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Effectiveness of The Wikipedia Collaboration of Dental Schools' Training Programme: a new Paradigm for Teaching and Learning of Evidence-Based Dentistry

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Background: The Wikipedia Collaboration of Dental Schools (WCODS) is a student-led initiative that aims to publish high quality scientific, evidence-based dental content on the Wikipedia online encyclopaedia by equipping its members to use research, critical appraisal and writing skills to create accurate content. In 2019, the Collaboration launched a standardised training programme developed by Wikimedia-trained committee members, academic dental school staff and the Cochrane Oral Health global community. *Objective*: To evaluate the effectiveness of this training programme in ensuring WCODS editors follow the processes underpinning Evidence-Based Dentistry (EBD). *Method*: A cohort of dental students and staff (n=136) from six dental schools in the UK and Malaysia took part in a standardised and structured training programme at the annual WCODS training meeting. Participants' abilities and their perceived levels of confidence in carrying out critical analysis of the literature were measured using pre- and post-training surveys, and competency assessments. *Results*: Participants' skills in conducting literature searches, critical appraisal of the findings and creating and editing a Wikipedia page improved after training. *Conclusion*: The training programme provided participants with the skill set and confidence to apply best practice to create and edit Wikipedia entries. This Collaboration intends to recruit more contributors to improve global oral health literacy using the free online Wikipedia encyclopaedia.

Keywords*: Wikipedia, Evidence-Based Dentistry, Curriculum, Dental Students, Dentistry, Training Programme*

Introduction

Founded in 2016 at the University of Dundee, Scotland, the Wikipedia Collaboration of Dental Schools (WCODS) is a student-led initiative with the core aims of expanding, maintaining and upkeeping dental content on Wikipedia using high-quality scientific evidence (Lai *et al.,* 2019). In collaboration with Cochrane Oral Health, WCODS promotes the dissemination of accurate dental information via Wikipedia encyclopaedia to the general public, and oral health professionals to equip them with information to make informed decisions concerning oral health (Smith, 2020). This goal mirrors the vision of the Cochrane Global Community of raising the profile of internationally recognised and trusted health evidence for patients and carers, to help them with decision making around their oral health and oral healthcare (Cochrane, 2020; Cochrane Oral Health, 2019).

When WCODS was established, we were drawing on an online resource with global access and an existing wealth of dental information (Wikipedia, 2008). It was a WikiProject (Wikipedia, 2007) with the aim of creating Wikipedia pages focusing on dental-related topics and editing those whose content lacked authority. Over the last five years, contributors have strived to transform Wikipedia into a reliable educational and knowledge exchange tool for the healthcare profession and public (Wikipedia, 2006).

The WCODS is led by a committee of eight undergraduate dental students at the University of Dundee Dental School (DDS), spearheaded by a President and Vice President in their final years of study. They coordinate activities with other Wikipedia student representatives from partner universities and seek guidance when required from staff members.

At the beginning of each academic year, WCODS launch the editing cycle by organising an introductory event for potential contributors. Recruitment of participants from DDS is carried out through word-of-mouth and the school's social media pages. In 2019, over 300 dental undergraduates and postgraduates in DDS were invited to the event, of which 60 attended in person. Recruitment from other dental schools was facilitated by informing their Deans, School Managers and student representatives who shared the information.

Participating students and staff are allocated to working groups of six to ten contributors, each led by a Wikimedia-trained student committee member, overseen by a staff member. At the first meeting, participants received training on navigating Wikipedia. In addition, dental articles on Wikipedia, judged as suboptimal based on anecdote, poor structure, or inadequate referencing, are edited using a structured approach framed within published evidence. Using a checklist to standardise the process, the veracity of the content is then confirmed by the staff member before being posted on Wikipedia.

Each March, an annual conference is held in Dundee to conclude the editing cycle, to which all contributors are invited. The conference celebrates the annual editing achievements, forms a platform for networking and to scope future developments and serves as the pinnacle of that year's editing cycle.

Starting with only a modest group of editing members from DDS, WCODS grew to comprise participants from other schools in the UK, Canada and Malaysia. It became apparent that a training programme was needed to ensure authoritative posts and beneficial edits, quality and consistency for existing entries, and to guide potential contributors. The training had to be applicable to different schools regardless of country. Because favourable outcomes were reported by Azzam et al. (2017) and Apollnio et al. (2018), the same training model as that used by the Medical and Pharmacy faculties at the University of California, San Francisco was adopted.

The new programme was devised and piloted by the Dundee Committee and offered participants training to; 1) formulate a research question, 2) conduct literature searches, 3) critically appraise the evidence and 4) create posts complying with Wikipedia's policies and guidelines. The programme aimed to recruit many of the processes used in EBD teaching to ensure Wikipedia complements other platforms for rigorous scholarship.

