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1 **How much do pre-clinical medical students utilise the internet to study physiology?**

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7 Abbreviated title: **Pre-clinical medical students' use of online videos**

8

9 Medical students increasingly utilise social media platforms to supplement their preclinical

10 learning; however, the prevalence of social media use for physiology learning in medical

11 education remains unclear.

12 The aim of the current study was to determine how first year medical students from both

13 direct entry medicine and graduate entry medicine interacted with social media as a learning

14 tool by assessing its prevalence, perceived benefits, favoured platforms and reason(s) for its

15 use.

16 Seventy-one percent of surveyed students (out of 139 participants) stated that they interacted

17 with social media in general more than 12 times per week. However, 98% had previously

18 used internet platforms to source physiology information, with 89.2% doing so at least once

19 per week during term. YouTube was the primary source of learning for 76% of students.

20 Significantly, 94% of students indicated that they would first search for answers online if

21 they did not understand something in physiology rather than contacting their instructor in

22 person or by e-mail. However, only 31% of students "fact-checked" physiology information

23 obtained from online sources, by using textbooks, papers and/or instructors.

24 Our study has revealed that most pre-clinical medical students utilise social media

25 extensively to study physiology. However, the absence of academic and ethical oversight,

26 paired with students' lack of critical appraisal of possibly inaccurate information, does raise

27 concerns about the overall utility of social media as part of physiology education.

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30

31   Snapshot: This study revealed that the vast majority (89%) of surveyed first-year medical

32   students frequently utilised social media, particularly online videos, to supplement their study

33   of physiology. Notably, 94% of students preferred to first search for answers online if they

34   had a physiology-related question rather than asking their instructor(s) in person or by e-mail.

35   Of concern however, was the finding that only 31% "fact-checked" physiology-related

36   information obtained online, suggesting a deficiency in students' critical appraisal skills.

37

Introduction

Physiology remains amongst the most essential of the basic sciences learned by medical students for their subsequent clinical training (1, 4, 9, 19, 34, 49). Although traditional didactic lectures and practical sessions remain at the core of most physiology syllabi (8, 33) many institutions are moving towards a more technology-enhanced learning (TEL) approach as one way of facilitating the change in approach of today's students to their education compared to students of previous eras (6, 18, 25, 42, 43, 46). Indeed, acknowledging students' love of social media, several higher education programmes, including those in the medical and allied healthcare sectors, have investigated integrating the use of social media platforms into their courses (3, 20, 21, 40).

Deployment of social media tools in this way enables students to study more efficiently (54), permits rapid and effective communication between users, and facilitates feedback to students from faculty (12, 36, 50). Furthermore, students who regularly use social media and other learning technologies report higher levels of engagement within the university, an enhanced sense of community (11, 31, 32, 48) and increased confidence/reduced anxiety (40). Social media also provide platforms for collaborations (27) and allows students to feel that they are in control of their own education rather than relying upon tutors to provide them with information (2, 18).

Within medical education, the impact of social media has been reported as near exclusively positive and desired by medical students (2, 3, 6, 10, 17, 20, 21, 30, 32, 40, 43, 48; for reviews see refs 12 and 53). However, it is currently unclear to what extent students are utilising and relying upon social media in physiology education. Therefore, we gauged how first year pre-clinical medical students (both graduate entry medicine (GEM) and direct entry

61   medicine (DEM)), within the medical school at University College Cork (UCC) employed

62   social media and other Web 2.0 tools to supplement their physiological learning.

63

Methods

GEM versus DEM programmes

The GEM programme at University College Cork (UCC) is an accelerated professional degree that usually spans only four, rather than the five, years of the more traditional DEM degree programme. This is accomplished by compressing the pre-clinical teaching for GEM students into just over one rather than two years. As such, GEM students must learn the same amount of material as their DEM counterparts in approximately half the time. Social media is not incorporated into existing student medical curricula.

The taught physiology component of both first year DEM and GEM courses is delivered over a duration of seven and 8.5 months respectively (four modules for DEM students, three for GEM students) and comprises a mixture of both didactic lectures and laboratory practical classes. Academic material for each module is supported by Blackboard Academic Suite into which lecture presentations, practical laboratory guides and supplemental learning resources are posted.

