



# Chapter 07. Institutional and Faculty Collaborations in Curriculum Development using Open Technologies & Open Content

Tufts University Sciences Knowledgebase (TUSK)  
Perseus Digital Library, Tufts University

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## ABSTRACT

In this chapter, the authors will share their experiences from the past two decades of working with international partners using open technologies and open content that range from the classics to the health sciences. The chapter focuses on the Tufts University Sciences Knowledgebase (TUSK), a comprehensive enterprise software system for dynamic knowledge and curriculum management for the health sciences, and the Perseus Digital Library (Perseus), a digital repository of open source textual and linguistic data for Greek and Latin. The authors present brief histories of their projects, describe current initiatives, and share from their experience the common elements for successful collaborations at institutional and individual faculty levels, including how networks formed and what role open technologies played in encouraging the sharing and reuse of open content.

## COLEARNING OBJECTIVES

The objectives for readers of this chapter include learning about the application of open technology in two contrasting content areas, how open technology may be adapted for use by different institutions, and how open software, content, and methods developed at one institution can have impact on a global network of institutions and millions of users. Readers will also increase their understanding of factors that have led to the two open systems enabling successful institutional and faculty collaborations.

## REUSABILITY

The discussion of TUSK will be of particular interest to those engaged in health sciences education and to those seeking to expand the use of open systems in low-resource and disaster vulnerable areas. The description of Perseus will inform scholars and educators engaged in language study and instruction, both classical and modern, and those interested in the intersection of research and teaching. While TUSK and Perseus are specific open systems that will be described, the lessons learned from their development and application are generalizable for how faculty and institutions can promote co-creation and sharing for specific courses or broader curriculum development initiatives, and how open initiatives are changing the



ways in which education and professional training are conceived, developed, delivered, managed, and sustained. This chapter may be reused under a Creative Commons license.

## KEYWORDS

Open Source, Health Sciences Education, Medical Education, Learning Management System, Knowledge Management System, Digital Libraries, Language Instruction, Digital Humanities

## 1. OPENING WORDS

How can open software, content, and methods developed at one institution have impact on a global network of institutions and millions of users?

The following diagram presents open educational resources at Tufts University, including particularly the Tufts University Sciences Knowledgebase (TUSK) and the Perseus Digital Library (Perseus), which are specific open systems that will be described in this chapter. These environments provide open content for specific courses or broader curriculum development initiatives. Some lessons learned, which are also discussed in this work, are generalizable for how faculty and institutions can promote co-creation, sharing, and reuse of OER.

The diagram is presented as an image. To interact with the diagram dynamically, see the reference below to the VUE diagram and download VUE.

The image shows two side-by-side screenshots of educational websites. The left screenshot is from the Tufts University Sciences Knowledgebase (TUSK), displaying a course page for 'MEDICAL GENETICS > CONTENT'. The right screenshot is from the Perseus Digital Library, showing a 'Welcome to Perseus 4.0' message and a list of 'Popular Texts' including works by Caesar, Cicero, Vergil, and Homer.

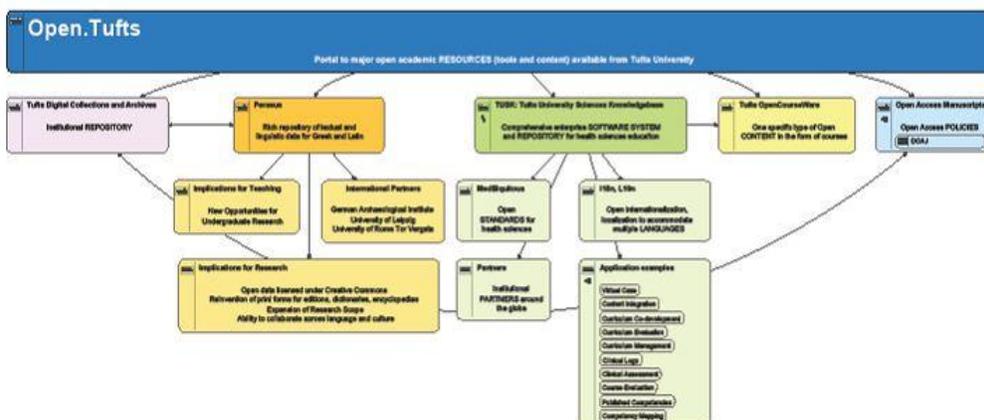
**TUSK Screenshot:**

- URL: [tusk.tufts.edu/view/course/Medical/2194/content](http://tusk.tufts.edu/view/course/Medical/2194/content)
- Navigation: Home, Browse All Courses, Search
- Menu: COMMUNICATION (Announcements, My Groups, Schedule), MATERIAL (Content, Quizzes, Cases, Grades, Assignments, Patient Logs), INFO (Objectives, Faculty List, Attendance Policy, Description, Equipment List, Grading And Evaluation, Other, Reading List, Tutoring Services)
- Course Content Table:

