

RESEARCH ARTICLE

Open Access



Blogging as a tool for the acquisition and dissemination of knowledge in health sciences: a preliminary evaluation

David Conde-Caballero¹, Carlos A. Castillo^{2,3*} , Inmaculada Ballesteros-Yáñez^{3,4} and Lorenzo Mariano-Juárez¹

* Correspondence: Carlosa.castillo@uclm.es

²Department of Nursing, Physiotherapy and Occupational Therapy, School of Physiotherapy and Nursing, University of Castilla-La Mancha, Toledo, Spain

³Regional Center for Biomedical Research, University of Castilla-La Mancha, Albacete, Spain

Full list of author information is available at the end of the article

Abstract

Tools for online collaboration are becoming increasingly prevalent in recent years. Certain characteristics of these tools encourage this proliferation: they are easy to use, always available, allow knowledge to be built collaboratively and disseminated quickly through social networks, and are usually free of charge. In this context, blogs are becoming increasingly important in the field of health as digital newspapers and magazines that support a large number of multimedia formats. The possibility to subscribe to blogs and their availability in formats adaptable to mobile devices mean their content can be taken anywhere.

Although the use of blogs is well-established among Health Science professionals, their use among university professors as a component of the teaching strategies in these disciplines is much less common, and thus the benefits, risks and limitations of using blogging as a pedagogical tool are poorly understood.

In this preliminary evaluation of a pedagogy, a public WordPress-based blog was developed for the Nutrition and Dietetics module of the undergraduate course in Nursing at the University of Castilla-La Mancha (Spain). This was primarily intended as a way to use ICT to increase the level of student engagement and interest in learning the subject, but also as a way to introduce future health professionals to the world of blogging.

This paper describes our experiences with this pedagogical project and discusses the advantages and disadvantages of the use of blogs in university Health Sciences teaching. Incorporating this tool into teaching methodologies takes advantage of the theoretical possibilities it offers, which include crucial aspects such as developing critical thinking, acquiring knowledge, answering questions from students, and enabling new mechanisms to develop the skills that must be acquired. However, the challenges and inconveniences are also highlighted; these are principally the lack of motivation and the low participation of the students. By analysing the outcomes of this preliminary evaluation of a pedagogy, it is concluded that blogs are a very useful tool, although it is suggested that the literature shows a certain bias toward the publication of successful trials.

Keywords: Blog, Educational technology, Electronic publishing, Health Sciences education, Knowledge acquisition, Knowledge dissemination, Nursing, Nutrition and dietetics

Introduction

The European Higher Education Area¹ has radically transformed university studies by placing the student at the centre of the educational process (Esteve, 2016). The new paradigm and the implicit assessment of acquired skills has forced teachers to rethink classical learning objectives (Correa & de Pablos, 2009). Therefore, recent years have seen a revolution in the classroom, with a large number of teachers striving to develop forms of active learning that seek to promote critical thinking and a high degree of autonomous learning (Initiative, 2004).

In this context of shifting pedagogical trends, one aspect referred to by some authors as the “digital revolution” stands out (Kaplan & Haenlein, 2016). This is the process adopted by those teachers who have been attracted by the possibilities of Information and Communication Technologies (ICT), which have great potential when it comes to transferring knowledge and allowing students to develop the necessary broad-spectrum skills (Zayer, Beran, & Alcaide-Pulido, 2017). In principle, wikis, blogs and social networks, to name just a few of the best-known examples, allow students to work on the proposed content in a participatory and collaborative way, thereby acquiring the necessary skills in an asynchronous and delocalised manner (Aguilar Martínez, Medina, Pons Albalat, & Saigú Rubió, 2013; Camacho, Carrión, Chayah, & Campos, 2016; Hamm, Klassen, Scott, Moher, & Hartling, 2013), as well as giving the subject matter a certain attractive aesthetic aspect. In the words of Bruns and Humphreys, these tools are capable of generating suitable communication spaces for the development of the desired skills, allowing a new model of critical, collaborative and creative technological literacy that opens a new pedagogical horizon unknown until recently (Bruns & Humphreys, 2005).

For the more specific case of the use of blogs (an abbreviation of the term web log² first coined in 1997 by Jon Barger (Blood, 2000)) -that was boosted in higher education by activities at Harvard University in the early years of the twentieth century (Lara, 2005)-, the literature has underlined the advantages of the incorporation of blogs into the university education toolkit: versatility when creating, updating and using different types of resources (videos, press releases, tweets, audio content, links to other blogs and websites, etc.) with no requirement for prior technical knowledge (Bonus, Wright, Scheidt, & Herring, 2005); the possibility of collaboration and involvement on the part of the student body as a consequence of the fact that all posts invite conversation and thus combine receptive skills (reading) with productive skills (writing); the ability to arrange posts by chronological order; and the possibilities this type of tool enables to disseminate teaching and research activity not only among students, but also among those professionals with an interest in continuing education (Soto, Senra, & Neira, 2009). All of these elements mean blogs should be considered as a means to support curricular content, especially since the available literature emphasises the positive results that have previously been obtained in a good number of similar initiatives in higher education (Alventosa, Peris, & Guerrero, 2016; Chun, Skinner, & Rosewall, 2019; Du & Wagner, 2007; Ferdig & Trammell, 2005; Molina, Valencia-Peris, & Gómez-Gonzalvo, 2016;

¹The European Higher Education Area is an educational initiative that started with the 10th anniversary of the Bologna Process in 1999, which now brings together almost all European States, and whose aim is to create a common framework that facilitates mobility and generates a competitive knowledge-based society. Associated with this, the need has arisen to promote the interrelation between different Higher Education systems in order to facilitate a labour market without frontiers and to offer a motivating and flexible framework for students from the rest of the world (Domínguez & Llorente, 2009).

Pérez-Navado et al., 2012; Williams & Jacobs, 2004). Other voices have been more pessimistic, highlighting the fact that the use of this type of tool has been more a myth than a reality, since students ultimately prefer more conventional, passive and linear forms of learning (Margaryan, Littlejohn, & Vojt, 2011).

