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Social Networks as a Learning Environment: Developed Applications and Comparative Analysis

Akrivi Krouska, Christos Troussas, Maria Virvou
Software Engineering Laboratory, Department of Informatics
University of Piraeus
Piraeus, Greece
{akrouska, ctrouss, mvirvou}@unipi.gr

***Abstract*—In recent years, social networks (SNs) are an indivisible part of human daily life. Through them, people can interact with others, share data or ideas, create communities and collaborate effectively. Using SNs in educational contexts, new forms of engagement between students and instructors are emerged. Such forms promote collaborative and informal learning where learning outcomes are reached through interaction and user-generated content. To this direction, teaching and learning become much more social. This paper analyzes the use of representative SNs for supporting social e-learning in higher education. For this purpose, learning applications were designed and developed using Facebook, Google+, Twitter, Elgg and Edmodo, and a comparative analysis was conducted. The main advantage of their adoption in education is that they support both formal and informal learning, as well as collaborative learning.**

Keywords*—*Elgg, Facebook, Google+, Twitter, Edmodo, Social networks, e-learning, comparative analysis

I. INTRODUCTION

The evolution of Internet has altered human interactions and introduces new services in the area of communications and networks [1]. One of the new innovations is the social networks (SNs). SNs are online platforms that enable users to connect with each other and exchange ideas, digital photos and videos, posts, etc. Social networks have become one of the most important communication tools among people nowadays. Given that people spend anyway a lot of their spare time on SNs, their adoption in education becomes effortless, extending learning experience beyond the boundaries of the classroom [2].

SNs provide a collaborative learning environment without time and place constrictions and promote informal learning where knowledge is constructed through peers' interaction. SNs facilitate students to communicate with one another, build a sense of community and develop content, thus supporting active learning through participating, thinking, and contributing [3]. Hence, learning through SNs becomes more interactive, student-centered, collaborative and on demand.

The aim of this study is to evaluate the use of SNs in higher education. Thus, three well-known social networking sites; Facebook, Google+ and Twitter, and two representative social networking platforms, that enable the development of social networking sites; one general scope, Elgg and one education-oriented, Edmodo, were chosen in this review. In order to analyze their educational affordance, learning procedures were designed using these SNs and a comparative analysis was conducted based on several educational features. The course which was selected for the instruction is a programming language being taught in the Computer Science Departments of many Universities worldwide. One major conclusion is that these platforms support formal and informal learning in an easy and effective way, promoting communication and collaboration between the participants of the learning process.

The rest of article is organized as follows. The next section provides a brief overview of related work in the exploitation of SNs for educational purpose. Section 3 presents the SNs evaluated in this study and the way they could be used as learning tools. Section 4 describes the evaluation steps and criteria based on which the survey was conducted. The next section provides the results of our analysis and a discussion on the findings we lead. Finally, the conclusions and further work are presented in Section 6.

II. RELATED WORK

The selected platforms for review have been used in many institutions as a social networking means for educational purposes since they provide both teachers and students with a motivated framework and cooperative online platform.

In [4], the authors investigated the attitude of university students towards Facebook as a virtual classroom. The results showed that Facebook promotes the communication with students and instructors, the notification of tasks concerning classroom activities and the expansion of knowledge, thus improving learning process. In [5], the authors analyzed the Facebook adoption for academic purposes and concluded that collaboration and resource sharing are the key factors for using Facebook groups. Moreover, in [6], the researchers discussed a project-based learning activity using Facebook groups in aspects of knowledge dimensions and cognitive process. Other application of Facebook groups is shown in [7], where the authors used this approach in Academia and concluded that it produces an intensive and collaborative learning environment. Moreover, a comparison between Facebook group and learning management system (LMS) is presented.

Concerning Twitter, in [8], an exploratory study on its educational use was conducted. The results showed that Twitter can facilitate the sharing of ideas beyond the classroom and support informal learning, but the tweets' character limit is its main disadvantage. In [9], the authors explored the effect of

Twitter usage in higher education on student engagement and grades. The results showed that engagement was significantly increased, as well as the average grade of the experimental group. Thus, the study demonstrated that Twitter can be used as an educational tool to help students reach desired learning outcomes and to promote communication and collaboration. Likewise, in [10], the authors used Twitter to facilitate learning activities. The results confirmed that Twitter can be successfully used as a discussion tool, providing a rich communication process and co-creation of knowledge.