Type	Document
Document	2012-2013 M16 Genetics Syllabus
Document	2012-2013 M16 Genetics Lecture Slides
Document	2012-2013 M16 Genetics Lecture Recordings
Document	2012-2013 Post-Lecture Summaries
Document	Frequently Asked Questions
Document	Practice Questions

**PERSEUS DIGITAL LIBRARY Screenshot:**

- URL: [PERSEUS DIGITAL LIBRARY](http://perseus.library.tufts.edu/)
- Editor: GREGORY R. CRANE, EDITOR-IN-CHIEF, TUFTS UNIVERSITY
- Navigation: Home, Collections, Texts, Images, Open Source, About, Help
- Message: Welcome to Perseus 4.0, also known as the Perseus Hopper. Read more on the Perseus version history. New to Perseus? Click here for a short tutorial.
- Announcements: July 11, 2012. We would like to call attention to a thoughtful blog post on the Latin Word Study Tool in Perseus and why it is important to improve it. The post names a number of key challenges and, more importantly, argues forcefully that answering those challenges in the morphological analysis is of pedagogical value. The big challenge is that machines are not perfect and won't be, even if they grow cleverer (as indeed they can) in their ability to morphologically analyze Latin. The best solution is probably to aggregate effort from many people. The big question is whether the problem is important enough and people care enough to build a system to manage corrections from many named sources. You can see work in this direction in the March 20 posting below. There we show work adapting the distributed editing environment developed for the papyrologists to the needs of Classicists working with literary texts as well. Editing morphological data is similar in principle, though a bit different in practice. While we do not have a simple morphology system, users could use the Greek and Latin Treebank editing environment and only edit the morphology. That might be a useful starting point. The real question is whether the morphology is worth the attention by itself when you could also annotate the syntax - but there are very qualified people (such as Helma Dik) who believe just that.
- Popular Texts:
  - Caesar, Gallic War (English, Latin)
  - Caesulis, Carmina (English, Latin)
  - Cicero, In Caecilium I (English, Latin)
  - Vergil, Aeneid (English, Latin)
  - Hesiodus, Works and Days (English, Greek)
  - Homer, Odyssey (English, Greek)
  - Plato, Republic (English, Greek)
  - Tom Martin, Overview of Classical Greek History from Mycenae to Alexander (English)
- Art and Archaeology:
  - Aegina, Temple of Aphaia
  - Silver sikel from Athens
  - Satyr on Attic red figure vase
  - The Barlett Head



OER1: Open Educational Resources at Tufts University

Author: TUFTS Team

Source: - Wikimedia Commons, Tusk Open TUFTS VUE MAP.vue

Objectives: Visualize and learn about different open educational resources developed at one university, including two specific open educational resources that apply open technology in contrasting content areas.

License: Creative Commons (CC BY SA)

References: Created using VUE, Visual Understanding Environment. VUE software available at: <http://vue.tufts.edu/>

## 2. INTRODUCTION

A major challenge for open educational initiatives has been helping individual faculty as well as institutions find ways to forge effective collaborations to enhance curriculum development and implementation with open resources.

We will share our experiences from the past two decades of working with international partners using open technologies and open content that range from the classics to the health sciences. We will present brief histories of our projects, describe current initiatives, and share from our experience the common elements for successful collaborations at institutional and individual faculty levels, including how networks formed and what role open technologies played in encouraging sharing and reuse of open content.

While the Tufts University Sciences Knowledgebase (TUSK) and the Perseus Digital Library (Perseus) are specific open systems that will be described, the lessons learned are generalizable for how faculty and institutions can promote co-creation, sharing, and reuse of open content for specific courses or broader curriculum development initiatives.



### 3. OPEN SOFTWARE AND OPEN CONTENT

This section presents TUSK, an open software platform for creating institutional networks, curriculum co-development, and local content development and implementation.

#### 3.1 What is the TUSK software?

TUSK is a dynamic multimedia knowledge management system that supports health sciences faculty and students in teaching and learning. The TUSK platform, now a fully open-source, enterprise-level software, started in 1995 at Tufts University, Boston, Massachusetts, USA with a National Library of Medicine (NLM) grant, and later received additional funding from NLM and the United States Department of Agriculture. (Meyer, 2012) TUSK has received several national awards, and in 2010, the United States Association of American Medical Colleges recognized TUSK, particularly for its institutional curriculum management capabilities. TUSK provides rich user applications for learners, faculty, and administrators, including mobile access that is essential for supporting users in remote areas. Its searchable content repository, which uses the NLM's Unified Medical Language System as its controlled vocabulary, enables all health sciences disciplines to share one system for content development and delivery across a diverse university or network. TUSK also includes health science-specific tools such as curriculum reporting features, patient logs, a virtual patient simulator, assessment features, and competency tracking.

