The Impact of Social Networks on Students' Academic Achievement in Practical Programming Labs

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Abstract—**Internet and Communication Technology (ICT) is being applied extensively in education to allow students to obtain information at anytime from anywhere. Social media is a new approach that is used to enhance and improve the delivery of education. Facebook groups and YouTube channels are the most operated networks that manage to deliver information. In this paper, we will study the impact of applying Facebook groups and YouTube videos on students' academic achievements in computer programming labs especially in object-oriented programming 2 (OOP2) lab at the Hashemite University. The practical programming lab plays an important role in understanding the theoretical programming concepts, for this reason programming lab is chosen as a case study. The proposed methodology embeds the social media networks as new major dimension in the teaching process of OOP2 Lab side by side with traditional lectures and e-learning tool such as Moodle. In this research: three surveys are utilized respectively to inspect the reasons of the weakness in OOP2 lab, evaluate the course learning outcomes (CLOs) by students before and after applying the proposed methodology and to investigate the opinions of students toward using social media networks within learning process. The results showed that operating the social media sites used by students on a daily basis creates a friendly and close educational environment as well as enhancing the academic results of students.**

Keywords—*e-Learning; Facebook; YouTube; social network; programming lab; course learning outcome*

I. INTRODUCTION

In traditional classrooms, many types of multimedia content such as images, audios, and videos are being used to deliver knowledge to students. The revolution of internet technology makes all media contents available via the internet and accessible at any time. Today, social media sites are popularly increased because they allow users to share collaborate and interact globally, in addition to access information directly and easily.

At present, the number of users who use Facebook and YouTube is dramatically growing. According to 2019 statistics published by biographon website[1], the total number of people who use YouTube are approximately 1,300,000,000 users. Regarding Facebook, the statistics of statista website[2] showed that Facebook has 2.41 billion monthly active users as of the second quarter of 2019.

Now-a-days, social media sites are being utilized in education. Studies showed that social media had improved the communication between instructors and students [1]. This helps to ease understanding and accessing information as fast as possible. As a result, studies showed that social media sites are effective in improving students' academic work [2]. However, it is recommended not to use social media during the lecture time [1]. On the other side, some studies showed that social media has a negative impact on students' academic performance because students spend more time in communication rather than studying [3]. The study of [4] revealed that students use social media to chat rather than to study. Time management is a major factor to determine a positive or negative impact of social media in education [5].

In Jordan, YouTube and Facebook websites are the most used social media sites. In this paper, we will study the impact of using such websites in computer programming practical lab courses. We will consider the course of object-oriented programming 2 (OOP2) lab in the Hashemite University (HU). OOP2 lab course teaches students to use JAVA as a programming language to understand object-oriented concepts.

It is important to mention that this research considers the following facts: Firstly, many HU students own phone mobiles connected to the internet. Secondly, most of the students have a Facebook account and finally, the YouTube website is accessible in the HU campus but not Facebook.

This paper is structured as follows: Section 2 introduces the related experiences that studied the impact of social media on the academic performance of student, Section 3 presents the object-oriented programming 2 lab course as a case study, Section 4 clarify the proposed teaching methodology, Section 5 discusses the results of applying suggested methodology and finally Section 6 concludes and summarize the study.

II. LITERATURE REVIEW

Studying computer programming demands gaining theoretical understanding and practical learning to develop programs. Many studies proposed approaches for learning programming using a computer laboratory context. Author in [6] presented a new approach for analyzing data, the authors suggested an approach that lights the interaction between learning by practice and learning of theory when students

[1]https://biographon.com/youtube-stats/[visited 13-9-2019].
[2]https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/). [visited 13-9-2019].

work programming within a laboratory. Author in [7] investigated the problematic relation between the learning of theory and learning of practice for novice programming student, the study discussed students' learning of practice, concepts, and specifically how these relate by utilizing phenomenography and variation theory. Author in [8] compared two approaches to producing structured, meaningful and useful descriptions of students' learning in labs.

There is no doubt that social media sites gain wider acceptability and usability in the whole world especially in third world countries that are controlled by variant values and restrictions. Our literature review focus on studying the impact of using social media sites on the academic performance of students in different countries that have miscellaneous cultures. This will be profitable for discovering the trends of diverse people toward embedding social media within learning.