Data Collection and Analysis

Ethical approval for the current study was granted by University College Cork Social Research Ethics Committee. Both DEM and GEM students could access an itemised survey through UCC's virtual learning environment, Blackboard Academic Suite (http://www.blackboard.com) from the start of April 2018 to the end of June 2018 before the data were downloaded for analysis.

The survey instrument consisted of 25 items which, in addition to collecting demographic data including age and gender, sought to interrogate students' use of social media websites generally, and specifically in relation to physiology, with one free comment option.

87   Seventeen of the survey items were Likert scale options. For topics related to social media

88   use in physiology learning, the survey items were designed to determine 1) how comfortable,

89   and how frequently, students were using social media to access information on physiology, 2)

90   what online sources students used to access physiology information, 3) under what

91   circumstances students used social media to access information about physiology, 4) how

92   students viewed the reliability of social media-derived physiology information, 5) students

93   preference for social media-derived physiology information over their lecture notes, and 6)

94   their views on a faculty-led social media physiology page. The entire questionnaire is

95   available in appendix.

96   For statistical comparisons, Likert scale responses and frequency of use data were each

97   converted to a 0-5 numerical value. Specifically, strongly agree = 5, agree = 4, neither agree

98   nor disagree = 3, disagree = 2, strongly disagree = 1; for frequency of use data, never = 0; 1-2

99   times = 1; 3-5 times = 2; 6-8 times = 3; 9-11 times = 4; 12 or more times = 5. All survey data

100   from respondents was downloaded from Blackboard Academic Suite, collated and entered

101   into GraphPad Prism for statistical analysis. For comparisons between GEM and DEM

102   students overall, Student's unpaired t-test was utilised to analyse data. For comparisons

103   across all DEM and GEM male and female subgroup data, one-way analysis of variance

104   (ANOVA) with Tukey's multiple comparisons test was employed.

105

Results

Student Demographics

One hundred and thirty-nine respondents completed the survey, of which 78 were female (40 DEM, 38 GEM) and 61 were male (32 DEM, 29 GEM).

Most students (83/139; 59.7%) indicated that their region of origin was Europe, with the second largest grouping consisting of students from Canada/North America (25.2%; 35/139). 33/35 of the Canada/North American students were in the GEM cohort. Although most students were aged 18-20 (43.2%), the age of the GEM cohort greater was significantly greater ($p \simeq 0.001$, unpaired *t*-test) than that of the DEM class. However, there was no significant difference between the ages of either the DEM male *vs* female students or the GEM males *vs* females.

Use of internet enabled devices and web-based resources

All students surveyed possessed at least one internet-enabled device (i-pad, laptop, tablet, smartphone, *etc.*) with 138/139 students possessing at least two (data not shown; no significant differences between GEM *vs* DEM, or male *vs* female, students). Although the majority of students (81.5%) reported that they were comfortable using social media ('strongly agree' and 'agree' combined; mean score = 4.07 (SD 0.99) (Fig. 1A), with 84% of respondents having used social media to discuss general GEM course-related issues with their colleagues (84% 'strongly agree' and 'agree' combined; mean score = 4.07 (SD 0.94) (no significant differences in the responses of GEM *vs* DEM, or male *vs* female, students; Fig. 1A), we found that a remarkable 98.5% of GEM and 97.3% of DEM students had used social media *specifically* to find information about physiology ('strongly agree' and 'agree'

128   combined; overall mean score = 4.63 (SD 0.58) (no significant difference between DEM *vs*

129   GEM, or male *vs* female students; Fig. 1A).

130   The video sharing platform, YouTube, was by far the most popular source of physiology

131   information for students (76.3%; Fig. 1B), with, for those who expressed a preference, "Khan

132   Academy" being the most popular (41% of students) specialised content channel within

133   YouTube itself (although it should be noted that 36% of students did not express a preference

134   for any particular channel; Fig. 1C).