#### 3.2 What are the TUSK core principles?

TUSK's development is guided by several core principles. Establishment of and adherence to these principles are intended to ensure that TUSK contributes to the transformation of health sciences education.

The core principles are to:

- Adhere to and contribute to open standards and development including adoption of Unicode for internationalization (i18n)
- Provide a comprehensive knowledge and curriculum management system for health-sciences institutions
- Enhance and support the work flow of a health sciences institution
- Provide software that allows institutions to meet and exceed educational accreditation standards
- Support knowledge management on a personal and school-wide level
- Enrich the connections between school and clinical affiliates
- Reinforce reusable content across the system
- Ensure access to content to TUSK users across the barriers of schools, courses, appliance (phone or computer), and time
- Continue to develop tools to:
  - Foster horizontal and vertical curriculum integration
  - Support cross-disciplinary learning
  - Support competency-based education
  - Support local/school-based administration



- Promote continuous improvement of a curriculum and its systems

### **3.3. Who can benefit from TUSK?**

Any institution can benefit, but particularly institutions that are rebuilding whether due to post-conflict or natural disaster, or who are building new programs to expand training capacity. Using open software as a platform for creating institutional networks, whether south-south or north-south, enables institutions to share content creation, curriculum development and delivery methods, enabling institutions to leverage valuable faculty time and expertise, particularly in resource-limited areas.

### **3.4. Where and how is TUSK being used?**

TUSK is being used or is planned for use by institutions in the United States, India, Africa, Sweden, Saudi Arabia, and South East Asia.

#### **3.4.1. India**

TUSK's application in India at Christian Medical College (CMC) in Vellore, India is particularly noteworthy for the scope and reach of its TUSK-supported network. CMC is one of India's top private medical colleges which includes dozens of allied health programs and a complex network of over 200 secondary hospital clinics across all of India, many in very remote sites. CMC is a leader in India's national curriculum reform efforts where CMC is a designated "regional node" responsible for faculty development, training and support of over two dozen other medical colleges in its region. All told, the CMC network provides care to millions of people, the majority of whom are underserved.

TUSK software was established as an enterprise infrastructure at CMC's hub in Vellore beginning in 2006. This one system supports the medical college and a growing number of its allied health programs, as well as the faculty and students across its wide national network, many of whom previously had essentially no access to training and learning resources. Remote access is achieved mainly through mobile devices such as smart phones or laptops that use cell phones for connectivity due to the absence of broadband at most of these sites. (Vyas, Albright, Walker, Zachariah, & Lee, 2010).

#### **3.4.2. South East Asia**

As part of the RESPOND initiative that in turn is part of the global USAID-funded Emerging Pandemic Threats Program, Tufts University is working with the South East Asian One Health University Network (SEAOHUN) that includes 10 universities across Thailand, Vietnam, Indonesia, and Malaysia. One major goal of the initiative is to create training programs across the network that will enable the institutions and countries to respond more effectively to the next pandemic - the next Avian Influenza, the next HIV/AIDS, or the next SARS. This will require development not only of training content and methods, but also of effective communication and collaboration across the network to support rapid information exchange and coordination of response efforts. One approach that will support such communication, collaboration, and coordination across the network is to provide TUSK as a common infrastructure for content development and delivery. Plans are now underway to explore a pilot "hub" for SEAOHUN that can be built upon as institutions are ready and as faculty are trained. Given the challenges of technical support, we envision



the creation of “cloud networks” where institutions can purchase use of the tools as needed as opposed to being required to set up and support a full system on their own.

### 3.4.3. Africa

Several faculty initiatives over the last 10 years involved TUSK-supported curriculum co-development across schools of medicine, public health, and veterinary medicine in Africa. There are several recent initiatives ongoing in Africa. A collaboration of Tufts, Brown University, Yale University, and the University of Ghana, funded by USAID/Higher Education for Development, will install TUSK at the University of Ghana School of Medicine. TUSK will house the medical school curriculum and the collaborators will co-develop curricula across multiple health sciences professions. Building on an earlier collaboration with Muhimbili University of Health and Allied Sciences (MUHAS) in Tanzania, Tufts worked with the University of California, San Francisco (UCSF) to install TUSK to house the new joint curriculum prepared by UCSF and MUHAS. TUSK is also playing a role in the RESPOND Initiative in the Congo Basin. The One Health approach requires building knowledge and sharing content across health sciences disciplines, which highlights a core strength of TUSK. TUSK is already working at Makerere University's Schools of Public Health and Veterinary Medicine in Uganda. Presently, Tufts has internationalized TUSK so that it can be translated into non-English languages. Through a partnership with Translators Without Borders, students at the University of Kinshasa in the Democratic Republic of the Congo (DRC) are being mentored as they translate the core words of the system into French. TUSK has been installed at the University of Kinshasa and the University of Lubumbashi, DRC. Each member of a consortium of African Schools of Public Health and Veterinary Medicine in Kenya, Uganda, Tanzania, Ethiopia, Rwanda, and DRC will eventually have TUSK so that the members can leverage and build shared curricula across schools and institutions as part of the One Health initiative linked to RESPOND.