The first selected research from Spain [9]. A sample of 1960 students who were studying one of two courses at the level of undergraduate and postgraduate level respectively. The study invested mixed qualitative (content analysis) and quantitative (descriptive analysis and ANOVA) design. 411 students of the sample carried out an activity based on social media participation and the remaining students carried out an activity based on traditional learning activity. The study showed that students who participated in social media-based activity had better performance than those who did not participate in the social media-based activity. Social media activity exerted a positive influence on the academic performance of students.

The second picked study from Saudi Arabia [10]. The article selected 60 Business Administration and management information students who are actively using social media. The study used quantitative as well as qualitative methods of research, the primary data acquired from 60 students. The variables of the study were: the frequency of using social media sites, the respondent's access to the internet and the usage and perception of social media. The paradigm of the study adopted Shikawa model. The results presented the dual impact of social media on the performance of students and it is necessary to approach adolescents' use of the social network with ultimate responsibility. The recommendation of the study was the institutions should focus on useful-prompting of social networks as a tool not only for communication and entertainment but also for learning.

From Pakistan [11] investigated the relationship between positive and negative characteristics of social media and the learning attitude of university students for sustainable education. The social Gratification theory was applied to examine students' behavior during social media usage. The study acclimatized the cluster sampling method and it identified 18 adversarial and constructive factors of social media from previous literatures. The positive factors were: creates awareness, lecture sharing, easy communicating, helps to maintain contacts, reduce the cost of purchasing books, improves confidence, improves social and communication skills, increases knowledge and reduce stress. The negative factors were lack of critical thinking, waste of time, disrupting

writing skills, leads to break up on study connectivity, increase cyber-bullying, creates laziness in students, and creates depression, problematic communications and health hazards in student's life. The researchers distributed 1013 questionnaires among bachelor's and master's degree students from five regions. The finding revealed that social media in Pakistan has a negative influence on a students' behavior as compared to positive aspects.

In Turkey, [12] studied the effectiveness of social learning networks. The influence of the Edmodo was investigated. The independent variables of the study were: cumulative grade point average, type of school, gender and the frequency of use of the internet and social networks. The dependent variables of the study were: achievement score and attitude towards online learning. The sample of study composed of 79 learners taking the courses of special methods in the department of computer education and instructional technologies in the education faculty. In addition to face to face lectures, the proposed method mixed group works, individual assignments and discussions under the guidance of teacher via Edmodo. The results presented the students who used Edmodo were successful than those who did not, Edmodo had positive contributions to learners' academic achievements.

The fifth research is a case study from India. Author in [13] investigated the academic use of social media applications by university students. The survey method was employed to investigate the sample comprised of 482 students. The results indicated that students have little exposure to use social media in their academic life. The recommendation of the study was social media needs to be given a new lease of life by the educators through separate curricula thus avoiding the fear.

The sixth study is from Malaysia [14]. The authors achieved a pilot study of undergraduate and postgraduate students at the university of Tekologi Malaysia (UTM). The variables observed in the study were: interactive with peers, interact with teachers, engagement, perceived ease of use and perceived usefulness, influence students' satisfaction, and academic performance of students. The research used the survey method, the prepared survey had distributed on 120 students. The analysis of data performed using SPSS application. The results showed that social media affects positivity and significantly collaborated learning with interaction with peers, interaction with supervisor, engagement, perceived ease of use, and perceived usefulness.

The seventh study is from Nigeria [15]. They surveyed students' social media networking sites usage and how it affects them. 539 students were completely filled the questioner. The hypothesis of the study is the frequent use of social networking sites by students has no effect on their studies. The collected data analyzed using frequencies; percentage and graph representation while the hypothesis was tested using chi-square. The study revealed no effect on the student who uses social media sites on their studies. The recommendation of the study to learners is to give importance to time management skills during using social media sites.

III. OBJECT ORIENTED PROGRAMMING 2 LAB COURSE CASE STUDY

Object-Oriented Programming 2 (OOP2) Lab is a mandatory course for all information technology students who enrolled in the Hashemite University. The lab is a synchronized course with the OOP2 course. In this course, object-oriented programming concepts are introduced using JAVA programming language, including inheritance, polymorphism, abstract classes, interfaces, API classes, event handling techniques, and exception handling concepts to handle run-time errors.

The OOP2 lab course is taught in every academic semester with three hours per week. Sections are distributed either Sunday, Tuesday and Thursday or Monday and Wednesday. The average number of students who register in the OOP2 lab during each semester is approximately 100 students.

