

HOW WE TEACH | *Generalizable Education Research*

Can Facebook pages be a mode of blended learning to supplement in-class teaching in Saudi Arabia?

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Anwar K, Sajid MR, Cahusac P, Shaikh AA, Elgammal A, Alshedoukhy A, Kashir J. Can Facebook pages be a mode of blended learning to supplement in-class teaching in Saudi Arabia? *Adv Physiol Educ* 41: 472–477, 2017; doi:10.1152/advan.00065.2017.—The aim of this study was to examine the potential of a self-designed Facebook page on Neuroscience, to supplement in-class teaching as a mode of blended learning. Posts were split into multiple choice questions (MCQs), general interest articles, neuroscience-related external links and resources, and lecture notes and PowerPoint presentations. The study was divided into three distinct phases: before, during, and after the Neuroscience block. Student responses were evaluated via a self-developed questionnaire. Grades achieved by students undertaking the block in 2015 and 2014 were recorded, as were the grades achieved by the same cohort in concurrent blocks in the same year of study. Results showed that ~80% of students reported that use of the page enhanced their overall subject knowledge and exam preparation. Highest page activity occurred during the Neuroscience block. Peak activity occurred directly before summative assessments, with MCQ posts having the highest impact. The cohort of students with access to the Facebook page achieved better grades in the block compared with the previous cohort, despite similar average performance in other subjects. We demonstrate the utility of Facebook as a powerful tool for undergraduate education, supplementing in-class teaching, and assisting in exam preparation, potentially increasing average student performance.

blended learning; Facebook; neuroscience; phobia; physiology

THE BACHELOR OF MEDICINE, Bachelor of Surgery (MBBS) program at the College of Medicine at Alfaisal University follows a problem-based, self-directed, 3-yr undergraduate curriculum, followed by 2 yr of clerkship and 1 yr of internship. Problem-based learning (PBL) is integrated with appropriate clinical skills training and community-based experiences (5). Alfaisal University also employs team-based learning (TBL) as a core instructional strategy in the first year of the medical school. The College of Medicine employs an integrated hybrid undergraduate curriculum,

where a “spiral” approach of education is employed. Modules in *years 1–3* are system-based “blocks,” incorporating a focus on pathophysiological mechanisms with vertical integration of clinical subjects (13). One of the blocks in *year 2* is Neuroscience (NEU), which, in particular, is a difficult subject in undergraduate medicine, with phobias associated with its study among medical students (2, 18). A prerequisite of being able to undertake the NEU block is to have passed all blocks in the first year of study.

E-learning teaching methodology employs web-based technologies to enhance knowledge and performance, offering learners control over content, sequence, pace of learning, time, and media (4, 6, 8, 9). Most studies exploring the use of e-learning are based on learning management systems, such as Blackboard and Moodle. Recently, social networking websites, including Twitter and Facebook, have become a mainstream form of interaction, spanning almost every age, career, and socioeconomic interest group. Such forums are being utilized for endeavors ranging from philanthropic initiatives to raising healthcare awareness (9). Facebook pages concerning various medical conditions, including forms of cancer, hypertension, and diabetes, already exist, with a credible number of users, including patients and their families, researchers, and clinicians (4, 11).

However, the utility of social networking sites as a consistent means of learning in undergraduate medical curricula remains a prospect that is much underinvestigated. The most popular social media site is currently arguably Facebook, encompassing 1.44 billion monthly and 936 million daily active users (14, 16). Indeed, >90% of medical students spend a considerable amount of time using Facebook on a daily basis (7, 8). Few studies exist that explore the utility of Facebook as a modality for blended learning to supplement traditional undergraduate medical education and the potential of such platforms to overcome physical barriers to teaching and providing content that is easily accessible and promotes interactivity (6, 7).

To examine the utility of employing social networking platforms as a blended learning aid in the undergraduate curriculum, we developed a Facebook page supplementing didactic classroom lectures, incorporating e-learning mate-

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rial, including general quizzes, multiple choice questions (MCQs), online lectures, and external reference material. The present study aimed to evaluate the effectiveness of this Facebook page as an e-learning tool for undergraduate medical students.

