Developing Open Source Software for Educational Sector – Case: Future Learning Environment 3

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Abstract

In last two years free and Open Source software has been seen to have a lot of potential in education sector. Behind the Open Source movement there is philosophy that emphasizes freedom of information, freedom of speech and expression, creativity and communalism. The modern education philosophy of collaborative knowledge building draws attention to same issues. To use Open Source software at schools and universities there is several pedagogical and administrational reasons.

Future Learning Environment (Fle3) is Open Source software for computer supported collaborative learning (CSCL). Fle3 is so called web based learning environment, which can be used with standard web-browsers. Fle3 software is developed by Open Source community, which contains pedagogical researchers, user interface designers, software engineers, practitioners of education, teachers and students. The main aim is to develop software for learner and group centered work that concentrates on creating and developing expressions of knowledge.

The modules of Fle3 are user’s WebTop (virtual desktop in the web), Knowledge Building module and Jam Session module. Fle3 software is already in use in many educational institutions, but research and development is still work-in-progress.

Keywords

Open Source, software, education, computer support, collaborative learning, CSCL, Fle3
Open Source Philosophy and Education

The term Open Source software refers to computer programs, which source code is openly available for users' modification and distribution. The term Open Source software is commonly mixed with “Free Software”. In the French-speaking world the Open Source software is called "Logiciel Libre". The concept of "libre" describes well what kind of openness the Open Source software community aims to.1

The idea of Open Source is to be open ("libre") for users to study and learn how the software works. To be able to see how the software works one must have access to the source code of the software. The source code must be open. Similar way in education one must get to the sources of information to understand the phenomena under study.

Open Source software is not necessary free in terms of money. By being open anyone may also sell them. As the buyer gets all rights - except the moral rights, which stay naturally in the original creators of the software - the prices of the software stay relative low. In most cases the Open Source software are free if one downloads them from Internet. The low price and freedom to use Open Source software can be seen equal to such public services provided by most nations as public libraries and education for all. In information society basic tools and standards needed to participate in the society and to express and educate oneself must be free and available for all citizens. This kind of tools in the information society are for instance the software needed to send messages, to browse and search information, to study, to write texts, to do basic calculations, to draw images and to create and play music.

Open Source software liberate users from the role of being passive consumer. If interested in, the user of the software may study how the software works, make in it some improvements and also share her changes with other users. In other words the user may study the logics of the software, design in it some new features and in this way learn more about the software and computing in general. Naturally user may also only use the software without caring how the software works. The founder of Free Software Foundation2, Richard Stallman has compared Open Source software to food recipes which people share with each other3. If someone makes some improvements to the recipe he most likely want to deliver the improved recipe to his friends, too. Sharing recipes and code always involves a process of learning, as well.

The development of Open Source software takes place in a community of users and developers working through Internet. The user-developer’s community’s activity is very similar to the scientific communities way of sharing and self-reviewing their own members work. Similar way as in science a new theory becomes part of the paradigm or school, in case of Open Source software a new piece of code becomes part of the core code through the community’s peer review process. The community reviews and evaluates if the new code brings something new to the existing core code. The development of Open Source software is ongoing process of inquiry, learning by doing and reviewing the results of the community.4 When considering the philosophy of Open Source software it is actually rather odd that something other than Open Source software have ever been used in educational sector.

Open Source Software for Schools

The amount of Open Source software has increased rapidly in the last five years. For most of the activities that are carried out in schools with computers there is an Open Source alternative. For the leading Open Source operating system, Linux, there are number of easy to use distribution packages with graphical user interface desktop and window systems (Slackware, Debian, RedHat, SuSE, Mandrake, Best Linux).5 One may choose from several Open Source web browsers, web editors and email software (Konqueror, Mozilla)6 and from several office packages (OpenOffice, Koffice)7 that include word processors, spreadsheet programs (AbiSource, Gnumeric)8 and presentation programs. One may also use one of the Open Source image processing programs (Gimp, Gphoto)9. Furthermore there are several specialized Open Source learning
environment software (Fe3, MimerDesk, Shadow netWorkspace and Manhattan Virtual School). Very important late advancements in a number of Open Source software are the remarkable improvements at the level of usability and the more comprehensive use of industrial standards, (mainly those set by the big North American software companies). One may argue that people who have learned basics computer skills with Open Source software may easily adapt their skills to other computer environments as well. It even seems to be that the change from using Open Source software to proprietary software is easier than other way round.

