Sharing and reuse in OER: experiences gained from open reusable learning objects in health.

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Abstract: The open educational resource (OER) movement has the potential to have a truly transformative effect on higher education, but in order to do so it must move into the mainstream and facilitate widespread participation in the sharing or creating of resources and in their reuse. To help in this process, experience can be gained from projects and initiatives which have acted as forerunners to this movement. Here we present the experiences gained and lessons learnt from one such project based around the open sharing of reusable learning objects in health sciences education. In particular we share our experiences of reuse, its patterns, measurement, drivers, barriers, and tools designed to balance the pedagogical tensions between use and reuse. Like many in the OER movement we promote an emphasis on the role of community-building. We also argue that in order to produce materials that are worth sharing, value must firstly be placed on developing materials suitable for primary use, including robust evaluation and an alignment to real-world learning needs. Lastly, unlike the prevailing trends in OER we urge a consideration of quality assurance and outline the role that it can play in promoting sharing and reuse.

Keywords: Open Educational Resources, Reusable Learning Objects, Reuse, Sharing, Community of Practice, Evaluation, Health.

1   Introduction

The open educational resources (OER) movement is one of the most exciting developments to emerge within Higher Education for a generation. It has the potential to have a truly transformative effect on the way education is governed, delivered and experienced. Whilst it can provide great benefits to an institution or individual in terms of prestige, marketing and awareness (Johnstone, 2005; D'Antoni, 2009), the driving force for many is the potential to redress inequalities in education by opening up resources to those who have traditionally been excluded geographically, culturally, economically or demographically (Johnstone, 2005; Lane, 2008). However, if these benefits of OER are to be realised, wide acceptance and participation in the movement is essential. Many of the factors that might influence such involvement have already been highlighted in the literature. They include issues that affect the sharing of resources, such as copyright, technical standards, supporting the content creators, how they are supported, the costs involved and sustainability. They also include issues that affect reuse of shared resources, including discoverability, the nature of repositories, the place of quality assurance, the types and breadth of materials being shared and the extent to which content should be customisable (Hylén, 2005; Downes, 2007; Caswell, Henson, Jensen and Wiley, 2008).

The growth of the OER movement has been largely organic, arising from individuals and organisations who have sought to capitalise on the interplay of developments in technology, social constructivist pedagogy and open licensing models to break down the traditional models of resource ownership (Caswell, *et al.*, 2007; Wiley, 2006). Some of these initiatives have been large scale, such as the early examples at MIT, whereas others have operated at a much smaller scale. As the OER movement emerges into the mainstream, it is evident that these projects have a great deal of

experience to share in order to help address the issues of sharing and reuse. In this paper we describe one such project, outline the methodologies used, share the lessons learnt and discuss how these may be applicable to the current OER movement.

The SONET (School of Nursing, Midwifery & Physiotherapy Educational Technology) group at the University of Nottingham has been delivering and sharing multi-media learning resources in health for 8 years. We have built a robust methodology for the creation and sharing of such content and approximately 120 resources are currently available. An overview of our work and the resources can be found at the SONET website [1]. Our desire to develop e-learning content was not driven by an altruistic imperative to share the content that we had made, but rather to employ technology to address the pedagogical needs that we faced, and which are common within health care profession education. These include the provision of personalised, student-centred resources that meet the needs of large groups of students with widely differing educational backgrounds and learning styles. Support for life-long learning and integration with practice and flexible study regimes for those, such as mature students, who require a different study-life balance are also important (Childs, Blenkinsopp, Halt and Walton, 2005).

The opportunities for open sharing of content for us grew from the processes developed at three key stages: resource choice and design, the development framework, and concurrent sustainability planning. We have been able to map a high level of reuse of our materials across the world (see Figure 5). Significantly, reuse itself has now become a major driver to our activities to encourage participation in content development, thus creating a sustainable circle of activity. This paper examines the SONET OER case study by first describing the 3-stage model for OER sharing followed by applications of this model to illustrate the lessons learned and an analysis of the reuse that has been achieved.

