I.J. Modern Education and Computer Science, **2017, 2, 1-13**
Published Online February 2017 in MECS (http://www.mecs-press.org/)
DOI: 10.5815/ijmecs.2017.02.01

An Analytical Study of the Use of Social Networks for Collaborative Learning in Higher Education

Afnan A. Alkhathlan
Department of Information Systems, King Saud University, Riyadh, Saudi Arabia
Email: Afnanalkhathlan@gmail.com

Dr. Ahmad A. Al-Daraiseh
Department of Computer Science, College of Information Technology, American University of Madaba, Madaba, Jordan
Email: creepymaster@yahoo.com

***Abstract*—**In recent years, the use of social networks has been growing at an unprecedented speed. Changing the way people communicate, interact and learn. Instead of passively consuming information, users are actively participating in the creation of knowledge, as a part of the social connection and interaction Social Networking Sites (SNSs) are built upon. And since learning, at abstract, is a social activity, educators around the world have been embracing the notion of incorporating social networks technology into the educational environment to support and enhance the teaching-learning experience. This work investigates the usage of social networks in higher education to support collaborative learning, improve the learning process and enhance students' engagement and academic achievements. A comprehensive review of the current literature is conducted to thoroughly analyze the use and impact of social networks on higher education students. In order to propose a framework for educational social networks that will support collaborative learning and enhance learning outcomes for higher education students.

***Index Terms*—**Social Networking Sites, Educational Social Networking Sites, Collaborative Learning Higher Education

I. Introduction

Since its creation, social media has been rapidly changing the world. Their impact is extending from the individual user to the situated environment. Politics, economy, and marketing are a few to name. The ubiquity of social media brought new meanings to social communication. People are using such technology to reconnect with old friends, maintain current ones and make new relationships. Education field is not apart from that, social media and other Web 2.0 technologies are increasingly becoming an essential part of students' life. It is transforming the way students interact, learn, and collaborate.

(Boyd and Ellison 2007) define social networking sites (SNS) as "web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system". Social networking sites have been used as a parallel learning channel or as an extension to the traditional classrooms. This shift is better explained by the fact that learning at abstract is a social activity. Based on the social learning theory by (Bandura 1977), learners tend to self-regulate their learning process in order to achieve the desirable outcomes. Social media encourage students to interact, collaborate and exchange ideas with each other as well as with their instructors, which will in turn, help students to match their different learning styles (Yan Yu et al. 2010).

Education in the last years has been heading towards collaborative learning. Taking advantage of the recent developments in Web 2.0 technology and social media, it is thriving. Collaborative learning is "a pedagogical style that emphasizes cooperative efforts among students, faculty, and administrators" (Whipple, 1987). There have been several attempts to create social networking sites optimized for collaborative learning. Such sites are referred to as Educational Social Networking Sites (ESNSs). ESNSs are "social networking sites that are built to promote collaboration among learners. Their main purpose is to take advantage of the social aspects to foster learning" (Al-Dhanhani, Mizouni, Otrok and Al-Rubaie 2015). Elgg, Ning, and Sophia are existing examples of educational social networks. Collaborative learning enables students to maintain a constant level of engagement and connect their knowledge with the outside world. Learners can use social networking sites as educational platforms to collaboratively construct and share knowledge while supporting their self-representation and social acceptance (Yan Yu et al. 2010).

Incorporating social media in the learning process is a very welcomed idea by the students. Since the vast

majority of social media users are from the younger generations, or the "Digital Natives" as referred to by (Marc Presky 2001). According to Marc, today's students "spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age".

Due to the recent evolution in the information and communication technology, and with the integration of Web 2.0 tools in mobile devices, today's students have more control on what, how and when they learn (Christine Greenhow 2011). The concept of the classroom is no longer associated with a defined place and time. Learning becomes self-initiated by students anywhere and anytime. Moreover, instead of passively consuming information, students are becoming active participators in their knowledge creation. (Kitsantas and Dabbagh 2010). On the other hand, this transformation adds extra burdens on the teachers' shoulders. They need to work harder on the students' attentions and quantity and the quality of class engagement (Tadeu and Lucas 2013). The goal of this research is to find preliminary evidence of the use and impact of social networks in higher education. Therefore, define a framework of an educational social network that supports collaborative learning for higher education students.

The reminder of the paper is organized as follows. We first conducted a comprehensive literature review of the use of social networking sites (SNSs) and educational social networking sites (ESNSs) in higher education settings. Then, we present an overview of the collaborative learning theory followed by a comparative study of several SNSs and ESNSs in regards to their collaborative learning capabilities and support for higher education. Next, we propose a framework for future ESNSs. We conclude the paper with a discussion, conclusion, and future plans.

II. Related Works

The following sections review the use of social networking sites (SNSs) in higher education in the literature. Mainly, the use of SNSs for education can be classified into two categories: the use of existing SNSs, and the development of new SNSs optimized for learning, referred to as Educational Social Networking Sites (ESNSs).

A. The use of existing SNSs in higher education from the students' perspectives

The significant impact of using social networking sites in education has not only been an improvement to the learning process itself, but also helped in improving the psychological well-being of students, their social interactivity, and skill development. A study by (Angela Yan Yu et al. 2010) has chosen the social network Facebook, due to its high popularity and usage, to investigate the pedagogical impact and implications of using social networking sites for educational purposes. The study is based on the social learning theory by (Bandura 1977) which emphasizes that learning is a social activity, where individuals are learning by interacting with each other and with the situated environment, to achieve the proper learning outcomes. The results strongly proved the beneficial impact on students by engaging in online social networking sites. As hypothesized, students tend to interact more on online social networking sites, which will help them to develop new relationships, gain social acceptance and acculturation, and boost their self-esteem and satisfaction.

Another study was done by (Junco 2011) to investigate the relationship between social media usage, specifically Facebook, and students' academic performance, represented by their Grade Point Average (GPA). The study concluded in a negative relationship between the amounts of time spent on Facebook and the students' overall GPA. It appears that the time students spend on their academic tasks are not significantly influenced by the time they spend on social media sites such as Facebook. Using Facebook activities that include browsing and sharing information, such as exchanging links and checking each other's updates, was a more positive predictive to the student's academic performance than using it for social activities such as chatting and updating status.