135   In terms of how frequently the students actually used social media, 98.6% accessed *general*

136   social media sites at least once per week during the academic term, with 70.5% doing so at

137   least 12 times per week (no significant differences between DEM *vs* GEM, or male *vs* female,

138   students; Fig. 2A). Specifically with regard to their study of physiology however, where

139   89.2% of students accessed physiology-related "online video clips" at least once per week

140   during term time, we did uncover some statistically significant differences between groups

141   (Fig. 2B). For example, GEM students accessed social media to source physiology material

142   significantly more frequently than DEM students (p = 0.03, unpaired t-test; *e.g.* 20.9% of

143   GEM students *vs* 6.9% of DEM students viewed physiology videos at least 6 times per

144   week), with GEM males also doing so more frequently than DEM females (p = 0.047, one-

145   way ANOVA, Tukey's multiple comparisons test; *e.g.* 27.6% of GEM males *vs* 2.5% of

146   DEM females viewed physiology videos at least 6 times per week), but not more than DEM

147   males or GEM females (Fig. 2C).

148   ***Students' perceived usefulness of online physiology material as a tool for learning***

149   We found that although near equally large percentages of DEM and GEM students found

150   online video clips "generally useful for understanding physiological concepts" ('strongly

151   agree' and 'agree' combined; 83.3% DEM, mean score = 4.28 (SD 0.79) *vs* 86.3% GEM,

152   mean score = 4.32 (SD 0.77)), there was a difference in how useful each cohort of students

153   perceived them to be (Fig. 3A). For example, we found that whereas 79.1% of GEM students

154   strongly agreed or agreed that they found online video clips "generally more useful for [their]

155   understanding of physiological concepts than taught lecture material/lecture slides" (mean

156   score = 3.64 (SD 0.95)), only 47.2% of the DEM cohort expressed similar views (mean score

157   = 3.46 (SD 0.85)), although this difference was not statistically significant (one-way

158   ANOVA). Indeed, just under half (40.3%) of DEM students were equivocal about the benefit

159   of YouTube videos to their studies over lecture material (Fig. 3B).

160   Interestingly, we also found that significantly more GEM females than either DEM males or

161   females (but not GEM males) felt that online physiology videos were better study aids than

162   taught lecture material/slides (GEM female, 68% SA or A, mean score = 3.82 (SD 0.8) *vs*

163   DEM female 50% SA or A, mean score = 3.45 (SD 0.93), p = 0.04, *vs* DEM male, 44% SA

164   or A, mean score = 3.47 (SD 0.76), p = 0.04) (Fig. 3B).

165   *Circumstances underlying social media use for supplemental physiology study*

166   We next wished to identify the motivation(s) for student's use of web-based resources in

167   physiology learning. We found that 49.7% of students overall disagreed or strongly disagreed

168   (mean score = 2.86 (SD 1.27)) that they would contact an instructor in person if they had a

169   physiology-related question (Fig. 4A). This *apparent* reluctance of students to engage with

170   faculty directly seemed to be supported by the finding that only 13.8% of students overall

171   strongly agreed or agreed that they would contact their instructors by e-mail if they had a

172   physiology query, with 69.8% indicating that they strongly disagreed or disagreed with the

173   statement; mean score = 2.24 (SD 0.98) (no significant differences existed between DEM *vs*

174   GEM or between groups (Fig. 4A). 92.8% of respondents strongly agreed or agreed (mean

175 score = 4.54 (SD 0.73)) with the statement, "If I don't understand something when I study

176 Physiology I first search for an answer online" (Fig. 4A).

177 We also gauged how students regarded the physiology information sourced from web-based

178 resources. 41.7% of all students disagreed or strongly disagreed that they automatically

179 trusted information from online sources such as YouTube, Wikipedia and Facebook (mean

180 score = 2.88 (SD 1.12)), while a third (34.6%) trusted this information, and 23.7% neither

181 agreed nor disagreed (Fig. 4B). Probing the same area, we sought to determine if students

182 ever "fact-checked" information obtained from online sources by using textbooks, research

183 papers and/or instructors. 31% did fact-check information although 43.9% did not (mean

184 score = 2.83 (SD 1.1)). There were no significant differences in the responses of GEM *vs*

185 DEM, or male *vs* female students (Fig. 4B).

186 *Instructor-led social media page*

187 Finally, we wished to determine if medical students "would enjoy interacting with course

188 materials on a social media page", such as Facebook. In both GEM and DEM cohorts, 45.3%

189 strongly agreed or agreed; mean score = 3.18 (SD 1.04). Nearly a third (29.2%) of students

190 did not express an opinion either way, and 25.6% indicated that they would not want to

191 interact with a physiology-focussed social media page (Fig. 5). Moreover, DEM students