Several studies on the exploitation of Elgg in education are available in the literature. In [11], the authors presented a study of the learners' perspective and experience using an Elgg-based learning environment. Findings indicated that learners enjoyed the social learning experience and supported one another in the learning process; however, their participation was limited to course activities, exhibiting little use of social interaction. Furthermore, in [12], the authors developed a social e-learning network using the Elgg platform and proposed a group/people/learning objects recommender widget. Following Elgg adoption, in [13], the authors developed an online social networking learning platform, based on Elgg, with collaborative activities, tailored assessment procedures and an associated user reputation system.

An approach that has studied Edmodo is presented in [14], where the results demonstrated a positive impact of SN on learning and raising the motivation levels. In addition, in [15], the researchers studied antecedents of Edmodo adoption as a classroom collaboration tool, comparing their effect and revealed university students' perspective. The results are applied to give guidelines for educators, to effectively use Edmodo in their classroom. In a similar context, in [16], the authors conducted a study in which students participated in literature discussions using the asynchronous discussion platform found on Edmodo.com. Student participation, student engagement, complexity of discussion and the effectiveness of Edmodo are presented.

The above literature overview confirms that the use of SNs in education promotes the teaching and learning process by providing a more communicative and interactive environment and supporting formal and informal learning. Thus, an evaluation of these platforms is essential for developing high quality social learning approaches.

III. SNs as Learning Tools

In this section, we describe the SNs selected for review and the way they could be used as learning tools. Furthermore, we display screenshots of the developed learning process through these tools.

A. *Facebook*

Facebook[1] is the most popular free social networking website that allows registered users to create profiles and connect with others users by sharing status updates, personal photos and other items of interest. Moreover, it allows users to interact with each other through chatting, posting and using reactions buttons, such as "Like". Also, it includes public features such as:

- Groups, where users with common interests can interact.
- Events, where users can publicize an event, invite guests and track who plans to attend.
- Pages, where users create and promote a public page built around a specific topic.
- Presence technology, which allows users to see which friends are online and to chat.

Educational use

Facebook Groups can be used to support the teaching of any curriculum subject. Files can be uploaded by the Group administrator, or/and members depending on defined privacy settings. In this way, teachers can deliver course materials and students can communicate, collaborate and learn through chatting, posting and commenting. Moreover, teachers can run debates on topical issues and hot issues and inform students about an upcoming exam or essay deadline, setting up an event on Facebook. Facebook Groups can be used to communicate with parents, providing prompt information besides face-to-face meetings.

Fig. 1. Learning process through Facebook

B. *Google+*

Google+[2] is an interest-based social network that is owned and operated by Google. A Google+ user profile is a public visible account of a user that includes basic social networking

[1] https://www.facebook.com/

[2] https://plus.google.com/

services, such as a profile/background/cover photo, about section, personal information, such as previous work, education, interests, etc and an area to post status updates. In addition, it has a "+1 button" to allow people to recommend sites and parts of sites, similar to the use of Facebook's "Like" button. The core features of this platform are:

- Circles, which enable users to organize people into groups or lists for sharing ideas.
- Communities, which allow users to create ongoing conversations about particular topics.

Educational use

Google+ provides better student collaboration through Circles, opportunities for blended learning (a combination of offline and online instruction) with Hangouts, project research with Sparks, and easier school public relations with content sharing and messaging. Teachers can use Google+ to communicate directly with learners, learner families or other educators. Google+ is integrated with others services, such as Google Calendar and Google Docs, supporting project-based learning.

