Teaching Ophthalmology to Undergraduate Medical Students Using Facebook Groups Guided by Institutions

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Abstract

Aim: To assess E-learning's feasibility and efficacy in teaching ophthalmology via a supervised Facebook closed group in a single medical University program at Mutah University.

Design: A cross-sectional survey.

Methods: A cross-sectional study was conducted at Mutah University by the article's authors between November 2019 and January 2020. An online survey involved only the members of the ophthalmology Facebook closed group (ophthalmology 2011-2012). The study assessed social networks' feasibility as an added tool in teaching short medical courses like ophthalmology. All of the participants were medical students who successfully passed the ophthalmology course at Mutah University and were members of the group at the time of study conduction. The 20-item questionnaire was developed by authors and designed in a document form using SPSS software.

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The questionnaire was distributed by direct messaging to the group members. At the study time, 1,364 questionnaires were sent via Facebook to students. Questions were divided into general information about students, information about social media use, and specific questions about students' interaction with the teaching ophthalmology group. Moreover, other items were designed to compare institutional guided Facebook groups' level of benefit to peer-monitored medical groups.

Results: Over 87.9% of students felt that the group was useful. Besides, 73% of students thought the group helped them to achieve a better outcome at the exam. The questionnaire return response rate was 52.8% (720 responses). 58% of medical students were checking their social media more than five times a day. Nevertheless, only 26.7% were likely to get involved in educational networks. Regarding Mutah's ophthalmology group teaching, 20.4% of students were daily users during the ophthalmology courses. 28.3% check it up every 2-3 days, and 16.9% check it once a week. Concerning activity and comment sharing, 52.2% had good activity and did their daily homework and assignments. However, 47.8% never entered a comment on the group.

Points of strength were case discussion, explanatory videos, and pictures. The group facilitated the transfer of the information regarding lecture notes and announcements. However, some believed it was a source of distraction.

Conclusion: Facebook closed groups monitored by tutors are a useful educational asset tool for teaching minor courses in medical universities. It facilitated the delivery of information, enhanced tutor-student and student-student interaction.

Keywords: Education, e-learning, Facebook, social media, medical students, ophthalmology course.

تعليم طب العيون باستخدام مجموعات مغلقة ومحكمة من قبل الجامعة عبر قناة التواصل الاجتماعي علي Facebook كأداة مكملة لتدريس طلاب الطب

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ملخص

هدف الدراسة: تقييم جدوى وفعالية التعلم الإلكتروني في تدريس طب العيون من خلال مجموعة مغلقة على Facebook تحت إشراف مدرسي مادة طب العيون في جامعة مؤتة.

التصميم: دراسة استبيانيه، مسح مقطعي.

الأســـاليب: أجريت دراسة مقطعية في الأردن بين تشرين الثاني (نوفمبر) 2019 وكانـــون الثانـي (يناير) 2020، باستخدام إستبيان عبر الإنترنت، واشتملت فقط على طلاب طب من السنة الخامسة، ممن اجتازوا بنجاح مساق طب وجراحة العيون. كل الطلاب المشاركين في الاستبيان هم أعضاء في مجموعة طب العيون المغلقة على فيسبوك لجامعة مؤتة. تم تقييم جدوى استخدام هذه الشبكة الاجتماعية في تدريس طب العيون كونها أحد المساقات السريرية القصيرة في جامعه مؤتة. الاستبيان مكون من 20 سؤال تم تصميمة على نماذج جوجل.

تم توزيع الاستبيان عبر الفيس بوك على أعضاء المجموعة (1،364) عضو. تم تقسيم الأسئلة إلى معلومات عامة عن الطلاب ووسائل التواصل الاجتماعي بالإضافة إلى أسئلة محددة حول تفاعل الطالب مع المجموعة التدريسية الخاصة بطب العيون. علاوة على ذلك، تم تصميم أسئلة أخرى لمقارنة مستوى الاستفادة من مجموعات مماثلة علىFacebook.