MATERIALS AND METHODS

Brief curriculum and block description. Running over 10 wk during the second year of undergraduate study, the NEU block at Alfaisal is fully integrated, covering anatomy and physiology of the central and peripheral nervous systems, alongside applied concepts and disease processes. An additional clinical skills program runs concurrently. Block contents are delivered through multiple formats, including lectures, PBL sessions, tutorials, laboratory sessions, and clinical skills sessions. Other blocks of study during the second year of study include Endocrine and Reproductive, Head and Neck, Basic Pathology and Microbiology, and Skin blocks.

We regularly use Moodle as a learning management system at Alfaisal University. However, to assess and evaluate the utility of Facebook as a supplementary teaching resource, our designed Facebook page was kept separate from Moodle.

Page design. A Facebook page was developed, supplementing classroom learning objectives for students undertaking the NEU block, termed “Interactive Neuroscience” (1). The types of posts made were split into four general categories: MCQs, general interest articles (covering topics not directly related to neurosciences), neuroscience-related external links and resources (covering topics directly related to neurosciences, such as external links to research articles and study resources), and lecture notes and PowerPoint material (including lecture PowerPoint slides and tutor notes). Posted MCQs were related to the various topics covered in the NEU block, which students were invited to answer and comment on. Correct answers with a brief explanation were posted on the page after 24–48 h. Student participation was voluntary and ungraded, and students were allowed to post content under moderation by the page manager.

Response evaluation. Student responses to the Interactive Neuroscience page were evaluated via student feedback using a self-developed questionnaire. The questionnaire (see APPENDIX) was uploaded onto surveymonkey.com, and the link emailed to students. The data were filled anonymously, and, on completion, the data were retrieved and analyzed using Microsoft Excel. A total of 14 questions were asked, in addition to 3 questions regarding age, sex, and year of study. The questionnaire focused on evaluating student perception regarding the aforementioned pages, assessing student access frequency, efficacy in complementing student access to performance in PBL, comprehension of didactic teaching, and preparation for summative examinations.

We also employed the “Insights” tool from Facebook to access page metrics, including page likes and reach, student engagement, demographic data, and post reach. Tracking such metrics allowed us to effectively track the number of active users in relation to page performance (10). Post impact (i.e., response to particular post type in relation to the number of such posts) was determined by calculating the ratio of post reach and number of posts. The course of our study was divided into three distinct phases: before the NEU block (pre-NEU; November 1, 2014 to January 15, 2015), during the NEU block (during NEU; January 25 to April 12, 2015), and after the NEU block (post-NEU; April 13 to June 15, 2015). Data obtained from the Facebook Insight tool were correlated to these phases, and correlations were made between page activity and occurrence of summative assessments.

Student performance evaluation. Grades achieved by students undertaking the NEU block in 2015 were recorded, as were the grades achieved by the same cohort in concurrent blocks in the same year of study. Concurrently, similar grades achieved by the previous cohort of students (2014) for the same blocks were also extracted for compar-

ison (i.e., grades obtained by the class of 2015 were compared with those obtained by the class of 2014).

RESULTS

Page reach. Collectively, the Interactive Neurosciences page was widely accessed, exhibiting significant activity in terms of weekly average engaged users (98), weekly average total reach (510), weekly average total impressions (10,438), and weekly average reach of page posts (462). The total reach of this page at the end point of our study was 1,035 people, comprising 58% women and 42% men. There were a total of 667 “likes,” with 84% from the 18- to 24-yr-old age group, followed by 10% from the 25- to 34-yr-old age group, over 2 yr. Global access and distribution exhibited page access from a total of 45 cities and 39 countries worldwide.

Student feedback. Students reported continuous access ranging from 1 to >24 wk, with an average of 9 wk for 47% of students. Almost 15% of students reported accessing pages on a daily basis, whereas another 22% accessed the pages more than once or twice on a weekly basis. Around 58% of students also reported visiting other online resources apart from the designed Facebook page. Only five students reported technical difficulties in accessing material posted on these pages. Approximately 63% of students reported using the page to download PowerPoint presentations and notes relating to lectures. MCQs was a popular category, with >78% of students reporting access. About 74% accessed the posted educational website links, including announcements relating to lectures and clinicopathological correlation sessions posted on these pages.