### 3.5 How is TUSK changing health sciences education?

Direct faculty-to-faculty methods across institutions include 1) content co-development - pairing faculty who teach similar areas to share content development, and 2) curriculum co-development - sharing course development and co-teaching. Content development includes sharing core content, the “building blocks” that can be easily enhanced and customized for local needs. This approach can be quite effective for enhancing or creating new courses, or for rebuilding a program after a disaster. At least in the health sciences, sharing core content is more desirable than sharing a full course “as is.” While there is much in common across institutions, faculty generally feel a need to customize core content to suit their specific local environment. Actual course co-development, where faculty from different institutions collaborate on co-developing an entire course, can be quite effective in increasing the quality of the course at both institutions and in building co-mentoring networks where faculty can learn new teaching methods from each other and support each other's work. The course can either be taught concurrently where students from participating institutions enter discussions with each other, or can be taught completely separately, with lessons learned shared afterwards. When such content and course development efforts are scaled across multiple faculty in multiple institutions, you begin to create exciting possibilities for sustainable networks that can provide crucial safety nets in the event of any type of disaster that would temporarily cripple any institution(s) within the network. These types of collaboration are greatly facilitated by many technologies including Skype and other teleconferencing methods that are low cost and easy to use. Current students find “hybrid or blended courses” that use classroom and technology methods highly engaging and effective, particularly when they have the opportunity to interact with students from other



institutions and countries. This type of engagement is especially important with One Health initiatives where communication across disciplines, sectors and countries is essential.

### 3.6. What are some key lessons from TUSK?

**Key factors within each institution.** The key ingredients for success in developing, using, and sustaining open source-related work within an institution are having 1) the commitment of higher-level leadership, and 2) faculty champions early in the process of adoption. Higher-level leadership (often an academic dean with a director of technology) is required to initiate and facilitate the installation of the open technology and to provide essential administrative support, including the establishment of policies, budget support, and the availability of dedicated staff to ensure the ongoing support of faculty development and the technology. (Lee, 2008) A core group of faculty champions, preferably of varying seniority and from multiple disciplines across the institution, must be engaged and supported in becoming role models as initial users and as faculty trainers and peer mentors. These faculty champions and administrative leaders serve as initial guides in envisioning how the technology will best be adapted for use at their institution.

Modest intramural grants to faculty to pilot e-learning can be highly effective to spur activity in open educational technology. (Vyas, 2010, pp. 215-216) Early faculty adopters often act as faculty champions to engage and train other faculty. (Lee, 2003, p. 260) Engaging key peer-recognized faculty members within a discipline or department early in the process of adoption, and including them in adapting the use of open technology to the local needs of the faculty, enhances the sustainability of the work. Conducting a needs assessment of prospective users also plays a key role in identifying the most urgent needs. The goal is to develop an e-learning system adapted to the institution's needs and objectives, that is, a re-branding of the open technology to the local context and culture. (Vyas, 2010, pp. 215 - 216, 220).

**Adaptability, usability, and support of the technology.** The effective use of open technology to develop curriculum depends upon a flexible content management system. TUSK's robust health sciences content management system supports content that is modular, flexible, and adaptable to local needs and requirements. Building a critical mass of material in the TUSK repository early in the process enables these strengths to become evident to faculty. Time is precious for all faculty, so TUSK tools need to be easy to use, both in general access (e.g., via strong cellular networks) and in their intuitive usability which has been confirmed in multiple countries.

Local technical requirements and support will become much less critical as cloud services become available, and as mobile technology continues to grow, both of which TUSK is exploring. Requiring small fees for cloud services is one method for enabling a technical network to become self-sustaining. Functioning technical networks can be huge assets for institutions, particularly in low-resource areas or areas vulnerable to disasters. TUSK enables stable support of these large networks, particularly if cloud services can be established, with content saved in multiple sites.

