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Localizing OER in Afghanistan: Developing a Multilingual Digital Library for Afghan Teachers

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Abstract

The Darakht-e Danesh ('knowledge tree') Online Library is the first open educational resource (OER) initiative in Afghanistan, established to enhance teacher subject-area knowledge, access and use of learning materials, and to foster more diverse teaching methodologies in order to improve learning outcomes in Afghan classrooms. This paper describes our experience developing this local language digital library, buildings its responsiveness to our audience of users as we progressed, customizing both the interface and the resources for Afghanistan's education environment. We innovated methods to devise relevant local content, localized usability, developed different access models to reach different populations of users, integrated impact measurement, and opted to openly license material in the library's collection. By making digital educational content open from the first introduction of digital repositories of learning objects in Afghan languages, we have an opportunity to establish the principle of openness and to promote open practices in teacher professional development in Afghanistan. The paper aims to share lessons on how OER can be customized for multilingual, resource-scarce contexts drawing from our experience to date in Afghanistan, and seeking to contribute to the literature on localization and multilingual OER.

Key Words: Localization, digital library, Afghanistan, OER, teacher education, educational resources, multilingual materials

Introduction

In developing the Darakht-e Danesh ('knowledge tree') Library for Educators in Afghanistan (DD Library)[1] we hypothesized that the OER approach offered a potential solution to some of the education quality challenges in Afghanistan, if OER could be rendered into the languages in which teachers speak and teach, and if the technology to deliver it was localized to respond to conditions in Afghanistan. Our Afghan OER repository uses an interactive, multilingual content management system currently housing OER in 20 subjects, in the three languages taught in the Afghan public school system: Dari, Pashto and English. The theory of change we are testing is that use of OER --> more exposure and use of educational content --> increased knowledge of subject knowledge and increased use of a variety of teaching methods and materials.

This paper describes our experience developing this local language digital library using the "software as hypothesis" (Leinonen, Purma, Poldoja & Toikkanen, 2010) conceptualization that characterized the development of the LeMill multilingual digital library. This approach allowed for the continual development of an OER collection and the initiation of a community of practice among teachers using the OER by using the architecture of the digital library to lead teachers to use it in a way that will enable meaningful use of the system. In other words, the software evolves as people use it, and the initiators systematically observe how it is being used, adapting the software to be more responsive to the users. Software as hypothesis puts the emphasis on the design of the library and the extent to which it supports users to integrate the resources into their teaching and learning, and to share their own resources with the community of users. As usage is observed, we continuously

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improve how we organize, structure and enable access to, creation of, sharing of OERs for Afghan teachers.

Multilingual digital libraries are understudied "and remain a bit of an enigma" (Diekema, 2012, p. 10), and this is particularly the case for multilingual digital libraries in the developing world, despite the recognition by researchers "that beyond accessibility, digital libraries have enormous potential for empowerment and building community, especially in developing countries" (Hutchinson, Rose, Bederson, Weeks & Druin, 2005, p. 5). While our digital library remains in the early stages of rollout, the iterative process of developing a tool responsive to the distinctive environment facing Afghan educators is worth sharing at this stage as we believe it offers valuable lessons on how OER can be customized for multilingual, resource-scarce contexts. In this paper, we have described our approach to localization, and the steps we have taken on our path to building a tool that would make OERs relevant to, and useful for Afghan teachers.

Context: teaching and education in Afghanistan

With millions of girls back in school, new teacher colleges opened in every province of Afghanistan, and ongoing curricular reform, the education system in Afghanistan is experiencing a rebirth. Yet significant challenges remain. Four decades of war and an ongoing insurgency that has singled out the education sector for attack makes this a difficult environment in which to teach and to learn. Afghan teachers contend with a daunting lack of resources: most schools do not have libraries or science labs, many students go without textbooks, and teachers have little material to help them work through a new curriculum that many struggle to understand. At the secondary level in particular, there are extreme textbook shortages, and no teachers' guides, resulting in minimal support with learning materials from the government. Despite greatly increased enrollment and thousands of schools rehabilitated, the majority of Afghan teachers are unqualified (do not have the minimum requirement of two years of teachers' college) or underqualified, and outdated teaching methods like rote memorization still predominate. Minimal instructional time (classes are typically 30 minutes in length) and weak teaching capacity, among other challenges, have meant that many Afghan pupils can still not read by the time they enter upper primary.