A case study has been conducted by (Veletsianos and C. Navarrete 2012) to study and analyze the students' experience and outcomes of using the social network Elgg to teach an online course at a large public university in the United States. Elgg.com is an open source social network where students can use a variety of social networking features such as personal profiles, friends, message boards, micro-blogging and collaborative document authoring. The results showed that all participants found it very valuable and engaging to learn through communicating and interacting with each other, and they appreciated the social connectivity they felt when taking the course. Moreover, students agreed on the ease of use and the ability to navigate easily through the social network. This enabled them to efficiently access course content, other students' blogs and ask questions freely. Also, Students found the student-centered approach used in this trial was positively contributing to their learning experience. Findings of this study indicated that students appreciated the social learning experience through the use of social networks. Their interactions and support for each other was a good contributor to their learning experience. However, it appeared that students were limited to course-related activities. They were not mixing their social and educational activities. Furthermore, formal learning in such online environments needs clear strategies to manage online presence and participation.

An explorative interview study done by (Hrastinski and Aghaee 2012) was done to explore the students' perspectives of the benefits and limitations of using social media to support their learning experience. Findings revealed that almost all the students were frequent social media users. All of them are also users of the traditional learning management systems (LMS) and they

considered it as a complement to social media which they also think complements face to face education settings. They preferred social media for short communications and coordination while face to face meetings for longer communications such as group work. Furthermore, the benefits students reported of using social media varied from anywhere anytime connection, to efficiency and time saving. On the other hand, students reported a wide variety of limitations regarding the use of social media for education purposes. Such as, less human communications, less spontaneous interactions and relying solely on online information. Moreover, social media interaction compared to the traditional face to face contact might result in a number of problems such as more misunderstandings and less creativity. It would also negatively affect the quality and the collaboration of group work since students are not working face to face together on-campus.

It is important to measure the relationship between the use of social media and the academic performance through collaborative learning. Under this objective, a research was done by (Al-Rahmi et. al 2015) on the students of University of Technology in Malaysia. The research is based on the hypothesis that there is a strong relationship between the three constructs: social media, collaborative learning and academic performance. Findings of the study highlighted the importance of the three variables, social media, collaborative learning and academic performance. It demonstrated that collaborative learning is the mediator between social media and collaborative learning. In other words, academic performance is highly affected by social media in the context of collaborative learning.

(Hamid et. al 2015) proposed an analytical study of the use of social media to support interaction between higher education students with each other and with their instructors. The study, in conclusion, introduced some empirical evidence of the benefits of using social media in higher education. The benefits can be mapped to three interactions social media can carry: interaction between students, interaction between students and teachers, and interaction between students and content. Most of the students found that OSN platforms improved collaborative activities amongst each other and enhanced their interaction with teachers.

B. The Use of ESNSs in Higher Education from the Students Perspective

One of the main features of social networking sites (SNSs) is the ability to support different collaborative activities such as learning. Hence, there have been several attempts to build customized SNSs for learning referred to as Educational Social Networking Sites (ESNSs). SNSs rely on social communication and building relationships while ESNSs rely on interacting and collaboration between students in formal and informal learning.

(Wodzicki, Schwammlein and Moskaliuk 2011) conducted three studies to investigate why and how higher education students use social networking sites for educational purposes. The three studies are based on the educational social network StudiVZ, one of the largest social networking sites in Germany. StudiVZ functionalities are much similar to those on Facebook. Findings in general showed that although students were using StudiVZ mainly for social communication, it appeared that social communication might have an indirect relationship with study-related knowledge exchange as demonstrated by the three studies, and that students in their last years of their study are less interested in using social networks for exchanging their knowledge than newer students. Future research would investigate the role of social networking sites for educational purposes at various stages of students' academic life.

Moreover, in the study by (Ahmed Al-Dhanhani et. al 2015), an educational social network, ELSE, is developed under the guidance of the Emirati Etisalat BT Innovation Centre as the first instantiation of the iSocial project. ELSE incorporates the basic socialization features with multiple incentive models to motivate learners to collaborate. The trial was conducted at Abu Dhabi Campus of Khalifa University for four months on 120 students and instructors. ELSE was launched at first without the motivational model and the recommender system. When they were added later, the number of users started to increase. In the final stages, they conducted a survey to study the impact and usefulness of ELSE. The results of the survey showed that 83% of users expressed their interest in using ELSE and 81% said that they would like to see ELSE used by other universities as well. Overall, students perceived ELSE as a positive experience that helped them in achieving the proper learning outcomes from the course, and are interested in using it for other courses as well.

C. The Use of SNSs in Higher Education from the Educators Perspectives

As web 2.0 technology goes beyond the traditional technologies used in classrooms such as Learning Management Systems (LMS), educators become more interesting in incorporating such tools to enhance the academic activities in their classrooms. The work by (Julia E. Rodriguez 2011) focuses on the educators' perspectives on how to employ this technology in the higher education environment and what are the consequences of moving the academic activities to a public space. The key areas of consideration for educators range from ownership issues, security and privacy, accessibility, technology stability and copyright. Moving the traditional closed classrooms to public online ones should alert the faculty to the importance of students' privacy. Educators should raise the awareness of online privacy to students and should inhibit such environment from publicly sharing students' private information such as their grades or their individual critical feedback. Moreover, faculty should consider the accessibility and compliance aspect when choosing a new tool to incorporate into their classrooms. Social media platforms with their rich content of images and links might be

complex to read by accessibility software used by students with disabilities. In addition, the reliability and stability of technologies used in classrooms is an important issue. On-campus support should be always available.

Another study was done by (Chen and Bryer 2012) to investigate how social media as a pedagogical approach can be used by instructors in higher education facilities to connect formal and informal learning. The study focuses on exploring the potentials of using social media technology in the educational context, the barriers that instructors may face and how to mitigate them. Different views were reported regarding the use of social media for teaching. A number of instructors reported that they don't see any academic benefits of using such technology. However, the majority of the interviewees agreed on discussions and collaboration as their most used instructional activities to integrate social media into learning. As for the assessments strategies they used for social media activities, most instructors believed that students participation through social networks is optional, and there is no need to have a specific assessment strategy for that. On the other hand, security and privacy were the top two challenges reported by the participants. They were mostly concerned about their professional identity and reputation as social networks are generally open and its content is hard to control. Ethical issues, time constraints and technology barriers were also reported as big concerns among faculty members as most of them mainly rely on their institutions' policies and support.