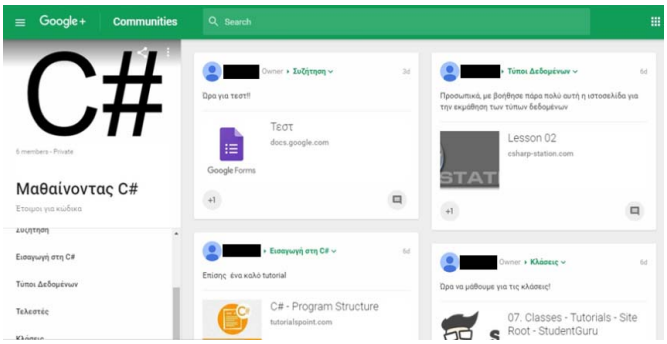

Fig. 2. Learning process through Google+

C. Twitter

Twitter[3] is the most popular social micro-blogging platform. As a social network, users post and interact with messages, called "tweets", restricted to 140 characters. Users may subscribe to other users' tweets; this is known as "following", while subscribers are known as "followers". Tweets are publicly visible by default, however, senders have the option to restrict message visibility to just their followers. Moreover, individual tweets can be forwarded by other users to their own feed, a process known as a "retweet", or they can be "liked" (formerly "favorite"); two features that provide users' interaction.

Educational use

Twitter proves extremely useful across academic applications. Teachers, students, and parents can benefit greatly of the advantages offered by using Twitter in education. The short tweets can be used to inform students about any changes, post a question or request resources, share interesting links, and collaboratively work. It can be set up custom course hashtags around lessons and topics, in order to follow these specific hashtags and keep a record of what was taught in the course.

Fig. 3. Learning process through Twitter

D. Elgg

Elgg[4] is an open source social networking platform which provides a robust framework to develop any kind of social networking sites. Most of the functionalities come from the installation of the proper plugins. It offers blogging, microblogging, file sharing, networking, groups and a number of other features. Each user has its own weblog, file repository (with podcasting capabilities), online profile and RSS reader.

Educational use

Elgg combines a set of features, appropriate for developing an online learning network, such as weblogs, bookmarks, instant messaging, storing files, sharing resources and connecting with others. Students have their online profiles where they can maintain their file gallery, blog, and personal customized templates. Besides, Wiki add-in component renders Elgg more practical for an academic course community which allows students to work together. Moreover, this platform can be integrated with other learning management systems, such as Moodle, to produce software specifically for education.

[3] https://twitter.com/

[4] https://elgg.org/

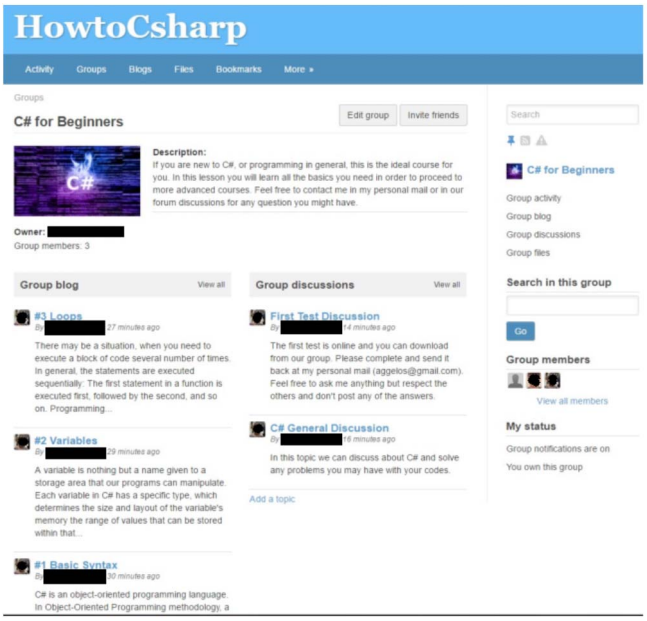

Fig. 4. Learning process through Elgg

E. Edmodo

Edmodo[5] is a full-featured social learning platform designed to connect and collaborate within the educational environment. Using this platform, students and teachers, but also parents or guardians, can connect by sharing ideas, problems, and helpful tips, sending notes, replying to posts and checking messages, grades and upcoming events, while they are away from the classroom. Edmodo is not a learning management system (LMS), but it is a free, teacher-centered social learning platform.

Educational use

Edmodo focuses on the development of educational SNs. Teachers can create groups, assign homework, schedule quizzes, manage progress, etc. Edmodo gives students new ways to engage, participate, and express themselves. Through posting on discussion topics, participating in polls, being awarded with badges, and more, it is fostered the communication and learning becomes social.