A lab manual is prepared carefully by the professors of the OOP2 theoretical course and OOP2 lab instructors to accomplish course requirements. The OOP2 lab manual is composed of sixteen assignments and six appendices. Assignments must be completed by the students using the Net Beans IDE. Based on the guidance of the lab instructor, some assignments must be solved individually and others must be solved as workgroups. The appendices present general instructions that may be required by students during semesters such as read a file and write a file in java, syllabus, the hierarchy of GUI classes in java, etc. OOP2 lab the manual is continuously updated.

As a student register to the OOP2 lab, he/she had the ability to access the course account in Moodle. Moodle is enabled for all OOP2 lab students. Lab material, syllabus, announcements, and additional material are uploaded on the Moodle by the instructor. Students are encouraged to download lab material at anytime from anywhere.

In most semesters, it was noticeable that the academic results of students in OOP2 lab are weak and the performance of students is less efficient than the performance in other labs. Moreover, the direct assessment of students for the OOP2 lab course indicated the failure of achieving the objectives of course satisfactorily for an academic institution.

A broad discussion and analysis of results occurred between OOP2 lab course instructors to enclose the reasons for the imbalance of the academic results of students. The suggested seven reasons were concluded:

1) Poor understanding of the theoretical concepts of object-oriented programming, for example, the concepts of classes, objects, and inheritance.

2) Duration of the lecture is short and insufficient to analyze and solve the given problem.

3) Shortage of group work during lab lecture.

4) General weakness in the practical side of programming languages(labs).

5) The difficulty of Assignments.

6) Computer Labs environment is uncomfortable.

7) Finally, Java is considered a difficult programming language.

For our preliminary study, we asked fifty students who studied the OOP2 lab course in different semesters to answer the following question: "What is the main difficulty that faced you during studying object-oriented programming 2 labs?" Students must nominate one of the seven trapped reasons mentioned previously. The responses of answers to the questions are as shown in Table I.

Answers of students elucidate that the most three difficulties that faced students during lab are: Duration of the lecture is short and insufficient, Lack of group work during lab lecture and Poor understanding of the theoretical concepts of object-oriented programming, for example, the concepts of classes, objects, and inheritance. The opinions of students will help us to suggest a new teaching methodology for the OOP2 lab that will be demonstrated in the next section.

TABLE. I. RESPONSES TO PRELIMINARY STUDY

ANSWER CHOICES	RESPONSES
1-Poor understanding of the theoretical concepts of object-oriented such as classes, object, inheritance...etc.	18.00% 9
2-Duration of the lecture is short and insufficient to analyze and solve the problem.	26.00% 13
3-Lack of group work during lab lecture.	20.00% 10
4-General weakness in the practical side of programming languages(Labs).	14.00% 7
5- Difficulty of Assignments.	12.00% 6
6-Computer Labs environment is uncomfortable.	10.00% 5
7-Java is a difficult Language.	0.00% 0
TOTAL	50

IV. SOCIAL MEDIA METHODOLOGY FOR TEACHING OOP2 LAB

In order to enhance student's results in the OOP2 lab, a new approach and methodology are suggested to support the lab. A Facebook group for OOP 2 lab is created, lectures within labs are recorded as detailed videos during the practical real-life lectures when the lecturer and students analyze, design and solve the assignments.

Students within the OOP2 Facebook group can communicate with each other, discuss some complex programming exercise together, discuss some solutions and concepts that were examined within lectures, review some assignments before practical exams and criticize the level of exams and other phenomena occurs during lectures. The Facebook group helps in breaking the ice between lecturers and students and consolidates the cooperation between students.

The recorded lessons review briefly the important object-oriented theoretical concepts demanded by students to complete the problem. The videos contain useful practical experiences such as the most common syntax and logic errors carry out during writing code and how to deal with and correct these errors. The videos also contain experiences about reading, analyzing problems and how to deal with the

diagrams and components of the unified modeling language (UML). Several shortcuts within NetBeans IDE editor are explained within videos to speed up solving the given problems.

All videos are uploaded on the YouTube channel and on the HU Moodle. All YouTube lessons are easily inserted into Moodle to create an integrated e-Learning social media community for students. Fig. 1 represents the proposed e-learning social media community.

The availability of videos makes the students feel comfortable and creates the desire to review lessons again. OOP2 lab videos are recorded, edited and regenerated every semester using the Camtasia tool. Currently, the number of uploaded videos is 17. The average length for all videos is 36.61 minutes and the average number of views for all videos is 898. Fig. 2 represents the YouTube channel and sample of lessons.