(Manca and Ranieri 2015) examined the attitudes of academic faculties towards using social media for personal and professional purposes. A survey was addressed to the academic staff in all universities in Italy to explore what social networks are mostly used by them for personal, professional or teaching purposes and what are the relationship between these three purposes and their use of social networks. Results revealed that the younger faculty members tend to use social network more than the older ones, especially for personal use. Moreover, it appeared that the higher the academic title the more they use social networks for professional purposes. As for the discipline of academic faculty, it was clear that the preference to use a specific social network is depending on the subject of the course. Humanities and Social Sciences tend to use the popular social networks such as Twitter, Facebook and YouTube for different purposes while Mathematics and Computer Science disciplines tend to use more professional networks such as LinkedIn and ResearchGate. To measure the relationship between the three uses of social networks; personal, professional and teaching, personal use seems to be associated with the professional one. While in the professional social networks such as LinkedIn, Wikis and SlideShare professional use was more associated with teaching. In other words, personal use of social networks is not necessarily a predictive of teaching use.

In conclusion, Additional studies and analysis are needed to further understand how social media could have positive implications for learning in light of their social means. The use of the existing SNSs and ESNSs for education, although limited, demonstrated the huge potentials they hold for education. They can extend the traditional classrooms and enhance the pedagogical approaches currently in use. Furthermore, students and instructors showed different perspectives regarding the use of social networking sites in the educational context. Students were more open to the idea of incorporating modern technologies into learning, while instructors, on the other hand, were more reluctant. Yet, the perception towards such technologies tends to change over time.

III. Collaborative Learning Theory

(Dillenbourg, 1999) defined collaborative learning as "the situation in which two or more people learn or attempt to learn something together". The elements of this definition can be interpreted in multiple ways. The first element "Two or more" can be either a pair, a small group of three to five subjects, a class of about 30 subjects as a maximum, a community of hundreds or thousands of subjects, or a society of millions of people/subjects. Learning as the second element of the definition can be interpreted as any collaborative activity in an educational context, such as learning a course or a course material, practicing learning activities such as problem-solving, or learning from the lifelong work expertise. Lastly, the third element "Together" involves various forms of interactions such as face-to-face, computer-meditated, synchronous, time frequent or not. Nevertheless, all these different interpretations illustrate that collaborative learning is more about "collaboration" rather than "learning" itself (Dillenbourg, 1999).

In order to provide a new perspectives to the development of educational social networking sites that support collaborative learning for higher education students, the proposed framework will be based on the collaborative learning theory of (Dillenbourg, 1999) due to its comprehensiveness in defining the various aspects of both collaboration and learning. According to (Dillenbourg, 1999), the four aspects of learning can be characterized as collaborative: a situation, the interactions, the process and the effect.

A. Situation

Situation describes the symmetry, the degree of division of labor. Collaboration is most likely to happen between people in the same level, such as a pair of students. Hence, a situation can be called collaborative if peers with similar status, together perform the same actions, with a common goal (Dillenbourg, 1999). Symmetry of actions describes the similarity of the range of actions allowed to each peer. Symmetry of knowledge is the degree to which peers have the same level of skills. While symmetry of status means the extent to which peers have similar status with respect to their community (Ligorio, 1997).

B. Interaction

Collaboration can be defined as a situation in which peers interact with each other in a collaborative way (Dillenbourg, 1999). Therefore, there are three distinct criteria to characterize an interaction as collaborative: interactivity, synchronicity and negotiability.

Interactivity means that a collaborative interaction should be interactive. The degree of interactivity between peers should be measured by the degree of which these interactions affect the peers' cognitive processes. The second criteria in synchronicity. Doing something together is defined as synchronous communication. While cooperation is defined as asynchronous communication. For two peers to interact collaboratively, they have to work synchronously and therefore interact asynchronously. The last criterion is negotiability. Collaborative interactions are usually negotiable. When peers interact together they are more likely to argue, negotiate and defend their points of view. Therefore, collaborative interactions are considered more complex than hierarchical ones like formal dialogues. In addition, peers in a collaborative interaction might also negotiate the level of authority and how to interact with each other (Dillenbourg, 1999).

C. Process

There are four learning mechanisms that are central to individual cognition, which can occur in a collaborative situation: induction, cognitive load, self-explanation and conflict. These four mechanisms operate at individual cognition level and then extend to the case of peers and group interactions.

Induction is the underlying process that makes peers integrate common features of the representation built by each one of them (Schwartz 1995). Cognitive load in a collaborative learning situation means that division of labor decreases the amount of processing (cognitive load) performed by each peer. In contrast, the cognitive load is increased when peers interact with other groups. As for the self-explanation, the concept of explanation is borrowed from social situations. Hence, in a collaborative learning environment, peers tend to explain and justify what they are doing to each other. Learning happens while peers explain to each other. The amount of learning by an individual who provides explanations seems to be related to the cognitive activities necessary for constructing and presenting explanations. Similarly, the amount of learning by individuals who receive explanations seems to be related to variables such as how relevant, understandable and elaborated the explanations are (Webb, 1989). Conflict is also a social concept. It happens among group members in any collaborative situation. Conflicts between the knowledge and the perception of two individuals often lead to conflicting statements with respect to the task at hand (Doise & Mugny,1984).

D. Effect

In general, effect is a broad term. And since collaborative learning process consists of a variety of contexts and interactions, we should be concerned about the effects of particular interactions rather than the effects of collaborative learning in general (Dillenbourg et al, 1995). The effects of collaborative learning are often measured by individual task performance measures (Dillenbourg, 1999). However, some argue that it is more valid to measure group performance. It is more verifiable in the latter approach to track a group performance or validate if the group members have developed their collaboration ability that they can use it again in other groups.

IV. Collaborative Learning in Social Networking Sites (SNSs)

Due to the participatory nature and collaborative capabilities of social media in general, social networking sites particularly hold great potentials for fostering and enhancing collaborative learning. In addition, the social aspects of social media technology play an important role in the collaborative learning process. Social connection and communication is the base that social networks are built upon. Allowing students to construct and share their knowledge as a part of their social connection.