192 overall were more in favour of a physiology-devoted social media page than the GEM

193 students (DEM mean score = 3.44 (SD 1.0) *vs* GEM mean score = 2.91 (SD 1.02); p=0.003,

194 unpaired t-test), with DEM females being particularly strongly in favour (66.7% DEM female

195 *vs* 37.5% DEM male (p=0.02, one-way ANOVA, Tukey's multiple comparisons test) *vs*

196 42.1% GEM female (p=0.004, one-way ANOVA, Tukey's multiple comparisons test) *vs*

197 28.6% GEM male (p=0.001, one-way ANOVA, Tukey's multiple comparisons test)) who

198 agreed or strongly agreed with the setting up of a physiology-related social media page (Fig.

199   5). There was no significant difference between DEM males *vs* GEM males, or between

200   GEM males *vs* GEM females.

201

Discussion

We wished to gauge the relevance and roles of social media for physiology learning in medical education. First year GEM and DEM medical students were invited to complete a survey designed to assess frequency of use, perceptions and preferences of physiology-related social media, with response rates of 81.7% (n = 67) and 56.3% (n = 72) respectively, and almost proportionally equal numbers of male and female student respondents. GEM students originated mainly from North America or Europe, and were aged between 21 and 29, whilst DEM students were predominantly European and aged between 18 and 20.

Irrespective of sex, the majority of first-year medical students were comfortable using social media, with most using these tools 12 times or more per week to facilitate their physiology learning, as well as to discuss physiology content with classmates (Fig.2). YouTube was the students' favourite social media information source, with Khan Academy being the most popular video channel for both DEM and GEM students (Figs. 1A & B). Interestingly, GEM students used social media content to aid their learning more than DEM students (Fig. 1C). GEM females in particular found online videos more helpful than lectures to learn physiological concepts, as exemplified by the following comments from two female GEM students, *"I usually use online material to clear up a topic that seems convoluted in the lecture slides and/or textbooks. Videos with animations are particularly helpful for my understanding of phys*[iology] *because I can "see" certain processes happen rather than just looking at a picture."*, and *"I usually use online material to clear up a topic that seems convoluted in the lecture slides and/or textbooks."*

These data indicate that the extent of social media integration into medical education is greater than has been previously reported (6, 12, 22, 24, 26, 28, 50, 53, 54). The reason for such integration most likely lies in the immediacy of responses to questions and/or a lack of

226   instructor accessibility. Indeed, in alignment with previous anatomy-oriented reports (6, 39),

227   only 14% of students indicated that they would seek academic guidance if they encountered

228   an issue in their physiology learning, opting to first search for an answer online. For example,

229   one female DEM student commented, "*I just find it less time consuming to search for something*

230   *online rather than look for it in a physiology textbook*", and*, "I find it easier to look [up] any*

231   *questions that I have up online because often I find there is not enough time to ask a lecturer a*

232   *question after a class because they are rushing to another class or I am rushing to another class*

233   *(mainly this reason)"*, with another, female DEM, student commenting, *"I tend to use online*

234   *resources mainly for videos of complicated concepts or simple factual questions with a definite*

235   *answer"*.

236   Significantly, 34.6% of GEM and DEM students indicated that they "automatically trust[ed]

237   information" from online sources without verification, with only 31.3% of students indicating

238   that they did fact-check information using textbooks (*e.g.* one GEM female wrote, "*If I am*

239   *looking for more detail on a conceptual question, I generally will use a textbook over an online*

240   *source"*), research papers or instructor input. Two other students addressed this topic directly

241   in the survey free-comment section, with one (DEM female) stating, *"Most times when I fact*

242   *check, it would be because the information given is different or stated in a different approach than*

243   *my lecturer or seems like it doesn't make sense or seems weird. other than that, the information I*

244   *have gathered online regarding academics have been quite sound"*, and another (GEM female)

245   writing, *"I do not fact check unless there is a major contradiction. Usually, it is very obvious what*

246   *online resources are most trustworthy i.e. based on the quality of the video, number of view* [sic]*,*

247   *comments, correlation with previous knowledge from lectures and notes".* This latter comment

248   reflects a common student misconception that the number of views, likes or comments about

249   educational videos on YouTube are reliable indicators of their reliability or usefulness, when

250   in fact no such correlation exists (50).