2   Methodology

Our 3-stage model for OER sharing and reuse involves methods relating to the three key stages: choice and design of the resource, the development process, and application of a sustainability plan.
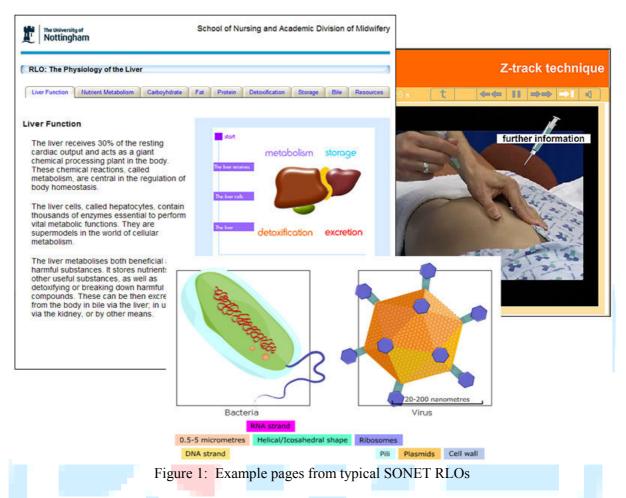
2.1   Resource design

The resource design chosen for our content creation was the reusable learning object (RLO). Although the definition of RLOs can be very broad (Wiley, 2000) we chose to define our resources very specifically. They have been described in detail elsewhere (Windle and Wharrad, 2010), but in brief:

- They are web-based resources that consist of a mixture of multimedia elements such as audio, text, images and video and which engage the learner in interactive learning through the use of activities and assessments. These aspects of the resources are highly rated by the students, and appear to support their learning (Lymn, Bath-Hextall and Wharrad, 2008; Windle, McCormick, Dandrea and Wharrad, 2010). The high media quality of the resources has also made them appealing from a reuse perspective.

- They are granular in nature representing approximately 15 minutes of learning activity. Importantly they adhere to the decoupling and cohesion model of learning object design (Boyle and Cook, 2003) meaning that internally they address a single well defined learning goal and that they do not link out to external resources. Previous research showed that nursing students generally responded well to more granular materials (Wharrad, Kent, Allcock, and Wood, 2001). Indeed the flexibility and control that this brings to the learning process is the attribute that students rate most highly (Windle, *et al.,* 2010). This portability has undoubtedly been a major driver in the reuse of the resources.

Example pages from typical RLOs are shown in Figure 1 and examples can be accessed at the SONET repository web page [2].

Figure 1: Example pages from typical SONET RLOs

2.2   Development Process

Our working practices are aimed at maximising participation and providing a sense of shared ownership of the materials being produced. The process, which has been described in detail previously (Boyle, Cook, Windle, Wharrad, Leeder and Alton, 2006), begins with workshops in which the project is scoped and team building occurs. The workshops involve the widest possible team of stakeholders including tutors, students and media developers. Technology is excluded from the process at this stage in order to allow creativity without the constraints of the media and also to prevent power relationships being established within the group on the basis of technical expertise. Following the workshops, a small team is tasked with the production of a complete specification for the resource. The fact that each resource is relatively small in size helps to make this achievable. The specification for the resource is then subjected to the first of two quality assurance steps. A series of standard peer review instruments have been developed for this process [3]. The content, proposed media elements and pedagogical representations are considered and revised before the project passes to a media developer. Potential learners may also be asked to review the resource. Following development, the resource is then subjected to a further review stage that concentrates on media representation and effectiveness. After any further revisions the resource is then released for use.

The ways in which the resources are used depends on the requirements of the original project team. Tutors are supported to embed resources within their courses and virtual learning environments

(VLEs). They are also supported to create meaningful learning opportunities around the resources. Evaluation of use with the target group of learners is an essential component in the process. A standardised evaluation toolkit created for this purpose is available [4].

Following release and evaluation with the target learner group, all resources are packaged and made openly available from the SONET RLO repository [2]. The repository listing is shown in Figure 2. It has purposefully been kept very simple, with an alphabetical listing of resources, a brief description and category. Further information is available, but complex learning object metadata has been avoided. All resources are released under the Creative Commons Attribution-Non-Commercial 2.0 UK: England & Wales licence [5]. The licence allows for free non commercial use and repurposing of the resources. Although content packages are available for download, access to specific development files can also be requested. Each resource travels with an online form that allows re-users to submit feedback. Further revisions are made on an ad-hoc basis as required by the feedback.