The four aspects of collaborative learning theory (Situation, Interaction, Process and Effect) are well supported by the existing technology of social networks. The use of social networking sites in the educational context creates a situation. Since users (students) can create their own profiles, post personal information and share their photos and videos with others easily. Similarity of actions is supported by social networking sites since they require no special knowledge or skills to use them. While similarity of actions can be applied by the use of groups. Where teachers can control the size, gender and heterogeneity or other features of group members. Moreover, the use of blogs and wikis can support the situation of interaction in social networking sites. Since they include a variety of collaborative activities such as reading others' views, commenting and engaging in discussions and receiving feedback. Thus, creating a situation of symmetric knowledge and actions.

Social networking sites have a wide range of interactivity capabilities that can be used to facilitate collaborative learning. For instance, the use of blogs, wikis and discussion boards contributes to a greater scope of interaction among peers. Students can write posts and get instant feedback which motivates them to contribute more. Educators on the other side can track and assess their students' progress through the analysis of interaction graphs (Fessakis, Dimitracopoulou & Palaiodimos, 2013). Furthermore, the variety of communication channels offered by social networking sites promote synchronous and asynchronous communication. Students can work together in groups or engage in collaborative activates which would open up the channel to argue and negotiate with each other. Resulting in a better learning experience

through the collaborative exchange of views and feedback (Liao, Huang, Chen & Huang, 2015).

Social networking sites support a wide variety of collaborative situations where several learning mechanisms can be applied. The use of the various features of a social networking sites such as groups, discussion boards and messages can enhance the collaboration acknowledgment among peers. Therefore, enhance their cognitive and self-explanation capabilities. Additionally, the exchange of ideas and opinions and the ability to comment on them promote the critical thinking and problem-solving abilities of students (Williams & Jacobs, 2004).

Furthermore, the effect of collaborative learning can be somehow easy to measure using the various applications of social networks. For example, discussion boards can be used to track and measure students' interaction. While blogs or groups can be used to monitor and assess students' performance and validate their collaboration ability.

V. Review of Selected SNSs and ESNSs

The use of social networking technology in education follows two distinct patterns: first, the use of social networking sites (SNSs) for education purposes. And the second is the design of SNSs that are optimized for education. Referred to as educational social networking sites (ESNSs). Of the first type, we will review two of the most used SNSs, Facebook and Twitter, and evaluate them in light of their use for collaborative learning. As for the ESNSs, we selected 8 existing ESNSs to review and compare based on a number of factors. The selection of the 8 ESNSs was based on their popularity and their support for higher education settings. A summarization of the selected SNSs and ESNSs based on the evaluation factors will be presented at the end of this section.

A. Review of Selected SNSs

Facebook

Founded in 2004, Facebook became one of the largest and most popular social networking sites around the world. Facebook supports several collaboration capabilities such as groups and blogging. As well as social features such as profiles and likes that tend to increase learners' engagement. On the other hand, there have been growing concerns regarding the privacy of Facebook users and the privacy of their data. Moreover, no incentive or grading systems are supported by Facebook yet. There is also no method yet to guarantee of the truth of the content published on Facebook.

Twitter

Twitter is a microblogging social networking site launched in 2006. It is one of the most popular social networks with more than 100 million users worldwide. In contrast to other social networks, Twitter limits users' posts or updates to only 140 characters. Which makes it a popular place for instant communication. Social connection in Twitter is represented by the concept of the timeline, where users follow each other's updates\tweets. In addition, Twitter uses a recommendation system that suggests accounts to follow based on the user's contacts, location and interests. However, Twitter does not support collaboration capabilities such as groups, forums, wikis and file sharing. Twitter also lacks many features that are important for educators to practice collaborative learning with, such as students' assessment techniques and incentive methods.

B. Review of Selected ESNSs

Edmodo

Edmodo is a free educational social network designed for teachers, students and their parents. It is a web-based platform that provides a safe environment for students to connect, collaborate and learn. Founded in 2008, Edmodo now has more than 70 million members, making it one of the biggest educational social networks for collaborative learning. Teachers can create virtual groups for each classroom they teach, where they can post the course content, summaries and assignments. Each classroom group can be joined by entering a specific code. Edmodo is a secure and controlled learning environment where class groups are managed by teachers only. Students join classes upon teachers' permissions. Moreover, students are not allowed to post anonymous content or communicate privately with each other. They can only communicate with their teachers or with the class as a whole. Parents on the other side are welcomed to view their children's progress and/or teachers' responses.

Classroom 2.0

Founded in 2007, Classroom 2.0 was one of the first sites that incorporates the technologies of Web 2.0 and social media to support collaborative learning. It is a free social networking site for educators and learners that supports the use of blogs, forums, discussion boards and photo and video albums. Users can create new groups or join existing ones. Moreover, users can link other apps to their Classroom 2.0 account such as Twitter, Google services and RSS feed. Users also can communicate with each other through messages or live chat. In addition, members can add each other as colleague or invite other colleagues from their contacts. However, teachers have no control over students' communication or content posting. Nevertheless, Classroom 2.0 lacks the use of incentive systems and assessment techniques. Mobile application is not yet supported by the current version of Classroom 2.0.

Twiducate

Twiducate is a free online platform that allows teachers and students to get all the benefits of social networks in a controlled and safe way. Teachers can create a private network for their classroom to connect, interact and collaborate. Moreover, teachers can broadcast notes, assignments and reminders to students. Chat can be enabled or disabled by teachers. Teachers also can

prohibit students from deleting their posts. Students can email their teachers via Twiducate. In order to enhance collaborative learning, teachers can also invite other teachers and their students to share their questions, ideas and inspirations. The user base of Twiducae hits more than 18,000 teacher and student.

Elgg

Founded in 2004, Elgg is an open source social networking engine that provides schools and universities with the chance to create a private and customizable social environment. Elgg supports collaboration through a number of features and plug-ins such as blogging, group management, discussions, file sharing and video chat. In addition to the built-in features, Elgg supports third-party integration with other social networks such as Facebook and Skype and/or with other services such as DropBox.

Sophia

Sophia is a free social network designed for teaching and learning purposes with a limited use of social activities. It was founded in 2011 and now used by more than 70,000 teacher and student. Teachers can use a wide variety of tools and services in order to create private classrooms groups, share content and monitor students' progress and activities. In addition, Sophia contains a numerous amount of free tutorials on various topics and in different media formats such as videos and podcasts. Users can follow tutorials (learning packets) or follow other users. Sophia has an incentive system that scores students based on their contribution. Learning packets in Sophia can also be rated in order to find the most useful ones. However, blogging and discussion boards are not yet supported in the current version of Sophia.