Although Moodle enables the academic staff to upload videos, our proposed teaching strategy exploited YouTube for a major reason. The major reason is the Moodle system contains a set of limitations, including that the students who can watch the videos are only the students who registered the lab. The general aim of study is to improve the level of all students whether they are registered the lab, registered the theoretical course of lab, graduated students or any students in the world.
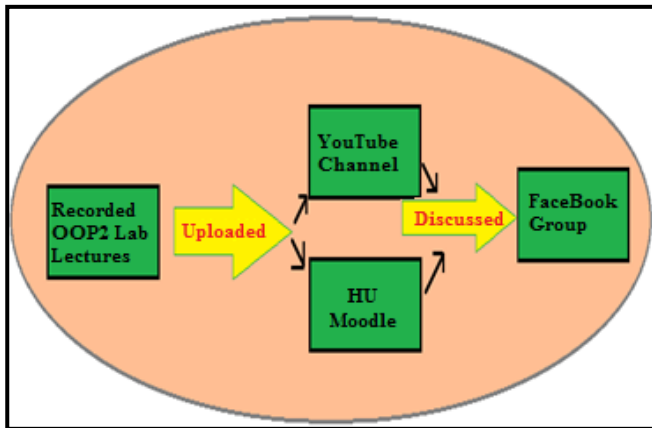

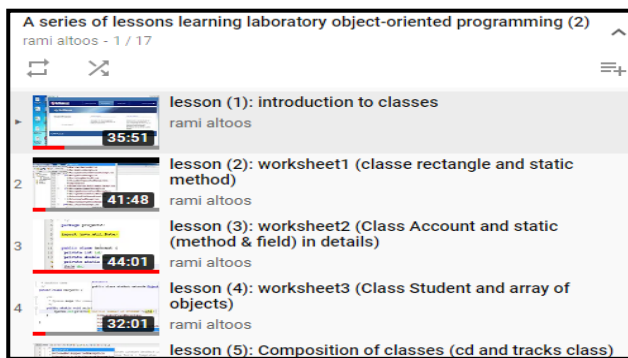Fig. 1. Integrated e-Learning Social Media Community.

Fig. 2. YouTube Channel and the Sample of Recorded Lessons.

V. RESULTS AND DISCUSSION

Our study focuses on measuring student's perception of their learning and how this learning is valued by different constituencies, at the same time the study examines the student's attitude toward using the YouTube channel and Facebook group in teaching OOP2 lab. In this research, a survey methodology is exploited to measure OOP2 lab course learning outcomes. Table II represents the OOP2 lab course learning outcomes (CLOs). A computerized tool is designed by the Hashemite University and it is used at the end of every course studied in information technology faculty. The tool measures the curriculum's course learning outcomes (CLOs) using a five-point Likert scale (Strongly Agree(SA), Agree(AG), Neutral(N), Disagree(DA), Strongly Disagree(SDA)). At the end of the semester and before one week of the final exam, the survey invitation is delivered to all students through the student's portal to answer the survey.

The CLO value is calculated as the following equation (1).

$$((count(SA)*5 + count(AG)*4 + count(N)*3 + count(DA)*2 + count(SDA)*1) \, / \, count(class)) \, / \, 5 \qquad (1)$$

Where,

count(SA) :- number of students who answered strongly Agree.

count(AG):- number of students who answered agree.

count(N):- number of students who answered neutral.

count(DA):- number of students who answered disagree.

count(SDA):- number of students who answered strongly disagree.

count(class):- number of students within the class.

TABLE. II. CLOs OF OOP2 LAB

	CLO Description	SA	AG	N	DA	SDA
CLO1	Apply object oriented programming concepts including classes, objects, inheritance, polymorphism, abstract classes, and interfaces in designing Java Applications.	☐	☐	☐	☐	☐
CLO2	Design Graphical User Interface using Java API classes	☐	☐	☐	☐	☐
CLO3	Create interactive application using event handling techniques	☐	☐	☐	☐	☐
CLO 4	Apply exception handling concept to handle run-time errors	☐	☐	☐	☐	☐

In this paper, we will compare the results of the survey before using the Facebook group and YouTube in the second semester of the academic year 2017 and after applying social media teaching approach in the academic year 2018/ first semester.

