FREE AND OPEN SOURCE SOFTWARE IN COMPUTER EDUCATION

EXPLORING THE CURRENT SITUATION IN GREEK SECONDARY SCHOOLS

SAKELLARIOU PANAGIOTA

Abstract
Free and Open Source Software is recently gaining attention, especially due to its primary characteristics – it is free of charge and can be freely and easily obtained. While Information and Communication Technologies (ICT's) assist education, schools are more than ever in need of quality software solutions to assist the act of teaching. Especially in Greek primary and secondary schools, which have limited financial resources, the use of FOSS can help lower the cost barrier and support the use of ICT's in classroom. The purpose of this study is to explore the extent of FOSS's use at computer courses in Greek secondary schools, focusing not only to the operating systems installed to the computer labs, but also to the specific applications used by teachers to improve students' computer literacy and advanced computing skills. In addition, the reasons for and against the use of FOSS in education are explored, according to the teachers' views.

INTRODUCTION

The notion of Free and Open Source Software (FOSS) consists of two separate concepts. The term Free Software was introduced in 1985 to support the development of the GNU operating system and related software products. The freedom that is implied in the notion of FOSS contains four main freedoms – to use the program for any purpose, to have access to and modify the source code, to share the program legally and to distribute the users' modified versions (Foltin et al., 2011).On the other hand, the term Open Source emerged by the Open Source Initiative in 1998, to describe software that is affordable, efficient, reliable, scalable and enables innovation, which must be distributed under a license that guarantees the right to read, redistribute, modify and use the software freely. The main differences between these concepts are that Open Source, in contrast to Free Software, is that it supports the right everyone has to source code and that it may includes commercial companies in the development of software. Despite this differentiation, most FOSS derives from the cooperation of both Open Source and Free concepts (O'Hara & Kay, 2003; Oreški & Šimović, 2012).

This kind of software is free of charge and free of sharing, in accordance to the GNU/GPL licence (Oreški & Šimović, 2012). Popular FOSS include the GNU/Linux operating system and several end user applications for daily use, such as OpenOffice, GIMP and Mozilla Firefox. Other well known applications are used in the fields of Mathematics and Statistics [i.e. Maxima, R, GeoGebra, Extcalc, Sage], and of the development of Web Applications [i.e. Drupal, Moodle, KompoZer] (Wick, 2009).

Interest in FOSS is growing during the recent years, especially concerning its role in education. While Information and Communication Technologies (ICT's) can assist the act of teaching at any level of education, competing demands of resources and high costs of related software impede the adoption of ICT's in educational institutions (Tong, 2004). Especially in primary and secondary schools, which may have limited financial resources, the use of FOSS can help lower the cost barrier and support the incorporation of ICT's in classroom. This way

the educators can exploit new available technologies and methodologies to reach and intrigue students (Kotwani & Kalyani, 2011).

Tong's (2004) research highlights the benefits for educational institutions by the incorporation of FOSS in classroom. These include lower costs, better reliability, performance and security in comparison to commercial software, along with the prospect of improved computer literacy and continuous innovation, since FOSS is based on academic grounds. In addition, Dagiene (2006) indicates that FOSS tacles the problem of illegal use of software when funds for commercial products are not available. Besides the advantages related to the educational institutions, Kotwani & Kalyani (2011) identify merits for the students themselves. They state that use of FOSS in school may help future computer science undergraduate students improve their learning outcomes, while it may contribute to the formation of highly skilled future IT professionals.

USE OF FOSS IN GREEK SECONDARY SCHOOLS

Regarding the computer science education in secondary schools, O'Hara & Kay (2003) argue that educators and students can benefit from FOSS by taking advantage of a world-size laboratory and support stuff, as well as by giving them experience in large scale software collaboration and development.

In Greece, FOSS is being communicated and supported by the Greek Free/Open Source Software Society (GFOSS), which is a non-profit organization founded in 2008 by 29 Universities and Research Centers. Its main goal is to promote openness through the use and the development of open Standards and open technologies in education, public administration and business in Greece.

In this paper we study the extent of FOSS's use in Greek secondary schools under Informatics courses. Furthermore, the reasons for and against the use of FOSS in education are explored, according to the teachers' views.

METHODOLOGY

The survey has been carried out during January – March 2016, by distributing an online questionnaire to the majority of secondary schools. The questionnaire was addressed to the schools' Informatics teachers, and contained questions concerning their interest of FOSS in education, potentially the FOS Software that they are already using in classroom and the reasons for and against the use of FOSS in education according to their perspective.