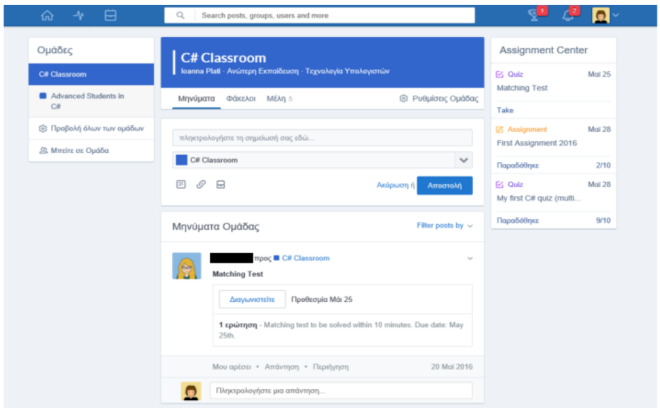

Fig. 5. Learning process through Edmodo

[5] https://www.edmodo.com/

IV. Evaluation Procedure

A. Evaluation steps

The scope of this research is to evaluate the use of several well-known SN as a learning tool, providing formal and informal learning, in higher education, and to compare the selected platforms regarding educational features.

Firstly, we conducted a thorough investigation of research area, focusing on the characteristics of SNs and their exploitation in the teaching and learning process. Subsequently, we developed a learning process using several well-known SNs, selected for review. The course that has been chosen for teaching was the programming language C# (C Sharp), which constitutes a lesson in Computer Science Departments of many Universities. Finally, we evaluated the SNs from educational perspective and analyzed the results.

Fig. 6 illustrates the steps of evaluation followed in this study.

B. Evaluation criteria

An effective e-learning environment supports a number of features in order to carry out the tasks of learning process. Based on these features, we analyze the capability of SNs to act as learning tools. Thus, the criteria of evaluation are:

- Course management: The capability to create a course and manage its settings.
- Content management: The capability to deliver and manage course material.
- Student management: The capability to manage students and monitor their activities.
- Course Enrollment: The process of initiating attendance to the course.
- User-generated content: The capability of students to create and deliver content.
- Assessment tool: The capability to create online quizzes and assignments, and manage them and their deliverables.
- Gradebook: The capability to store student's grades from all assessment (quiz, exam, essays etc) and provide reports.
- Communication & Collaboration: The tools that enable the participants of the learning process to communicate and collaborate in this context.
- User-friendliness: if the platform provides an easy-to-use interface.

V. Comparative Analysis & Discussion

In this study, we conduct a comparative analysis of five well-known SNs in terms of provided educational features. Table I illustrates the evaluation results.

The emergence of SNs broadens learning's horizons, extending online learning environments to social ones. The exploitation of SNs in education promotes the learning through social interaction and collaboration. Moreover, the daily use of them by learners and instructors in their personal life renders their adoption in learning process more easy.