115 RLOs available for use

Title	Description	Subject(s)	Detail
Acids, Alkalis and Bases: an Introduction	Defining and explaining acids, bases, and alkalis, from an ionic standpoint, and introducing the pH scale.	Chemistry	ⓘ
Acids, Alkalis and Bases: Further Application	Examining the operation and application of acids, bases and alkalis, including neutralisation, acid/base reactions, and salts.	Chemistry	ⓘ
Action for drugs that target enzymes	To describe how enzymes function and how drug inhibitors block this action.	Pharmacology	ⓘ
Advanced literature searching	How to construct literature search enquiries using the thesaurus, focus or explode your search, use the search term taxonomy to refine your search and combine these methods into an advance search protocol.	Study skills	ⓘ
An introduction to receptor pharmacology	To describe the different types of receptor which drugs target.	Pharmacology	ⓘ
Aseptic Non-Touch Technique	Introduces the concept of ANTT, used to prevent infection during clinical procedures; includes a video demonstration.	Practice learning and clinical skills	ⓘ
Atomic Bonding	Examining ionic, covalent and mixed bonding in atoms.	Chemistry	ⓘ
Bacteria and viruses compared	Introduces and compares the structural components associated with bacteria and viruses by allowing users to "build" their own.	Biological processes, Science basics	ⓘ

Figure 2: The simple look and feel of the SONET repository site

2.3 Sustainability planning

The sustainability of OER projects is a key issue (Wiley, 2006; Downes, 2007). The development and delivery of RLOs by the SONET group has been supported and sustained by a mixture of funding models. Core foundation funding is provided by the University of Nottingham. Although there is no requirement to share these resources from an economic perspective, the benefits derived from doing so, in terms of attracting additional funding allows more resource development to be undertaken. For example, this approach led to the securing of HEFCE funding for a Centre for Excellence in Teaching and Learning in 2005 (RLO-CETL) [6], together with partners at London Metropolitan University and the University of Cambridge. Like the CETL, many externally funded projects require the products to be released as OER. Finally, partnership models have also been used to support the work of the SONET group (Wharrad and Windle, 2010). Partners include other HEIs or NHS organisations. We are generally able to reassure partners of the value of releasing resources as OER. In our experience, although OERs do not attract direct income, we can offer a range of associated services, such as workshops, development and consultancy that do attract funding and therefore sustain OER production. Sustained OER production can be achieved by sustainability planning at the outset and running these activities alongside the production of OER described in sections 2.1 and 2.2.

3 Lessons Learnt

During the development and delivery of OER within health science we have learnt a number of lessons that may be of value to the OER movement. In this context, two lecturers and co authors of this article (DM and HL) describe OER projects they led, to illustrate first hand, the application of the methodologies described in the previous section.

3.1 Get use right and sharing will follow

3.1.1 Designing for Use

There is much debate about the extent to which materials should be developed for use or reuse. To what extent should materials be developed with a specific learning audience in mind? Issues such as contextualisation and the focus of the learning goal become very relevant in this respect. We find that a focus on developing materials for use, and getting this right, is central to stimulating reuse. Although, there are some benefits to the individual tutor for releasing their materials as OER, as outlined in the introduction, it is unrealistic for this to be their main driver. Developing something that is going to be of benefit to them and their students is far more immediate and relevant. However, we find that the learning needs that content authors identify are often universal and the degree of alignment of materials to these common learning needs often makes them highly attractive for reuse.

3.1.2 A practitioner's OER experience (Author DM) - "Supporting biosciences in the nursing curriculum"

A number of studies have expressed concerns that nursing students have difficulty applying biological sciences to practice (Clancy, McVicar and Bird, 2000; Davies, Murphy and Jordan, 2000). Whilst these challenges represent a major problem, the biosciences remain under-represented within an increasingly crowded curriculum (McKee, 2002), leading to high levels of student anxiety and attrition. To address these issues the bioscience team engaged in the development of a series of RLOs. Some pages from these resources are shown in Figure 1 and others at the website [2]. The resources were initially deployed as self-directed learning packages to supplement lead lectures. We evaluated the RLOs using the RLO-CETL evaluation toolkit. One of the evaluation tools is an online feedback form which travels with every RLO; it asks 10 simple questions about how the students rate the resource. Some results from 380 students (intended users and re-users from other institutions) using 14 bioscience RLOs are shown in Figure 3. Evaluations were extremely positive so RLOs were also incorporated into other educational contexts. For example, a digital whiteboard was used as a platform to display selected RLOs within a traditional lecture to generate meaningful interaction within a large group presentation. Evaluations again revealed that the RLOs could be used in different educational contexts whilst retaining a positive impact on student satisfaction. Based on these evaluations and the experiences of bioscience academics the following themes emerged as key areas that should be considered when developing OER.

