

FOSS and Education

1. Relevance of FOSS in Education

FOSS is relevant and important in the education sector for the following major reasons:

1. **Lower cost:** Today, most educational programs require access to a lot of computing software resources, e.g., Matlab, circuit simulators, drawing packages, etc. Mostly proprietary solutions are used by institutions, costing lakhs of Rupees in license fee. FOSS solutions are available in many areas, with the commonly used licensing terms for distribution and modification, and in almost all cases, at zero cost. As part of the National Resource Centre, FOSS equivalents for a large list of softwares are being investigated.
2. **Deeper access:** Access to the source code of the programs allow students to explore internals of complex systems and hence acquire a deeper understanding of what they study. E.g. learning about operating system concepts by checking out the code which implements similar functionalities in Linux.
3. **Ability to extend/adapt:** FOSS in general provides freedom to users to make modifications without any norms attached. This enables localisation in language, capabilities, etc on many of the FOSS.
4. **Huge resources:** FOSS has a development community running into millions spread across the world, among different professions. This has resulted in good quality software spanning a large number of domains. From school to professional areas, thousands of software resources are today available in FOSS.

Three broad classes of resources are available in the community. In addition, most material produced by FOSS community, either as supporting resources for FOSS software or whitepapers/documents on specific topics are normally available under generous sharing terms (e.g. Creative commons class of licenses). We take a brief look at the three classes in the next three sections.

2. Open Content useful for Education

Institutions and faculty members produce content (text, video, audio, animations, etc) for their use, and then make them available to community. The best known example of this initiative is, perhaps, the MIT (USA) initiative OCW (Open Course Ware). OSSRC is also making serious efforts to encourage teachers at colleges and schools to create content and make them available under a suitable open license.

Another excellent example of such an effort is Wikipedia. It is a community

driven effort to produce an encyclopedia working over the Internet. Any user can create/modify content here. The large community size has ensured that the content produced this way is more authentic than systematically produced resources of a similar nature (studies available). Today, the site has over a million terms with a very high degree of cross links and explanations. There are efforts to extend the content to include audio and other languages. Content is available (though to a smaller extent) in hundreds of languages across the world.

Another relevant example is the project Gutenberg, which is preparing electronic versions of thousands of books with expired copyright period, including most of the world's classic literature. Thousands of books are today available through this project, for free download and use. This enables people to access classics from across the world through Internet.

There are a number of other repositories also focussed on specific areas. All these make available a lot of content for the interested reader/learner, without the shackles of licensing terms and cost.

In the current Indian drive to be a 'knowledge producer', (and not just a knowledge consumer), this is an important activity. In my interaction with teachers in different forums, I have received very positive response to the idea of content development initiatives aimed at teachers. We plan to announce some schemes in this area soon, which can be scaled up to a larger reach if adequate resources are available.

MIT Content: ocw.mit.edu

Wikipedia: www.wikipedia.org

Gutenberg: www.gutenberg.org

3. FOSS for education (content-level)

While, in the previous section, we were looking at relatively straightforward content, in this section, we look at software that serves as content (simulations, interactive tutorials, etc) in specific areas. There are lots of open source software in many areas featuring such content. One of the interesting Indian contributions is a live-CD called Vigyaan from IIT Delhi, containing a number of powerful software tools for biochemistry.

You can find programs which illustrate concepts such as molecular bonds, 3-D structure of complex molecules, periodic table, fractals, algebra equation solvers, astronomy simulations, CAD, circuit simulator, elementary school topics such as arithmetic and counting, etc. The sites below provides a good collection of such tools.

Some example FOSS software in specific areas are listed below

- Kstarts - desktop planetarium (simulate sky for any time point)
- Kalcium - periodic table

- QCAD - 2-D Computer Aided Design
- MayaVi - scientific data visualiser
- Tkgate - digital circuit simulator
- R project - Statistical package
- EduKator - Physics and Maths teaching
- Scilab - scientific computations (comparable to Matlab)
- MOLO - molecular workbench
- Kmplot - mathematical function plotter
- Aero - physically based simulation system
- ORSA - celestial mechanics simulation

Useful sites:

- osef.org (Open source education foundation)
- freeduc (UNESCO sponsored resource collection for education)
- www.osv.org.au/education
- schoolforge.net

4. FOSS for education (tools)

Just as in the case of most walks of life including entertainment and health, ICT is impacting education sector as well in significant ways. From use of presentation tools to prepare slides and sophisticated word processors to prepare notes, to use of learning management systems (LMS) to run and manage courses on line, technology is being used in many ways. Some of the important software components relevant to education and some open source solutions for them are given in the table below.

<i>Category</i>	<i>Description</i>	<i>Example FOSS tools</i>
LMS	Learning management systems providing for management of course, students, grades, content, etc.	moodle (www.moodle.org)
CMS	Content management system (including dynamic websites)	drupal
Multimedia Content creation	audio editing	audacity
	video editing	kino

Category	Description	Example FOSS tools
	3-D animation/rendering	blender
	Web page creation/editing	Nvu
	Text document	Openoffice writer
	Mathematical equations	Openoffice Math
	Image/photo manipulation	gimp
school/college administration	Library	koha
	admissions, etc	
Communication/Collaboration	e-mail	Thunderbird
	chat	several tools avail
	bulletin board	
	video conferencing	VNC
	virtual classroom	

There are also other areas such as online examination (normally provided by LMSs), school administration, portfolio management, and so on. For most of these also, one can find good FOSS tools.

5. Conclusion

The notion of FOSS has tremendous significance in the field of education from a number of perspectives. Beyond the obvious factor of cost, it is important to nurture the concept of transparency, curiosity (exploration of the tool and extension where possible), and the culture of sharing which is so well embodied by the FOSS community. The really vast range of resources available (running into Gigabytes of softwares) is another major incentive for this.

Useful articles

- <http://edge-op.org/grouch/schools.html> -- a good compilation of useful articles
- eduforge.org -- primary site for FOSS in education.