Almost 80% of students felt using Interactive Neurosciences enhanced their knowledge and understanding of lectures, tutorials, and laboratory sessions. However, only 39% felt that such material helped them in PBL sessions. Around 76% of students felt that the Facebook pages enhanced their critical capability in understanding neuroscience and their ability to answer exam questions. Nearly 81% of students acknowledged that visiting these webpages enhanced their overall knowledge.

Facebook insight metrics. Comparison of the period before, during, and after the NEU block indicated a peak in reach and interest correlating to block activities, with maximal numbers of people accessing the page just before the formative and summative assessment components of the block. The three main summative assessment components of the NEU block were two TBL activities and the final exam, all three of which correlated directly to the three highest peaks in total reach observed in our entire study period (reaches of 299, 292, and 377, respectively), with the highest peak of the entire study period observed directly before the final exam (Fig. 1). It is also apparent that maximal activity in terms of total reach of overall posts on the Interactive Neurosciences page occurred during the NEU block at Alfaisal University, increasing significantly in comparison to before the block started. After the block had ended, activity fell slightly, on average, but remained considerably higher compared with the pre-NEU period.

Analysis of data relating to individual post impact revealed that the highest impact was made by the MCQ category of posts, followed by general interest posts. This was followed by neuroscience-related external links and resources, with lecture-related notes and PowerPoint material having the least impact.