The programme was devised to include all the skills that the Society considered important for editing. Based on this, an interactive educational screencast was designed to equip participants with the following skills:

- devising clinical questions using the PICO framework to facilitate literature searches;
- accessing publications from research databases such as Cochrane Library, PubMed and Trip Medical Database;
- cross-checking sources and applying the hierarchy of evidence pyramid;
- critical appraisal; and
- writing accurate and coherent text using non-medical jargon.

This tutorial was enhanced by appraising a systematic review using the Critical Appraisal Skills Programme Checklist (CASP, 2018). This group activity was guided by students who had posted on Wikipedia.

The program concluded with a step-by-step guided tutorial on how to create and verify individuals' Wikipedia accounts. Alongside live demonstration, participants were given a soft copy of the Tutorial Guide (Appendix 1 https://drive.google.com/drive/folders/1psBO04fSZiSEu84jWMvyYLxD82qI1TCi?usp=sharing) in navigating Wikipedia. The participants worked in groups to identify suboptimal dental articles that required editing and to suggest new oral health topics to be added to Wikipedia.

Similar initiatives have been introduced in other healthcare areas. Maggio et al. (2020) reported that the editing of Wikipedia posts delivered from dashboards maintained by Wiki Education formed part of several North American healthcare programmes including Medicine, Nursing, Audiology and Pharmacology. Such learning exercises also explored EBM skills, but their efficacy was not reported. Therefore, this project aimed to evaluate the effectiveness of the standardised and structured training programme launched by WCODS. A

bespoke questionnaire was delivered before and after the training with the objectives of 1) comparing participants' knowledge and levels of confidence before and after the training, and 2) identifying future educational initiatives to improve the process in compiling the posts and thereby improving their academic rigor.

For this study, 'levels of confidence' are defined as the self-belief that participants can contribute to and post their edits on Wikipedia.

Method

In 2019, nine dental schools across the UK and Malaysia were invited to take part in WCODS. Six dental schools agreed, so that 162 individuals attended the introductory event either physically or virtually, and 157 students and two members of staff signed up to take part in the training in that academic year. All participants completed a questionnaire titled "Readiness to Wiki" (Appendix 1 at http://shorturl.at/knJT4) before and after training.

The overarching objective was to offer a uniform training programme but individualised to meet the perceived need of different schools. For example, resources were made available online via Google Drive and the questionnaire was delivered as a web-based survey using Google Forms to account for geographical and time differences. The Dundee committee provided training using virtual meetings to partner schools in the UK. Some participants from the International Medical University (IMU) and University Sains Malaysia (USM) received face-to-face training from members of the Dundee Committee when visiting Malaysia.

"A Readiness to Wiki Questionnaire" was a competency exercise to evaluate change in participants' understanding of EBD before and after training using six multiple choice questions (MCQs) (Table 1). As a marker of engagement in training and to be allowed to contribute to Wikipedia as part of the WCODS, participants were required to achieve at least four or more correct answers from the six questions. Four questions, with pre-coded responses on 5-point Likert scales enquired about participants' confidence to conduct an online literature search to address a research question; critically appraise the strengths and weaknesses of a paper; access the most robust suitable evidence in order to answer the research question(s); and carry out edits. To embed their training and for future reference, all were provided with a second digital Project Guide (Appendix 1 https://drive.google.com/drive/folders/1psBO04fSZiSEu84jWMvyYLxD82qI1TCi?usp=sharing).

The pre- and post- questionnaires were the same, apart from one section, which was excluded from the post-training questionnaire. This section explored participants' frequency of accessing evidence from different sources and the information was only required one time.

Data from before and after training questionnaires were analysed to determine whether there was a difference in participants' knowledge, skills and levels of confidence in editing dental articles for Wikipedia using high-quality evidence before, and after the training. In the knowledge component, each correct answer was awarded one mark, thus the highest achievable score was six and the lowest was zero. Only three questions were used to assess participants' confidence in the necessary skills to produce reliable dental content.

Table 1. The six Pre- and Post-Training Competency Questions.