251 The rise of social media platforms in undergraduate medical education is likely due to

252 eroding student – instructor interactions, their increasing number and accessibility and their

253 emergence as primary inter-student communication tools (23). However, student

254 interdependence on physiology-based web resources raises several issues. For example, there

255 is an enormous variation in the quality and accuracy of online life science content (18, 53).

256 Inaccuracies in YouTube videos in particular have already been documented with, for

257 example, the majority of anatomy material falling far below a useful learning standard (5,

258 45). Moreover, in addition to the fact that many students are "conditioned to select the first or

259 most easily accessible information resource" available to them (18), they also generally lack

260 the media literacy and critical analytical skills to determine if information sourced from

261 online resources is correct or not (15, 16, 18, 35, 47, 52). It is however worth noting that in

262 the present survey, three students specifically commented that they would appreciate being

263 directed towards "reputable" physiology videos, *e.g. "In general, I find watching a video can be*

264 *useful in helping to retain information and would be very grateful if there were more signposts/ links*

265 *to reputable video channels for more of the concepts we cover in Physiology."* (GEM female),

266 *"For every lecture, it might be useful to have some youtube links to videos explaining the contents of*

267 *the lecture."* (GEM male)

268 *"Lecturers could ……..put recommended videos in lectures notes for better understanding"* (DEM

269 female)

270 However, these sentiments aside, in an era of increasing time-constraints for academics, their

271 continued peer monitoring of social media physiology content is unlikely and developing

272 students' digital insights is not a generalised curricular component (14, 18).

273 The solution to this issue would seem to lie in the development of dedicated academic-led

274 physiology social media content where, for example, links to physiology-orientated videos

275   that had been checked for accuracy of content could be provided. However, there is often a

276   generational and technological gap between students and faculty (41). So-called "digital

277   immigrants", who were born before the rapid rise in digital technology (36), may not only be

278   sceptical about the benefits of utilising social media platforms to support their teaching (29,

279   37, 41), but may also be less than comfortable using them (7). As such, it is possible that

280   some academics will be unaware of the full versatility of the social media platforms that they

281   are instructed/requested to use in their teaching. This in turn means that such platforms are

282   unlikely to be used optimally, to the overall detriment of student learning (53).

283   Nonetheless, social media does allow faster communication with, and feedback from,

284   instructors (21, 30, 50) and may reduce overall academic workload (53). However, in our

285   study only 45.3% of students stated that they would enjoy interacting with course materials

286   on a social media page. Significantly, more DEM than GEM students were in favour of such

287   an idea, with females almost as twice as enthusiastic as males. The reasons for these

288   demographic differences are unclear, but in terms of the DEM *vs* GEM differences, the

289   significantly older GEM students may simply be more academically autonomous. However,

290   it may simply be due to a lack of clarity about the exact purpose(s) and content that such a

291   social media page would be/contain, *e.g. "I'm not sure what you mean by course materials on a*

292   *scoial [sic] media page: if you mean facebook [sic], then I disagree because it is distracting for me; if*

293   *you mean videos and interactive activities/ quizzes, then I strongly agree."* (GEM female).

294

295   **Limitations**

296   One potential drawback of our study is that it is did not quantitatively measure the impact of

297   social media usage on student learning and/or exam performance. A further limitation of the

298   study is that students were recruited from two different medical programmes within UCC,

299   that are each taught and assessed differently. Whilst associated alterations in data could be

300   attributable in some way to the fact that they are taught and assessed separately and distinctly,

301   it may also indicate that their significantly different educational backgrounds and age

302   demographics engender different and distinct educational requirements.

303

304   **Conclusion**

305   Here, we contribute to medical/physiology education literature by revealing the extent of

306   social media use in graduate and direct entry pre-clinical medical physiology learning. It is

307   clear that medical students are becoming increasingly reliant on digital resources to

308   supplement their academic-led curricular resources (6, 12, 13, 22, 41). As such, awareness of

309   the growing digital divide that exists between students and faculty is rapidly becoming a key

310   asset in addressing the educational and communicative needs of the next generation of

311   medical students.

312

329

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465

Figure Captions

Figure 1. Students' social media usage. Graph depicting combined DEM and GEM students' general and physiology-specific social media use with each line representing the mean ± standard deviation (A). Pie charts illustrating overall student responses to the questions, "If you use YouTube to source online physiology material, what channel do you view most frequently?" (B) and "If you have used online video clips to help you with your understanding of Physiological concepts, where do you mostly source them from?" (C).