Mahara

Founded in 2006, Mahara is an open source web application that combines personal learning with social networking capabilities. Users can create and customize personal portfolios on Mahara and control what others can see in these portfolios. Pages (groups) can be created by portfolios' owners and they can invite other individuals or groups to access and contribute on the same page. In addition, different types of files can be uploaded and shared on Mahara. Blogging tools are also supported. One of the distinguished features of Mahara is SmartEvidenc, where portfolios can be created with an attached competency framework. This enables teachers and assessors to efficiently assess students' performance and track their work using the built-in evidence maps. Mahara is intended to be used by educational institutions as it offers various configuration settings for an organization such as authentication methods, institution setup as well as Moodle integration. Moreover, Mahara implements several security mechanisms including a number of detection systems to protect against different types of threats such as database injection attacks.

Ning

Ning was launched in 2005 as an online platform to host and create social networking sites (SNSs). Ning allows users to design and customize their own social community with the ability to integrate other social networks such as Facebook and Twitter. Social networks can be created on Ning by any user and for different purposes. Each social network can be either a public, private or limited only to specific members. Users can design their own social network by their own or choose from the pre-designed templates Ning offers. Blogs, forums, photos and videos can be used in social networks created by Ning. In addition, a number of community features are implemented by Ning to enhance user engagement such as liking, sharing and personal profiles.

Neo

Neo is a learning management system (LMS) with social networking capabilities designed to be used by teachers, schools and universities to enhance the experience of e-learning. Teachers can create different kinds of group classes and they can synchronize a single class across multiple sections. Moreover, teachers can use various assessment methods such as timed quizzes, discussions or teamwork to assess their students and grade them using the pre-designed gradebook which offer analytical tools to make grading easier. In addition, Neo supports a variety of collaboration tools for students to connect and communicate through such as wikis, forums and chat system. Teachers have high authority over students using Neo, they can access all students' communication through wikis, forums and chat messages. As well as setting policies for which information can be accessed by students and which are not. Moreover, all social networking capabilities, such as chats and forums, can be enabled or disabled by teachers. Moreover, Different incentive techniques are supported by Neo such as award badges and custom certifications.

Table 1 summarizes the results of the reviewed SNSs and ESNSs based on a selected set of criteria.

VI. The Proposed Framework

Based on the study of the collaborative learning theory by (Dillenbourg, 1999), and on the review of several existing SNSs and ESNSs, we propose a framework for developing ESNSs that support and enhance collaborative-

Table 1. Summary of the results of the reviewed SNSs and ESNSs.

		Groups	Profiles	Blogs	Discussion boards	Teacher control	File Sharing	Assess & Grade	Incentive Techs	Adaptive features	Mobile App
SNSs	**Facebook**	yes	yes	yes	yes	limited	yes	no	no	Recommendation System	yes
	Twitter	no	yes	yes	no	no	yes	no	no	Recommendation System	yes
ESNSs	**Edmodo**	yes	yes	yes	yes	high	yes	no	no	no	yes
	Classroom 2.0	yes	yes	yes	yes	no	yes	no	no	no	no
	Twiducate	yes	yes	no	yes	limited	yes	no	no	no	no
	Elgg	yes	yes	yes	yes	no	yes	no	no	Plug-ins	yes
	Sophia	yes	yes	no	no	limited	yes	yes	no	Rating System	no
	Mahara	yes	yes	yes	yes	limited	yes	yes	no	Smart-Evidence	limited
	Ning	yes	yes	yes	yes	limited	yes	no	no	Plug-ins	yes
	Neo	yes	yes	yes	yes	high	yes	yes	yes	Grading System	yes

learning among higher education students. The framework provides the basic set of capabilities that needs to be considered when designing a new ESNS. These functionalities support the four aspects of the collaborative learning theory (situation, interaction, process and effect). Social connection, collaboration and learning is the core elements of any educational environment that fosters and supports collaborative learning. Hence, the ESNS. Fig.1, illustrate the concept of the proposed framework.

The following set of features represents the basic framework for an ESNS that supports the for-mentioned aspects:

Profiles

It is important for students to show and maintain their identities in any learning environment. A profiles is the place where students can store and display their online identity. They can show different types of information like photos, videos and audio files that reflect their personal taste and interests. As well as they can learn about other students through their profiles.

Groups

Collaborative learning occurs in groups. The ability to form groups is an essential element of any ESNS. Groups facilitate collaborative work and promote a higher status of interactivity among students. Interactions within the group is an example of asynchronous communication. Within a group, students can interact collaboratively during team-work. They can exchange ideas and negotiate their views which contributes to the improvement of their critical-thinking and problem-solving capabilities. Furthermore, the learning process tend to be improved when peers in groups explain and justify what they are doing to each other (Dillenbourg, 1999). On the other side, teachers have a higher level of control over students when they are in groups. Since they can control the group size, gender distribution, symmetry of knowledge and range of actions allowed for each group. In addition, Groups can be public or private, depending on the context they were created within and the purpose they serve.

Activity Feed

An activity feed is the place where recent activities and updates are displayed. It provides users with better insight of what is happening by their friends and other users. Activity feeds in ESNS would encourage students to participate and contribute more when they constantly see the work of other students. It would also help students to keep track of class activities such as events and assignments. Teachers on the other side can also benefit from the use of activity feed by overviewing all the activities that happened in their classrooms such as recent discussions and new posts.

Discussion Board

Discussion board is a space where users can engage in various discussions and conversations by posting messages. In a collaborative learning environment, it is crucial for students to have the ability to argue, negotiate and defend their ideas and points of view, in order to enhance students' participation and motivation.