The results illustrated a remarkable increase in the percentage of achieving each objective of the course and also increasing the overall average of fulfillment for all objectives of the course. Table III represents the results before applying the social media methodology of teaching in the academic year 2017/second semester and the results of the academic year 2018/first semester after applying the social media approach in teaching. 10.49% is the percentage of enhancement.

In addition to the CLOs survey, we distributed simple survey to 50 respondents students to answer questions that are related to the new teaching approach. The simple questionnaire has been prepared to investigate whether students benefited from using YouTube Channel and Facebook groups. The questionnaire had three questions concerns about student's experience with the YouTube channel and Facebook group. The survey exploited the two-point Likert scale (YES-NO). The survey was conducted at the end of the semester after the students examine social media teaching methodology YouTube channel and Facebook group.

The results showed that 90.20% of the students agreed that OOP2 lab Facebook group contributes sufficiently to communicate with other colleagues and with the instructor. Fig. 3 represents the percentage of students who agreed that OOP2 lab Facebook group contributes sufficiently to communicate with other colleagues and with the instructor. As a result of this interaction and communication with others, students' academic results are enhanced and students are getting excited to ask, interact, and collaborate comfortably in a Facebook group rather than face to face communication.

In addition, students are willing to evaluate the teaching technique used in the classes, review the assignments questions, and discuss the level of exam, etc. 72.22% of the students agree that the Facebook group reinforces and supports criticizing the teaching technique and any other issue related to the OOP2 lab. Fig. 4 depicts the percentage of students who agree that the Facebook group support criticizing and reinforces the teaching technique and any other issue related to the OOP2 lab in the Facebook group.

TABLE. III. THE RESULTS BEFORE APPLYING THE SOCIAL MEDIA METHODOLOGY OF TEACHING IN THE ACADEMIC YEAR 2017/SECOND SEMESTER AND THE RESULTS OF THE ACADEMIC YEAR 2018/FIRST SEMESTER AFTER APPLYING THE SOCIAL MEDIA APPROACH IN TEACHING

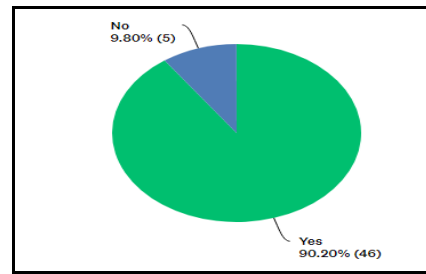| OOP2 CLOs	year 2017 Second Semester	year 2018 First Semester
CLO1	66.40%	86.15%
CLO 2	73.32%	85.13%
CLO 3	74.15%	79.66%
CLO 4	64.33%	69.28%
Average	69.55%	80.05%

Fig. 3. The Percentage of Students Who Agree that OOP2 Lab Facebook Group Contributes Sufficiently to Communicate with other Colleagues and with the Instructor.
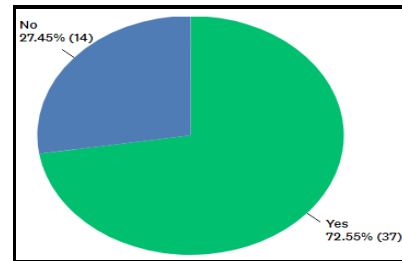

Fig. 4. The Percentage of Students Who Concur that Facebook Group Supports Criticizing the Teaching Technique and Any other Issue Related to the OOP2 Lab.

Regarding YouTube lessons, 86.27% of the students showed that the recorded videos contribute to enhance the understanding of object-oriented concepts. Fig. 5 depicts the percentage of students who showed that the recorded video contributes to enhancing the understanding of object-oriented concepts. This can be explained due to the use of the Arabic language "the native language of the students" as the explanation language of the recorded videos.

Using the Arabic language affects positively on exceeding the barrier of understanding foreign languages. YouTube can be considered as a convenient tool for mobile learning and since the wide segment of students at HU owns a mobile device, the YouTube channel is assumed as an ideal choice to develop the performance of students at the OOP2 lab. The videos are available at any time and students can view, rewind and replay the records many times as they need. The explanation language, permanent availability of videos and the ease of integrating records within the HU e-learning environment had improved the skills of taking-note, analyzing problems and focusing on the key points.
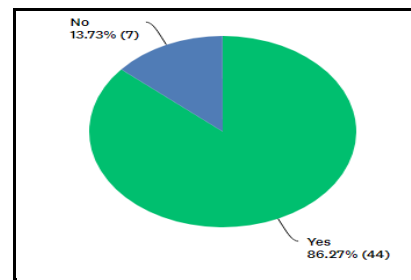

Fig. 5. The Percentage of Students Who Showed that the YouTube Recorded Video Contributes to Enhancing the understanding of Object-Oriented Concepts.