The open educational resource (OER) movement has meant that huge collections of materials are made available to educators free of charge and without copyright restrictions, giving teachers direct access to sources of knowledge and teaching tools that can be adapted and repurposed for their classrooms, or simply used to enhance their knowledge of a subject. However, teachers in the developing world who speak languages other than English are largely excluded from taking advantage of this wealth of free information. A scan of the main OER collections online reveals that while some have modest multilingual collections, no indigenous Central Asian languages are currently included. The lack of multilingual interfaces and metadata restricts use of these sites in other languages (Amiel, 2013). In terms of print resources within the country, most books are imported from Iran or Pakistan and the domestic publishing industry is weak. There are almost no materials targeting teachers, and educational resources developed by NGOs are not typically shared externally, published online or openly licensed.

Background: the Darakht-e Danesh Library

In response to this situation, we created the Darakht-e Danesh Online Library, Afghanistan's first comprehensive digital educational resource collection.[2] We saw technology as offering a shortcut to building the quality of teaching and learning in Afghan schools. By giving teachers direct access

to knowledge resources in their own language, we can support an improved quality of teaching: enhancing teachers' subject-area knowledge and fostering more diverse teaching methodologies in order to improve learning outcomes in Afghan classrooms. The Darakht-e Danesh (which means 'knowledge tree' in Dari) Library uses an innovative interactive, multilingual custom-designed content management system, housing hundreds of resources for teachers in 20 subject categories, for both primary and secondary teachers in Afghanistan, and works in the three languages taught in the Afghan public school system: Dari, Pashto and English.

After registering, users can search the database by subject, resource type, language and level, or just browse the collection. For instance, a grade 10 biology teacher can search out water evaporation experiments, a teacher working with students with disabilities can find guidebooks with practical classroom strategies, or a geography teacher can download images of maps to print out for her classroom walls. Primary teachers can download full children's books for and by Afghans, and high school teachers can find full texts on subjects they are trying to better understand, like the Industrial Revolution, how to teach poetry, or strategies for reading.

Given our focus on access and our desire to encourage sharing of learning materials among educators, we opted to make the resources in the collection openly licensed, resulting in Afghanistan's first OER collection. There is no cost to access the resources, which may be freely shared: downloaded, printed, copied, and even repurposed. Afghan teachers can mix and mash resources to make them relevant for their classrooms, adapting them for local use. In adopting an OER approach to meet our objectives, our intent is twofold: to improve Afghan teachers' access to information sources from within and outside the country, but also, to draw in their participation to the knowledge commons, such that they are both users *and* shapers of knowledge resources in the information society.

Making OER for Afghanistan

The issue of language accessibility remains an under-supported and under-researched need in developing the OER movement. While the OER movement is centred around the notion of extending the knowledge commons, and is globally oriented in its aim to expand knowledge, in practice existing OER collections rarely support multiple languages, alphabets or scripts (West & Victor, 2011). The 2012 Paris Declaration on OER calls for the development and adaptation of OER in "local languages and diverse cultural contexts to ensure their relevance and accessibility" (UNESCO, 2012). Language accessibility has permeated every step of the development of the DD Library and was the most intensive draw on our software-as-hypothesis working model, wherein we are building and refining the software as it is used and as we track the user experience, continuously adapting the library to be a tool that is responsive to user needs and enables localization. This approach was relevant for us given that "affordances of the tools are realized only when they are used in the real world" (Leinonen et al., 2010, p. 117). In addition, we also needed to develop a sustainable means of generating content, to continuously adapt our design to enhance usability for our audience, and to innovate access models, a process which remains ongoing. These steps are described as follows.

Generating relevant quality content

In building the DD Library, our first task was to generate the content. As others have found, "dumping content onto a server isn't the most effective way to encourage fast learning" (Larson, 2014). Our objective was for the DD Library to be a source of high quality content usable within the Afghan curriculum. It thus should have materials that were novel and stimulating to educators, but which also integrate easily into the teaching and learning landscape of our specific population of users.