النتائج: شعر أكثر من 80٪ من الطلاب أن المجموعة كانت مفيدة. ووجد أن حوالي 73% من الطلاب قد استفادوا من المجموعة في تحقيق معدلات مرتفعة بماده العيون بسبب مشاركتهم الفاعلة في المجموعة. بلغ معدل الاستجابة للاستبيان 52.8٪ أي ما يعادل 720 استجابة. بالنسبة للجزيء الغير أكاديمي تبين أن 58٪ من طلاب الطب يتفقّدون وسائل التواصل الاجتماعي الخاصة بهم أكثر من خمس

مرات في اليوم. ومع ذلك، فإن26.7٪ من طلاب الطب ينخرطون في الشبكات التعليمية. مما حفز الأساتذة المشاركين في الدراسة على تطوير المجموعات المغلقة لتحفز الطلاب على الانخراط الفاعل في التعليم عن بعد على مدة أكثر من 10 سنوات وتوجيه اهتماماتهم الاجتماعية إلى اهتمامات علمية تساعدهم في مهنتهم. من خلال الاستبيان وجد أن خُمس الطلاب، (20.4٪) من الطلاب مواظبين على استخدام المجموعة حتى بعد التخرج بشكل يومي. و 28.3٪ يزورون الموقع كل يومين الي 3 أيام. و16.9٪ يزورون المادة العلمية على الموقع مرة واحدة في الأسبوع. بالمجمل هناك ما يقارب ثلثي الطلاب باتصال دائم مع المدرسين حتى بعد التخرج مما يعطيهم فأئده التعليم المستمر في مادة طب العيون.

فيما يتعلق بمشاركة الطلاب الفاعلة في العملية التعليمية على الأسئلة والتمارين في المجموعة المغلقة، وجد أن52.2% هم مشاركين مواظبين وفاعلين، بينما 47.8٪ من الطلاب غير مشاركين في حل أي من الأسئلة الإلكترونية وكانوا ينتظرون المعلمين لحل الأسئلة.

أعجب الطلاب بطريقة مناقشة الحالات الطبية ومقاطع الفيديو التوضيحية والصور. سهلت المجموعة نقل المعلومات المتعلقة بملاحظات المحاضرات والإعلانات المتعلقة بالدوام اليومي مع المجموعات التي تليها. بعض الطلاب اعتقدوا أن المجموعات لم تناسبهم وكانت مصدر للإلهاء.

الخلاصة: تُعد المجموعات المغلقة على Facebook التي يراقبها المعلمون ومديرو البرامج طريقة تعليمية فعالة للدورات الثانوية في الجامعات الطبية لأنها تسهل إيصال المعلومات، وتعزز التفاعل بين المعلم والطالب والتفاعل بين الطلاب أنفسهم.

Introduction:

E-learning or web-based learning is an educational intervention or program that is mediated electronically through the Internet (Vaona, 2018). Social media is a daily growing platform nowadays that has a role in E-learning. It has shaped the world we live in, from how we think and what we see. It can influence and connect people regarding distance, ethnicity, age, gender, and stances. Facebook is one of the leading top three most used social networks worldwide. It has developed into a tool for exchanging knowledge for many different fields. (Krishnamohan, 2017 & Guraya, 2018)

Millions of people use Facebook all over the world. Besides personal use among users, many companies and commercial service providers depend on their Facebook pages to attract more customers. This fact applies to educational institutions as well, which are looking for a larger number of students. The medical field is one example, as doctors and students worldwide share the Facebook platform for delivering and receiving information, cases, questions, and lectures. (Alsuraihi, 2016 & Alshiekhly, 2015)

In 2012, a study carried out in the USA showed that about 96% of medical students use Facebook regularly, and about 50% of the health care providers continue to use it after graduation (Muhlen, 2012). These rates are expected to be higher nowadays. Many medical schools have their own Facebook pages from which students can get up-to-date information. In contrast to regular websites, students are easily notified about the upcoming events, and a larger number of students are reached in a shorter time (Vogelsang, 2018). Instructors on Facebook can create an open or closed group for people with the same ideas, professionalism, or education to share or exchange information and experiences. In closed groups, only members who have the same interest can share their knowledge or ideas under the supervision of the group admin. Moreover, to ensure that all members suitable to join, security questions can be designed.

Unlike most medical branches, ophthalmology has a specific particular jargon in medicine, and it is a very challenging and demanding course

during medical school. Besides, being only two weeks course at Mutah University, we consider it tougher on students as the course duration is slightly shorter than average. Therefore, the authors have created an institutional monitored Facebook group to help the students adapt more efficiently and comfortably to the course.