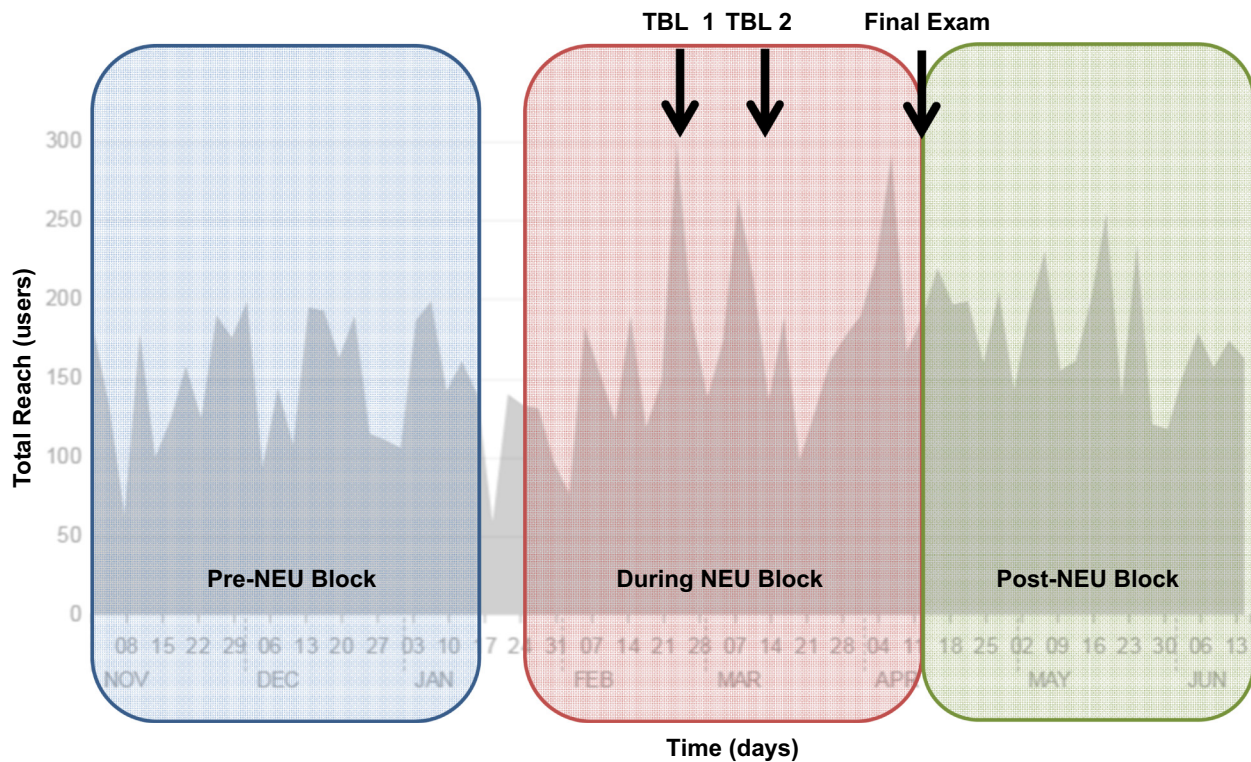


Fig. 1. Histogram representing the total reach of overall posts on the “Interactive Neurosciences” Facebook page throughout the study period (November 1, 2014 to June 15, 2015) conducted during the NEU block at Alfaisal University. This was further divided into periods defined as Pre-NEU (blue box), During NEU (red box), and Post-NEU (green box) periods. Both TBL sessions and the occurrence of the final exam are indicated with arrows. All three summative assessment components are directly preceded by maximal peaks in total reach observed throughout this study.

We found that the post impact of all categories apart from MCQs remained relatively consistent throughout all three phases of our study, with general interest posts increasing slightly in impact in the post-NEU phase. Lecture and PowerPoint material impact increased slightly in the during-NEU phase compared with the pre-NEU phase and had no impact in the post-NEU phase, as no such posts were made. Intriguingly, MCQs were consistently accessed with the highest impact in all three phases of our study, with a very sharp increase in post impact observed in the during-NEU phase (Fig. 2).

Student grade analysis. Students undertaking the NEU block in the 2015 cohort ($n = 197$), who had access to the Facebook page, performed considerably better in terms of grades achieved compared with the previous (2014) cohort ($n = 160$). Collectively, while the proportion of failing students (grade F) was only slightly lower (8.2% compared with 8.5%), the proportion of students achieving grades A–C was dramatically high in the 2015 cohort (22.9, 28.5, and 20.4% respectively) compared with the 2014 cohort (10.3, 25, and 14.4%, respectively) (Fig. 3A).

A general comparison of student performance in each cohort, indicated by comparison of the average grades obtained in the rest of the year by students, indicated very minor differences, with comparable levels of grades achieved ($P > 0.05$ following the Student’s t -test). The proportion of students achieving grade A in 2015 (21.6%) was slightly lower compared with the 2014 cohort (23.9%), with slightly higher proportions of students achieving grades B and F in 2015 (41.1 and 16%, respectively) compared with the 2014 cohort (40.1 and 14.7%, respectively) (Fig. 3B).

A further analysis of student performance indicated that students performed worse in the NEU block compared with other blocks in the same year for the 2014 cohort, with lower proportions of students obtaining grades A (10.3 vs. 23.9%), B

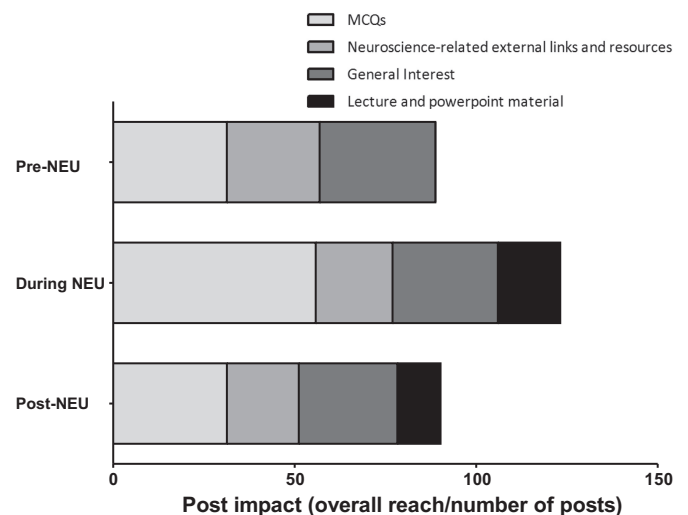


Fig. 2. Histogram representing the comparative impact of post type related to distribution throughout our study period (November 1, 2014 to June 15, 2015) for the neurosciences (NEU) block at Alfaisal. This period is represented before the block began (Pre-NEU), during the block (During NEU), and after the completion of the block (Post-NEU). Post impact was calculated by obtaining the ratio between overall post reach and number of posts for each post type (i.e., MCQ; neuroscience-related external links and resources; general interest posts; and lecture/PowerPoint material).