'Learning resources should be integrated into the course content and focused on meeting the needs of the student'. As a team of bioscientists we were aware of the problems that student nurses have with biosciences. Because we were given a high level of control over the development process, we were able to produce resources that were highly aligned to their learning needs and goals (Figure 3, panel B). We were aware of the pedagogical approaches that worked in class and were able to maximise these in the development of the RLOs. We were also able contextualise the materials and enable the student to apply biological sciences to practice. This application to practice is particularly important within the health sciences. Whilst acknowledging that these approaches may limit reuse by increasing their specificity, such alignment has to be the main driver in the development of any health related resource.

'The most effective learning objects are those that have been developed using consistent pedagogical approaches'. The RLOs we have developed are all based upon an established methodology (sections 2.1 and 2.2). This was flexible enough to allow us to represent the things that we wanted, but gave us confidence as a team that we were developing resources based on an effective pedagogy. Such an approach may prevent some of the worst examples of online learning being promoted as OER. For example, there is a common misconception among some academics that online learning can be achieved by simply transferring resources into an electronic format without consideration of the underlying pedagogical implications.

The consistency was also something that the students liked. If they went to the SONET site to find a resource to help with a particular issue, they knew what type of resource they would get. They were also more likely to reuse resources or recommend them to others (Figure 3, panel C). It is also our sense that tutors and students from other organisations are more likely to revisit our repository if they wish to address a particular issue for the same reason. Taken as a snapshot, in May 2010, $72 \pm 5\%$ (mean ± standard error) of use of these bioscience RLOs came from external organisations.

'Most courses employ a variety of different teaching methods. A resource which can be used to complement different teaching and learning strategies will be more reusable'. As stated above, based on the success of initial RLO deployment, we also explored the pedagogical potential of using RLOs in other educational contexts. In the second phase of this study a digital whiteboard was used as a platform to engage with RLOs within a traditional lecture. This worked very well and evaluated positively. It promoted an environment of collaborative learning which was a novel and unexpected addition to their effectiveness. Previous studies within nurse education have suggested that collaborative learning has the potential to promote deep learning strategies (Oermann, 2004). Whilst such an approach is very beneficial to our students, it also demonstrates the potential these resources have to be reused in different ways by others.
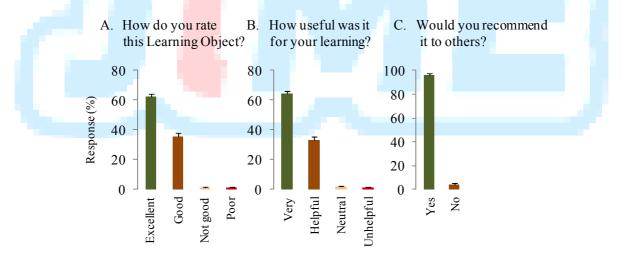

Figure 3: Evaluation data from 14 bioscience RLOs

Titles: Kidney anatomy; Kidney physiology; Liver anatomy; Liver physiology; Concentration Gradients; Starling's Forces; Drug metabolism in the liver; Drug metabolism in the kidney; Glomerular filtration; Bacteria & viruses; Osmosis & diffusion; Respiratory ventilation; Exploring the synapse; Cell division). Data were collected from an online feedback questionnaire attached to each RLO and collated using Excel (total n = 385). Data collated in May 2010.

3.2   Engage the community to enable them to share

3.2.1   The importance of community

One of the most significant lessons that we have learnt is the importance of communities and participation. If you want people to engage, then you must engage with them. The notion of "*build it and they will come*" has been proved wrong over and over again when it comes to educational technology and the same is true of content creation. In our experience true engagement in a community of practice such as Wenger envisaged (Wenger, McDermott and Synder, 2002), including a sense of belonging, shared purpose, empowerment and activity, is the greatest driver for participation in the sharing of resources. Three characteristics that we have found to be important in this area are:

- **A sense of achievability**. So often the creation of high quality resources for sharing is seen as something that "*others*" can achieve, excluding those who might have the best resources, knowledge or experience to share. The small, granular nature of the RLOs that we have developed, coupled with person-centred processes make content creation accessible for all. This is evinced by an exponential increase in the number of academics engaging in resource creation in our school over the last 8 years, and the broadening of the subject areas being tackled (Windle and Wharrad, 2010).