Herein, the authors are assessing this Facebook group as a method of teaching ophthalmology for the last nine years. Assessing peer teaching and peer's encouragement, tutor guidance, insight into lectures and cases, case discussions, interpersonal communication, promoting group collaboration, and language development.

Method and Materials

A cross-sectional study was conducted at Mutah University (Jordan) between November 2019 and January 2020, using an online survey and involved only the members of the Facebook closed ophthalmology group at the Mutah University to assess the feasibility of using this social network in teaching.

All group members are medical students or medical graduates from Mutah University who took the ophthalmology course during their 5th year. The tutors of the program started the group in 2011, and it currently contains 1,364 medical students.

The study assessed the efficacy of Facebook as a teaching tool for the undergraduate ophthalmology course. The questionnaire was developed by authors and designed in a document form, using SPSS software. The survey consisted of 20 questions and tackled three parts. The first part was demographic information about the students, such as the age, year of graduation, and the completion of high educational training in ophthalmology. The Second part tackled the frequency of using the Facebook group during the course or after. It assessed the positive impact of the group on members and its role in improving their peer teaching and peers' encouragement, tutor guidance, insight into lectures, challenging cases, case discussions, interpersonal communication, promoting group

collaboration, and language development. In addition, it assessed the presence of any negative impact. The last part evaluates the level of benefit from institutional guided Facebook groups and comparing it to peer-monitored medical groups that do not have any institutional guidance. The extent of benefit, privacy protection, and distraction from the group was expressed on a scale from 1 to 10. It reflects that one being the least and 10 the most. For the sake of simplicity, the scale was presented as (1-4), (5-7), and (8-10).

The authors directly sent messages containing the survey to all members of the group who completed the ophthalmology course between 2011 and 2019. All participants were members of the closed Facebook group. Over a thousand electronic surveys were distributed to participants urging them to complete the survey.

Statistics

The results and statistics were automatically analyzed and generated, in the form of bar and pie graphs by the Google forms software. (Google LLC, CA 94043, United States).

Ethics

The medical ethics committee at Mutah University reviewed the research design and exempted the study from additional ethical approval (approval number 201832). The confidentiality and anonymity concerning electronic data were maintained throughout the study. Any names or potentially identifying information were removed before analyzing the data.

Results

The online survey conducted on medical students allowed us to understand some of the problem's students encountered while using technology to support their E-learning. Furthermore, it gave us feedback on how to improve some critical points in the future.

Of the 1,364 group members, 720 members completed the survey successfully, making a response rate of 52.8%. Males (55.1%) responded to the survey more than females (44.9%). The majority of responders were

between 21 and 23 years (71.4%). Already graduated students constituted 46.9% of the total responders, and the majority of responders are expected to graduate between 2019 and 2020. Table 1.

Table (1) Participants' characteristics.

Demographic variable	**Overall (n= 720)**	
	Frequency	**Percentage**
Age		
21-23	514	71.4%
24-27	174	24.2%
>28	32	4.4%
Gender		
Males	397	55.1%
Estimated year of graduation		
2018	52	7.2%
2019	137	19.1%
2020	193	26.8%
Already graduated	338	46.9%

It was found that 58.2 % of medical students were checking their social media more than five times a day, and 75.1% were checking social media platforms at least once a day. Approximately 71.3% of responders had their friends on social media platforms. Despite the high number of students involved in social media platforms, the likely hood of being involved in educational programs was limited to 26.7%.

Regarding the time spent on social media platforms, 26.5% of medical students spent more than four hours a day, 44.9% spent between one to three hours a day, and 28.6% allotted only a few hours a week. Regarding the ophthalmology group, it was found that 20.4% were daily users during

the ophthalmology course, while 15.4% never used the group. Stupendously, the vast majority of students were very reluctant to send comments on the group or add photos as 47.8% never entered a comment on the page, and 37.5% were good commenters, who used to comment from one to four times a week. Many students were optimistic about using the group after graduation, 39.2% expected to visit the group once a week or more, and 36% once a month. Table 2.

Table (2) Interactivity of students with social network websites and the Facebook ophthalmology group.