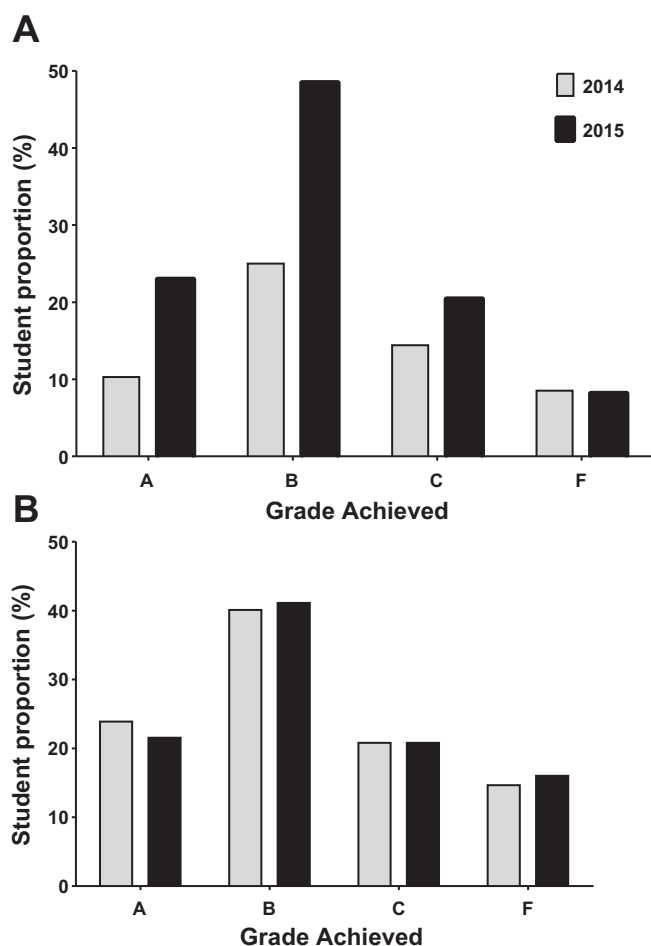


Fig. 3. Histogram representing the comparative grades achieved between cohorts in 2014 (previous cohort; shaded bars) and 2015 (study cohort; solid bars) in the NEU block (A) and grades achieved during the rest of the year (B). The histogram shows the proportion of students achieving the stated grades (A, B, C, and F).

(25 vs. 40.1%), and C (14.4 vs. 20.8%). However, there were a lower number of failures (grade F; 8.5 vs. 14%) (Fig. 4A). Comparatively, however, students in the 2015 cohort performed considerably better in the NEU block in comparison to the rest of the blocks in the year, with higher proportions of students achieving grade A (23 vs. 21.6%) and B (48.5 vs. 41.1%). The proportion of students achieving grade C remained comparable (20.4 vs. 20.8%), whereas the proportion of students achieving grade F fell (8.2 vs. 16%) (Fig. 4B).

DISCUSSION

Use of social networking sites, including Facebook, Skype, YouTube, WhatsApp, and Twitter, are now increasingly being used for educational purposes (7, 15). Facebook is the most popular social media platform being used for social interaction and educational purposes (8, 9). Herein, we report the design and employment of a Interactive Neuroscience Facebook page. Care was taken to align the material being posted on these two pages with the themes of the week in our regular block. Our analysis indicated that, although educational items were being accessed, other supplementary items, including anecdotes, life hacks, spiritual medicine-related articles, and other health-

related material increased the interest of site visitors, making page appeal more universal.

Published reviews on the utility of Facebook in teaching have failed to identify any study examining the applicability of social media in undergraduate medical student summative examination outcome (15). Our results indicated that students generally accepted the usefulness of these pages in helping them prepare for their summative examinations. Indeed, this is consistent with our observation that access and reach of both pages peaked just before the assessment components of the blocks. The three highest peaks of activity were observed just before the three major summative assessment activities in the block (TBL sessions and the final exam). This further correlates with our findings that MCQs exerted the highest impact in all three phases of our study, with a large increase in post impact during the NEU block.