Question	Options (Bolded response illustrates correct answer)
1 Which of the following is NOT considered Secondary Evidence?	A. Systematic Reviews B. Review Articles C. Cochrane Reviews **D. Journal Articles**
2 If I am unsure about which citation to use on Wikipedia, I should...?	A. Cite any study, what matters is that a citation is used **B. Ask other users on the article's talk page/Wiki Project Medicine Talk page** C. Not use any citation D. I don't know
3 Published reports on treatments can be ranked with respect to the strength of the evidence. Which one of the following is the most correct statement with respect to ranking of evidence?	A. Clinical case studies are ranked higher than randomized controlled trials. **B. Expert opinion is the lowest level of evidence.** C. Lab animal research is the highest level of evidence. D. Research supported by the National Institutes of Health is the highest level of evidence E. I don't know.
4 In judging the quality of the dental literature, which one of the following is the highest level of evidence?	A. Article on a non-randomized clinical trial that includes references . B. Case series article that has been peer-reviewed and published in the Journal of Dental Research. **C. Cochrane review of an oral health topic.** D. Detailed report of a clinical case by a recognized dental expert. E. I don't know.
5 Which of the following statements best describes a PICO?	A. Checklist of guidelines to assist investigators with the reporting of the findings from a meta-analysis. B. Defines a specific MeSH heading and provides synonyms covered by that heading. **C. Process for converting a clinical problem into questions that can be answered by searching for evidence.** D. Technique for combining search terms in order to restrict a search to articles with specified elements. E. I don't know.
6 Which of the following describes Clinical Guidelines?	**A. Systematically developed statements to assist practitioner decisions about appropriate healthcare for specific clinical circumstances** B. An agreed framework outlining the care that will be provided to patients in a designated area of practice. They do not describe how a procedure is performed, but when, where, when and by whom the care was given C. A statement, reached through consensus, which clearly identifies the desired outcome.Usually used within audit as a measure of success D. A formal written statement detailing the particular action to be taken in a particular station that is contractually binding E. I don't know

A simple descriptive analysis in SPSS described the participants. A paired samples *t*-test, followed by bootstrap resampling with 5000 datasets to identify differences in scores before and after the training. The significance level was set at p <.05. Bootstrapping allowed for a more robust analysis of ordinal data than would be possible with t-tests.

Results

All 159 participants submitted the pre-training questionnaire but only 136 (84%, 134 students and two staff) completed it post-training (Table 2). The 23 who withdrew did so for a variety of reasons and appeared to be representative of those participants who completed the study, and therefore did not appear to influence the results. One participant dropped out during the editing cycle.

Fifty-seven participants had just started their clinical training, with the others at various stages during their programme. Four were pursuing a Masters programme. Forty-eight had previously made entries to Wikipedia.

The effectiveness of the training programme was reflected by changes in participants' scores. Although the process was formative, an arbitrary score of four was considered a good indication of competence.

Before the training, participants achieved a mean score of 3.29 (minimum and maximum possible score 0 and 6). From 136 participants, eight (5.88%) scored 0 and fourteen (10.3%) achieved all correct answers. Less than half (42.6%) achieved four correct answers, underpinning the need for training. Post-training, the mean score improved to 5.11, with over 90% achieving four correct answers (Table 3). Although somewhat counter-intuitive, of the 14 participants who previously scored the highest, only eight maintained their score.

The training programme was successful in that slightly more than a fifth (23.5%) lacked confidence in searching the literature to address a dental or oral health related question at baseline, whereas post training only three percent (2.9%) lacked confidence. Indeed, following training, half (47.8%) were confident and twenty percent (20.6) very

Table 2. Details of 136 participants of the WCODS.

	School of Dentistry, University of Dundee	International Medical University, School of Dentistry, Malaysia	Queen's University Belfast School of Medicine, Dentistry and Biomedical Sciences	Institute of Dentistry, University of Aberdeen	School of Dental Sciences, Pusat Pengajian Sains Pergigian, Universiti Sains Malaysia	University of Glasgow Dental School
1BDS	15	-	3	-	-	-
2BDS	9	-	6	-	4	-
3BDS	6	37	7	4	2	-
4BDS	8	2	3	2	1	-
5BDS	15	-	-	4	-	2
Post-graduate	4	-	-	-	-	-
Staff	-	-	-	-	2	-
TOTAL	57	39	19	10	9	2

Table 3. Confidence of 136 participants Pre- and Post-Training.

	Literature Searching		Critically Appraising		Finding Suitable Evidence	
	Pre-%	Post-%	Pre-%	Post-%	Pre-%	Post-%
Very Confident [5]	10.3	20.6	3.68	13.2	8.09	30.9
Confident [4]	22.1	47.8	16.2	44.9	31.6	47.8
Moderately Confident [3]	40.4	28.7	38.2	36	34.6	20.6
Not Confident [2]	23.5	2.2	35.3	5.2	24.3	0
Not Confident at all [1]	3.7	0.7	6.6	0.7	1.5	0.7
Mean Difference	-0.74		-0.89		-0.88	
Bias	0.01		0.02		0.01	
P paired samples bootstrapped t-test	<.01		<.01		<.01	

confident as they mentioned that it was seldom covered in the undergraduate syllabus. Participants' confidence in critical appraisal increased from 3.7% and 16.2% (confident and very confident respectively) to 45% and 13.2% post training.