The questionnaire was returned by 337 Informatics teachers, which mostly teach in junior high schools (46.9%) and high schools (42.7%). The sample consisted of 62.6% male and 37.4% female teachers, with most of them holding a Bachelor degree (54.3%), 41.5% Master's degree and just 4.2% a PhD. In regard to seniority, the majority of the respondents work for 10-20 years in education (65.0%), while 18.4% are newer teachers and 16.6% hold the profession for above 20 years.

RESULTS

Regarding the teachers' interest in using FOSS in education, almost all express interest (93.8%), only 1.2% is not interested and 5.0% state that they don't have enough information about it. Even though the interest in FOSS emerges, a lower actual use is reported; 76.3% use FOSS in classroom, while 23.7% don't use any relative software.

As mentioned before, FOSS includes both operating systems and applications. Teachers report that Windows is mostly used in their school's computer lab (67.7%), with GNU/Linux being also widely used.

Operating System	Percent
GNU/Linux	29,4%
Windows 95/98, XP, Vista	32,3%
Windows 7	29,7%
Windows 8 / 8.1	3,9%
Windows 10	1,8%
Other	3,0%

Table 1 – Operating systems in secondary schools' classrooms

The most commonly used applications to reinforce computer literacy of students are the office suites that provide word processor, spreadsheets, presentations, databases, graphics and other features. The most widespread office suite in Greek secondary schools seems to be Microsoft Office (53.4%), but the two FOSS suites have also gained the trust of educators (34.1% use LibreOffice and 12.2% OpenOffice).

Apart from the FOSS office suites, computer teachers use a wide range of other free and open source software to reinforce teaching and learning. This software includes from daily-use to more sophisticated applications that are categorized in the following table:

Software Category	Examples	Frequency
File compression	7-zip	11
Programming	AppInventor, MicroWorldPro	52
Web browsers	Mozilla Firefox	31
Multimedia applications	GIMP, Audacity, VLC media player, Inkscape	241
Computer systems and network administration	MySQL, UBUNTU LTSP	50
Concept mapping	Cmap Tools	5
Learning management tools	Moodle	4
Paint tools	TuxPaint, KolourPaint	13
Office administration	Google Apps, PDFCreator	9
Educational software	Scratch	81

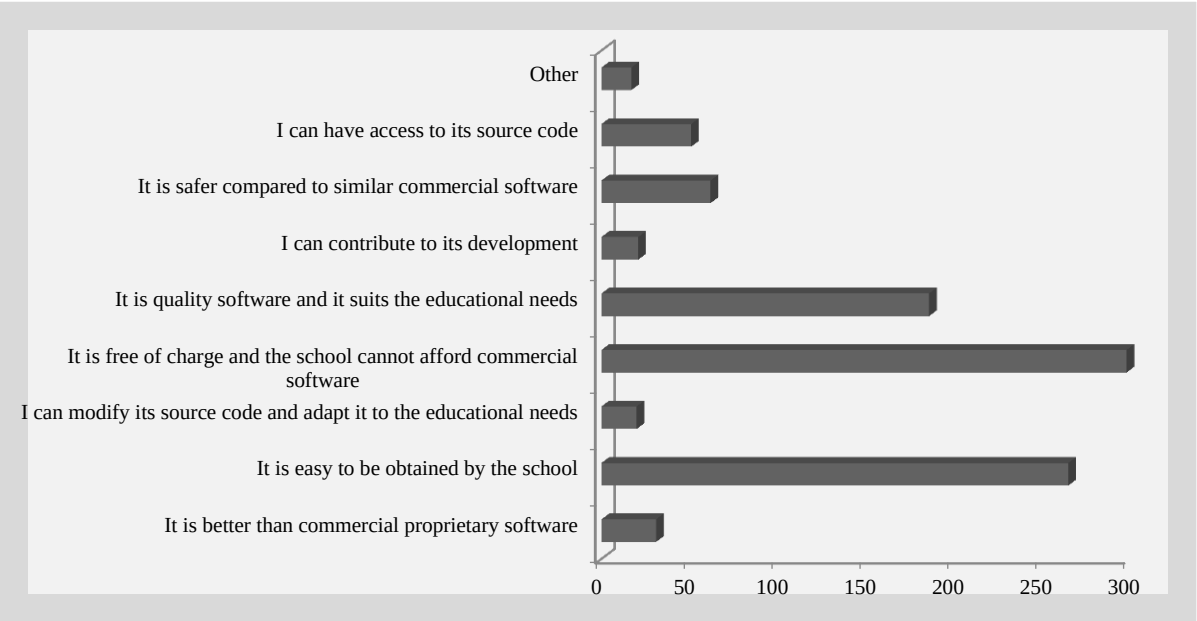
Table 2 – Main FOSS used in secondary schools' classrooms

Nevertheless, the primary goal of the research was to explore the reasons for and against the use of FOSS in the computer lab, as part of the computer education in secondary schools.