Our experience demonstrates that Facebook is no longer only a platform for social interaction, but can also be utilized for educational purposes with custom-built information provided to students. This enhances and complements their in-class learning in a safe and interactive environment, with no dependence on time constraints. A further advantage of devel-

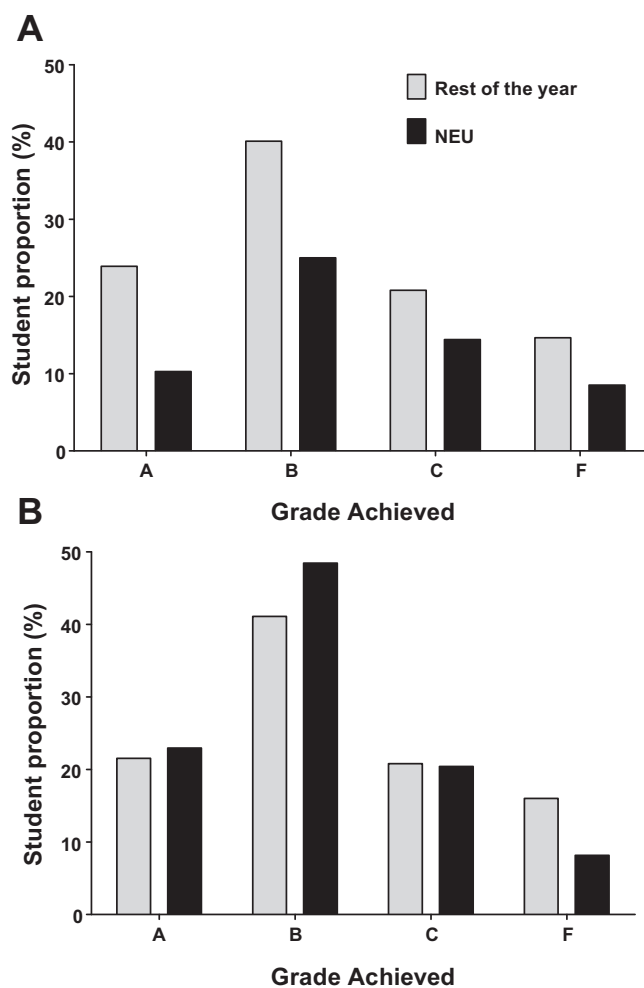


Fig. 4. Histogram representing the comparative grades achieved between the rest of the blocks occurring in the year (shaded bars) and the NEU block (solid bars) in 2014 (A) and 2015 (B) at Alfaisal University. The histogram shows the proportion of students achieving the stated grades (A, B, C, and F).

oping Facebook pages is that group membership is not required, making this a free platform for interaction and learning. Students are able to choose and access material privately, minimizing elements of peer pressure, in stark contrast to an in-class environment, where shy students may refrain from interaction during lectures or small-group activities, such as PBLs or TBL.

To the best of our knowledge, our present study is the first to examine the utility of such novel teaching methodology in Neurosciences. Indeed, a literature search did not reveal any such published studies. This is particularly relevant, as it is well accepted that students are generally averse to Neurosciences. Our present study indicated that supplementation of didactic teaching with Facebook teaching helped alleviate this phobia, at least as far as student perception was concerned, consistent with our present observations (2).

Analysis of student performance in terms of grades achieved indicated that students were performing better in the NEU block compared with other blocks during the rest of the year in the 2015 cohort, and also performed better in general compared with the 2014 cohort. As a general comparison of cohort competence, we found that student performance during the rest of the year (excluding grades achieved in the NEU block) was more or less comparable in both 2014 and 2015 cohorts. However, we found implantation of our Facebook page in the 2015 cohort improved grades achieved, with a higher proportion of students obtaining grades A–C, particularly those students obtaining grade B. Indeed, it is a commonly held notion in medical education that the number of high and low achievers (i.e., students obtaining grades A and F) will most likely not change their outcome, regardless of teaching methodology employed. Thus it is essential to target the population of students who remain on the cusp of good grades, i.e., to try and increase the number of students getting a B and decreasing students getting C and F. Our results suggest that our Facebook page is assisting in doing just that, increasing the number of grades A and B obtained by the 2015 cohort in comparison to the last year.