In the specific realm of Health Sciences education, the available evidence points to a noticeable increase in the use of this type of media (Kala, Isaramalai, & Pohthong, 2010; Myrick, Caplan, Smitten, & Rusk, 2011; Vogt, Schaffner, Ribar, & Chavez, 2010; Zinger & Sinclair, 2013). These works have suggested that the use of blogs can have a significant impact on the formative development of students, since the reflections and discussions that the blogs enable are very helpful (Churchill, 2009). Furthermore, looking at professional practice, teaching biomedical students to use blogs also has its merits, especially given the importance such publication routes may have in the future for disseminating medical scientific research and supporting the health education of patients (Boulos, Maramba, & Wheeler, 2006). In this sense, this medium represents a unique opportunity to improve the transmission of knowledge in the field of health, due to the interactive communication it facilitates between health professionals and citizens (Bissonnette-Maheux et al., 2015). This is reflected in the current growth of what some authors have referred to as the “medical blogosphere” (Kovic, Lulic, & Brumini, 2008): a large collection of blogs dealing with all kinds of health-related issues, from general aspects to such specific issues as Palliative Care (Ngwenya & Mills, 2014) or Diabetes (Kaufman, 2010). Blogs are even used in training biomedical students, frequently to engage learners and enhance education, because students may still achieve benefits by engaging in emotional disclosure and personal reflection (Becker & Freberg, 2014; Garrity, Jones, VanderZwan, de la Rocha, & Epstein, 2014; Sterling, Leung, Wright, & Bishop, 2017). For all these reasons, the boom in the use of blogs in university training programmes in Health Sciences seems to be just starting, especially as more and more teachers recognise that if this is to be a commonly-used tool in the future, its management must be standardised during the years of university learning.

The use of blogs has also become popular in aspects of Health Science as important as food, nutrition and diet³. Many of the advantages of blogs are indispensable here in making content development more dynamic and the dissemination process more versatile in these times of so-called *fake news*. Evidence on the use of blogs in teaching subjects in these areas reveals the wide variety of possibilities, including their use as tools for a better understanding of food systems, work on cultural aspects, narratives of students’ own experiences in implementing sustainable practices, and regular training in nutritional assessment instruments (Leveritt, Ball, & Desbrow, 2013; Maher & Burkhart, 2017; Paulus & Spence, 2010; Romero, Espinoza, & Hernández, 2019). Other articles have analysed the use of blogs in the teaching of nutrition in the field of Nursing, where a good number of previous approaches focussed on factors such as the good

³It is not easy to give a definition for the concept of a blog. Bruguera and Campàs suggest that it is nothing more than a personal or communal web page in which the editing and publication system has been simplified to the point that the user does not need specific knowledge of the electronic medium or the digital format to be able to provide content immediately, quickly and permanently from any point of Internet connection (Bruguera & Campàs, 2007). Walker, on the other hand, defines a blog as a website containing content endowed with personal styles and presented in reverse dated chronological order (Herman, Jahn, & Ryan, 2010). Winner adopts a more technical perspective, defining blogs as a hierarchy of texts, images, multimedia objects and chronologically ordered data that can be viewed through a browser (Winer, 2003).

reception by students (Lin & Shen, 2013; Reed & Edmunds, 2015) provided the factors influencing low participation are addressed (Moule, Ward, & Lockyer, 2010), the possibilities they offer to improve the standard of training (Garrity et al., 2014; Maag, 2005), and the advantages of being able to reach a greater number of people interested in health care and food given the potential of blogs to share knowledge and inform (Almeida, Christovam, & Correia, 2018).

It is in precisely this context that the experience we shall examine here is framed. In the following, we will present results obtained from research into the advantages and disadvantages of, and attitudes of students to, the use of blogs as a pedagogical tool in the Nutrition and Dietetics module of the undergraduate course in Nursing at the University of Castilla-La Mancha (Spain).

Objectives

Our general objective was to do a preliminary implementation and evaluation of the potential of a virtual learning environment, specifically a blog, developed for the Nutrition and Dietetics module of the undergraduate course in Nursing. This initiative was designed to increase student engagement and improve the quality of education through the use of ICT. Through the use of this virtual learning environment, we focus on facilitating the acquisition of critical thinking skills through reflection on how the ways in which evidence is produced necessitate both continuous training and a critical attitude toward this evidence (Lee, Abdullah, Subramanian, Bachmann, & Ong, 2017; Reed & Edmunds, 2015; Schuelke & Barnason, 2017; Shirazi & Heidari, 2019).

A secondary objective was to develop general skills that would facilitate our future professionals' health promotion work, which nowadays includes the management of virtual learning environments as an essential part of the concept of digital care (Mitchell & Kan, 2019). In addition, the structure of the contents of the blog provides a more open insight into the professional networks that exist, using references and quotations from other blogs or experts on the topic that can be found and contacted on social networks such as *Twitter*. The exchange of information in the field of Nutrition and Dietetics is very fast, due to the high rate of scientific output and the challenges posed by nutritional epidemiology (Ioannidis, 2018). The use of blogs allows us to work collaboratively and directly in this frenetic context of constantly-evolving evidence, as well as providing a point of reference where students and professionals can share experiences and find answers to questions.

Implementation and evaluation of a pedagogy

Project design

The study described in this paper comes from the second stage of a larger two-stage project. The former stage took place during the academic year 2016/2017, when a blog on the subject of Nutrition and Dietetics⁴ was created and hosted on WordPress.com using a free plan, and served to prototype the project in its initial phases and to develop

³Doctors, nutritionists and fitness specialists have become a phenomenon on social networks, with a large number of pages and blogs where they share tips, images and healthy recipes, which is known as *Nutritional Coaching*. Some websites even provide classifications of which blogs are better or worse, both in English (e.g. <https://bit.ly/2XJj2he>), and even, for example, in Spanish (e.g. <https://bit.ly/31kLJD7>). However, authors such as Bissonnette-Maheux and colleagues stress that these tool are still in their infancy, and much work remains to be done before we can determine its effectiveness in improving healthy eating (Bissonnette-Maheux et al., 2015).

a more detailed and systematic plan for the remainder of the project. This stage was necessary to gather information from the students so that they cope with (an accept) a tool such as blogs for teaching purposes and which aspects of this tool they found most attractive. A key finding was that the teaching staff needed resources to introduce students to the new tools. In addition, during this stage the research team adopted the decision that the blog should be distributed in a publically-available way (accessible to anyone through search engines and published under a Creative Commons (CC BY-NC-ND 4.0) license). Therefore, this project also meant that the doors of the classroom were opened not just to students from other courses, but also to society in general.