As Amiel (2013) notes, “an often-ignored barrier to remix and revision is the English-language and western bias of the Internet and particularly OER”, noting that language revision “involves a substantial amount of thought into the process of localization” (p. 132). To provide relevant content, we opted to source content from three sources: 1) English language OER that we translate into Dari and Pashto, often with adaptations to better suit the Afghan context; 2) Educational resources created by others (NGOs, government, commercial publishers) that we acquire permission to freely share digitally; and 3) User submitted educational resources. This content is then searchable in the user’s choice of language interface (Figure 1).

In selecting English OER to translate, we selected those that fell within the Afghan curriculum, and which ‘travel well,’ that is, they can be easily translated and recontextualized (Petrides, Jimes & Karaglani, 2008) so as to fit into one of the units of the Afghan curriculum around which we have structured the library. To translate the OER into Dari and Pashto, we tapped into Afghanistan’s large diaspora community, recruiting bilingual Afghans with specific areas of expertise—such as health and medicine, or language and literature—to translate OERs, who were seeking a meaningful way to contribute to the development of education in the country, despite living in exile. The translators are volunteers and work remotely. Their translations are vetted by a professional, remunerated editor, and then are formatted and designed. At this stage, adaptations are often made to suit the local context, such as adding captions or definitions for terms that might be new for Afghan teachers. Working with volunteer translators, supported by professional editors, resulted in a viable means of efficiently and cost-effectively generating quality local language OER.

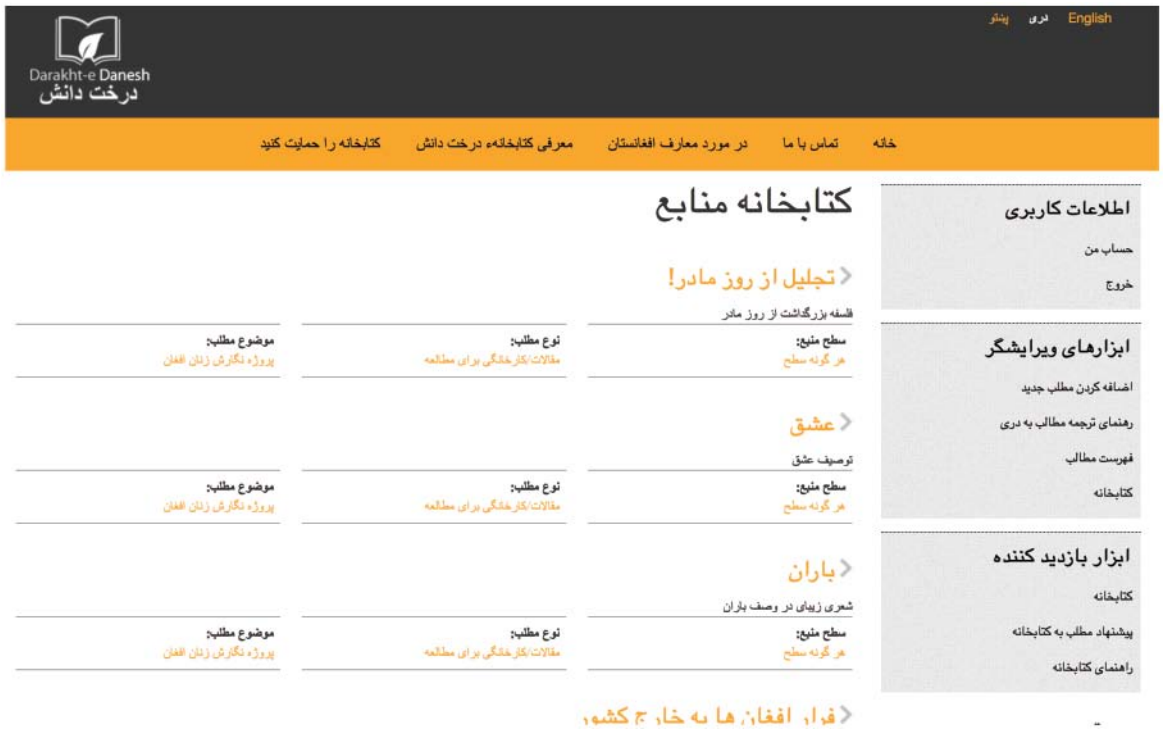

Figure 1: The Dari library interface

In selecting educational resources published by others, we asked organizations working in the education sector that had published materials that fit our criteria for permission to share the resources. Most provided us with digital copies of their materials and the requested permission, except in two