- **A sense of ownership**. So often academics feel disempowered by initiatives designed to create or share resources. We find that fostering a sense of ownership of the resources at all stages of development and deployment is a crucial driver towards engagement with our project. Moreover tutors who have a sense of ownership tend to become active advocates for their resources, stimulating reuse within their own communities.

- **A sense of support**. It is also essential that academics are provided with sufficient support to enable them to achieve their goals. Apart from the technicalities of development of resources issues such as copyright or metadata can so easily deter someone from sharing their materials. These are likely to require ongoing support for some time to come within the OER movement.

3.2.2   Involving others

One of the greatest benefits of an open, accessible framework for content creation and sharing is the ability to engage a much wider range of stakeholders in educational resource development, and thus to bring whole new areas of experience, perspective and knowledge into the educational arena. This alone could have a transformative effect on higher education. In our case it has enabled us to work with patients, carers, health care practitioners and students to enrich the resources available to our students and other OER users.

3.2.3   A practitioner's experience (Author HL) - "Students' developing OER on Learning Disability"

It is widely acknowledged that people who live with a learning disability are some of the most disadvantaged groups in our society (DoH, 2009) and that this is often reflected in the health care they receive. The SHOULD project (Supporting Health Occupations Understanding of Learning Disabilities) [7] aimed to address this, by enabling learning disability nursing students themselves to develop and share OERs with fellow health care students. The premise being that they may be better placed to articulate approaches more likely to influence their peers.

Learning disability nurses and educators who work with and for people who live with a learning disability constantly strive to ensure that actions, beliefs and values lead to lives where people have:

- The right to take part in community life

- The right to experience valued relationships with all members of society.

- The right to make choices, both large and small, in one's life.

- The right to learn new skills and participate in meaningful activities with whatever assistance is required.

These ideals can be transformative for any community and indeed it was clear that the students involved in the SHOULD project were really valued as equal partners in our OER community. As one of the students stated: *"You can't be empowered and have a voice some of the time, you have to be empowered and have a voice all of the time."*

37 students from 7 higher education institutions from across the UK and Ireland were involved in the SHOULD project. The students came with a shared passion to ensure that people with a learning disability get fundamentally what we often take for granted. The students owned the project and the solutions right from the beginning. The effect of this was that things that we may consider to be hurdles, they embraced as challenges and with the expert support from media developers, became true '*knowledge-technologists*'. We saw traditional boundaries between different higher education establishments becoming blurred or even dismissed. True leaders for tomorrow's services have emerged, and the lifestyles of people who have a learning disability have been enhanced. There have been times in the process when each of us has not found it easy or comfortable to give up perceived control to students. They made decisions that we wouldn't have done, but isn't that the point? It requires a new way of thinking and a new way of working, but in true collaboration, difficulties have been resolved and each participant has been valued on the content of their character and expert knowledge. The end result of this has not only been the creation of the resources originally envisaged, but also expansion of the project (thereby sustaining OER activity) into ways that we could not have even imagined, including a national student learning object competition, further funded projects, translation of resources into Welsh and students, now qualified, developing and sharing resources within their own practice. Figure 4 shows a screenshot from one of the SHOULD project RLOs.

Figure 4: A screen shot taken from one of the student-generated RLOs from the SHOULD project. For a complete listing of SHOULD RLOs see the SONET website [2].

4   Discussion

4.1   A question of quality

One of the most contentious issues facing the OER movement is the extent to which quality control should be applied to materials that are being released for sharing. At one level the issue is seen as an anathema to the ethos of OER, as it imposes restrictions and centralises control over what is being shared. Others feel that formal quality assurance at the point of delivery is unnecessary as only materials of sufficient quality will gain a level of reuse. In this "*buyer-beware*" or rather "*re-user-beware*" market it is argued that quality control will be dealt with by the person who is selecting materials for their use. Another argument that is often proffered is that the individual sharing the OER content will themselves act as an intrinsic quality control mechanism and will be unwilling to share or release materials whose content they are not completely confident about, as it is their reputation at stake.

Our experience is at odds with the arguments above. We have found a robust quality control mechanism to be an important driver of both sharing and reuse. Whilst it is true that such quality assurance may be more important within subjects such as health sciences where the consequences of

misinformation can literally be a matter of life of death, the principles may well apply to other disciplines.