Student interaction can be grouped into two categories. When commenting on the MCQs, students either ventured answers alone, or answered questions with explanations. These explanations were posted beneath each MCQ, and were the major pathway by which concept clarification occurred. The other category related to general comments and likes/dislikes which aided page administrators to modulate page content accordingly, which was also applicable to lecture and PowerPoint material, alongside other general posts. It should also be noted that while MCQs were indeed the highest accessed material, other material such as general interest items and external links were also accessed to a fair degree.

Finally, as the contents of these pages are in the public domain, the only limit to access is internet availability. The Facebook Insights tool provides us with statistics aiding in measuring page growth and audience. These data are only available to page administrators and not to visitors. Most Facebook pages utilize these data for marketing purposes. One of the most important parameters that page administrators should examine is “engaged users” and impressions of posts, parameters previously demonstrated to be important (7, 9). However, a key consideration is that Facebook constantly updates and/or improves the algorithms by which insight met-

rics are determined. Authors attempting to perform similar analyses should thus consider the time scales within which they would perform similar analyses.

Conclusions. This study demonstrates that development and implementation of the Interactive Neurosciences Facebook page in the NEU block was received favorably by students, providing motivation and engagement of students in a variety of activities, supplementing their in-class teaching and clarifying core concepts. Multiple choice items were most popular among students, delivering a platform to assess their knowledge, and providing assistance in preparation for summative assessments. Indeed, we found evidence that such activities had a profound impact in increasing average student performance in summative assessment. However, while large differences were observed in grades achieved following implementation of our Facebook page, we were unable to perform analyses to confirm the statistical power of such increase due to the limited cohort numbers reported herein (2014 and 2015).

We conclude that implementation of our Facebook page was most likely a very useful resource for students to use in knowledge consolidation and exam preparation, in a manner that is conveniently accessed by students in a pressure-free environment. It is thus essential that such studies are now expanded to a wider range of subject material in the undergraduate medical curriculum and to a wider number of student cohorts, with respective controls to examine effectiveness of such resources.

APPENDIX

Survey for the Utility of Facebook Page

Year:

- Year 2
- Year 3

Sex:

- Male
- Female

Nationality:

Age:

Do you access any other educational interactive site?

- Yes
- No

1. Interactive Neuroscience

Did you access this page?

- Yes
- No

How long have you been accessing this page? Please circle one.

- 1–4 wk
- 5–8 wk
- 9–12 wk
- 13–24 wk
- >24 wk

How frequently do you access this page? Please circle one.

- More than once daily
- Once daily
- Once or twice weekly

- Fortnightly
- Monthly
- Rarely

Have you encountered technical difficulties accessing these pages?

- Yes
- No

Have you used this page to download or view PowerPoint presentations and notes connected with lectures?

- Yes
- No

Have you used this page to access the daily posted MCQs?

- Yes
- No

Have you answered MCQs posted on this page?

- Yes
- No

Have you tried to access links posted on this page (links do not include MCQs and lectures)?

- Yes
- No

Have you accessed announcements regarding lectures and clinico-pathological correlation?

- Yes
- No

Has using the page enhanced your knowledge and understanding of the lectures, tutorials, and practicals?

- Yes
- No

Has using the page enhanced your capabilities in participating in PBL discussion?

- Yes
- No

Has using the page enhanced your capability in answering exam questions?

- Yes
- No

Has using the page enhanced your critical capability in understanding pathology?

- Yes
- No

Does this page provide useful links to other web-based learning resources?

- Yes
- No

Do you think this page has overall improved your knowledge?

- Yes
- No

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

AUTHOR CONTRIBUTIONS

K.A., M.R.S., A.A.S., and A.A. conceived and designed research; K.A., M.R.S., and A.E. performed experiments; K.A., M.R.S., P.M.B.C., A.A.S., A.E., A.A., and J.K. analyzed data; K.A., M.R.S., P.M.B.C., A.A.S., A.A., and J.K. interpreted results of experiments; K.A., M.R.S., P.M.B.C., and J.K. prepared figures; K.A., M.R.S., and J.K. drafted manuscript; K.A., M.R.S., A.A.S., A.A., and J.K. edited and revised manuscript; K.A., M.R.S., P.M.B.C., A.A.S., A.E., A.A., and J.K. approved final version of manuscript.

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