cases where organizations sold print copies of the materials and felt that making their publications available in the DD Library would compromise their ability to generate sales from the print versions. Collecting materials created by others presented us with the need to provide licensing options that assured the creators of the intended use of, and access to, the materials, an issue discussed further on in the Open Licensing section.

The third way we generated content was to open the collection to users to add their own materials. As others have found, "the best way to spread content is with locally created content" (Larson, 2014). We launched the library in 2014 when we felt satisfied that there was a critical mass of material to be of use to teachers. All of the OER at that time were our translations. After launch, we invited users to submit their own content. To facilitate this, a feature was added for users to submit a resource and metadata for the resource. Users have submitted materials as diverse as Dari translations of western philosophical works to ancient Persian poetry, to a simple health guide for rural villages. This feature not only aided the growth of the collection, but also promoted its 'ownership' by the Afghan users and encouraged the culture of sharing content. These efforts continue, as we added a "Want to translate this resource?" option to untranslated English resources, and in our planning of a national contest soliciting submissions of mini video lessons from Afghans, to diversify the content to include audio-visual materials.

Localizing usability

Localization is interface designed to be customized for a particular audience (Hutchinson et al., 2005). While OERs lend themselves to adaptation and repurposing, the localization of OERs within developing countries, where OERs could arguably make the greatest impact given the more acute learning materials access challenges teachers in such contexts face, has been less explored by the global OER community and less exploited in practice. Along with Teacher Education in Sub-Saharan Africa (TESSA) and Teacher Education Through School Based Support in India (TESS-India),[3] we aim to contribute to the "emerging framework for localisation to ensure more equitable and sustainable OER development and use" (Buckler, Perryman & Seal, 2014, p. 222)

We continuously adapted the DD Library in response to feedback from Afghan users, who are mainly teachers, including users of varying degrees of computer literacy, to maximize user friendliness. We aimed for site navigation to be intuitive. We often debated choices of terms to use, given the lack of consensus over appropriate technical terms in Pashto (i.e. "home page"), and our decision to generally avoid Iranian Farsi terms in favour of Afghan Dari terms, despite the dearth of technical terms in Dari. We are currently cross-linking resources that are available in different languages. For example, if a user is viewing a Dari physics experiment, an icon on the page indicates the resource is also available in Pashto and is hyperlinked to that resource (Figure 2).

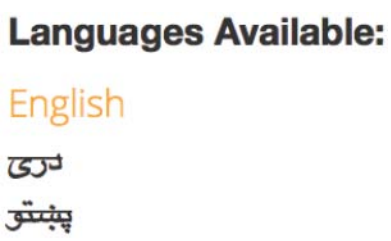

Figure 2: User's View Showing Languages In Which a Resource Is Available

As use of the tool expands, our intent is to build in more interactive features to the site. In the case of the multilingual LeMill digital library, computer supported collaborative learning in knowledge

building communities led to "the emergence of national communities, peer learning among teachers, extracognitive mechanisms, social presence, and the importance of coevolutionary methods in the development of LeMill" (Leinonen et al., 2010, p. 126). This was facilitated by design features such as teachers' building portfolios, having discussions, forming groups, reusing and remixing, mixing languages and making metadata creation implicit, among others. In the case of Afghanistan such features can be especially relevant, nurturing teachers' competency building and creativity (i.e. through remixing, or in being part of a community of practice), and even as a way of building national identity as teachers (i.e. through use and adapting of knowledge resources in the local languages, for the Afghan curriculum).