Firstly, we would argue that quality control actually empowers the content provider. In our experience many are reluctant to share content because they feel it is not of sufficient quality. A transparent quality control process can provide them with the confidence that they need to share. Also as mentioned previously, the potential to infringe intellectual property rights (IPR) deters many potential sharers (Fenlon, 2010). A quality control process that specifically deals with IPR can give contributors the confidence to share.

Secondly, we would dispute that quality control is best handled at the point of reuse rather than at the point of delivery. As noted by Hylén, (2005), learners, particularly if they are self-learners, might not be in a position to judge the quality or relevance of the resource for themselves. Similarly, it should not be assumed that all teachers will necessarily be able to judge the quality of resources with which they need to engage. Very often teachers are asked to cover subjects that are outside of their comfort zone. One potential consequence of a lack of quality control at the point of delivery is selection of poor or inappropriate resources. A more widespread and hidden consequence might be a reluctance on the part of teachers or students to choose OERs altogether. Instead they may turn to more expensive resources such as textbooks, or produce their own. Whilst decentralised quality control mechanisms such as user-comments and rating systems may have an important role to play in allowing users to choose OERs (Hylén, 2005), we would still argue that quality assurance provided at the point of release is of paramount importance. Take the analogy of research data. This has been shared within academic circles for centuries. It is true that the end-user must still critically appraise the data that they are accessing, but at the same time robust peer review processes at the point of delivery remain the gold standard and ensure a level of confidence in the data and its provenance. It is our experience that quality assurance has been a major driver to the reuse of our resources, their acceptance, inclusion in a range of catalogues and their recommendation by third parties.

Lastly, we would also urge caution in the assumption that content providers will act as their own internal quality assurance mechanism. Although they may well be motivated to share only high quality resources, they may not be the best placed to judge this. Again, think of the analogy of research publication. Most academics are concerned to show their research in the best possible light through the data they share, but an independent review process is still necessary, as much to protect *them* from mistakes and oversights as to protect the potential recipients of the data. In terms of OER, tutors may make inadvertent factual errors or present information in a way that makes sense within their context, but not when looked at from another perspective. Also, as mentioned above, tutors may be unaware of potential IPR concerns within their materials. We have been able to deal with a range of issues like these through the review process. Nearly every resource will undergo some factual or contextual editing before it is released. Tutors generally find this process to be supportive and helpful, providing them with the confidence they need to share and the knowledge that they are represented in the best possible way.

One of the reasons why quality assurance of OERs is so problematic is that quality means different things to different people, for example the extent to which the resource can be customised, technical interoperability, the 'look and feel' or pedagogical parameters of the resource. We have constructed and validated a tool called the Learning Object Attribute Metric (LOAM) tool in which twelve pedagogical attributes were identified with the explicit intention to measure their effect on reuse (Windle & Wharrad, 2010). The tool displays the scores for the twelve attributes and the pattern of distribution of scores provides a characteristic 'footprint' for each OER. This work is in progress but further research matching LOAM 'footprints' with different student groups may lead to a classification system for selecting quality OER suited to particular learners, thus making selection of OER materials easier for students and their lecturers. The question of quality presents the OER

movement with a number of dilemmas and the future direction is uncertain. It is possible that a tiered system will emerge, a gold standard subset of quality assured materials together with a second layer of non-assured resources. Whether this is inevitable or desirable remains to be seen.

4.2 Does reuse matter?

4.2.1 The importance of reuse

There has been much debate amongst RLO communities about reusability and reuse but what is it and is it important? Koper (2003) defines *reusability* simply as 'the availability of learning objects for others to use' (pg 48). An alternative view is that *reusable* means that 'the content included within the resource is appropriate for learners outside the immediate group that it was intended for' (Windle & Wharrad, 2010). The former definition implies that resources are simply made available for sharing whereas the latter indicates an intention to support reuse. Currier and Campbell (2005) in their study to evaluate the reusability potential of content define '*horizontal reuse*' as interdisciplinary reuse and '*vertical reuse*' where resources are reused at more than one educational level. We have previously reported on case studies demonstrating both horizontal and vertical reuse of RLOs (Wharrad & Windle, 2010).