The second stage of this work took place during the academic year 2017/2018, when the experience described here was carried out. During this stage, the project contemplated two main milestones: the development of a common public blog, which would fulfil with the characteristics of the use of blogs in education described in the literature, and to promote the development of blogs of similar characteristics by the students of the course, to evaluate the potential for developing the activity themselves as future health educators.

Participants

The Nutrition and Dietetics module is a one-semester course taken in the second semester of the first year of the undergraduate course in Nursing. The University of Castilla-La Mancha itself is situated in the centre of Spain and has a multi-campus structure. The evaluation of a pedagogy reported here took place on the Toledo campus, and was therefore conducted in Spanish. During the academic year 2017/2018, 99 students were attending the Nutrition and Dietetics module.

Project development

In a first session at the beginning of the academic year 2017/2018, the students were introduced to the concept of blogs, as well as to their potential uses in Health Sciences. In this same training session, the students were introduced to the WordPress platform and practised some basic blog management skills (editing posts and pages, publishing posts and basic concepts of personalisation). The video tutorials used to train the students are published on *YouTube* and described in Table 1.

Throughout the Nutrition and Dietetics module (which ran from February 1 to May 18), the instructor published a weekly blog post summarising the basic concepts covered in that week's theoretical and practical classes. These posts included both the elements studied in class and practical examples drawn from current news to facilitate understanding of the concepts which had been developed through face-to-face teaching. These posts were published in the course's *general* category, and labels were used to facilitate their later retrieval by subject. Additionally, a specific *questions* category was used to publish answers to questions asked by the students, which were generally related to myths in nutrition, based on the available scientific evidence. Finally, students were asked to subscribe to the blog in order to stay up-to-date with new publications.

At the beginning of the course, the students were divided into working groups to develop a class group project accounting for 30% of their final grade. This group project involved the students, in groups of five or six, publishing their own blog focussing on, at least, one of

⁴Accessible through <https://bit.ly/2Wyr4rC>.

the major themes of the module (eating habits, nutritional anthropometry, consumption of harmful substances, or the impacts of physical activity or sedentary lifestyles on health).

Project evaluation

Finally, the students’ degree of satisfaction with the exercise, as well as any feedback, were evaluated using an anonymous online questionnaire (hosted on *Google Forms*) consisting of 5 general (yes or no) questions on their previous experience with virtual learning environments, along with a series of questions about the use of the blog (4 questions), the impact of the blog on their work during the course (8 questions) and the teacher’s work in the developing the blog (4 questions), which were answered using a scale of estimated ratings (from *strongly disagree* to *strongly agree*, including an *unsure* option), that were adapted from previously published questionnaire (Churchill, 2009).

Data collection

Answering these questions was not obligatory, nor was any kind of reward offered to those students who responded; the students were asked to participate in this online survey via an email sent only at the end of the course once the grades had already been published. The students signed a virtual consent form to participate in the survey and were duly informed of the confidentiality of the survey. Students were also invited to provide more information by participating in informal interviews lasting about 10 min. These interviews were intended to provide data complementary to those collected by the questionnaire, with questions designed to motivate students to communicate their comprehension of the activity, their experiences in this regard and their opinions on the effectiveness of the activity. This also took place after the publication of the grades in order to avoid possible bias in the responses.

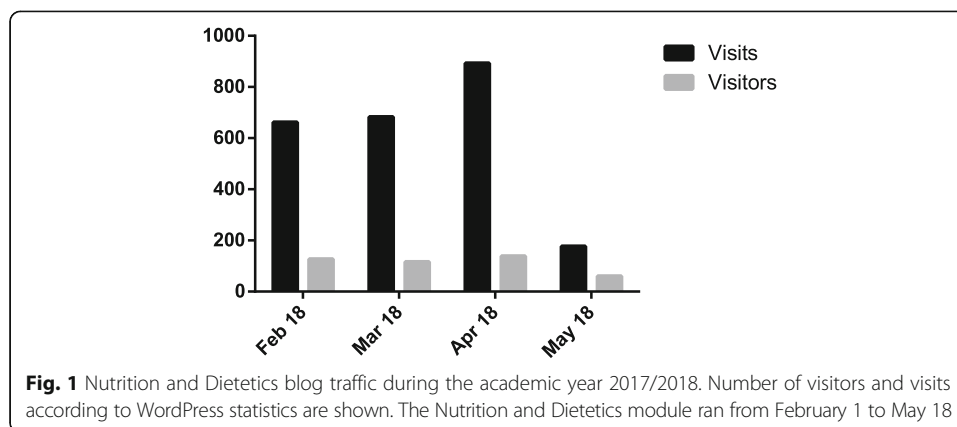
Findings

Blog traffic

During the academic year 2017/2018, a total of 14 posts were published in the module’s *general* category, and 8 posts in the *questions* category. The traffic generated during this period (February to May) amounted to 2415 views by 442 visitors, for an average of 5.5 views per visitor. The data quoted here were obtained directly from the traffic analysis tool available in WordPress and are broken down by month in Fig. 1. While each visitor on average made 5.5 visits to the blog, if we assume that the vast majority of those

Table 1 Video tutorials produced to facilitate students training. A general description of the content of the video is provided, together with a URL which provides direct access to video playback via *YouTube*

Video description	URL
Main differences between WordPress and Blogger. Registration in WordPress	https://goo.gl/XRoF4e
Editing pages in WordPress	https://goo.gl/iux8Yd
Basic configuration of WordPress	https://goo.gl/3AAfAF
Publishing posts in WordPress	https://goo.gl/aLCx1M
Personalising WordPress	https://goo.gl/wkv1rY
Organisation using categories and labels	https://goo.gl/11nr69



visitors would be students taking the module, it is reasonable to assume that each of the module's 99 students visited the blog an average of 24.4 times. This would imply that each post published during the course was visited approximately once by each student. No post received any comments from any student.

Blog organisation

The main menu of the Nutrition and Dietetics blog (see Fig. 2) offers four pages that visitors can access: all published posts (Home), a page explaining the blog's main objectives (*Objetivo del blog*), links to other blogs and professional dietitians to follow on social networks (*Para aprender más ...*), and a contact form to directly contact the project director (*Contacto*). The blog posts were organised into two categories: the first comprised weekly posts (with information pertaining to the week they were published), organised according to the academic year in which they were published (in this case 17–18); the second category (*Dudas*, meaning *questions* or *doubts* in Spanish) consisted of posts taking students' questions as a starting point to discuss a specific topic from the course in more detail. In addition, specific labels were used to tag each post according to its content, making it possible to search for posts on a given subject.