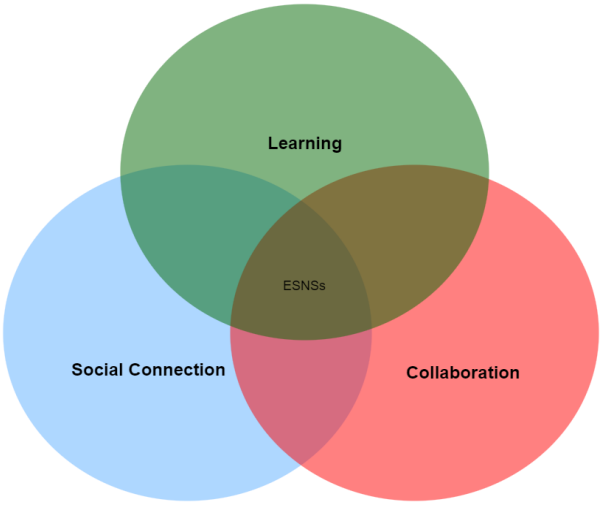

Fig.1. The concept of the proposed framework

Blogs

A blog is basically an online journal where different users contribute to posting and discussing various topics. Blogs in an ESNS can be used for information and learning resources management. The use of blogs creates a situation of interaction where students recognize the importance of being part of the classroom community. Students can use blogs to share their ideas, discuss their opinions and read other students' ones. Blogs have various collaborative activities. For example, the comment feature enables students to receive teachers' or other students' feedback and opinions. In addition, symmetry of knowledge and actions can be applied using blogs, where teachers can control the level of knowledge and the level of actions allowed for students in order to create an effective situation of interactivity.

Wikis

A wiki is an online space where a group of users can collaboratively create and edit its content. Wikis support synchronous interaction, which is simultaneously "doing something together" (Dillenbourg, 1999). A wide variety of collaborative learning activities can be done using wikis. Wikis facilitate group work and group-work tracking as well. Students can easily co-create and edit wiki pages anytime anywhere. They can also discuss their work and get their teachers' comments and feedback on the same wiki page.

File Sharing

It is important in any online learning environment to have the ability to manage and share different types of media such as photos, videos, audio files, documents …etc. An ESNS should support as many types of media as possible to promote the sense of collaborative interaction and increase students' engagement.

Messages

A messaging system should exist in any ESNS to support and enhance communication between students and teachers. Messages are a private form of communication which will allow students and teachers to freely discuss various topics that are not suitable for public discussions. Additionally, students can use messages to increase their social bonding with each other.

Chat System

The instant-response nature of chat systems makes it the preferable communication channel for many of people. Students can use the chat feature in ESNSs for social support or social connection. They can ask each other questions, exchange their experiences or build new relationships. In addition, chat could smooth out the formality of the learning process and make students more attached to the learning environment.

Teacher Control

Teacher control capabilities are what often distinguish ESNSs from SNSs. It is essential to have the ability to monitor students' behaviors and communications in any learning environment. Teachers should have the ability to enable/disable or limit the use of social features such as messages and chats. It is also important to be able to control the size and the privacy settings of groups. For example, groups can be public or private. Or that groups can be joined by invitations only or by using a specific group code.

Assessment Tools

The process of collaborative learning consists of a variety of situations and interactions. When designing an ESNS, we should be concerned about the effects of particular interactions rather than the effects of collaborative learning in general (Dillenbourg et al, 1995). The assessment process is one of the most vital operations of any learning environment (Mohammad Ali et al. 2012). A variety of assessment methods and techniques should be implemented in an ESNS to facilitate the assessment process for teachers and provide students with timely, accurate and informative feedback. For instance, the use of test building tools helps teachers to set up quizzes and exams easily and therefore evaluate students in a quick and efficient way. In addition, automated essay scoring can be used to assess and grade students' written essays. Tracking graphs and analytical tools can also be used to track and assess students' progress and therefor measure the course outcomes more accurately. Moreover, scoring rubrics is an efficient way to provide an accurate and fair ongoing assessment, since they can be customized with different criteria and levels. The use of rubrics make students involved in their own evaluation process and provide them with more informative feedback. At the same time, it reduces the time teachers spend on evaluation and allows them to measure the effectiveness of their assessment approach. Furthermore, automatic and adaptive grading systems can be used to assess instructors in the evaluation process. An adaptive grading system has the ability to "learn" the correct and wrong answers and save them for future use.

Therefore, increase the quality and speed of feedback for both instructors and their students.

Gradebook

A gradebook is where students' grades are posted by their instructors. It can be configured with analytical tools to produce real-time statistics and reports. Moreover, grading scales can also be customized in order to accurately measure students' performance.

Incentive Techniques

Incentives are the things that motivate a person to perform a particular action. In the educational field, different incentives motivate different types of students. An ESNS should implement a variety of incentive methods and techniques to promote participation and collaborative work amongst students. For example, custom certifications can be created by teachers and rewarded to students for accomplishing specific tasks. Furthermore, the use of badges, scores or leader boards encourages students to be more active and participative in the learning environment. In addition, gamification can also be incorporated in ESNSs to add fun aspects to the learning process and attract students to engage in various learning activities. Gamification is the use of game-design techniques in non-game contexts such as education.

Recommendation System

Most of the existing SNSs rely mainly on the users' efforts in connecting with each other and building their own social networks. An ESNS is supposed to promote collaboration between users by helping them to choose the right people to connect to. Recommendation system can use students' past performance, personal traits and mutual interests to match them in pairs or teams for group work. Hence, enhance the collaboration between them and help them to gain better results. Moreover, the use of recommendation systems in an ESNS help students to enrich their learning experience. For instance, the personal information of students published in their profiles can be used to recommend related content. However, the content recommendation process should be an adaptive one due to the changing and evolving needs of students.

Help Desk

The use of "help desk" in an ESNS is important for students to help them understand and adjust to the learning environment more easily. Help desk can be automated to provide more accurate and timely responses. For example, questions about the course, assignments or grades can be responded to in an efficient way by using an automated help desk.

Accessibility Tools

It is crucial in any educational environment to support students with different learning styles and abilities, including students with impairments or disabilities. ESNSs can support accessibility through the use of assistive technology. Such as text-to-speech and speech recognition. Moreover, the content of the ESNS should be accessible to people who use assistive technology such as screen readers. Therefore, the basic accessibility standards should be considered when designing an ESNS.

Security and Privacy

The safety of using social media in general is a major concern. When it comes to educational use, it is very crucial to have a safe and secured learning environment both for students and their teachers. An ESNS should implements a wide set of security and privacy mechanisms in order to establish a safe and effective learning environment. Students and teacher should be authenticated using their institutional ID's or any other reliable credentials in order to prohibit access from unauthorized parties. Moreover, students' and faculty personal information should be secured against unauthorized access. Other sensitive information such as grades and messages should also be secured. In addition, instructors should be capable of configuring additional policies and restrictions as needed. Furthermore, an ESNS should have customized privacy settings. Both by the instructors or the educational institution, and by the students themselves. For instance, students can control what others are allowed to see of personal information, photos and posts. Students' posts, comments, messages or any form of communication on the ESNS should also be private and limited to the intended parties only. Instructors, on the other hand, should be able to control and limit what features can be used by students and what type of information they are allowed to access.