This current OER movement is opening up repositories to be populated with all sorts of materials but does it matter if OER is concerned with simply filling repositories with resources, and have institutions fulfilled their "public" obligation by doing so? Are they also responsible for whether people actually use it and for supporting and monitoring whether they do so? In 1999, the Universitas 21 learning resource catalogue sought to "*make efficiency gains by minimising replication and to reuse the existing unpublished learning and teaching resources that are replicated by universities the world over*". Despite significant backing from U21 University Vice Chancellors, the project was terminated in 2006 as a critical mass of users was never achieved (Allen, Kligyte, Bogle & Pursey, 2008). It may be that these earlier repository projects were before their time and the teaching and learning academic community in this 'Google generation' will be more responsive to reuse of others' content. Institutions will need to drive and support a move towards a more widespread culture of transparency and sharing.

4.2.2 Measuring reuse

Methods for evaluating resources including RLOs have tended to focus on use (Lymn et al, 2008) or potential for reuse (Currier & Campbell, 2005) rather than on *actual* reuse. Use of server tracking statistics and analysis of feedback forms provides useful data about geographical spread of reuse and some information about vertical and horizontal reuse. For example, we analysed 1258 online feedback forms returned by users of 58 of our RLOs across the world between October 2007 and July 2008. The feedback forms provide data on rating and usability of the resource and which institution and geographical location the user is from (Figure 5). Completion of the feedback form is optional, and we estimate that between 10 and 20% of users provide feedback. 36% of the users were from the University of Nottingham and 64% were reusing the RLOs in other institutions. Interestingly, re-users rated the materials more highly [9].

This '*incoming stream*' of data however does not get to the deeper questions around reuse. How does reuse develop? What makes a resource reusable? How and why are resources reused? We are carrying out deeper evaluations with the community of re-users shown in Figure 5 to try to answer some of these questions. Although the research is in its early stages we are beginning to identify a number of patterns of reuse.

1. Transfer effect – simple transfer to a recipient who reuses resources.

2. Relational effect – where rich reuse partnerships are established. A recipient institution develops a relationship with us and then extends the depth and richness of the reuse partnership, providing feedback, data and possibly then providing resources in return.

3. Nodal effect – spread from one institution to another and then from the recipient to another.

4. Ripple effect - spreading out from a recipient institution at the centre, but continuing to spread through the exposure and recommendation of others.

5. Cloning effect – a host institution reuses our resources and them begins a programme of development and sharing for themselves.

Figure 5: Map showing institutions reusing one or more of 58 RLOs between September 2007 and July 2008

4.2.3   Barriers and drivers

There is a complex array of factors that are important in driving reuse. Some of the factors that we have identified are shown in Figure 6. The issues surrounding content and the design of resources have been discussed above. Further up the ladder, making RLOs easily accessible in terms of ensuring a simple searchable and open interface [2], using a Creative Commons licence [5] and providing content packages which allow re-users to modify the RLOs have all helped to support reuse.

At the top of the ladder are issues that individual OER providers are less able to influence. It is at this level that the wider OER movement can have an impact, in terms of fostering a culture of reuse and supporting individuals to locate and utilise resources.
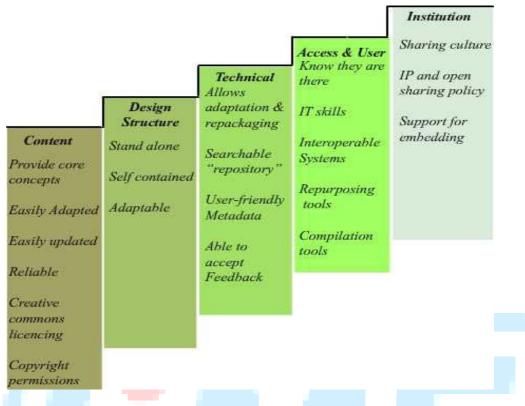
Figure 6: Ladder showing some of the common barriers and drivers for reuse of OER

