastefully and appropriate visual cues are used to differentiate headings, subheadings, quotes, body text, videos, images, etc. online study may be become more effective and moti-vating. Visual design should not only be the "icing in the cake", it should also be employed to shape features. Figure 2c shows the process of editing content. Users edit their docs using the skills they are already have. This web app produces beautiful, highly readable, scalable, structured docs. You can drag and drop con-tent to reposition it within the document (Figure 2a). Complex content types are sup-ported such as flash, images, movies etc. Documents can be exported in a variety of formats – currently we provide a "web view" of documents which can be shared with people who do not have permission to edit the docu-ment. This can easily be saved to PDF. See Figure 2d.

Networked Learning is a concept de-veloped mainly by Goodyear and colleagues (2004, p. 1). They defined it as "learning in which information and communication tech-nology (ICT) is used to promote connections: between one learner and other learners and tutors; between a learning community and their learning resources". In an earlier study, they referred to this concept as shareable rep-resentation of practice. The suggestion then was to

> Build technology around real user needs rather than an idealised managers view of what is needed… [This philosophical ap-proach] should suit most areas of higher/future education… We need to under-stand how the members of a distributed community of practice engage in [online learning], and how their existing technologies shapes and limits what they do, so that we can understand how to improve the technol-ogy at their disposal… (Goodyear & Steeples, n.d., p.8)

Existing online systems for fostering collabora-tion are limited in the sense of enabling a dis-tributed community of practice to engage and exchange to learn together. We created an app in which conversations happen around con-tent, not separate from it. Online discussions in context are needed for facilitating establishing connections among concepts as well as rel-evance. See Figures 2c and 3.

Methods for Gathering Data to inform Software Development

The first principle of the BDP process (see above) enables to organise user participation and team development tasks to gather data for requirements and feature selection. The different ways of interacting with OB3 features are de-signed around a deep understanding of:

- The tasks that lecturers and students un dertake with content
- The interests of the elearning community interests, especially medical education (see Ellaway and Masters, 2008), and
- The interaction design issues that prevent effective online course delivery or online study sessions

Some Issues Identified during data gathering	**Brief Description** some findings
Poor forum participation	Limited to placing announcements in most cases. Only forums used as source of learning develop into meaningful study materials.
Reference papers were not searchable in OB2	Papers were not used at all to identify references for assignments. Tutors and students preferred the internet
Strong dependence on OB2 technologist to place developed content online	Transferred course content prepared in Word into OB2 or HTML format. Did podcasts for them Inefficient use of time
Lecturers found daunting the diverse number of technologies presented in seminar	When are we going to find the time to learn all of these applications to teach?
Little contact between course experts and student	Course experts were hardly active in discussions. Very busy people. But also the more senior are not really good with online technologies.
Assignments prepared last minute	Students joining study programme at week 10 due to heavy workloads prepared all assignments in one week.

Table 1

Low and high fidelity prototypes have been devel-oped as part of the iterative BDP cycle (Figure 1). Principles 2 to 6 shape or infom the development of each prototype together with data collected via multiple sources:

- Interactions with costumers: 6 years (e.g. informal conversations)
- Documentation (emails, passed discus sion forums performed in OB2 – an ear lier version of the system developed by OceanBrowser Ltd)
- A pilot case study on the use of concept maps with distance postgraduate stu dents in 2007 – 2008 (see technical report, Gomez, 2008)
- Literature reviews on related topics. Read section "some background literature"
- Reviews of published reports on the use of other e-learning applications such as eTools (see Heinrich et al, 2009, p. 478), Moodle (see Arteaga & Duarte, 2010, p.8), or a comparison between Camtasia and Breeze Plug-in for PowerPoint (see Mehlhorn, Burcham, & Smartt, c2006, p. 5), or an analysis of a software for scaf folding complex learning the Explana tionConstructor (See Reiser, 2004)

See table 1 for a brief description of data gathered via the instruments listed above. These exemplify the types of wants and needs we identified for this user community. The OB3 web app has been designed to solve these issues.