**Building academic networks across and within institutions.** As an open technology resource, TUSK can readily fulfil a range of objectives for building academic networks for collaborative curriculum development and implementation. TUSK is "being used as a platform for curriculum co-development and global sharing across institutions ... [with] an export-import tool [that] allows easy movement of content across institutions." (Lee, 2012, p. 4) CMC in India is using TUSK to build a "hub and spoke" model for its



national network of medical colleges, hospitals, and clinics, enabling multi-directional interaction among a full range of users across wide geographic locations. The system fosters the development of “robust feedback loops” that support continuous program improvement and enhance the strength of organizational networks. (Vyas, 2010, p. 220) Face-to-face meetings and focus groups complement online evaluation. TUSK enables institutions to create their own visual identity. By rebranding TUSK as the CMC E-Learning system, CMC was able to “promote engagement and pride among the CMC community” (Vyas, 2010, p. 220) – key ingredients for local ownership and sustainability.

**Future work.** The RESPOND Initiative in South East Asia will be using TUSK to reach across country borders to facilitate the establishment of networks of faculty from multiple disciplines across 10 universities to collaborate on One Health content, curriculum development, and curriculum implementation. In advance of implementing TUSK, faculty are collaborating through the network to define their needs for training. The SEAOHUN network is being built through both in person and online interaction, communication, and training. In Africa, TUSK is being applied to integrate health science disciplines across institutions. Language translation for the TUSK system which has been initiated will be a key factor in enabling TUSK to foster broader networks and collaboration.

#### 4. OPEN CONTENT AND OPEN REPOSITORY TOOLS

This section presents PERSEUS, a multifaceted open repository with user tools hosted at one institution to promote curriculum development and implementation.

##### 4.1 What is Perseus?

Perseus has been a major open resource for the Greco-Roman culture since the 1980's, providing a rich, evolving digital repository for classical Greek and Roman collections, art and archaeology images, and user tools for students and faculty. As the leading provider of open source textual and linguistic data for Greek and Latin, Perseus's website serves a substantial audience - 884,000 visits and 9.6 million page views in November 2011 alone. Perseus's integrated reading environment combines source texts, translations, dynamically generated links to dictionaries, and language technologies (e.g., morphological and syntactic analyses) that significantly enrich and expand the range of materials with which users at all levels can work. In addition, Perseus provides the initial framework for a new generation of e-Portfolios that not only display digital versions of traditional projects but also capture the working vocabularies language students acquire over time as well as every form of contribution that students - and faculty - can make to increasingly complex “machine actionable knowledge” (Crane et al., 2012).

##### 4.2. How has Perseus developed as an open resource?

The Perseus Digital Library began development in 1987 at Harvard University and moved, along with its director, Gregory Crane, to Tufts in 1992. Perseus has developed digital collections on a range of subjects but has particular strength in the primary sources, reference works, and art and archaeological data about the Greco-Roman world. Originally published on CD ROMs by Yale University Press, Perseus shifted to open access Web publication in 1995. The Perseus Digital Library maintains a web site at <http://www.perseus.tufts.edu>. Open source data from Perseus is described at <http://www.perseus.tufts.edu/hopper/opensource>.



Open access alone proved not to be adequate for our community - our colleagues wanted to more than simply consult the primary sources and reference materials that we had put into a machine actionable form. Our colleagues needed to apply their own analytical methods to the XML source files and then to create their own derivative works that reflected the annotations that they had themselves devised and added. For Classicists, such work is deeply traditional - all of our editions, commentaries, lexica, and scholarship build upon prior work, often quite directly (Crane, Seales, & Terras, 2009). We formally adopted a Creative Commons (CC) license for our data in March 2006 and began to release our data as well as our source code. Five years later, in 2011, we went further and removed the non-commercial restriction, abdicating any claims on revenues.

Work that we have given away has been commercialized in the past in ways that we found problematic (most egregiously with academic units defending their new proprietary data and services with law suits) but this has not happened since the shift to a CC license with a ShareAlike provision. The shift to CC licensing accelerated our ability to collaborate closely with colleagues in the US and abroad. In the 6 years since we released our data under a CC license, we have managed funded collaborations with institutions in the United States and abroad such as Humboldt University, the University of Cologne, the German Archaeological Institute, the University of Cairo, the City University of Hong Kong, Imperial College, Mount Allison University, and Harvard University, with funding from the US National Endowment for the Humanities, the National Science Foundation, the Institute for Museum and Library Services, the Mellon Foundation, the Cantus Foundation, the German Science Foundation, and the UK Joint Information Systems Committee. Our data has been repurposed and enabled funded projects in the UK, Germany, Italy, and the United States with which we have had no formal ties. The CC license has accelerated, if not entirely made possible, a far more collaborative mode of work than we were able to pursue in our first 20 years of work.