Writing and posting blog content

During each week of the course (with the exception of the first week, in which the training for students took place), a post was published compiling the information covered during that week, with a total of 14 posts during the course. In this section, the general characteristics of these publications will be discussed using a specific post as a concrete example.

As a general rule, each weekly post focussed on a topic previously addressed throughout the week in the theoretical and practical classes, taking advantage of the general characteristics of blogs to provide additional information that would encourage students' interest in the subject. Figure 3 shows an example of this type of post, where a discussion on the vitamin C content of blueberries, which was taken from a radio programme popular among university students, is used to explain in detail how the nutrient content of foods can be calculated using databases (in this case the Spanish Food Composition Database (BEDCA)). In addition to showing how to make these calculations and which sources of information to refer to, links to additional content related to the subject matter are provided.

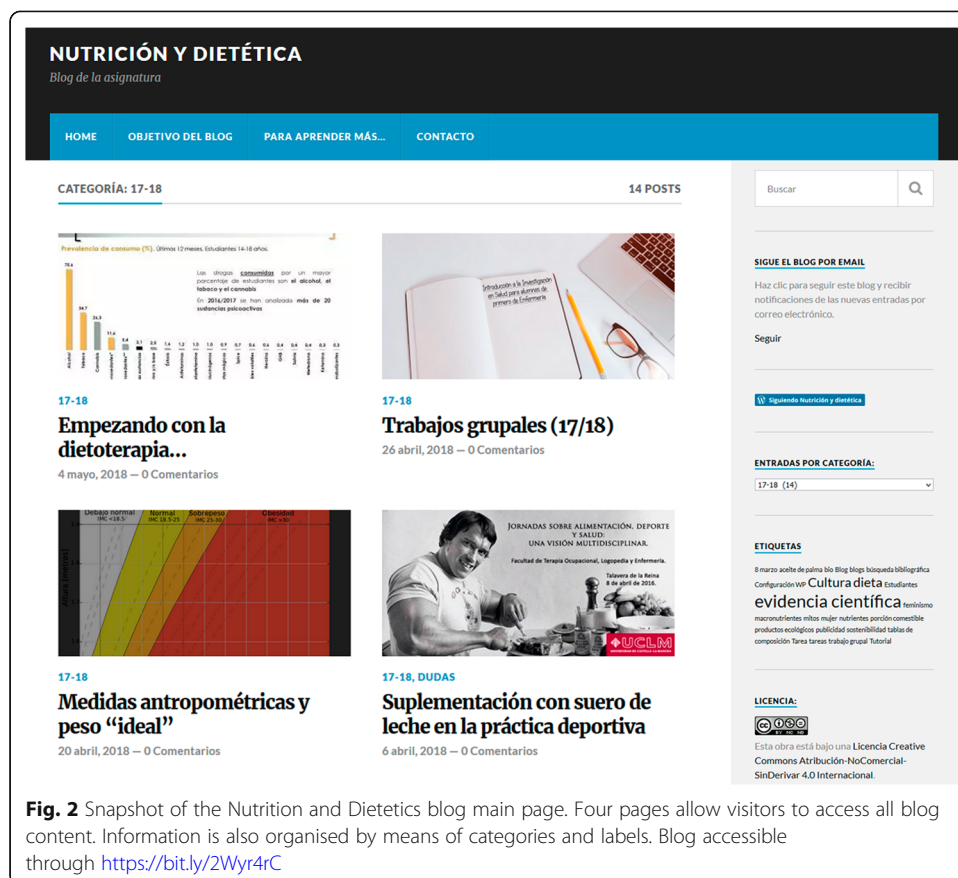


Fig. 2 Snapshot of the Nutrition and Dietetics blog main page. Four pages allow visitors to access all blog content. Information is also organised by means of categories and labels. Blog accessible through <https://bit.ly/2Wyr4rC>

Answering questions via blog posts

Students sometimes ask questions to the whole class through Moodle, the Learning Content Management tool used at the University of Castilla-La Mancha. The most interesting questions raised are answered in a blog post on that topic. Generally, each of these posts starts with the student’s question framed in a box. From that starting point, the question is addressed using the most up-to-date evidence available, enhanced by the features of the blog (i.e. using images and video where possible). An example of this type of post is shown in Fig. 4. The student’s question here is related to a previous post which asked whether our culture has any influence on the food we eat. In this case, new evidence had become available to clarify the debate on this issue: firstly, the work of Stringhini and collaborators, which postulates that there is an relationship between socio-economic status and health with a relevance comparable to other well-known health determinants such as the consumption of tobacco or alcohol; and secondly, the ALADINO study involving 10,000 Spanish children in 2015 also observed greater incidences of obesity with lower socioeconomic status (Estudio ALADINO 2015, 2016; Stringhini et al., 2017).

Students’s blogs

As part of the grading of the module, the students had to carry out a group task which involved creating a blog on a specific topic of their choice from those covered in the module. The idea was to apply the scientific method to resolve a specific question:

problem statement, hypothesis statement, study of literature and, finally, evidence-based conclusions. To do this, all the information obtained had to be organised into a blog. Figure 5 shows a representative example of a blog created by one of the 15 groups of students⁵; this example addresses the issue of nutritional supplements for sportsmen and women, and provides evidence-based recommendations for their consumption.

Students feedback

Students were asked to evaluate this project by voluntarily answering an anonymous self-administered questionnaire. Out of a total of 99 students who took the Nutrition and Dietetics module, only 14 filled in the questionnaire (14.1% response rate), so the analysis of these responses may not represent the actual opinions of the class about this project. However, disregarding the possible bias in the analysis, the students who did respond generally expressed good levels of satisfaction with the use of the online blogging environment in the course, as well as its ease of use and the work of the instructor. The students also stated they were willing to use this tool again in the future.

From a qualitative point of view, the students' comments underline the positive way in which the initiative was received, recognising and valuing the work and dedication of the teacher. However, the students also commented that these approaches involve more work for students in an environment that they perceive as already saturated, admitting that their main motivation is to pass, while the learning process itself remains a secondary priority.