Reasons to choose Open Source software for educational sector can be dived in two groups; administrational and pedagogical. The most important, the pedagogical, reasons are:

- With Open Source software one learns principles and theories – not the specific software solutions of one software provider;
- Possibility to freely combine learning material and software (e.g. text materials and simulations);
- Emphasizes critical approach to tools and content;
- Gives new possibilities for teachers and students creativity;
- Learning, studying and understanding are processes, which requires that students get to know earlier generations’ achievements, inquiry on them, discuss on them and develop them in future

We may also define several administrational reasons that promote the use of Open Source software in education:

- For school use there is good enough selection software with enough functionality with good enough usability;
- Independency from only one provider;
- Possibility to make competition between several providers;
- Investments done stays in local level and do not go overseas;
- Possibility to improve and fix the software;
- Updates immediately available;
- Easiness of license administration;
- Expenses.

For several uses of computers in schools there is no Open Source alternative. For example a number of educational CD-ROMs can be used only in proprietary environments. Also for more advanced audio, video and multimedia production one must use proprietary software. However, meaningful distribution between Open Source and proprietary computers in schools could be 80 % to 20 %. In cases when the use of computers is planned to be integrated to teaching of all school subjects, and computers will be located in all class rooms, the Open Source software can meet the basic needs.

The recent development of computing becoming more network and server based than depending on software run in a personal computer is also defending more extended use of Open Source software in education. The situation where a school is using server based learning environments the client computers can be relative thin, running only browser software and basic tools (Office and drawing). In the following we present an example of server based learning environment, which can be used with thin clients.

**Case: Future Learning Environment 3**

Since spring 2001 the research group of learning environments for progressive inquiry of the UIAH Media Lab has been developing an experimental web-based learning environment called Future Learning Environment 3 (Fle3). Fle3 research and development is supported by The European Commission in the Information Society Technologies (IST) framework; IST-00-III.2 ‘School of Tomorrow’ [ITCOLE project].

Fle3 is Open Source and Free Software released under GNU the General Public Licence (GPL). Fle3 is a Zope product, written in Python. Zope is Open Source application server and run on almost all Operating Systems (Linux, MacOS X, *BSD, etc.) and Microsoft Windows.

Fle3 is software for computer supported collaborative learning (CSCL). The main
The aim of CSCL is to provide students advanced computer tools for knowledge production taking place in an interaction in a community of learners. In most of the CSCL applications (e.g., CSILE, CoNotes, Belvedere, Knowledge Forum) the knowledge production takes place in a shared working space where students add to the database their knowledge products and carry out progressive discourse interaction. Fle3 is designed for learner and group centered work that concentrates on creating and developing expressions of knowledge.

To use Fle3 one must install Fle3 software to a server in a network. The network used can be the “public internet” or local area network or Intranet using Internet protocol. This way Fle3 can be installed at classroom, school, school district, national or international level depending on what kind of learning projects it will be used for. The installation to a local area network is a good solution to achieve better security and students’ privacy. For instance in schools with wireless local area network (wlan) the teacher’s computers can act as the Fle3 server of the class and the students may contact the server with their laptops or any computer in the school building. Connection to “public Internet” is not required but recommended as students may use it to browse and search information related to their studies.

Fle3 users, teachers and students, can use Fle3 with standard web browsers. Fle3 is designed to work with every web browser (Netscape, Opera, Explorer, Mozilla, Konqueror) on every operating system (Unix, Linux, Mac OS, Windows, etc.). Furthermore Fle3 is usable with standard web browsers in hand held computers and mobile phones (e.g., Nokia Communicator). Fle3 is easy to localize to different languages. Currently users may choose their own user interfaces language to be Finnish, English, Spanish, French, Italian, Lithuanian, German or Swedish.

Fle3 is already in use in several educational institutions. The design of Fle3 is done in Open Source community adapting also the methods of user centered and participatory design. The members of the development community contain pedagogical researchers, user interface designers, software engineers, practitioners of education, teachers and students. The community developing Fle3 is using several online tools to coordinate the work. Main development takes place in the Free Software Foundation’s Savannah service set up for Open Source software development, mailing lists are used to coordinate activities and Fle3 is used itself by the core design team for collaborative design.

Fle3 research and development follows the procedure of action research, which can be described as an interacting spiral and loop of (1) looking, (2) thinking and (3) acting. In our core research and development team in the UIAH Media Lab the looking stage takes place by using Fle3 ourselves. From other users we also collect User Stories that propose changes and new features. Thinking and analyzing possible new features are done in cooperation with pedagogical researchers of Centre for Research on Networked Learning and Knowledge Building, University of Helsinki. All potential features are considered deeply from both pedagogical and usability point of view. Finally the research and development group takes action by designing and building prototypes for testing. The aim is to get into rapid prototyping process where possible new features are quickly implemented to be part of the software and tested with real users in a real situation. The rapid prototyping is a process used in design process for problem solving, exploration and sharing of thoughts.

Fle3 consist of modules that are designed to facilitate collaborative knowledge building and collaborative design work through a constructive process. The modules are: user’s WebTop (virtual desktop in the web), Knowledge Building module and Jam Session module. The staff and people taking care of the courses
and course participants have tools for managing users, courses and participants of the courses.