#### **4.3. What is the impact of Perseus?**

By shifting to open CC licenses, we are far better positioned not only to work with students of Greco-Roman culture but also to begin developing a far more global conception of Classics, moving from a traditionally narrow focus upon Greek, Latin, and Greco-Roman culture and towards a model that views all cultures from the Atlantic to the Pacific as interacting components of interacting networks. But if we have begun to broaden our understanding of Classics as a field, the shift to a digital space has also challenged us to rethink - and arguably re-assert - our core mission as humanists. And that reassertion of our mission only strengthens the utility of open source publication (Crane et al., 2009). Medical schools educate the doctors who bring us into this world and keep us here as long possible. But where doctors address the core biological needs of life, humanists have an opportunity - and for some of us, an obligation - to advance the intellectual life of society as a whole. Insofar as we specialize on some subset of the human record (as indeed we must), our task is to help that subset of the human record contribute as fully as possible to this large intellectual life. For those of us who work with the linguistic record of the Greco-Roman world, our job is to help Greek and Latin sources play the fullest possible role. Put in a more material form, our task is to get Greek and Latin primary sources, whether in modern language translations or in the original languages, into as many brains as possible as often as possible (Crane, 2011).



#### 4.4. The Alpheios project: expansion to Arabic

The CC license paid immediate dividends as it allowed us to attract \$450,000 in funding from the US Department of Education to expand our infrastructure so that it could work with Arabic. We produced in collaboration with the Alpheios project (Alpheios.net) the first open source reading environment for Arabic, including a machine actionable version of the most important Classical Arabic to English Lexicon, produced by Lane in the 19th century. Support from the Provost's Office at Tufts has allowed Perseus to introduce a course on Greek, Arabic, and Latin within the Classics curriculum and to lay the foundations at Tufts for a new Classics Department, one that includes not only Greek and Latin, but also Classical Arabic, Sanskrit and Chinese.

#### 4.5. Expanding access

Even if we confine our focus to Greek and Latin, the amount of available sources and the potential audience have exploded. Analysis of the first million open source books downloaded from the Internet Archive yielded more than 2 billion words of Latin (Bamman & Smith, 2012). This level of access is impractical, if not inconceivable, without an open content policy. Because institutions such as the Internet Archive have adopted aggressive open source policies, the internet public that now exceeds 2 billion and covers more than a third of humanity can now view at least 10 times more Greek and Latin than the most advanced researchers worked on a decade ago. This explosion in access has in turn changed the problems that specialists in Greek and Latin must confront. If billions of people can call up a text in Latin, the percentage of those users who can read Latin would be almost un-measurably small. Physical access does not confer intellectual access. How do we make our Greek and Latin sources both physically and intellectually accessible?

#### 4.6. A language infrastructure for global cultural heritage

But, of course, we live in a world that is far more interconnected today than even in the 20th century, when broadcast media and air travel had, in the words of some, annihilated space. The intellectual and cultural processes set in motion during Greco-Roman antiquity - and these processes remain fundamental in politics, literature, philosophy, and religion - now interact in real time with processes that were set in motion by ideas expressed in the Classical forms of Chinese, Persian, Arabic, Sanskrit, and other historical languages. Figure 1 illustrates the challenges that emerge as we begin to think of human cultures as a network of interactions across time and space. Once we begin to think globally, even if we try to restrict ourselves to major languages preserved from groups between the Atlantic and Pacific (all of which interacted in some fashion over thousands of years), challenges rapidly emerge. Classicists are traditionally a cosmopolitan group and are expected to work with secondary sources in (as a minimum) English, French, German and Italian. If, however, we look beyond Europe and restrict ourselves to the official languages of the UN, we are working with eight modern languages - of which 1 (Russian) has been classified as a hard language and 2 as "super hard" (Mandarin, Modern Standard Arabic). If we then begin to enumerate major cultural heritage languages for which substantial remains survive, the number rapidly increases - the list below includes 19 languages but could easily be expanded.

A language infrastructure for global cultural heritage would, in the model below, need to manage 152 (8 \* 19) language pairs. The magnitude of this challenge becomes greater if we consider the need for ideas to circulate across modern languages. Not only should speakers of Chinese be able to work with materials



in Greek and speakers of English be able to work with materials in Classical Chinese, but speakers of Chinese and of English should be able to share their contributions to Classical Chinese and Greek with each other, as well as with speakers of the other 6 languages listed below. This is not an abstract issue - the University of Cairo, for example, has a thriving department of Greek and Latin studies, but its faculty publications in Arabic are almost entirely unknown in Europe and North America.