Discussion

The analysis of this experience of the use of a blog as a component of a health education teaching strategy shows a notable degree of heterogeneity. On the one hand, the evaluation of the teaching staff is very positive, and it is in line with the advantages and usefulness of blogs and other web applications that the existing literature has identified (Boulos et al., 2006; Chawinga, 2017) but, on the other hand, a poor level of participation and a significant workload for the teaching staff has been also reported. Among the positive aspects, beyond offering a complementary and successful model for the dissemination of content and answering student questions, these technologies represent a suitable tool for the acquisition and development of skills essential for nurses who can think critically. For example, this experience has allowed students to delve deeper into questions such as the way the scientific process operates, the distinction between science and *bad* science (Goldacre, 2014), and the need to adopt a critical attitude toward the production and presentation of facts (Kala et al., 2010; Oravec, 2003; Zinger & Sinclair, 2013). In addition, these skills are crucial to keep up with the rapid pace of scientific output in health, particularly in the field of food and nutrition, in which much misinformation frequently circulates, yet has the potential to directly impact consumer habits⁶. Therefore, if nursing students acquire the skills necessary to develop critical thinking they could be more aware about how the world is changing and the way they are developing their practice and, as a result, those skills may help to improve the quality and safety of care (Jefferies et al., 2018).

⁵A complete list of projects completed is available at: <https://nutri17.wordpress.com/2018/04/26/trabajos-grupales-17-18/>.



The negative outcomes of this experience must be also underlined, in particular the low participation rate of the students (an average just 24.4 visits to the blog per student), beyond the collaborative work that formed part of the assessment of the module. The low response rate to the questionnaire (14.1% of students responded), and the lack of any comments on the posts are no coincidence. We would suggest that a large proportion of students tend to express a preference for more linear methodologies, with more “solid” content, which are less open to interpretation and discussion. There is one recurring question virtually every university professor has heard repeated in every course – “will this be on the exam?” – which shows a greater tendency toward the evaluation of content than of skills.

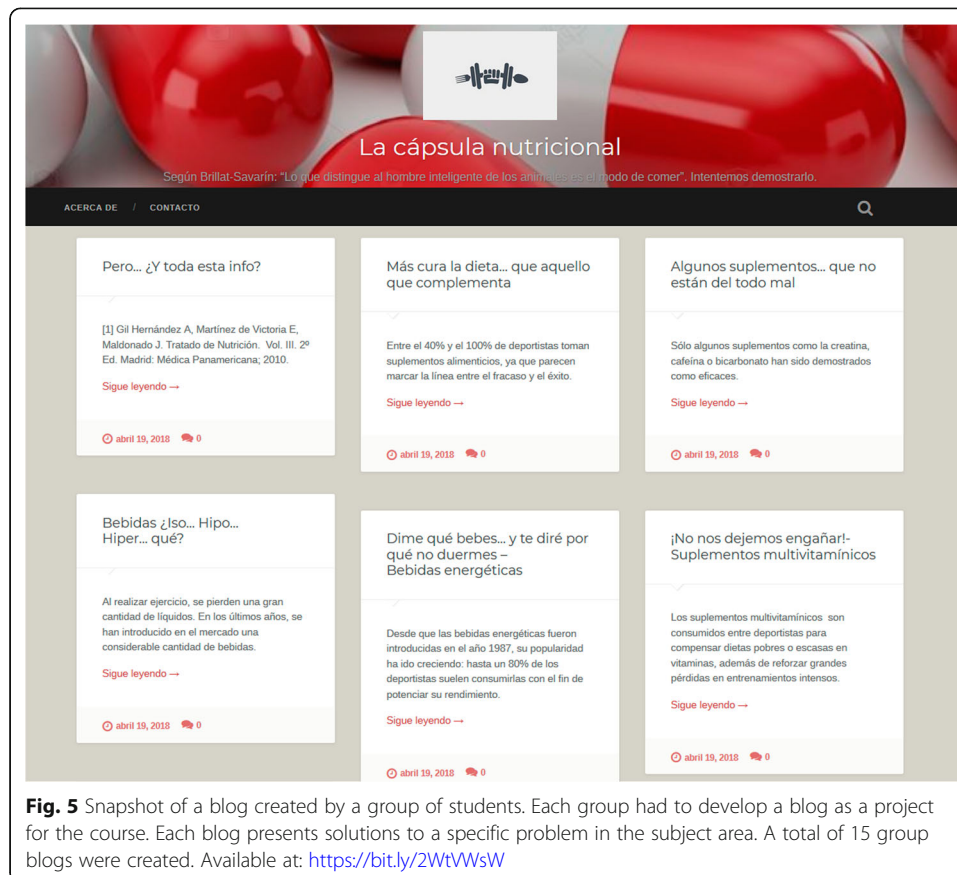
It is also important to point out that the use of blogging as pedagogical tool in health education entails a significant workload for the instructor, which takes away time from other activities and could possibly hamper performance in an increasingly-demanding role which includes duties in disparate areas such as teaching, management, bureaucracy and research. This time commitment did not go unnoticed by students, who tend to value positively initiatives such as the one presented here, where the visual aesthetics of this form of dissemination particularly stand out.

⁶For example, during the course of this experience, a hoax propagated claiming that bananas should be banned because they were being infected with HIV-contaminated blood. Available at: <https://bit.ly/2WBXTx>.



Despite the ethical consequences of not publishing negative results (Kaplan & Irvin, 2015; Mlinarić, Horvat, & Šupak Smolčić, 2017), although negative/null results are not negative for science, the existence of a publication bias toward the selective reporting of positive outcomes in the literature has previously been recognised and extensively discussed (Dwan, Gamble, Williamson, Kirkham, & Reporting Bias Group, 2013; Hope-well, Loudon, Clarke, Oxman, & Dickersin, 2009; Wayant et al., 2017). A global analysis of the present experience, taking into account the increased workload for educators and the low participation of students in this type of activity, seems to support the idea that publication is biased toward successful experiences, which emphasises the attractive end product of the project (the blog itself) and the positive evaluation of the students' experiences. Future research must elucidate how strongly publication bias affects scientific literature in this field (van Aert, Wicherts, & van Assen, 2019).

