

# Open Source and Open Standards for e-Learning

Amy Allcock, Benjamin Chen, Larry Killen, Matt Simpson  
Medical Education Technology Unit - Queen's University

Kingston, Ontario, Canada

## Open Source Defined

Open-source software is computer software distributed under a licence that allows end-users to run the software and to modify and re-distribute the source code.

## Is it free?

It is important to note that open source software is not necessarily free software. For example, charges may be applied to the cost of distribution; it all depends on the specific licence used by the open source software. There are also costs if in-house developers are needed to customize, implement, and support the open-source software.

## Open Source and related licences

Open-source software licensing is based on the premise that the end-user of a computer program has the right to use and modify the original program. Most open source licences also agree that the user has the right to redistribute their modifications. However, different licences stipulate what licence must be used for the redistributed content. For example, the GNU General Public Licence (GPL) states that all derived copies must be redistributed under the GPL licence. Other more permissive licences, such as the Lesser General Public Licence (LGPL), MIT Licence, and BSD Licence state that the derived copies may be redistributed under open source or proprietary licences. There are also many other examples of open source licences.

With shared source licensing, the end-user is granted access to the source code for reference purposes only. However, the author of the code maintains control over the use of the code. Examples of shared source licences are those that permit reuse for academic or non-commercial purposes only.

The most popular licences are compared in Table 1. No one licence is necessarily superior to another. By having multiple licences to choose from, a software developer can select a licence that strikes the desired balance between the need to collaborate with the need to protect one's copyright or intellectual property.

**Table 1: Different Types of Open Source Licences**

	GPL	LGPL	BSD	MIT	Shared Source
Unrestricted use	Yes	Yes	Yes	Yes	No
Restricted to non-commercial use	No	No	No	No	Optional
Modify	Yes	Yes	Yes	Yes	No
Re-distribute under GPL	Yes	Optional	Optional	Optional	No
Re-distribute under same licence	Yes	Optional	Optional	Optional	No
Re-distribute using proprietary licensing	No	Optional	Optional	Optional	No
Attribution	Optional	Optional	Yes	Optional	Optional

## If it's not free, why not purchase a commercial solution?

The central philosophy behind open-source software is that a larger community of developers can work collaboratively to improve software's features and robustness, and the results can surpass the quality and development speed of proprietary software. Well-known examples include the Linux operating system, Apache web-serving software, and the Mozilla Firefox web browser.

**Table 2: Open Source vs. Proprietary / Closed Source**

	Open Source	Proprietary / Closed Source
Source Code	Source code is available for modification and re-distribution.	Source code is hidden
Security	Security through visibility; security flaws can be identified and fixed by anyone.	Security through obscurity; security flaws are not fixed but are hidden from the public view.
Development Model	Distributed development	Centralized development
Sample Applications	Linux, Apache, OpenOffice, MySQL, PHP, Mozilla.	Windows, IIS, MS Office, Oracle, ColdFusion, IE
Total Cost of Ownership	No licensing costs, but pay in-house developers for customized features and support.	Pay vendor for licence and support, and pay additional costs for customization and upgrades.
Profit Opportunities	Provide developed source for free, but charge for installation, support and for distribution.	Sell licences of developed software, and charge for installation and support.

**"Over 80% of schools surveyed said that they use open-source software on a day-to-day basis."**

**Chart 1: Types of Open-source software used by Canadian Medical Schools (n=13)**



**"75% of schools surveyed thought that the total cost of ownership for open-source and commercially licenced software was generally equal."**

## Open Source Projects

Queen's has developed several open-source software projects that we are willing to share with the education community. We believe that it is through collaborative efforts that our software can become much better and more sustainable in the long term.

qWEB is an open-source content management system used to create and manage complex websites that was developed in-house by one developer over a 1-month period using PHP and MySQL. Several open-source scripts and libraries were used in the development of qWeb, including HTMLArea, ADOdb, jpGraph, PHPSniff, PHPMailer, and LastRSS.