Open licensing

Educational materials in the DD Library could be subject to copyright law in several jurisdictions, including Afghanistan, and the source country of resources. In the English collection, we selected OER from external sources such as Curriki, and our Dari and Pashto translated materials were licensed under the Creative Commons BY 4.0 international license, which requires attribution of the copyright holder but allows for adaptation and redistribution. After an assessment of our licensing practices against best practice in OER repositories, we made several changes to the DD Library, including adding a licenses menu (Figure 3) for users to select the appropriate license when submitting a new resource to be added to the publication, with the following options:

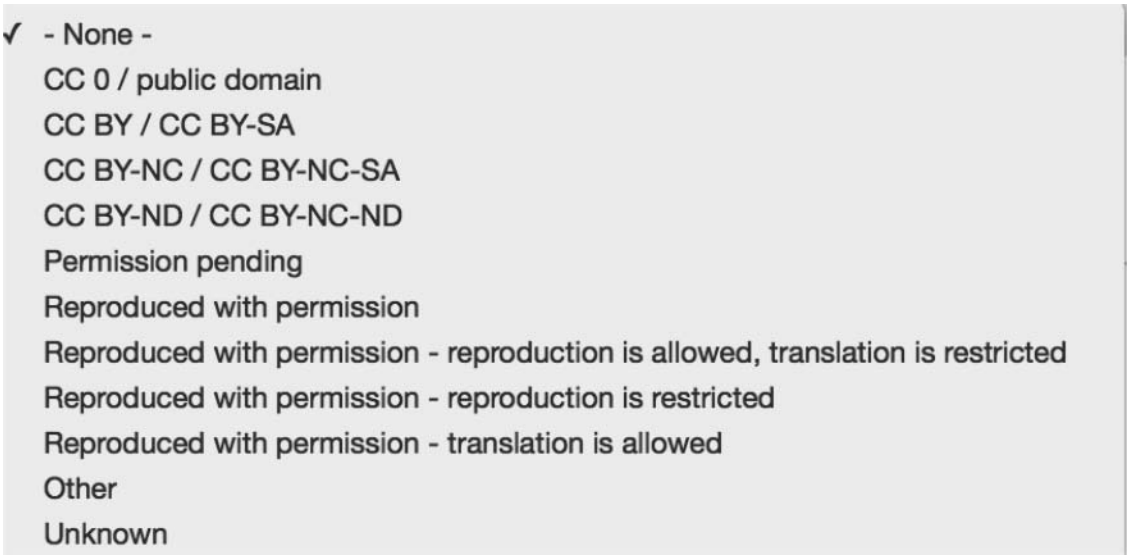

Figure 3: English version of Licenses Menu

It is here that we believe significant potential lies, in that we can make digital educational content open from the very beginning in Afghanistan. As there are few repositories of educational content specifically for Afghans, we have an opportunity to set the stage for promoting openness, by opting for open licensing and open practices in our collection. This, however, requires providing our users with education about open licensing, which in turn requires educating users about the concept of intellectual property and its various models including traditional copyright. We do this in several ways. We explain copyright law, open licensing, and specifically, Creative Commons licensing, when we do demos of the DD Library for Afghan teachers. We stamp all our own publications with a CC license, and when users submit resources, they are asked to select a license from a menu, and

can find links to information about each license to aid their selection. Our intent is that these efforts will aide the potential for open source software and freely-licensed content to feed "a widespread culture of collaboration and the sharing of ideas" (Larson, 2014).

Innovating Access Models

The first phase of the DD Library was developing the system and the collection of resources. We are now in the second phase, which is focused on expanding access to the Library to reach as many different users as possible, from those in urban areas to teachers in remote, rural areas. The library currently has users representing all 34 provinces of Afghanistan, in addition to users from some two dozen countries, with an average of three new users registering per day. However, this population is limited to teachers who independently find and use the library online. We have conceptualized alternative access models for others, each designed for a different population of educators (Table 1).