Beyond this somewhat pessimistic view, we can identify certain elements that may present barriers to greater participation. We start from the premise that there are no socioeconomic barriers here, since all students have the means to access the resources. On the one hand, our project involves first-year students whose previous learning experiences have, as a general rule, employed teaching methods that are more vertical than dialogical, embodying a model that places more value on the memorisation of facts than on the process of producing and questioning them. It is left for the future to repeat the experiment with students at different stages of their university education and also whether or not they will continue using blogs to learn (Ifinedo, 2018). On the other hand, students tend to cite the "overwhelming" or "excessive" amount of time



demanded by the way in which study courses are organised. This results in them allocating the time that they do have to mandatory and classical activities (which they are already familiar with and know how to handle), which take priority over new learning experiences such as those proposed here, which are perceived as “extra” effort. We do not know if the high number of students in the class also limits the effectiveness of initiatives such as these, just as it is difficult for us to measure the real effectiveness of this type of proposal (Boulos et al., 2006).

Conclusions

The evaluation of the use of blogs in the teaching of the Nutrition and Dietetics module is generally positive. From a theoretical perspective, and from the point of view of evaluators, blogging allows a new tool to be incorporated into the pedagogical process, which replicates most of the advantages identified in the literature (e.g. their capability to encourage learners’ deeper engagement with learning materials and their powerful collaboration features). However, the student participation evaluated in this paper has not been in line with many of the published works. Here we support the hypothesis that there may be a publication bias toward successful experiences, idealisation of activities in virtual learning environments, or perhaps a specific characteristic of the Spanish university environment that requires further analysis.

Future investigations are needed to address the lack of evidence-based guides for the use of blogging as a pedagogical tool, specifically in health education. Some additional

issues require further development, such as work to eliminate barriers and increase participation and motivation, and ways to integrate these offerings into revised general models. For example, the process of assessing skills acquired through dialogic pedagogical models must be refined. On the other hand, blogs are fully-customisable tools, so one pertinent question is: “Is there a blog structure that works better than the others?” In other words, how should the blog be structured to best facilitate students’ learning?

Acknowledgements

The authors would like to thank all university students that kindly participated in this project to help improve it.

Authors’ contributions

DC-C and LM conceived and drafted this manuscript. CAC developed the work on WordPress and created blog content. IB-Y and CAC analysed the results and extracted the main conclusions. All authors contributed to the final manuscript. All authors read and approved the final manuscript.

Funding

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Department of Nursing, Faculty of Nursing & Occupational Therapy, University of Extremadura, Badajoz, Spain.

²Department of Nursing, Physiotherapy and Occupational Therapy, School of Physiotherapy and Nursing, University of Castilla-La Mancha, Toledo, Spain. ³Regional Center for Biomedical Research, University of Castilla-La Mancha, Albacete, Spain. ⁴Department of Inorganic and Organic Chemistry and Biochemistry, School of Medicine, University of Castilla-La Mancha, Ciudad Real, Spain.

Received: 4 April 2019 Accepted: 5 July 2019

Published online: 14 August 2019

References

- Aguilar Martínez, A., Medina, F. X., Pons Albalat, J. A., & Saigí Rubió, F. (2013). Challenges and opportunities of 2.0 tools for the interdisciplinary study of nutrition: The case of the Mediterranean diet wiki. *International Journal of Educational Technology in Higher Education*, 10(1), 210–225. <https://doi.org/10.7238/rusc.v10i1.1341>.
- Almeida, B. d. L. O. d. S., Christovam, B. P., & Correia, D. M. d. S. (2018). El uso de blog como estrategia de formación continua en enfermería: Una revisión integradora de la literatura. *Enfermería Global*, 17(49), 500–528. <https://doi.org/10.6018/eglobal.17.1.277841>.
- Alventosa, J. P. M., Peris, A. V., & Guerrero, C. S. (2016). Percepción de los estudiantes de una experiencia de uso didáctico de blog docente en Educación Superior. *Educación XXI*, 19(1). <https://doi.org/10.5944/educxx1.15579>.
- Becker, K. A., & Freberg, K. (2014). Medical student storytelling on an institutional blog: A case study analysis. *Medical Teacher*, 36(5), 415–421. <https://doi.org/10.3109/0142159X.2014.891007>.
- Bissonnette-Maheux, V., Provencher, V., Lapointe, A., Dugrenier, M., Dumas, A.-A., Pluye, P., ... Desroches, S. (2015). Exploring women’s beliefs and perceptions about healthy eating blogs: A qualitative study. *Journal of Medical Internet Research*, 17(4), e87. <https://doi.org/10.2196/jmir.3504>.
- Blood, R. (2000). Weblogs: A History and Perspective. Retrieved from Rebecca’s pocket website: http://www.rebeccablood.net/essays/weblog_history.html.
- Bonus, S., Wright, E., Scheidt, L. A., & Herring, S. C. (2005). Weblogs as a bridging genre. *Information Technology & People*, 18(2), 142–171. <https://doi.org/10.1108/09593840510601513>.
- Boulos, M. N. K., Maramba, I., & Wheeler, S. (2006). Wikis, blogs and podcasts: A new generation of web-based tools for virtual collaborative clinical practice and education. *BMC Medical Education*, 6(1), 41. <https://doi.org/10.1186/1472-6920-6-41>.
- Bruguera, E., & Campàs, J. (2007). El hipertexto y Los blogs. Editorial UOC.
- Bruns, A., & Humphreys, S. (2005). Wikis in teaching and assessment: The M/cyclopedia project. In *Proceedings of the 2005 international symposium on Wikis*, (pp. 25–32). <https://doi.org/10.1145/1104973.1104976>.
- Camacho, M. E., Carrión, M. D., Chayah, M., & Campos, J. M. (2016). The use of wiki to promote students’ learning in higher education (Degree in Pharmacy). *International Journal of Educational Technology in Higher Education*, 13(1), 23. <https://doi.org/10.1186/s41239-016-0025-y>.
- Chavinga, W. D. (2017). Taking social media to a university classroom: Teaching and learning using Twitter and blogs. *International Journal of Educational Technology in Higher Education*, 14(1), 3. <https://doi.org/10.1186/s41239-017-0041-6>.
- Chun, H. C. P., Skinner, S.-M., & Rosewall, T. (2019). The educational utility of blogging for MRI technologists. *Journal of Medical Imaging and Radiation Sciences*, 50(1), 129–135. <https://doi.org/10.1016/j.jmir.2018.09.005>.
- Churchill, D. (2009). Educational applications of web 2.0: Using blogs to support teaching and learning. *British Journal of Educational Technology*, 40(1), 179–183. <https://doi.org/10.1111/j.1467-8535.2008.00865.x>.
- Correa, J. M., & de Pablos, J. (2009). Nuevas tecnologías e innovación educativa. *Revista de Psicodidáctica*, 14(1), 133–145.