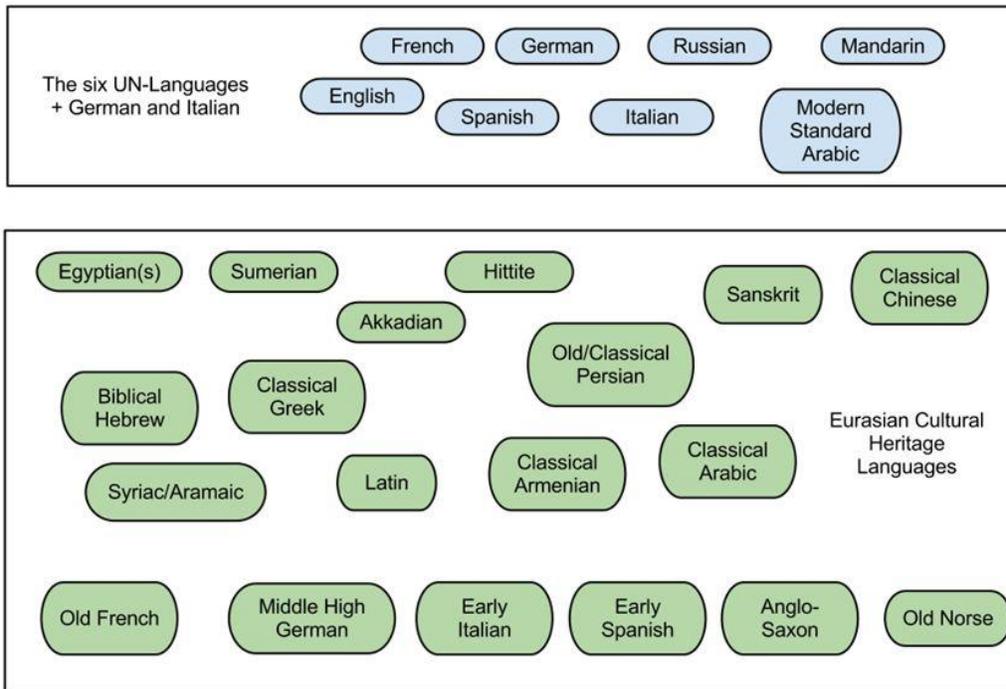


Figure 1: Above, a Eurocentric view of modern languages that adds German and Italian to the 6 official languages of the UN; below, some cultural heritage languages in the network of cultures from the Atlantic to the Pacific.

Greek, Latin, and Hebrew emerged as the core cultural heritage languages upon which European scholars focused their efforts. While the relative importance of historical languages such as Greek and Latin has declined over the centuries, the relative focus of those who do study historical languages, at least in the United States, has not changed. The 2009 Modern Language Association survey of enrollments in US postsecondary language courses other than English identifies 70,291 students studying 36 cultural heritage languages from the Eurasian land mass. Of these, 54,123 enrollments - 77% - were in Greek or Latin. If we include Biblical Hebrew, the total number of enrollments rises to 67,545 - 96% of all enrollments in Historical Language courses were in Greek, Latin, and Hebrew.

The concentration of enrollments within Greek, Latin, and Hebrew means that these languages must provide the on-going US funding for what must become a much more general infrastructure for cultural heritage languages. It is important to emphasize the resources that these enrollments represent. According to the US Department of Education, the average college tuition in the United States for all postsecondary institutions, including lower cost 2-year colleges, was \$17,464 in 2009 (for 4-year institutions the figure was \$20,986). Even if we adopt the lower figure and assume that each enrollment in Greek and Latin accounts for 1/8 of a tuition bill, Greek and Latin enrollments account for \$119 million. If



we add Biblical Hebrew, the total rises to \$148 million. If we add the 28,884 fall 2009 Arabic enrollments, the fall 2009 investment in these languages reaches \$212 million per semester - more than \$400 million per academic year. That \$400 million provides the base funding from which institutions can support the study of these languages. The proprietary model has not delivered - and will not deliver - the open platforms that we need to deliver the education that we now wish to offer. The open source model provides us with a new opportunity to more directly support our core pedagogical - and research - goals.

The \$400 million tuition base ultimately provides the funding for sustainable infrastructure. An open source model allows our libraries to shift their resources from collecting restricted data from commercial entities and towards producing new data and the systems by which that data can play a critical role in learning and research (Moulin et al., 2011). How important is a new open source infrastructure to accomplish the goals for which those \$400 million have been invested?

#### **4.7. Integrating research and learning**

20th century print publications reached specialist audiences, passed through tiny networks of circulation, and were often, at least in the humanities, largely irrelevant to undergraduate education. We need a new, less fragmented intellectual culture that integrates teaching and learning both because our students learn better when they are contributing new knowledge and because we need to decentralize intellectual life. The volume of content now available online in Greek, Arabic, Hebrew, and Latin is far too vast for the relative handful of advanced researchers and library professionals. We find ourselves challenged to develop a new kind of pedagogy, one in which student researchers and citizen scholars play a critical role in analyzing the vast and exploding mass of digital source materials. This in turn has stimulated the beginnings of a new curriculum that is both a radical departure from 20th century Humanities practice and a reassertion of ideas with which Wilhelm von Humboldt and others developed the modern research university in the 19th century: university education involves the production of new knowledge and engages the intellectual life of society as a whole.