Table 1: Access Models for the DD Library

Access Model	Method and Target Users	Status
DD Library website	The website reaches users who can independently access the internet, who are located in Afghanistan, or anywhere in the world.	Our current work includes continuing to improve usability, and increasing the size and scope of the collection, expanding the Pashto collection, diversifying media to include video and audio files in the collection, and marketing the URL such as through billboards in Afghan cities and through social media.
e-Learning labs at teacher colleges	In this model, student teachers will access the DD library on site at their college and instructors will integrate the educational resources into their teacher education, and in some cases, in-service teachers will also access the lab.	To test this model, we equipped a teacher's college in a rural province near Kabul with the DD Library using a router and 3G network we installed at the lab that allows for access to the Library, given the college is not equipped with an internet connection.
Mobile technology-based apps	In this model, the library is made available via tablets and mobiles (compatible with both feature phones and smartphones) to reach educators in rural areas, using the 3G network. This involves adapting the Library interface for mobile use and deploying a tracking tool.	We install the library on teachers' personal phones, rather than distributing devices, in line with findings from elsewhere that suggest using the technology people already have is a more sustainable approach (Trucano, 2013) than distributing free devices. In participating schools, we provide 5–10 tablets to the school library, managed by the librarian and signed out like books.

Measuring impact

Now that we have a functional multilingual interface and a modest collection of high quality localized OER, our attention is focused on measuring impact, and using performance data to continuously adapt the tool, in line with the software-as-hypothesis approach. We have anecdotal and observational evidence that teachers are using the library materials to plan lessons, improve their subject knowledge, or deliver new activities in their classroom, and teacher trainers use the resources in

teachers colleges. For example, a teacher in Nimruz, an isolated southern province, who also trains teachers, wrote to us to say, "the resources in the library help us a lot and we fully use them in our teaching in remote provinces such as Nimruz. I also use the library materials to solve other teachers' problems when they come to me for help." While such feedback is very encouraging, we are currently collecting data for an impact study that will tell us more precisely what the impact of the OER in the DD Library has been for the teachers who access it.

Part of a series of OER impact studies[4] in several countries, the DD Library is studying a group of 50 secondary teachers, including 25 female teachers and 25 male teachers, in a rural province who are accessing the library, using purposive sampling. We have interviewed teachers, administered a pre-test, and collected samples of their lessons plans prior to their exposure to the library. The teachers then participated in a workshop explaining how to register an account, search the library, save learning materials, and share their own learning materials. There is no specific instruction given on how to integrate the learning materials into teaching; we leave that to the teachers to

Table 2: Types of Impact To Be Measured

Expected Impact	Indicators	Tools	When	How
KNOWLEDGE Enhanced knowledge among teachers of subject content and teaching methods	• No. of educators (sex disagg.) who report using diverse teaching content, tools and methods, and report sources for this • No. of educators (sex disagg.) who report enhanced information and understanding of subject areas learned on DDL	Lesson plan—Pre training	After selecting the teachers	Will be administered same time
		Pre-Training questionnaire	After selecting the teachers	
		Lesson Plan—Post training	After training and after completing the preparation period (time period to study OER materials)	May inform the selected teacher well in advance through email/ phone/circular.
		Trainer observation	Any time after post-training lesson plan preparation	Will be administered same time
		Student observation		
		Post-Training questionnaire		
ACCESS Widespread use and growth of DD Library among Afghan users	• # of users in Afghanistan • # of resources downloaded • # Mins accessing content via app •types of resources most frequently downloaded	• User registration data • Generated traffic reports from site Reports from app usage	• Tabulation of registration data • Tabulation of traffic data (From Log data of website)	
OPENNESS Afghan educators participate in development of the resource collection	• # of resources uploaded by Afghan users • Knowledge of principles of openness	• Uploads • Included as question on post assessment for the teachers	• Tabulation of uploaded documents from Afghan users • post training questionnaire	Any time after post-training lesson plan preparation

determine, since the DD Library is intended to serve teachers' self-directed learning and professional development. The teachers are given access to the DD Library through several means, including three physical sites: computer labs in the local teachers' college computer lab and in two public schools, where we have installed the Darakht-e Danesh Library through an offline local network (there is no internet connection at the lab) in each lab. Teachers can also access the library from their mobile phones and from tablets onto which we loaded the offline DD Library and which were placed in the two schools' libraries, where they are signed out like books. We then observe teachers in the classroom after several weeks of using the DD Library noting observations in a rubric, and we interview their students. After two months of accessing the DD Library, we will once again collect lesson plans, administer a post-test, and interview the teachers, comparing the data to the pre-treatment interviews, tests and lesson plan assessments.