Students' activities	**Frequency of the activities**									
	More than 5 times a day		**Once a day**		**Once or more a week**		**Once a month**		**Not at all**	
	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Checking social network websites	58.2%	419	16.9%	122	19.9%	143	5%	36	0%	0
Checking social network websites for educational purposes	19.4%	140	14.4%	103	38.6%	278	27.6%	199	0%	0
	Everyday		Every 2-3 days		Every week		Once a month		Not at all	
	%	n	%	n	%	n	%	n	%	n
Checking the group during the course	20.4%	146	28.3%	204	16.9%	122	18.9%	136	15.5%	112
Commenting on posts from the group during the course	0.8%	6	13.9%	100	27.2%	196	10.3%	74	47.8%	344
Participating in posting photo/video/status on the group if they have the option	1%	7	8.7%	63	22.1%	159	12.1%	87	56.1%	404
Checking the group after graduation	0.4%	3	6.5%	47	39.2%	282	36%	259	17.9%	129

The students found the group very useful during the course, as 87.9% responded by giving the group 5/10 or more, being 1 as useless, and 10 as very useful. Concerning privacy protection during the group use, 94.5% gave a mark of 5/10 or more (one being uncomfortable and ten being very comfortable regarding privacy protection). Around 50.0% of students thought that case discussions were the most beneficial, followed by explanatory notes, videos, pictures (39.9%), and lectures and book guidance (10.1%).

Few questions were designed to understand the effect of Facebook group on the interpersonal relationship between colleges in a better way, and whether Facebook can be a source of distraction during study time. About 83.6% of the students felt that the Facebook group facilitated the transfer of the information regarding lecture notes and announcements, giving it a mark of 5/10 or more. A comparable number (84.8%) felt that it facilitated group discussion and group studying, and 41.9 % of students thought that it helped them to achieve a high mark in the exam giving it a mark of 8/10 or more. Finally, when students were asked about the Facebook group as being a source of distraction, responses were evenly distributed. Around 33.9% thought it was very distracting, giving it a mark of 8/10 or more (Being 10 as most distracting), 30.6% were equivocal, giving it a score of 5-7 out of 10, and 35.7% felt that it did not pose any source of distraction giving it 1-4 out of 10. Table 3.

Table (3) Students' opinions regarding the Facebook ophthalmology group

Key points in the Facebook ophthalmology group evaluation	Evaluation Score					
	[1-4]		[5-7]		[8-10]	
	%	n	%	n	%	n
The expediency of the course	12.1%	87	42.3%	305	45.6%	328
Students activity during the course	14.3%	103	43.3%	311	42.4%	306
Feeling of privacy	5.5%	40	40.8%	293	53.7%	387
Feasibility of case discussions	10.3%	74	39.3%	283	50.4%	363
Contribution in interpersonal communication and information exchange	16.4%	118	46.9%	338	36.7%	264
Contribution in improving collaboration skills and group study	15.2%	109	50.9%	367	33.9%	244
Effect on exam performance	12.5%	90	45.6%	328	41.9%	302
Amount of distraction compared to the classroom	35.7%	256	30.6%	220	33.9%	244
Suitability for posting personal rather than educational issues	37.7%	271	38.6%	278	23.7%	171

Discussion:

Our experience in using Facebook as a teaching tool was unique at Mutah University. Strict privacy of the group allowed better control over students' activity and better monitoring. To the best of our knowledge, this

is the most extended cohort having an institution using Facebook as a teaching tool in medical universities, and the first to evaluate its efficacy in teaching ophthalmology worldwide.

In Germany, a previous study conducted by Nicolai L et al. to identify the role of using Facebook groups for studying purposes. It found that Facebook groups appear to be a beneficial tool for undergraduate medical students at the University of Ludwig-Maximilians to complete the curriculum and to discuss contents related to medical topics (Vogelsang, 2018). Another study revealed that undergraduate medical students use peer monitoring Facebook groups to seek help from their colleagues for many issues related to studying and preparing for exams. Moreover, it encourages formal mentoring programs to integrate social media into the educational process (Pinilla, 2018). These studies are in the same line with ours and strongly support the idea of monitored Facebook groups as an effective tool for teaching medicine.

A study similar to ours carried out at the University of Cardiff, the UK, aimed to assess social media use to support the learning of a small group of undergraduate medical students. It showed that social media, particularly Facebook, was very beneficial for this purpose (Alshiekhly, 2015 & Gonzalez, 2017 & Ali, 2016 & Alshiekhly, 2015 & Zanon, 2018 & Cole et al, 2018). Besides, a recent study conducted at the University of Arkansas for Medical Sciences was parallel to ours and found that Facebook discussion groups were an effective and efficient way to develop a good relationship between undergraduate medical students and teachers (Henry, 2020). Using social media as an educational tool needs more cooperation from medical institutions. In 2018, a survey carried out in Europe (German-speaking countries) showed that web-based media play a minor role in the medical education process. The main reasons against using web-based media in education were the lack of assistance staff and the amount of time required to conduct the process (Nicolai et al, 2017). From our point of

view, using Facebook as an educational tool can overcome these limitations.