**"Over half of the schools surveyed are currently in the process of developing, or are interested in developing, open-source software."**

Online Course Resources is a robust course management system that allows instructors to easily deliver lecture notes and other learning resource materials to students in a secure online environment. One developer created this system in-house over a 2 month period using PHP and MySQL. Several open-source scripts and libraries were used in the development of the Online Course Resources, including HTMLArea, ADOdb, PHPSniff, and PHPMailer

## Open Standards Defined

Open standards are publicly available specifications that can be implemented to achieve a specific goal or result. Although open standards are free to implement, there may be a cost associated with receiving certification of compliance. Many open standards exist. The most important ones for e-learning are reviewed here.

### ► SCORM

SCORM stands for Sharable Content Object Reference Model, and it is a set of specifications used to describe, package and deliver reusable learning objects to a Learning Management System (LMS). SCORM consists of the Run-time environment (RTE) which describes how content should behave when launched by the LMS and the Content Aggregation Model (CAM) that outlines how content should be packaged and described.

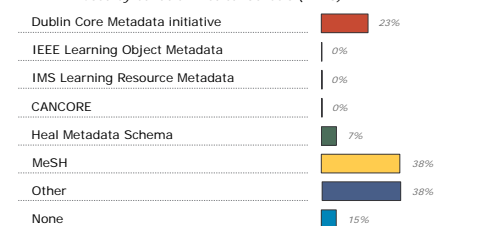
A LMS is SCORM-compliant if it can run SCORM-compliant learning objects (i.e. it supports the SCORM RTE). Examples include WebCT Vista, Blackboard, and Desire2Learn. An authoring tool is SCORM-compliant if it produces learning objects that are packaged and described according to the SCORM CAM. SCORM-compliant learning objects can be produced by a variety of software applications, including Macromedia Flash or an HTML editor.

### ► Metadata

Metadata standards provide a uniform way to describe resources and their requirements for use so that they can be searched and shared more easily. Metadata standards include the Dublin Core Metadata Initiative (DCMI) for describing digital objects and the IMS Learning Resources Metadata Specification for describing learning resources. There are also metadata vocabularies that apply specifically to medicine such as the Heal Metadata schema and MeSH (Medical Subject Headings).

**"100% of schools surveyed agreed that the adoption of open standards is important for e-learning systems to ensure interoperability, reusability, and scalability."**

**Chart 2: Metadata standards, specifications, and vocabularies currently used by Canadian Medical Schools (n=13)**



### ► IMS Question and Test Interoperability

A specification that allows the interoperability of content within assessment systems by providing a consistent and standardized way to represent question and test data and corresponding results reports.

### ► Open Knowledge Initiative (OKI)

Open and extensible architecture that specifies how the components of an educational software environment communicate with each other and with other enterprise systems.

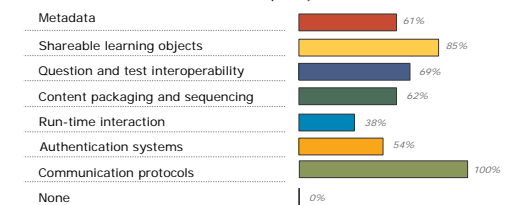
### ► Web Services

A web service is a collection of protocols and standards that allow data to be exchange between various applications.

### ► Shibboleth

Federated identity-based authentication system which allows participating institutions to share secured online services and provide access to restricted digital content.

**Chart 3: Important areas for open standards in e-learning according to Canadian Medical Schools (n=13)**



## Benefits of adopting open standards

**Reusability** - Course content may be easily incorporated into applications and easily modified by various development tools. Reuse helps promote sharing and reduces content development costs.

**Accessibility** - A standardized way to describe, package and store content simplifies the search and retrieval process. Promote sharing of content by providing a consistent way to describe and identify content.

**Interoperability** - Allows for content created in one application to be easily identified and launched from a different delivery application.

**Scalability** - Modular learning objects may be combined to create new learning objects.

## Summary

Canadian medical schools strongly support compliance with open standards, and many are interested in open source collaboration. The MEDTech Unit at Queen's University is committed to developing e-learning solutions through collaborative open-source software projects that comply with relevant open standards. We invite our colleagues at other schools to join us on this exciting journey.