OB3 features enable lecturers and students to build multimedia essays (Figure 2). For ex-ample, they can type text or cut and paste text from a word processing or internet page into an OB3 blank document. Also, they can easily upload or drag and drop files, images, audio, video and/or flash objects into this document. It is also possible to create links to other web-sites as well. See Figures 2a to 2d and 3

Novak and Cañas (2006) explain "Both direct presentation and discovery teaching methods can lead to highly rote or highly meaningful learning by the learner, depending on the dis-position of the learner and the organization of the instructional materials." (pp. 4-5)

Figure 2b shows how a user can place a video into a blank document using drag and drop. This example illustrates dragging and drop-ping a movie from the user's computer to an OB3 document. The video will be added, up-loaded and displayed. A similar process ap-plies to other content types such as images and file attachments.

Programming Technologies

OB3 is delivered as software as a service (SaaS). It runs in your web browser, and is largely built in Javascript, the core library we use is Ext-JS from Sencha (http://sencha.com), although we also make use of a number of other commercial and open source libraries. At the backend we build on top of Silverstripe Sapphire (http://www.silverstripe.org/a-sapphire-framework-for-oceanbrowser/), OB3 content can be delivered organically within Silverstripe websites, allowing sophisticated custom elearning solutions to be developed. See also: http://ob3.cc/research

First Two Weeks of Study

OB3 features are being implemented over pro-gressive series of 5 betas. Software develop-ment started early in 2010 and is ongoing. The features enabling lecturers, students, and aca-demic staff author lecture and study notes (without the direct assistance of a technologist) as well as make comments within self-created documents have gone live within a distance postgraduate course in Ophthalmology in March 2012.

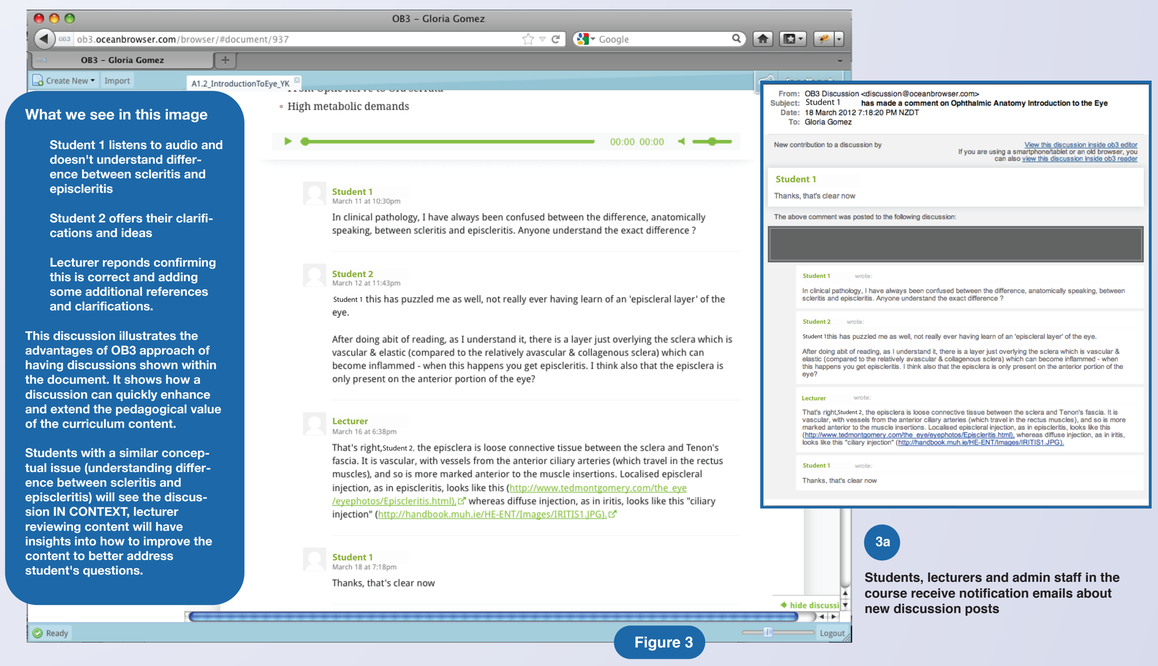
Preparation of a Curriculum Document is shown in figure 2. This sec-tion, "The Globe", of a lecturer's notes in-cludes written text, audio-recordings making reference to illustration and diagram. Figure 3 shows another section of the notes focusing on an audio-recording and related discussions.