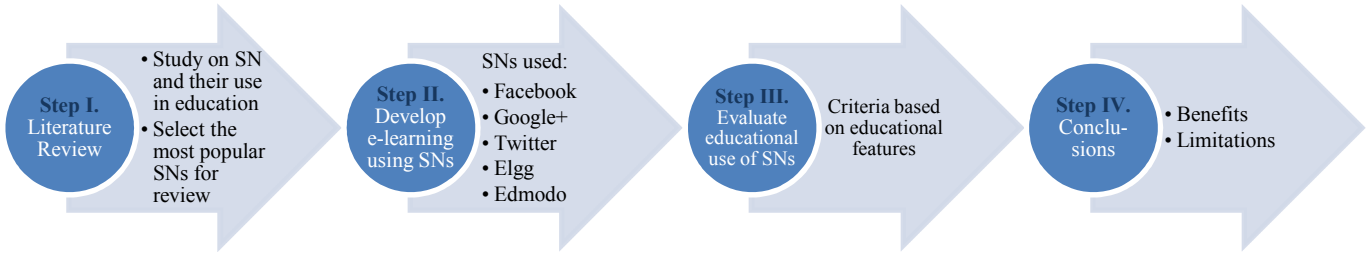

Fig. 6. Evaluation procedure

TABLE I. EVALUATION OF SNS

SNs / Characteristics	Facebook	Google+	Twitter	Elgg	Edmodo
Course management	Through Facebook Groups.	Trough Google+ Communities.	Trough a Twitter account.	Through Groups	Only a teacher account can create course pages.
Content management	Upload files, images, videos etc and configure post settings. Manage material using hashtags.	Upload files, images, videos etc and configure post settings. Manage material using tags.	Post text, links and images. Manage material using hashtags.	Bookmarks section, Uploaded files section, Groups providing group activity/ files/ blog/ discussions.	Upload files, images, videos etc and configure post settings. Organize material in folders.
Student management	No	No	No	No	Assign student into groups. No activity reports.
Course Enrollment	Join Facebook Group.	Join Community.	Follow course/teacher account.	Join group.	Join group using code.
User-generated content	Post material and comment posts	Post material and comment posts	Through tweets	Posts in blog and discussions.	Post material, comment posts, Backpack module (a place where student upload their material)
Assessment tool	No	No	No	No	Yes
Gradebook	No	No	No	No	Yes
Communication &Collaboration	Posts, comments, private chatting	Posts, comments, private chatting	Tweets, comments, private chatting	Posts, comments, private messages	Posts, comments, send message to teacher
User-friendliness	Yes	Yes	Yes	Yes	Yes

Facebook is the most used SN, with the overriding majority of students and teachers to have a Facebook account. This fact fosters its adoption, as there is no need to create new account or use different platform for learning, besides this already used in everyday life. Furthermore, the users are familiar with its interface, thus making easier the learning process. Facebook enables a great interaction through its Groups.

Twitter is the most representative SN providing microblogging service, with an abundance of users. It has an easy-to-use interface; however its significant restrictions are the short length of tweets and the lack of uploading files in tweets. Hence, course content should provide as image or link.

Google+ is a well-known SN with less popularity than the aforementioned ones. However, it provides a great content organization with tags and a user-friendly environment. In addition, it can incorporate other Google services, such as forms, calendar etc.

Elgg is a social networking platform which provides an integrated solution for developing social e-learning environments. It has an easy-to-use interface and enables group creation with special features, for instance blog, files, pages, discussions etc. Using groups, the course content can be delivered effectively. The main disadvantage of this platform is the limit variety of plugins.

Edmodo is social networking platform for developing educational environments. It provides a Facebook-like interface, making it user-friendly. Through this platform, the instructors can develop integrated online learning environments and manage course content and students in an easy way.

In general terms, all the aforementioned SNs, being used for this review, are free of charge and provide a user-friendly environment either for teachers to organize their lessons or students to participate in learning activities. Moreover, they foster social interaction and collaborative learning, promoting innovative forms of teaching and learning.

In contrast to Elgg and Edmodo, Facebook, Google+ and Twitter have an additional advantage which is that the majority of educational community already uses these platforms. Hence, they are familiar with them and it does not need to create new account or get used with different platform.

All the evaluated platforms, except for Edmodo, have no education-oriented features, thus they have limited capabilities

as learning tools, such as student tracking, assessments, gradebook etc. However, all the platforms facilitate the instructional process, providing a learning experience beyond the classroom.

VI. Conclusions & Future Work

Social networks have the potential to facilitate interaction between peers. Their use in higher education can enhance the learning experiences of students, promoting co-creation of content, communication and collaboration. This study evaluates five well-known SNs, namely Facebook, Twitter, Google+, Elgg and Edmodo, as tools for teaching and learning. The main advantage of their adoption in the learning process is that they are free of charge and easy to use for both students and instructors. Moreover, they support formal and informal learning, as well as collaborative one. However, concerning Facebook, Twitter and Google+, their principal drawback is that these platforms lack education-oriented features, thus providing a functionally limited learning tool.

Several intriguing issues are arising from this study for future investigation. For instance, our future plans include the potential use of the developed systems to support the learning process of the undergraduate course titled "Object-Oriented Programming", in the Department of Informatics of the University of Piraeus and the analysis of the SN platforms from learners' perspective regarding the achievement of the learning outcomes.

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