In 2016, A meta-analysis by Guraya SY et al. revealed that about 75% of medical students admit using online social networking sites on a daily basis, and approximately 20% of those students use it for educational purposes (Alshiekhly, 2015 & Gonzalez, 2017 & Ali, 2016 & Alshiekhly, 2015 & Zanon, 2018 & Cole et al, 2018). Facebook use is wide spread among health care professionals (45-96% have a Facebook profile) of all academic levels, and they use it for preparation for exams, online sharing of materials, information exchange, and organization of meeting for educational purposes (Arnbjörnsson, 2014). According to our study, 75.1% of students spend much time daily (71.4% spend >1 and 26.5%> 4 hours a day) on social media networks, and only 26.7% of them were involved in educational programs. These results are alarming. Thus, the issue requires prompt intervention from universities and teaching institutions to work hand in hand to make this wasteful period more fruitful for students. Groups related to universities can make teaching very interactive and minimize the time wasted on other unrelated stuff.

Having a Facebook group related to Mutah University gives it many advantages. Firstly, students have confidence in the content, so there is no need to question the material. Many previous studies mentioned the lack of reference as a significant drawback on Facebook teaching in medical groups. This lack creates confusion among students within the teaching group (Alshiekhly, 2015 & Gonzalez, 2017 & Ali, 2016 & Alshiekhly, 2015 & Zanon, 2018 & Cole et al, 2018). Secondly, since the group is a part of the ophthalmology curriculum, this will make students more formal and reluctant to share personal and unnecessary contributions. As a result, peer education will be more focused and fruitful.

Using the latest pixel technology offered by Facebook, university professors can track each student's performance independently over three months. By this, the tutor can monitor students who have a poor performance during the course or who are inattentive (DUMAN et al, 2015

& Hootsuite 2019). Moreover, using Facebook gave tutors more time for online teaching, as tutors are available to their students at any time. The personal communication between the students and the tutor ensures better educational results by providing a longer time to digest the material. In contrast to creating an institutional website, creating a Facebook group for teaching is cheap, rapid, and needs little technical follow up. Website designing can be expensive and need advanced technical knowledge, which can be very time-consuming.

Facebook, like any other social network, has drawbacks and disadvantages. In our study, students mentioned that Facebook could be a source of nuisance and distraction, which was limited to some degree by asking tutors to post in certain hours of the day between 2 pm and 4 pm. Another concern regarding privacy rises since personal information from students might be collected. Students' privacy was protected by allowing group joining to the university students only. In order to ensure this, some security questions were added to prevent other people from getting access to vital information of the students (Jha et al., 2016 & Al-Dubai et al., 2013)

Our Facebook group was convenient when the national lockdown was enforced in March and April 2020 during the COVID-19 outbreak.

Communication with students was effortless at the time of the quarantine. Professors from the ophthalmology department gave lectures via life sharing. Tutors shared their slides as Albums on Facebook, which helped students prepare well before live lectures.

Strengths and limitations:

This study has many strengths represented by the considerable number of participants and the disciplined selection of the surveyed group, which reduces the possibility of participation from outside the group. About 47% of responders had already graduated, which gave more credibility to their answers. Moreover, the same module directors were responsible for

teaching over the last eight years. This fact provided all participants with the same experience and decreased bias. There are some limitations to this study. First, although responders' identities are unknown, some students may try to satisfy their tutors rather than reflect their own opinions.

Second, other students may have a previous unfavorable experience during the courses or exams. Therefore, their responses will be directed by negative experiences. In either case, this may lead to a bias.

In conclusion, Facebook Closed groups might be a powerful tool in the teaching process of short medical courses like ophthalmology. It helps students to achieve great benefits from the material provided in a short period.