To put together this lecture notes (on Ophthal-mic Anatomy, Introduction to the Eye) with rich multimedia data, the academic staff have:

1. Gathered information of medical concepts found in different places.
2. Edited and integrated the content into the document, maybe, by typing, or doing copy-and-paste from sources (Figure 2a), or voice-recording.
3. Published the content to all the mem bers of the course via the sharing dialog. Automatically, they have access to a read only version (called OB3 reader) for smart phones, tables, and older versions of Internet browsers.
4. Shared the notes to discuss with their distributed study community. The stu-

Discussion Types that took place from March 6 to 15	**Quantity**
Comments on co-writing a study document - ways to keep track of authorship	1
Comments on locating and searching files in OB3	1
Comments on study task requiring use of features e.g. inserting web resources	2
Comments on two or more people using a same account for commenting	1
Comments including specific study tasks	16
Comments including study content	52
Comments made by OB3 technical team within OB3 documents	5
Comments on due dates for assignments, posting things late, profile, busy work study life, apologies for missing deadlines	5
Comments on how to use OB3 features	7
Comments on missing content from a lecture notes	1
Comments on not being able to post tables	3
Comments on OB3 in docs	1
Comments on request for inserting images within comments	8

Table 2



3a Students, lecturers and admin staff in the course receive notification emails about new discussion posts

Figure 3

dents of this course are located in Australia and New Zealand and access study materi-als from varied locations. Figure 3 shows com ments can include active links.

Neither face-to-face nor online tutorial sessions or tutorial documentation on how to use OB3 were carried out with students. The three tutors of the course familiar with OB2 were contacted and provided basic files on "How to Get Started with OB3". The authors offered the tutors the option of an introductory session. Only one tutor accepted the invitation and we met at a café in a Sunday afternoon on March 5 for an hour - we all reside in the same town. The other two tutors reside in Australia.

The Data Gathered for a Quick Analysis of OB3 Performance from March 6 to 15 shows that students, lecturers, and admin staff generated 113 discussion messages. Discussion activity was tracked via notification emails (Figure 3a) sent to the people registered in the study program. (The authors of this poster have access to every paper in a course as a way to gather data to inform product development. This is done with the authorization of the clients). Each email notification contains the trail/history of each discussion on a particular section of a topic.

Figure 3 shows a discussion on the content of audio-recordings and comprised of 4 com-ments. But, we noticed documents with discus-sions comprised of 7 comments - some more than 300 words in length. An ob3 document can contain more than one discussion happen-ing at the time. You can start a discussion on any content type such as text, videos, and/or an image as in Figure 2c.

To identify ownership, the first author created PDF versions of the discussion messages (Figure 3a) and placed them in a folder titled "Data Gathered - By course, by student":

- The majority of messages belong to 27 student accounts registered in one or more of these papers: Optics S1, Cornea and Anat. Seg. Surg S1, Phyisiology S1, and Anatomy S1.
- 1 message belongs to an account label "Lecture Notes"
- 1 message to a lecturer account
- 1 message to the admin staff account
- 1 message to OB3 technical staff account

Categorization of the messages according to emerging themes enabled to identify the con-versation types that occurred during this period within the lecture notes, assignment docu-ments, or exam preparation notes. A self-titled folder for each theme was created to place in it the alias of an email notification in PDF format. One notification could contain com-ments fitting within more than one theme.

See Table 2 for a list of 10 themes or discus-sion types identified. Quantity refers to the number of aliases/notifications of a comment within a particular folder/theme. Most conver-sations in the first two weeks of study referred to the activity of studying: "study content" (52) and "specific study tasks" (16). Some conver-sations referred to interactions with the OB3 web app: "how to use OB3 features" (7), "re-quest for inserting images within comments" (8), "not being able to post tables" (3), "locat-ing and searching files in OB3" (1), or "OB3 in docs". Few conversations related to "co-writing study documents (1) or identification of missing content from a lecture notes (1), or "using a same account for commenting" (1).

These findings so far show that OB3 web app enables members of a distributed community of learning author and discuss media-rich study materials. They show that applications built on people's familiar actions with comput-ers (e.g. drag-and-drop or copy-and-paste) lower the adoption barrier of technology, require little training, and enhance lecturer-student and student-student interactions.

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