- Domínguez, G., & Llorente, M. d. C. (2009). La educación social y la web 2.0: Nuevos espacios de innovación e interacción social en el espacio europeo de educación superior. *Pixel-Bit. Revista de Medios y Educación*, 0(35), 105–114.
- Du, H. S., & Wagner, C. (2007). Learning with weblogs: Enhancing cognitive and social knowledge construction. *IEEE Transactions on Professional Communication*, 50(1), 1–16. <https://doi.org/10.1109/TPC.2006.890848>.
- Dwan, K., Gamble, C., Williamson, P. R., Kirkham, J. J., & Reporting Bias Group (2013). Systematic review of the empirical evidence of study publication bias and outcome reporting bias - an updated review. *PLoS One*, 8(7), e66844. <https://doi.org/10.1371/journal.pone.0066844>.
- Esteve, F. (2016). Bolonia y las TIC: De la docencia 1.0 al aprendizaje 2.0. *La Cuestión Universitaria*, 0(5), 58–67.
- Estudio ALADINO 2015 (2016). *Estudio de Vigilancia del Crecimiento, Alimentación, Actividad Física, Desarrollo Infantil y Obesidad en España 2015*. Madrid: Agencia Española de Consumo, Seguridad Alimentaria y Nutrición. Ministerio de Sanidad, Servicios Sociales e Igualdad.
- Ferdig, R. E., & Trammell, K. D. (2005). Content delivery in the “blogosphere”. *Journal of Educational Technology*, 1(4), 16–19.
- Garrity, M. K., Jones, K., VanderZwan, K. J., de la Rocha, A. B., & Epstein, I. (2014). Integrative review of blogging: Implications for nursing education. *Journal of Nursing Education*, 53(7), 395–401. <https://doi.org/10.3928/01484834-20140620-01>.
- Goldacre, B. (2014). Preventing bad reporting on health research. *BMJ (Clinical Research Ed.)*, 349, g7465. <https://doi.org/10.1136/bmj.g7465>.
- Hamm, M. P., Klassen, T. P., Scott, S. D., Moher, D., & Hartling, L. (2013). Education in health research methodology: Use of a wiki for knowledge translation. *PLoS One*, 8(5), e64922. <https://doi.org/10.1371/journal.pone.0064922>.
- Herman, D., Jahn, M., Ryan, M.L. (2010). *Routledge encyclopedia of narrative theory*. Routledge. <https://doi.org/10.4324/9780203932896>.
- Hopewell, S., Loudon, K., Clarke, M. J., Oxman, A. D., & Dickersin, K. (2009). Publication bias in clinical trials due to statistical significance or direction of trial results. *Cochrane Database of Systematic Reviews*, 1. <https://doi.org/10.1002/14651858.MR000006.pub3>.
- Iñedo, P. (2018). Determinants of students' continuance intention to use blogs to learn: An empirical investigation. *Behaviour & Information Technology*, 37(4), 381–392. <https://doi.org/10.1080/0144929X.2018.1436594>.
- Initiative, J. Q. (2004). Shared ‘Dublin’ descriptors for short cycle, first cycle, second cycle and third cycle awards. In *A report from a Joint Quality Initiative informal group (contributors to the document are provided in the Annex)*.
- Ioannidis, J. P. A. (2018). The challenge of reforming nutritional epidemiologic research. *JAMA*, 320(10), 969–970. <https://doi.org/10.1001/jama.2018.11025>.
- Jefferies, D., McNally, S., Roberts, K., Wallace, A., Stunden, A., D'Souza, S., & Glew, P. (2018). The importance of academic literacy for undergraduate nursing students and its relationship to future professional clinical practice: A systematic review. *Nurse Education Today*, 60, 84–91. <https://doi.org/10.1016/j.nedt.2017.09.020>.
- Kala, S., Isaramalai, S.-A., & Pohthong, A. (2010). Electronic learning and constructivism: A model for nursing education. *Nurse Education Today*, 30(1), 61–66. <https://doi.org/10.1016/j.nedt.2009.06.002>.
- Kaplan, A. M., & Haenlein, M. (2016). Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the cookie monster. *Business Horizons*, 59(4), 441–450. <https://doi.org/10.1016/j.bushor.2016.03.008>.
- Kaplan, R. M., & Irvin, V. L. (2015). Likelihood of null effects of large NHLBI clinical trials has increased over time. *PLoS One*, 10(8), e0132382. <https://doi.org/10.1371/journal.pone.0132382>.
- Kaufman, N. (2010). Internet and information technology use in treatment of diabetes. *International Journal of Clinical Practice. Supplement*, (166), 41–46. <https://doi.org/10.1111/j.1742-1241.2009.02277.x>.
- Kovic, I., Lulic, I., & Brumini, G. (2008). Examining the medical blogosphere: An online survey of medical bloggers. *Journal of Medical Internet Research*, 10(3). <https://doi.org/10.2196/jmir.1118>.
- Lara, T. (2005). Blogs para educar. Usos de los blogs en una pedagogía constructivista. *Telos: Cuadernos de comunicación e innovación*, 65, 86–93.
- Lee, D. S., Abdullah, K. L., Subramanian, P., Bachmann, R. T., & Ong, S. L. (2017). An integrated review of the correlation between critical thinking ability and clinical decision-making in nursing. *Journal of Clinical Nursing*, 26(23–24), 4065–4079. <https://doi.org/10.1111/jocn.13901>.
- Leveritt, M., Ball, L., & Desbrow, J. (2013). Students' perceptions of an experiential learning activity designed to develop knowledge of food and food preparation methods. *Journal of Food Science Education*, 12(3), 56–60. <https://doi.org/10.1111/1541-4329.12009>.
- Lin, K.-Y., & Shen, Y.-F. (2013). The nursing students' attitude toward using blogs in a nursing clinical practicum in Taiwan: A 3-R framework. *Nurse Education Today*, 33(9), 1079–1082. <https://doi.org/10.1016/j.nedt.2012.03.019>.
- Maag, M. (2005). The potential use of «blogs» in nursing education. *Computers, Informatics, Nursing: CIN*, 23(1), 16–24 quiz 25–26.
- Maher, J., & Burkhardt, S. (2017). Experiential learning for engaging nutrition undergraduates with sustainability. *International Journal of Sustainability in Higher Education*, 18(7), 1108–1122. <https://doi.org/10.1108/IJSHE-01-2016-0010>.
- Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education*, 56(2), 429–440. <https://doi.org/10.1016/j.compedu.2010.09.004>.
- Mitchell, M., & Kan, L. (2019). Digital technology and the future of health systems. *Health Systems and Reform*, 1–8. <https://doi.org/10.1080/23288604.2019.1583040>.
- Mlinarić, A., Horvat, M., & Šupak Smolčić, V. (2017). Dealing with the positive publication bias: Why you should really publish your negative results. *Biochemia Medica*, 27(3). <https://doi.org/10.11613/BM.2017.030201>.
- Molina, P., Valencia-Peris, A., Gómez-Gonzalvo, F. (2016). Innovación docente en educación superior: edublogs, evaluación formativa y aprendizaje colaborativo. *Profesorado*, 20(2), 432–449. <http://hdl.handle.net/10481/42595>.
- Moule, P., Ward, R., & Lockyer, L. (2010). Nursing and healthcare students' experiences and use of e-learning in higher education. *Journal of Advanced Nursing*, 66(12), 2785–2795. <https://doi.org/10.1111/j.1365-2648.2010.05453.x>.
- Myrick, F., Caplan, W., Smitten, J., & Rusk, K. (2011). Preceptor/mentor education: A world of possibilities through e-learning technology. *Nurse Education Today*, 31(3), 263–267. <https://doi.org/10.1016/j.nedt.2010.10.026>.
- Ngwenya, N. B., & Mills, S. (2014). The use of weblogs within palliative care: A systematic literature review. *Health Informatics Journal*, 20(1), 13–21. <https://doi.org/10.1177/1460458213475894>.
- Oravec, J. A. (2003). Blending by blogging: Weblogs in blended learning initiatives. *Journal of Educational Media*, 28(2–3), 225–233. <https://doi.org/10.1080/1358165032000165671>.