Mobile Application

According to (Adam and Lipsman, 2016), almost 80% of the social media time in 2015 are spent on mobile devices. Most of the existing SNSs have their own mobile application due to the increasing number of users who use their mobile devices to "connect on the go" and get instant alerts and feedback. And since the vast majority of social networks users are from the younger generations, it is very crucial to have a mobile version of ESNSs as well. A mobile application helps students to stay connected anywhere anytime to the learning environment. It also helps students to have instant communication either with their teachers or with other students which is essential in collaborative work.

Third-party Integration

Third-party integration refers to the ability to connect and integrate other services. An ESNS should have integration capabilities to connect with other social networks or web services. Students, for instance, can connect their social networks accounts such as Facebook and Twitter in order to increase their social connection and boost their engagement to the learning environment. Teachers also can benefit from the third-party integration by integrating different learning resources such as YouTube videos or Google Apps. They can also connect

with their colleagues and academic professionals to enrich their educating views and experiences.

VII. Discussion

Based on the comparative study that was conducted on two popular SNSs and eight existing ESNSs, we identified a number of collaborative features that are crucial in building any ESNSs. We proposed a framework that employs these features to achieve the meaning of collaborative learning based on the theory of collaborative learning by (Dillenbourg, 1999). The comparative study showed that the existing SNSs offer only a limited number of collaborative capabilities. They mainly focus on social and communication activities. Educational networking sites, on the other hand, were either designed for formal or informal learning. Designing an ESNS that combines both formal and informal learning capabilities would be a better alternative that aligns students' visions with their teachers' and institutions' ones. Most of the reviewed networks were lacking the use of teachers' control. It is important to have the authority over students' in-class activities and communication especially in formal learning settings. The use of assessment tools and techniques was also missing in most of the reviewed ESNSs. The ability to measure and assess the outcomes of the learning process is an essential element in any educational environment. Moreover, the use of incentive techniques is also a major component of any learning situation to encourage learners and promote the sense of collaboration. Additionally, ESNSs should implement a number of adaptive and intelligent techniques to provide a dynamic learning experience and promote collaboration amongst learners.

The proposed framework supports the basic social functionalities of any existing SNS such as profiles and activity feeds in addition to many collaboration features such as groups and wikis with the focus on the use of teachers' control, assessment tools and incentive techniques which provide the right settings to establish a collaborative learning environment. Furthermore, third-party integration and mobility capabilities were considered as basic elements of an ESNS seeing how they can attract more students to spend more time on social networking sites. Accessibility tools and techniques are also important to support accessibility for students with disabilities. Lastly, it is essential in any ESNS to implement a wide set of security and privacy mechanisms in order to establish a safe and effective learning environment.

VIII. Conclusions and Future Work

Since the vast majority of SNSs' users are from the younger generation, Social networks became an essential part of today's students' life. Students can construct their knowledge as part of their social connection and interaction. Social support provided by social networks is an important factor to the students' healthy wellbeing, which will, in turn, improve their affective development and academic performance (Morrow, 1999; Steinfield et al., 2008). The notion of incorporating social networks into the educational field has received a significant research interest over the few last years. Numerous studies have been conducted to investigate the use and impact of SNSs in higher education settings. Students from different universities and higher education institutions around the world showed their readiness and enthusiasm to integrate social networks into their learning systems. However, it appeared that social networks have been slowly adopted by universities despite the presence of infrastructure that supports their existence in most of the universities. Faculty members are also still reluctant about integrating such technology into their classrooms mostly due to social networks' open nature and lack of clear security and privacy policies. It is important to note that this work focuses mainly on the positive attitudes of incorporating social media in the educational context. However, we should not ignore the fact that there are several serious consequences of using social media to serve the purpose of education. Several researchers (Junco 2011; Hrastinski and Aghaee 2012; Flanigan and Babchuk 2015) have reported a number of issues associated with the use of social networking sites in the educational field. For example, self-esteem, self-control and identity crisis issues were among the most reported concerns. Lack of spontaneous interaction and human communication, excessive online time were also reported by a number of students.

In addition, since the creation of social media, security and privacy have been a major fear for many users. For instance, ownership and intellectual property are popular challenges associated with the use of social media in general. The ownership of the academic content published on social networks is a matter of concern when deciding to use them to carry out learning activities. Accessibility requirements should also be considered when using social media for educational purposes. Furthermore, students with disabilities face more challenges when accessing social networks due to their rich content of media. As for the faculty members, they are mainly concerned about their professional identities (Chen and Bryer 2012). Time constraints and increasing the dependency on technology were also major concerns (Julia E. Rodriguez, 2011).

This work proposes a framework for an educational social network that fosters and enhances collaborative learning among higher education students and overcomes the existing limitations in today's SNSs and ESNSs. The framework would be implemented in the future as an educational social networking site that can be used by both higher education students and their teachers. Furthermore, a field study will be conducted to investigate the use of the ESNS and analyze its impact on collaborative learning.

ACKNOWLEDGMENT

This work is submitted in partial fulfillment of the requirements for the degree of Master of Sciences in Information Systems from college of computer and information sciences, King Saud University.

REFERENCES

[1] Abraham E. Flanigan and Wayne A. Babchuk. (2015). "Social media as academic quicksand: A phenomenological study of student experiences in and out of the classroom". *Learning and Individual Differences.* 44 (2015) 40–45.

[2] Adam Lella and Andrew Lipsman. (2016). "Cross-Platform Future in Focus Report". ComScore.

[3] Ahmed Al-Dhanhani, Rabeb Mizouni, Hadi Otrok and Ahmad Al-Rubaie. (2015) "Analysis of Collaborative Learning in Social Networks Sites used in Education". *Social Network Analysis and Mining*. 1869-5469.

[4] Angela Yan Yu, Stella Wen Tian, Douglas Vogel and Ron Chi-Wai Kwok. (2010). "Can learning be virtually boosted? An investigation of online social networking Impacts". *Computers & Education* (55) 1494–1503.