As a normal consequence of all improvements that have been performed to apply the proposed teaching methodology, the difficulty level of the exam has been increased. The difficulty level of exams, quizzes, and projects during the first semester of 2018 is increased to double compare with the exams, quizzes, and projects in the second semester of 2017. Though the direct assessment of students which measures directly the academic performance of students witness an improvement. The percentage of failure students in the second semester of 2018 dropped 0.8% compared with the percentage of failure during the second semester of 2017.

VI. CONCLUSION

Nowadays, social media networks are considered as another learning channel for a lot of students. Our study exploited the features included within Facebook and YouTube to enhance the academic performance of practical Labs. Our study invests YouTube channel to share video resources with students and Facebook is invested as a platform to express opinions and exchange ideas among students. The social media teaching methodology proves its success in improving the academic performance of students. In the future, our methodology will be extended to include more social media networks such as snap chat and Instagram to study their impact on the academic performance of students.

REFERENCES

[1] Abousaber, I., Oueder, M. (2018). A Study on the Impact of Social Media Usage on Student Academic Performance: University of Tabuk an Example. American Scientific Research Journal for Engineering, Technology, and Sciences (ASJETS), 40(1), pp. 77-88.

[2] Amin, Z., Mansoor, A,. Hussain, S., and Hashmat,F., (2016).Impact of Social Media of Student's Academic Performance.International Journal Business and Management Invention, 5(4), pp. 22-29.

[3] Asemah, S., Okpanachi, R. (2013). Influence of social media on the academic performance of the undergraduate students of Kogi State University, Anyigba, Nigeria, Research on Humanities and Social Sciences, 3(12), pp. 90-96.

[4] Owusu-Acheaw, M., Larson, A. (2015). Use of social media and its impact on academic performance of tertiary institution students: A study of students of Koforidua Polytechnic, Ghana, Journal of Education and Practice, 6(6), pp. 94-101.

[5] Mensah, S., Nizam I. (2016). The impact of social media on students' academic performance – a case of Malaysia Tertiary Institution. International Journal of Education, Learning and Training, 1(1), pp. 14-21.

[6] Thuné, M., & Eckerdal, A. (2018). Analysis of Students' learning of computer programming in a computer laboratory context. European Journal of Engineering Education, 1-18.

[7] Eckerdal, A. (2015). Relating theory and practice in laboratory work: A variation theoretical study. Studies in Higher Education, 40(5), 867-880.

[8] Bernhard, J., & Carstensen, A. K. (2015). Analysing and modelling engineering students' learning in the laboratory: a comparison of two methodologies. In The 6th Research in Engineering Education Symposium (REES 2015), July 13-15, 2015, Dublin, Ireland (pp. 620-628).

[9] Santoveña Casal, S. (2019). The Impact of Social Media Participation on Academic Performance in Undergraduate and Postgraduate Students. International Review of Research in Open and Distributed Learning, 20(1).

[10] Talaue, G. M., AlSaad, A., AlRushaidan, N., AlHugail, A., & AlFahhad, S.(2018).The Impact of Social Media on Academic Performance of Selected College Students. International Journal of Advanced Information Technology (IJAIT) Vol. 8, No.4/5. R.

[11] Abbas, J., Aman, J., Nurunnabi, M., & Bano, S. (2019). The Impact of Social Media on Learning Behavior for Sustainable Education: Evidence of Students from Selected Universities in Pakistan. Sustainability, 11(6), 1683.

[12] Durak, G., Cankaya, S., Yunkul, E., & Ozturk, G. (2017). The Effects of A Social Learning Network on Students'performances and Attitudes. European Journal of Education Studies.

[13] Subramani, R. (2015). The academic usage of social networking sites by the university students of Tamil Nadu. Online Journal of Communication and Media Technologies, 5(3), 162.

[14] Al-rahmi, W. M., Othman, M. S., & Musa, M. A. (2014). The improvement of students' academic performance by using social media through collaborative learning in Malaysian higher education. Asian Social Science, 10(8), 210.

[15] Camilia, O. N., Ibrahim, S. D., & Dalhatu, B. L. (2013). The effect of social networking sites usage on the studies of Nigerian students. The International Journal of Engineering and Science, 2(7), 39-46.