Figure 2. Students' general social media use. Pie charts illustrating the number of times per week during term time that both GEM and DEM students combined accessed social media generally per week (A) and frequency of use of "online video clips" to facilitate students' physiology learning per week (B). Histogram illustrating the same data as in pie chart B, but including GEM/DEM and male/female composition. Overall, GEM students viewed physiology video clips significantly more frequently than DEM students (p=0.053, #), with GEM males viewing these significantly more frequently than DEM females (p=0.047, *).

Figure 3. Students' perceptions of social media resources utilised for their understanding of physiology. Graph depicting combined DEM and GEM students' perceptions of physiology-specific online videos for their understanding of physiology with each line representing the mean ± standard deviation. Histogram illustrating the breakdown of data for student responses to the statement "If you use online video clips, do you find them generally more useful for your understanding of physiological concepts than taught lecture material/lecture slides?", into GEM and DEM, male and female subgroups. Significantly more GEM females than either DEM females (p=0.04, *) or males (p=0.04, *) found online physiology videos to be significantly more useful for their "understanding of physiological concepts than taught lecture material/slides".

490 **Figure 4. Students' preferences for interactions with physiology faculty and online**

491 **physiology platforms.** Graph depicting students' attitudes towards interactions with faculty

492 versus social media with each line representing mean ± standard deviation (A). Pie charts

493 illustrating overall student responses to the statements, "I automatically trust information

494 which has been obtained from online sources" (B) and, "I always 'fact-check' Physiology

495 information obtained from online sources using textbooks, papers and/or instructors" (C).

496 NA=not applicable, UA=unanswered.

497 **Figure 5. Students' perceptions of a dedicated physiology social media page.** Histogram

498 illustrating student responses to the statement, "I would enjoy interacting with course

499 materials on a social media page". Overall, DEM students were significantly ($p<0.01$; ##)

500 more in favor of a dedicated physiology social media page than GEM students. DEM females

501 were significantly more in favor of the creation of such a page than all other individual

502 groups (all p values relative to DEM female, * $p<0.05$, ** $p<0.01$).

503

504   **Appendix**

505   ## Physiology Internet Usage Survey 17-18

506
507   This questionnaire is designed to provide Dr Rae with information as to how both GEM and
508   direct entry medical students, utilise online material for their understanding of Physiology. It
509   is hoped that this little researched question will be disseminated to other interested parties
510   (e.g. as a research paper) but that no personal information (names, student numbers, etc.) will
511   be linked to any of the information provided. Indeed, I can give you my word that I will not
512   even attempt to gather this type of information from the survey responses. Thank you in
513   advance for your participation.
514   Please note that by completing the survey either in full or in part you are indicating that you
515   are voluntarily participating in the study and that any anonymised information provided by
516   you may be analysed and disseminated by the designer of the survey, Dr Mark G. Rae.

517
518   **Which gender do you identify as?**
519   Male
520   Female
521   Other

522
523   **Please specify your age profile:**
524   A. 18-20
525   B. 21-23
526   C. 24-27
527   D. 28+

528
529   **Please specify your region of origin:**
530   A. Africa
531   B. Asia
532   C. Europe
533   D. Middle East
534   E. North America/Canada
535   F. Other

536
537   **Would you consider your educational background to be biomedical or non-biomedical**
538   **(this question probably only relates to graduate entry students)?**

539
540   Biomedical
541   Non-biomedical
542   Not applicable

543
544
545
546
547
548
549
550
551

Which one of the following is your preferred method of sourcing physiology information?

A. Recommended textbooks
B. Instructor
C. Social media platforms (e.g. Facebook, Twitter, WhatsApp, etc., not including YouTube or Wikipedia)
D. YouTube
E. Wikipedia
F. Random internet search engine hits
G. Other

How many internet ready devices (Laptop, Smartphone, ipad etc) do you possess?

A. 1
B. 2
C. 3
D. 4
E 5
F. 6+

"I am very comfortable using social media (Facebook, Twitter, etc)."

A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree
F. Not Applicable

During the academic term, how often do you interact with social media (e.g. Twitter, Snapchat, Facebook, etc.) in a week?