4.2.4 Supporting reuse

Although we have asserted that materials that are effective for use in a particular context are more likely to be reused, tensions do exist between the characteristics favouring use and those that make resources reusable. Well integrated and highly contextualised materials may be most effective for a given group of students, whereas small, granular, decoupled and context-neutral materials are more likely to be reusable. These context-neutral materials can detract from application and learning and many educators decline to adopt them. There are some solutions to this problem. One approach is to repurpose resources through tools such as the GLO Maker authoring tool [8] (Boyle, Ljubojevic, Agombar & Baur, 2008). GLO Maker enables the development of highly adaptable RLOs. However, many educators do not possess the skills, confidence or the time required to adapt materials, so we are working closely with students and nurse-educators to develop the CORE tool (Compiler for Open Resources in Education) which allows OERs to be selected and integrated into a seamless online content package (CORE tool user interface screenshot is shown in Figure 7). Bespoke content can then be added as a form of contextual "*glue*" that provides the specificity required by the new user (Taylor, Windle & Wharrad, 2010). GLO Maker and CORE tool essentially support different levels of reuse; they are openly available as are their products. Their development and use is centred within a community of practice involving students, lecturers and learning technologists.
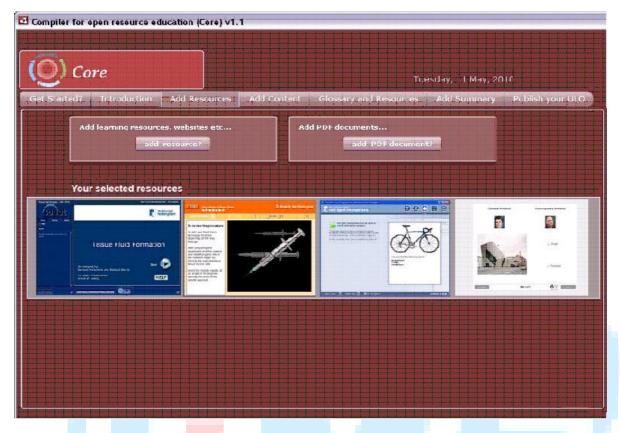
Figure 7: A screenshot from the CORE tool user interface showing 4 RLOs selected by the user. Further contextual material in the form of pdf documents for example can be added before the compiled OER package is finally published.

5   Conclusions

In this paper we have been able to outline some of the lessons that we have learnt from sharing RLOs over the last 8 years and tried to highlight how these might inform the emergent OER movement as it seeks to move into the mainstream. Although it must be stressed that some of these issues might be specific to RLOs rather than OER more broadly, learning objects continue to make a significant proportion of the OERs currently being shared (OECD, 2007).

It is evident that the issues that we have identified concern both sharing and reuse. To date the OER movement has mostly focused on the input or sharing aspect of this equation. A relatively large amount of funding has been made available for the creation of repositories, and the movement has had some success in encouraging individuals to share their resources. Much less is known about the reusability or reuse of the resources that have been accumulated. Who is reusing the resources? How much is being reused? What is being reused? Why are they reusing? What makes it easier or more difficult? So far we have only very sketchy answers to these questions in relation to OER and that is why data from this SONET case study and others are important. They provide preliminary evidence on which further research studies could be based. Answers to some of these questions will be vital if the OER movement is to succeed and become sustainable in order to move nearer to what Atkins, Brown and Hammond (2007) describe as an "*Open Participatory Learning Infrastructure*".

It is clear from our experience that, in reality, sharing and reuse form part of a virtuous cycle and many of the issues that will stimulate one are likely to have a similar effect on the other. For example, we highlight the importance of community, ownership and empowerment. This equally

applies to the sharing and reuse community. Also evidence suggests that those who feel empowered to reuse are more likely to themselves to share and vice versa (Windle, Wharrad, McCormick, Dandrea, *et al.,* 2007). Similarly it is clear that an emphasis on quality assurance can be a driver to both sharing and reuse and likewise elements that make for good design for usability also seem to foster reuse. Although the OER movement is still relatively new, we advocate a greater awareness of this virtuous cycle, further research aimed at understanding its impact and a focus on tools that might support it.

6   References

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7   Footnotes

[1] SONET group website homepage: http://sonet.nottingham.ac.uk

[2] RLO listings from SONET website: http://sonet.nottingham.ac.uk/rlos/index.php

[3] Quality control tools used for RLO creation: http://sonet.nottingham.ac.uk/rlos/dev

[4] Evaluation tool kit: http://www.rlo-cetl.ac.uk/whatwedo/evaluation/index.php

JIME http://jime.open.ac.uk/2010/04

[5] Creative Commons 2.0: http://creativecommons.org/licenses/by-nc/2.0/uk/

[6] RLO-CETL website: http://www.rlo-cetl.ac.uk/

[7] The SHOULD project website: http://sonet.nottingham.ac.uk/projects/should.html

[8] The GLO Maker tool: http://www.glomaker.org/

[9] Reuse evaluation data http://www.rlo-cetl.ac.uk/whatwedo/evaluation/results.php