References:

Vaona, A., Banzi, R. & Kh, K. (2018). E-learning for health professionals (Review) Summary for findings for the main comparison. Cochrane Databse Syst Rev:1–82.

doi:10.1002/14651858.CD011736.pub2.www.cochranelibrary.com

Krishnamohan, S., Prabakaran. S & Singh, Z. (2017). Efficacy of health education using Facebook to promote healthy lifestyle among medical students in Puducherry, India: A non-randomized controlled trial. J Clin Diagnostic Res;11:LC07-LC10. doi:10.7860/JCDR/2017/27385.10259

Guraya, S., Almaramhy, H. & Al-Qahtani, M. (2018). Measuring the extent and nature of use of Social Networking Sites in Medical Education (SNSME) by university students: Results of a multi-center study. Med Educ Online;23. doi:10.1080/10872981.2018.1505400

Alsuraihi, A., Almaqati, A. & Abughanim, S. (2016). Use of social media in education among medical students in Saudi Arabia. Korean J Med Educ;28:343–54. doi:10.3946/kjme.2016.40

Alshiekhly, U., Arrar, R. & Barngkgei, I. (2015). Facebook as a learning environment for teaching medical emergencies in dental practice. Educ Health (Abingdon);28:176–80. doi:10.4103/1357-6283.178609

Muhlen. M, & Ohno-Machado L. (2012). Reviewing social media use by clinicians. J Am Med Informatics Assoc;19:777–81. doi:10.1136/amiajnl-2012-000990

Vogelsang, M., Rockenbauch, K. & Wrigge, H. (2018). Medical education for “Generation Z”: everything online?! - An analysis of Internet-based media use by teachers in medicine. GMS J Med Educ;35:1–20. doi:10.3205/zma001168

Pinilla, S., Nicolai, L. & Gradel, M. (2015). Undergraduate Medical Students Using Facebook as a Peer-Mentoring Platform: A Mixed-Methods Study. JMIR Med Educ 2015;1:e12. doi:10.2196/mededu.5063

Gonzalez, R., Amer, S. & Yahia, N. (2017). Facebook Discussion Groups Provide a Robust Worldwide Platform for Free Pathology Education. Arch Pathol Lab Med;141:690–5. doi:10.5858/arpa.2016-0369-OA

Ali. A. (2016). Medical students' use of Facebook for educational purposes. Perspect Med Educ;5:163–9. doi:10.1007/s40037-016-0273-5

Alshiekhly, U., Arrar, R. & Barngkgei, I. (2015). Facebook as a learning environment for teaching medical emergencies in dental practice. Educ Heal Chang Learn Pract;28:176–80. doi:10.4103/1357-6283.178609

Zanon, M., Altmayer, S. & Pacini, G. (2018). Facebook as a tool to promote radiology education: Expanding from a local community of medical students to all of South America. Radiol Bras;51:242–7. doi:10.1590/0100-3984.2017.0112

Cole. D, Rengasamy. E. & Batchelor, S. (2017). Using social media to support small group learning. BMC Med Educ;17:1–7. doi:10.1186/s12909-017-1060-7

Henry, D., Wessinger, W. & Meena, N. (2020). Using a Facebook group to facilitate faculty-student interactions during preclinical medical education: A retrospective survey analysis. BMC Med Educ;20:1–10. doi:10.1186/s12909-020-02003-w

Nicolai, L., Schmidbauer, M. & Gradel, M. (2017). Facebook Groups as a Powerful and Dynamic Tool in Medical Education: Mixed-Method Study. J Med Internet Res;19:e408. doi:10.2196/jmir.7990

Arnbjörnsson, E. (2014). The Use of Social Media in Medical Education:

A Literature Review. Creat Educ;05:2057–61. doi:10.4236/ce.2014.524229

Duman, I., Demirci, N. & Şekercioğlu, A. (2015). University Students' Difficulties And Misconceptions On Rolling, Rotational Motion And Torque Concepts. Int J New Trends Educ Their Implic;6:46–54.

Hootsuite. (2019). The Facebook Pixel: What It Is and How to Use It. Blog Published Online First:.https://blog.hootsuite.com/facebook-pixel/

Jha, R., Shah, D. & Basnet, S. (2016). Facebook use and its effects on the life of health science students in a private medical college of Nepal. BMC Res Notes;9:1–8. doi:10.1186/s13104-016-2186-0

Al-Dubai, S., Ganasegeran, K, & Al-Shagga, M. (2013). Adverse health effects and unhealthy behaviors among medical students using facebook. Sci World J. doi:10.1155/2013/465161