A. Never
B. 1-2 times
C. 3-5 times
D. 6-8 times
E. E. 9-11 times
F. 12 times or more

"I use social media to discuss Physiology-related issues with my classmates on a regular basis (e.g. every 1-2 weeks)."

A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree
F. Not Applicable

602   **"If I don't understand something when I study Physiology I contact my instructor by**
603   **email."**

604

605   A. Strongly Agree
606   B. Agree
607   C. Neither Agree nor Disagree
608   D. Disagree
609   E. Strongly Disagree
610   F. Not Applicable

611

612   **"If I don't understand something when I study Physiology I ask my instructor a**
613   **question in person."**

614

615   A. Strongly Agree
616   B. Agree
617   C. Neither Agree nor Disagree
618   D. Disagree
619   E. Strongly Disagree
620   F. Not Applicable

621

622   **"If I don't understand something when I study Physiology I first search for an answer**
623   **online."**

624

625   A. Strongly Agree
626   B. Agree
627   C. Neither Agree nor Disagree
628   D. Disagree
629   E. Strongly Disagree
630   F. Not Applicable

631

632   **How quickly do you expect a response from an instructor regarding a Physiology**
633   **question? Within:**

634

635   A. 2 hours
636   B. 6 hours
637   C. The same day
638   D. The same week
639   E. I don't mind as long as I receive a reply at some point.

640

641   **"The speed at which I want an answer to my question determines whether I ask my**
642   **instructor or search for an answer online.''**

643

644   A. Strongly Agree
645   B. Agree
646   C. Neither Agree nor Disagree
647   D. Disagree
648   E. Strongly Disagree
649   F. Not Applicable

650

651 **"As part of my current degree I have used internet search engines to investigate the**
652 **Physiological topic I am studying"**
653
654 A. Strongly Agree
655 B. Agree
656 C. Neither Agree nor Disagree
657 D. Disagree
658 E. Strongly Disagree
659 F. Not Applicable
660
661 **During the academic year, how often do you use online video clips to facilitate your**
662 **Physiology learning in a week?**
663
664 a. Never
665 b. 1-2 times
666 c. 3-5 times
667 d. 6-8 times
668 e. 9-11 times
669 f. 12 times or more
670
671 **If you use online video clips, do you find them generally useful for your understanding**
672 **of Physiological concepts?**
673
674 A. Strongly Agree
675 B. Agree
676 C. Neither Agree nor Disagree
677 D. Disagree
678 E. Strongly Disagree
679 F. Not Applicable
680
681 **If you use online video clips, do you find them generally more useful for your**
682 **understanding of Physiological concepts than taught lecture material/lecture slides?**
683
684 A. Strongly Agree
685 B. Agree
686 C. Neither Agree nor Disagree
687 D. Disagree
688 E. Strongly Disagree
689 F. Not Applicable
690
691 **If you have used online video clips to help you with your understanding of Physiological**
692 **concepts, where do you mostly source them from?**
693
694 A. YouTube
695 B. Facebook or other social media site
696 C. Random search engine hits
697 D. Physiology/Medical textbook online material
698 E. Medical / health oriented websites
699 F. Non-internet sources, e.g. DVDs associated with textbooks
700

If you use YouTube to source online Physiology video material, what channel do you view most frequently?

A. Khan Academy
B. Crash Course Anatomy & Physiology
C. The Physiological Society
D. No preference for any specific channel, just view videos generated by search hits
E. Other
F. Not applicable

"I automatically trust information which has been obtained from online sources (e.g. Wikipedia, YouTube, Facebook)"

A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree
F. Not Applicable

"I always 'fact-check' Physiology information obtained from online sources using textbooks, papers and/or instructors"

A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree
F. Not Applicable

"I would enjoy interacting with course materials on a social media page."

A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree
F. Not Applicable

How do you generally view online Physiology material?

1. On a computer only.
2. Only on a portable media device (i.e. tablet, ipod, generic MP3 player, etc.)
3. I utilise both computers and portable media devices to view / listen to online material.
4. I do not use them at all as I prefer to use my notes and / or textbooks

Please insert any other comments and/or suggestions relating to your use of online Physiology material, particularly if it is not covered in the survey or if you want to expand upon any of your provided answers.