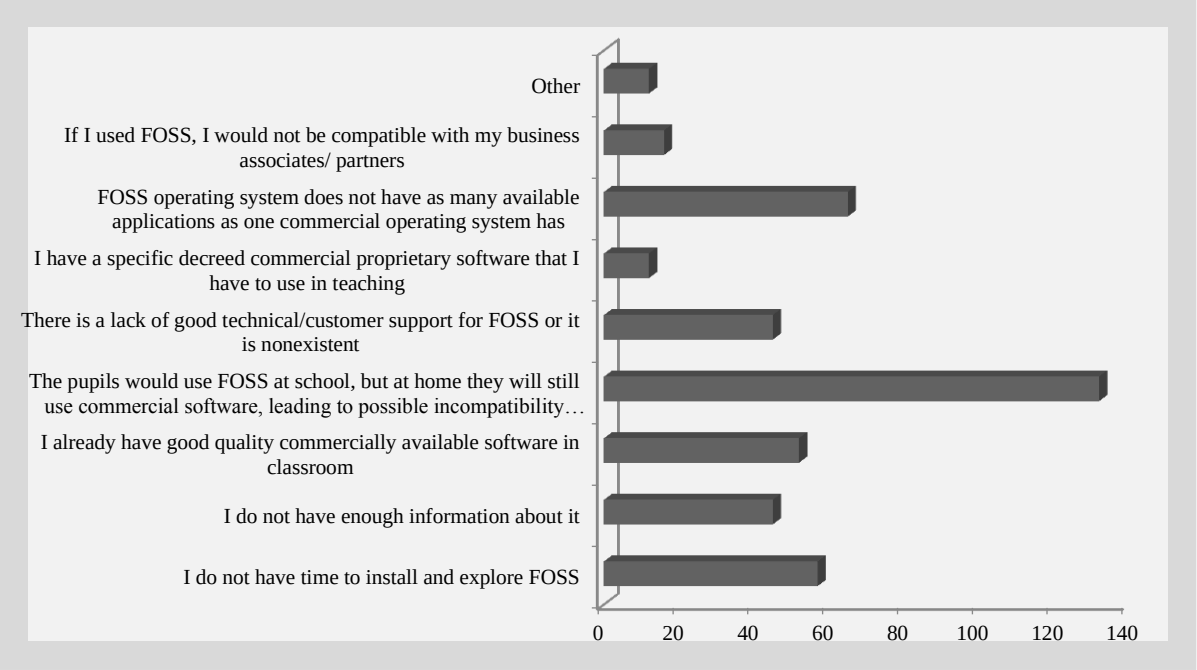
In this context, the teachers that use FOSS chose firstly the reasons why they prefer it in classroom in comparison to similar commercial software. The main advantages of FOSS, according to the teachers' views, are the fact that it is free (298 answers - 88.4%) and that the school can easily obtain it (265 answers - 78.6%).

On the other hand, teachers outline the potential compatibility of files, when the students use FOSS in school and commercial software in home (132 answers - 39.2%).

The detailed answers reflecting the teachers' opinion about the use of FOSS are presented in the following graphs.



Graph 1 - Reasons for using FOSS in classroom



Graph 2 - Reasons against the use of FOSS in classroom

CONCLUSION

This research aimed at estimating the extent of FOSS's usage in computer education, as it is performed in Greek secondary schools. While almost all teachers are interested in using this kind of software in classroom, not all of them are. It seems that the majority of teachers actually incorporate FOSS in their computer courses, with applications like office suites (LibreOffice, OpenOffice) and multimedia tools (GIMP, Audacity) being the most widespread. Regarding the operating systems used, mostly Windows are installed in the computer labs' workstations.

In the opinion of Greek teachers, FOSS is preferred in education because it is free and easily obtainable by schools. This notion possibly derives from the low public funding of schools in the recent years, forcing the educators to find alternative ways to fulfill their mission and accomplish the best learning outcome for students. Furthermore, many teachers outline the whole philosophy behind the creation of FOSS, based on freedom and independence, which inspires themselves and the students towards the free and open access to knowledge.

After all FOSS is the software of the future, education cannot neglect its possibilities any more.

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Contact person

Panagiota Sakellariou, MBA & BSc in Informatics

ASPETE, Achaikis Sympoliteias 20, 26223, Patra, +302610461412, giotasak@icloud.com