**WebTop**

Each user of Fle3 gets a personal WebTop. WebTops can be used to store different items (documents, files, links to resources in the web, link to knowledge building notes and jam session artifacts) related to the studies and organize them into folders. The items in the WebTops are share with other users in a same course as users may visit each other WebTops.

*Picture 2.: WebTop of the user Lasse.*

Only owner of the WebTop may create, edit and remove items in her WebTop, but visitors may read the items. WebTop also includes shared “Course folder” for each course (the folder is available in the Knowledge Building and Jamming too).

**Knowledge Building**

With Knowledge Building tool groups may carry out knowledge building dialogues, theory building and debates by storing their thoughts into a shared database. The knowledge building discussion is scaffolded and structured by knowledge types, which label the thinking mode of each discussion note. The Knowledge Building tool contains two default “knowledge type sets”: (1) Progressive Inquiry, and (2) Design Thinking. Teachers may also copy, edit and create new “knowledge type sets” of their own. Depending on the knowledge type selected a user gets guidelines and checklist to write her note to the database.

*Picture 3.: User Lasse writing “My Explanation” note to the Knowledge Building database.*

For instance the Progressive Inquiry knowledge type set contains the following types: problem, my explanation, scientific explanation, evaluation of the process and summary. The types scaffold students to carry out research kind of activities, which are deepening their understanding of the area under study. Users may take different kind of views to the Knowledge Building database by shorting notes as a discussion thread, by writer, by knowledge type of by date.

**Jamming**

Jamming tool is a shared space for collaborative construction of digital artifacts (pictures, text, audio, video). A study group may work together with some digital artifacts by simply uploading and downloading files. Versions are tracked automatically and different versions are displayed graphically. Users may also add annotations to artifacts.

*Picture 4.: Jam Session with collaborative design of school badminton team’s t-shirt.*

When setting up a jam session the tutor may choose from two types of jam sessions; (1) “mutate on previous” or (2) “explore possibilities”, giving users slightly different possibilities when making new versions. Originally the Jamming tool was designed to be used for visualizing ideas in a group. On the other hand Jamming
can be used for many kind of collaborative design work requiring versioning. The artifacts under process can be text, picture, poster, music, video, animation, multimedia or a piece of software.

**Course and User Management**

The staff and teachers taking care of the courses and course participants have tools for managing users, courses and participants of the courses. With the user management tools staff users may add new users manually or by inviting them via email. With the course management tools staff users may add users to courses with a role of being student, tutor or teacher in that particular course.

Furthermore staff user may manage the knowledge type sets, create new ones, copy and edit existing ones and export and import them between Fle3 systems. The staff users may also import and export course in XML format, compatible with the Educational Modelling Language – EML defined by the Netherlands Open University. Same way the administrator of Fle3 server may export the whole database in XML and import the package to another Fle3 server.

**Conclusion**

Originally the term hacker means a person who want’s to do things he is passionate about, use ones creativity and build things for the good of all. Originally the word hacker doesn’t refer to computer criminals. Hackers doing Open Source software bases their work on the belief that information sharing is a powerful positive good. 22

Most of the Open Source software is done by hackers for hackers. Most of hackers doing Open Source software are highly skillful programmers. For this reason usability and learnability have not been any crucial questions. In Fle3 research and development we have tried to combine the best hackers' ways of working with meaningful design process to ensure that end-users not familiar with computer technology and software can also benefit from Open Source software.

In addition we have tried to design similar kind of tools for schools and universities, which are used by the Open Source community.

In the growth of Open Source software, critical tools have been email, FTP, newsgroups, IRC and WWW (all these tools were developed by the community itself). Without these tools there would not be such Open Source community as there is today. There is analogy between the tools of the Open Source community and the tools of Fle3. In the case of Fle3, the WebTops are like home directories in Unix world, Knowledge Building is one kind of easy to use newsgroup application with specific pedagogical support and Jamming module can be seen as a Concurrent Versioning System (CVS) for the rest of us. However, Fle3 is made not for the Open Source community but for schools and universities. For this reason the usability, learnability and pedagogical aspects are critical.

Fle3 research and development is still work in process. The software is already released, but a lot of pedagogical testing, evaluation and research must be done to recognize the best practicies of using the software in schools and universities. Naturally, Fle3 software is also under ongoing reviewing and may change in time. Cooperation with teachers, students and pedagogical researchers around the world are essential when designing and developing this kind of specific tool.

Our research group’s vision, which we hope we share with other members of Fle3 Open Source community, is that Fle3 could empower school children and university students in many different areas of human interest, varying from science, to politics and social questions, and art and design. Same way as the tools of the Open Source community has lead to empowerment and emancipation of the members of the community in the field of technology, we hope that Fle3 could do something similar in schools and universities.
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