The shift to open data has accelerated two emerging and fundamental changes in Humanities education. Classics is significant because barriers to entry are steep and only those who had a PhD were, for the most part, able to contribute to 20th century Classical scholarship.

First, Classicists have always had reading lists of Greek and Latin source materials, but now in a digital space, these reading lists can be dynamic and customized to the interests of particular students. These reading lists can also provide feedback to learners and methods for self-assessment never possible before, and certainly not for historical languages for which living speakers are not available. These reading lists can also be published as part of e-Portfolios so that students who are not at well-known programs can document what they have mastered. Such e-Portfolios reflect a more general shift to assessment that depends less upon abstract (and often inscrutable) grades and upon the analysis, whether by machines or humans, of work that students choose to publish. e-Portfolios are not just a place to “publish” work and be assessed, but are also being used as active learning platforms (Crane et al., 2012).

Second, we see the re-emergence of editing as a central intellectual task within Classics. The scholars who produced our editions, lexica, commentaries, encyclopedias and other elements of infrastructure would immediately understand the goals that we pursue as we make primary sources intellectually



accessible in a digital space. We have, however, begun to transform the practice of editing, with new forms of annotation, new knowledge sources and new services transforming what we can do with sources - we can actually work directly with primary sources in languages that we have not studied. Automated methods provide a starting point but there is an immense new space in which student researchers and citizen scholars can - and must – contribute (Crane, 2010). The undergraduate thesis must become a machine actionable contribution available, if its quality merits, to a global audience if we are to make available the cultural record of humanity. Again, the implications of such a shift go well beyond Classics. If our undergraduates can contribute to our understanding of Greek, Latin and other challenging languages, they are well equipped to analyze the voluminous amounts of primary and secondary sources in English and other modern languages.

Open source publication has changed the potential relationships between teaching and research, research and society as a whole, and tuition and our emerging library infrastructures. Our students do not simply internalize existing information but produce useful new knowledge as they learn. Our research, no longer trapped in specialist networks, can now advance the intellectual life of society as a whole. And tuition now can pay for library infrastructures that do not primarily support advanced research but impact student learning from the first days at the university.

#### **4.8 Lessons Learned and Future Work**

For Perseus, major lessons learned include: (1) the creation of a large, searchable collection with online tools to support contextualization of content expanded the cognitive range of individual learners; (2) the ability to contribute real data while learning, even – and especially – in intermediate classes, engages students; and (3) the creation of an open collection has allowed learners to rekindle knowledge of complex languages such as Greek and Latin that they had not studied for years and even decades, tangibly transforming opportunities for life-long learning.

The next major focus for Perseus must be to integrate dynamic collections (such as those managed by Perseus), with learning management systems on the one hand (such as TUSK or Sakai or Moodle) and with institutional repositories on the other.

### **5. COLEARNING ACTIVITY**

The following video discusses strategies/challenges for collaboration for institutions and faculty using open content/tools/networks.

Based on this video, reflect and discuss key elements for collaborative curriculum development in your institution using Open Technologies and Open Content.



**OPEN**COURSEWARE CONSORTIUM **ore** Open Research Education

Location: Cambridge 2012

## Identifying key elements for successful Institutional and Faculty Collaborations

Author: Mary Y. Lee, Author: Gregory R. Crane April 2012 License: Creative Commons Attribution (CC-BY)



OER2: Identifying key elements for successful Institutional and Faculty Collaborations in Curriculum Development using Open Technologies and Open Content

Author: Mary Y. Lee, Gregory R. Crane & Susan Albright, Tufts University, US

Conference Theme: Collaboration

Description: Interactive discussion powered by "vidya"

Source: [http://presentations.ocwconsortium.org/uk2012\\_314\\_lee\\_institutional\\_faculty\\_collabora/](http://presentations.ocwconsortium.org/uk2012_314_lee_institutional_faculty_collabora/)

Objectives: explore, visualize, comprehend key factors for using Open Technologies and Open Content for curriculum development

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## 6. CONCLUSION

Open source initiatives have gained significant momentum in the past few years. TUSK and Perseus, both as early open initiatives, provide examples of how open software, content, and methods developed at one institution can have impact on a global network of institutions and millions of users. Their development provides lessons for the adoption of other open source initiatives in different content areas, including the central role of higher-level leadership and faculty champions within an institution and the contribution of adaptability and usability attributes to the expansion of open technology. TUSK and Perseus show how open initiatives may act as catalysts to establish and strengthen networks within an institution as well as across institutions, country borders and disciplines. These innovations demonstrate how open technology can expand learning by students, from undergraduates to professional students, by engaging them directly. Open source initiatives are significantly changing how education and professional training are conceived, developed, delivered, managed, and sustained. We no longer are islands but are part of the global community that is creating, sharing, and reaping the benefits of giving and receiving.

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