[5] Baiyun Chen, Thomas Bryer. (2012). "Investigating Instructional Strategies for Using Social Media in Formal and Informal Learning". *The international review of research in open and distance learning*, Vol 31, No 1.

[6] Bandura, A. (1977). "Social learning theory". Englewood Cliffs, NJ: Prentice-Hall.

[7] Boyd, d. and Ellison, N. B. (2007). "Social Network Sites: Definition, History, and Scholarship". *Journal of Computer-Mediated Communication*, 13/2: 210–230.

[8] Christine Greenhow. (2011). "Online social networks and learning". *On the Horizon*, Vol. 19. ISS 1 pp. 4 – 12.

[9] Dillenbourg P. (1999) "What do you mean by collaborative learning?".*Collaborative-learning: Cognitive and Computational Approaches*. (pp.1-19). Oxford: Elsevier

[10] Dillenbourg, P. & Baker, M. (1996). "Negotiation spaces in Human-Computer Collaborative Learning". Proceedings of the International Conference on Cooperative Systems (COOP'6), juan-Les-Pins (France), June 12-14 1996

[11] Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C. (1995). "The evolution of research on collaborative learning". In E. Spada & P. Reiman (Eds) Learning in Humans and Machine: Towards an interdisciplinary learning science. (Pp. 189-211) Oxford: Elsevier.

[12] Doise, W. & Mugny, G. (1984) "The social development of the intellect". Oxford: Pergamon Press.

[13] Fessakis, G., Dimitracopoulou, A., & Palaiodimos, A. (2013). "Graphical interaction analysis impact on groups collaborating through blogs". *Educational Technology & Society*. Vol. 16(1), 243–253.

[14] George Veletsianos and Cesar C. Navarrete. (2012). "Online Social Networks as Formal Learning Environments: Learner Experiences and Activities". *The international review of research in open and distance learning*, Vol 31, No 1.

[15] Hamid, S., Waycott, J., Kurnia, S. and Chang, S. (2015). "Understanding Students' Perceptions on the Benefits of Online Social Networking Use for Teaching and Learning". *The Internet and Higher Education* (2015)

[16] Julia E. Rodriguez. (2011). "Social Media Use in Higher Education: Key Areas to Consider for Educators". *MERLOT Journal of Online Learning and Teaching*, Vol. 7, No. 4.

[17] Junco R. (2011). "Too Much Face and Not Enough Books: The Relationship between Multiple Indices of Facebook Use and Academic Performance". *Computers in Human Behavior.*

[18] Katrin Wodzicki, Eva Schwämmlein and Johannes Moskaliuk. (2011). "Actually, I Wanted to Learn: Study related knowledge exchange on social networking sites". *Internet and Higher Education*, 15 (2012) 9–14.

[19] Liao, Y.W., Huang,Y.M., Chen, H.C., & Huang, S. H. (2015). "Exploring the antecedents of collaborative learning performance over social networking sites in a ubiquitous learning context." *Computers in Human Behavior*. Vol. 43, 313–323.

[20] Ligorio, B. (1997) "Social influence in a text-based virtual reality." School of Education and Psychology, Universty of Geneva, Switzerland.

[21] Mohammad Ali H. Eljinini,Salwa Alsamarai,Suha Hameed,Amaal Amawi. (2012). "The Impact of E-assessments System on the Success of the Implementation Process*". I.J.Modern Education and Computer Science*, 2012, 11, 76-84.

[22] Morrow, V. (1999). "Conceptualizing Social Capital in Relation to the Well-being of Children and Young People; a Critical Review". Sociological Review, 47, 744–765

[23] Nada Dabbagh and Anastasia Kitsantas. (2010). "Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning". *Internet and Higher Education*, (15) 3–8

[24] Pedro Tadeu and Joana Lucas. (2013). "Social Network in Education: a Mathematical Pilot Test". *Procedia, Social and Behavioral Sciences*, 106 (2013) 2409 – 2418

[25] Prensky, M. (2001). "Digital Natives, Digital Immigrants". *On the Horizon, 9(5)*

[26] Schwartz, D.L. (1995). "The emergence of abstract dyad representations in dyad problem solving." *The Journal of the Learning Sciences*, 4 (3), pp. 321-354.

[27] Steinfield, C., Ellison, N. B. and Lampe C. (2008). "Social Capital, Self-Esteem, and Use of Online Social Network Sites: a Longitudinal Analysis". *Journal of Applied Developmental Psychology*, 29(6), 434–445

[28] Stefan Hrastinski and Naghmeh M. Aghaee. (2012). "How are Campus Students Using Social Media to Support Their Studies? An Explorative Interview Study". Educ. Inf. Technol, (2012) 17:451–464

[29] Stefania Manca and Maria Ranieri. (2015). "Yes for Sharing, No for Teaching!: Social Media in Academic Practices". *Internet and Higher Education*, 29, (2016) 63–74

[30] Waleed M. Al-rahmi, Mohd Shahizan Othman, Lizawati Mi Yusof and Mahdi Alhaji Musa. (2015). "Using Social Media as a Tool for Improving Academic Performance through Collaborative Learning in Malaysian Higher Education". Review of European Studies; Vol. 7, No. 3. ISSN 1918-7173. E-ISSN 1918-7181

[31] Webb, N.M. (1989). "Peer interaction and learning in small groups". *International journal of Educational research*, 13 (1), 21-39

[32] Williams, J.B., & Jacobs, J. (2004). "Exploring the use of blogs as learning spaces in the higher education sector". *Australian Journal of Educational Technology*. Vol. 20(2), 232-247.

[33] William R. Whipple. (1987). "Collaborative Learning: recognizing It When We See It". AAHE Bulletin, Vol.40.

Authors' Profiles

Mrs. Afnan Alkhathlan received her B.S degree in information technology from King Saud University. She is currently pursuing a MSc degree in information systems at King Saud University.

Dr. Ahmad A. Al-Daraiseh an associate professor at the computer science department at AUM. Received his MSc & PhD. in computer engineering from the University of Central Florida, Orlando in 2002 & 2006 respectively.

How to cite this paper: Afnan A. Alkhathlan, Ahmad A. Al-Daraiseh,"An Analytical Study of the Use of Social Networks for Collaborative Learning in Higher Education", International Journal of Modern Education and Computer Science(IJMECS), Vol.9, No.2, pp.1-13, 2017.DOI: 10.5815/ijmecs.2017.02.01