- Paulus, T., & Spence, M. (2010). Using blogs to identify misconceptions in a large undergraduate nutrition course. *TechTrends*, 54(5), 62–68. <https://doi.org/10.1007/s11528-010-0438-8>.
- Pérez-Navado, F., Medina, E. A., León, A. H., González, A. M., Bernáldez, M. J. B., & Ramos, M. d. G. C. (2012). Otras actividades complementarias para mejorar la docencia universitaria: Elaboración y utilización de blogs. *EduTec. Revista Electrónica de Tecnología Educativa*, (40), a200. <https://doi.org/10.21556/edutec.2012.40.363>.
- Reed, S. J., & Edmunds, D. (2015). Use of a blog in an undergraduate nursing leadership course. *Nurse Education in Practice*, 15(6), 537–542. <https://doi.org/10.1016/j.nepr.2015.07.010>.
- Romero, R. M., Espinoza, L. O. V., & Hernández, D. R. (2019). Organic chemistry basic concepts teaching in students of large groups at higher education and web 2.0 tools. *Actualidades Investigativas en Educación*, 19(1), 31–31. <https://doi.org/10.15517/aie.v19i1.35589>.
- Schuelke, S., & Barnason, S. (2017). Interventions used by nurse preceptors to develop critical thinking of new graduate nurses: A systematic review. *Journal for Nurses in Professional Development*, 31(1), E1–E7. <https://doi.org/10.1097/NND.0000000000000318>.
- Shirazi, F., & Heidari, S. (2019). The relationship between critical thinking skills and learning styles and academic achievement of nursing students. *The Journal of Nursing Research: JNR*. <https://doi.org/10.1097/jnr.0000000000000307>.
- Soto, C. F., Senra, A. I. M., & Neira, M. C. O. (2009). Ventajas del uso de las TICs en el proceso de enseñanza-aprendizaje desde la óptica de los docentes universitarios españoles. *EduTec. Revista Electrónica de Tecnología Educativa*, (29), a119. <https://doi.org/10.21556/edutec.2009.29.451>.
- Sterling, M., Leung, P., Wright, D., & Bishop, T. F. (2017). The use of social media in graduate medical education: A systematic review. *Academic Medicine: Journal of the Association of American Medical Colleges*, 92(7), 1043–1056. <https://doi.org/10.1097/ACM.0000000000000167>.
- Stringhini, S., Carmeli, C., Jokela, M., Avendaño, M., Muennig, P., Guida, F., ... Zins, M. (2017). Socioeconomic status and the 25 × 25 risk factors as determinants of premature mortality: A multicohort study and meta-analysis of 1.7 million men and women. *The Lancet*, 389(10075), 1229–1237. [https://doi.org/10.1016/S0140-6736\(16\)32380-7](https://doi.org/10.1016/S0140-6736(16)32380-7).
- van Aert, R. C. M., Wicherts, J. M., & van Assen, M. A. L. M. (2019). Publication bias examined in meta-analyses from psychology and medicine: A meta-meta-analysis. *PLoS One*, 14(4), e0215052. <https://doi.org/10.1371/journal.pone.0215052>.
- Vogt, M., Schaffner, B., Ribar, A., & Chavez, R. (2010). The impact of podcasting on the learning and satisfaction of undergraduate nursing students. *Nurse Education in Practice*, 10(1), 38–42. <https://doi.org/10.1016/j.nepr.2009.03.006>.
- Wayant, C., Scheckel, C., Hicks, C., Nissen, T., Leduc, L., Som, M., & Vassar, M. (2017). Evidence of selective reporting bias in hematology journals: A systematic review. *PLoS One*, 12(6), e0178379. <https://doi.org/10.1371/journal.pone.0178379>.
- Williams, J. B., & Jacobs, J. S. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology*, 20, 232–247.
- Winer, D. (2003). Harvard Weblogs: What makes a weblog a weblog? Retrieved 18 March 2019, from <http://blogs.harvard.edu/whatmakesaweblogaweblog.html>.
- Zayer, L. T., Beran, S. N., Alcaide-Pulido, P. (2017). Exploring the challenges of social media use in higher education. In A. C. Scheinbaum (Ed.), *The Dark Side of Social Media*. Routledge. <https://doi.org/10.4324/9781315167718>.
- Zinger, L., & Sinclair, A. (2013). Using blogs to enhance student engagement and learning in the health sciences. *Contemporary Issues in Education Research*, 6(3), 349–352.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen® journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► springeropen.com