Acknowledging the challenges inherent in isolating causality of learning outcomes (Halai, 2004), we are collecting a variety of data, including lesson plan analyses, assessment, teacher interviews, and student focus groups, to understand what impact, if any, the OER will have on teacher practice, and/or in enhancing teachers' subject knowledge. In total, we will be analyzing eight data sets collected in the field, in addition to the data recorded by the library itself (demographic data including languages spoken and taught, teaching level, sex, subject(s) taught, age, location, server; and usage data including number of visits, sessions, views, downloads and cohort analysis). Usage data can be collected from the tablets and mobiles as well. Our instruments are intended to measure access, use and impact, as well as to capture how teachers engage with the OER, thus we are attentive to process, as much as to end results, seeing impact "as a process of change that is adaptive in nature, enabling those implementing new ideas or practices to interpret and adapt them" (Halai, 2004, p. 516). Data is collected in three stages: before teachers use the library, while they are using the library, and after they have been using the library regularly for two months. Table 2 shows the areas of impact we hope the data will illuminate.

Conclusion

In looking ahead at the ongoing development of the DD Library, we ask: can we use OER to structure access and help direct Afghan teachers to content that is quality, localized and linked to their curriculum? Will this raise learning outcomes in Afghan classrooms, improving the quality of education? The software as hypothesis lens can continue to serve us as we adapt and evolve the tool to ensure activity taking place within the library and among its community of users is leading us towards meeting these objectives. The DD Library is the first technology-powered collection of educational materials for teachers that is tailor-made for Afghanistan, addressing the distinctive challenges the country's education sector faces. As the content diversifies and expands at the hands of the community of users, we expect the library to move beyond an audience of educators, to become a rich collection of knowledge resources for and by Afghans. It is well used by non-educators, including university students, NGOs, and members of the public. Our future plans include adding more Afghan languages such as Uzbeki and Turkmeni, adding full courses, and including audio-visual content created by Afghan users.

We are convinced that the availability of educational resources in local languages through readily accessible technology can profoundly improve the quality of education in Afghanistan, provided that the design of both the container for those educational resources and the means of accessing them are developed in a way that is responsive to Afghanistan's unique, and acutely challenging, conditions. This means responding to the specific needs of its teacher population and allowing for the DD Library platform to evolve in response to data on how the learning materials are used in practice.

This requires systematic communication with teachers and analysis of data on their use, to scaffold the library's architecture to enable access, sharing, knowledge development, and openness.

The infrastructure to connect people with knowledge, across time and space, exists already. As Wiley (2006) asserts, "We cannot in good conscience allow this poverty of educational opportunity to continue when educational provisions are so plentiful, and when their duplication and distribution costs so little" (¶1). Exploiting the potential of the abundance of knowledge resources for the teachers who need them the most will demand deliberative thinking of how technology can be adapted and deployed in locally meaningful ways. To this end, it is our hope that ongoing experimentation with the DD Library will yield new strategies and insights that can improve teaching and learning in multilingual, resource-scarce environments.

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Endnotes

1 The library, and background information about its creation, can be viewed at www.darakhtdanesh.org or www.ddl.af

2 The Darakht-e Danesh Library is a project within the Technology for Education Program, of Canadian Women for Women in Afghanistan (CW4WAfghan), a registered Canadian charity working to support education for Afghan women and girls, since 1996. Work to design the DD Library and develop the initial collection of local language learning materials began in 2010, and the library platform was launched formally in 2014.

3 These two projects, of the Open University (UK), are among the few OER initiatives that have prioritized local language content creation, and which support users in country to create content, that is thus of greater relevance to their peers within the context of use.

4 Awarded through a grant from the Wawasan Open University in Malaysia funded by the International Development and Research Centre (IDRC) and the Department for International Development (DFID). The impact studies, together with the series of OER adoption studies coordinated by the University of Cape Town, form the Research on OER for Development (ROER4D) programme.

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