Discussion

This study found that the training programme improved participants' confidence in identifying subject areas not covered by Wikipedia, searching the literature and critically appraising that literature. It is argued that this training programme will improve the quality of the edits although more objective measurements such as citation indices can only be performed over time, and it is difficult to compare this with other knowledge platforms.

Based on these results and feedback from the programme, contributors valued the opportunity to synthesise and evaluate papers, systematic reviews and guidelines to enhance their knowledge. Of note, they considered they were better able to communicate complex dental related concepts into bite-sized, readable chunks for the general public. By posting reliable, up-to-date and contemporary information on Wikipedia, patients are better empowered to make autonomous decisions about their dental care. As of May 2021, more than 400 articles have been edited by the participants of WCODS using over 6,000 references, which yielded 148 million article views (Wikipedia Outreach Dashboard, 2018).

Although the data support an improvement in knowledge and confidence, these changes might not have solely been associated with the training. The intervention was confounded with time and participants' confidence may have increased regardless of participation. It was not possible to ascribe improved confidence to the programme, although it would seem logical that this was an outcome of the process.

To further support the effectiveness of the programme, the staff reviewers were more than satisfied with the quality of the edits and the control over the direction of the contributor's work, particularly when compared with previous years. However, they suggested participants should consider adopting a more structured approach by agreeing at a preparatory stage an outline framed by headings and estimating the number of references to validate the quality of evidence and impact of the subjects.

At present, there is little to demonstrate the translation of benefit from improving understanding of EBD amongst clinicians, to patient benefit. Similarly, it has not been shown that Wikipedia improves patients' understanding of complex dental concepts. As dental evidence undergoes updates on a daily basis, Wikipedia serves as a pertinent, dynamic tool for dental professionals to keep updated and therefore supports the delivery of the most appropriate care for patients.

Could Wikipedia be a potential substitute for textbooks and dental journal articles for both patients and dentists

to expand their dental knowledge? WCODS is steering towards forming a robust network of editors capable of carrying out contemporaneous edits independently and to the highest standard. At the same time, this collaboration aims to ensure that pages are constantly updated and recruit the latest guidance, and that posts are scrutinised by those competent to assure authority before being released into the public domain.

There are some limitations to this study. Although the six multiple choice assessment questions were crafted to test participants' knowledge on key points covered during the training session, they may not serve as an adequate reflection of true competence to edit Wikipedia. Formative assessments carried out at regular intervals during the editing year could potentially enable close monitoring of true growth and improvement for each participant.

This training programme has only been held once and had to be postponed in 2021 because of the COVID-19 pandemic. However, focus on participants' skills and confidence is embedded. It is intended to test this by repeating the same questionnaire, enhanced with open questions.

The overarching aim for WCODS is to continue creating, educating and collaborating with an ever-increasing international community of dental health care workers who are passionate about improving the availability and access of authoritative information. Plans are in place to welcome other members of the dental team such as dental therapists, dental hygienists and dental technicians to enhance interdisciplinary learning and to give another dimension to this project. The introduction of a training programme recruiting quality assurance serves as a platform in ensuring greater accuracy of edits, and in addition using a larger contributor base.

Our intention for the future is to use a validated tool to investigate EBD skills such as the Knowledge, Attitudes, Access and Confidence Evaluation (KACE) instrument or the Evidence-Based Practice Confidence scale (EPIC) (Hendricson *et al.*, 2011; Salbach *et al.,* 2013). Such tools must be introduced sensitively such that new entry contributors do not become overwhelmed by the rigor of the process but appreciate fully that posts and edits must be accurate. A further approach to enhance collaboration and build on the existing community of editors is to implement Wikipedia and EBD courses into the undergraduate curriculum. Participants can then use the materials as a foundation. Protected time must be afforded to deliver this aspiration successfully. This approach has been adopted successfully for a cohort of third year dental undergraduate students in International Medical University, Malaysia.

In conclusion, a standardised training session for potential Wikipedia contributors enabled them to identify subject areas not previously covered more effectively, to undertake a literature search and critically appraise that literature. In addition, it improved their confidence in creating posts and editing Wikipedia. This training programme developed by WCODS has enhanced existing pillars to deliver global access to evidence based oral health information with equity of access irrespective of economic circumstances.

Declaration of Interests

The authors declare no conflicts of interest with respect to the authorship and/or publication of the article.

References

Apollonio, D., Broyde, K., Azzam, A., De Guia, M., Heilman, J. and Brock, T. (2018): Pharmacy students can improve access to quality medicines information by editing Wikipedia articles. *BMC Medical Education* **18**, 265

Azzam, A., Bresler, D., Leon, A., Maggio, L., Whitaker, E., Heilman, J., Orlowitz, J., Swisher, V., Rasberry, L., Otoide, K., Trotter, F., Ross, W. and McCue, J.D. (2017): Why Medical Schools Should Embrace Wikipedia. *Academic Medicine* **92**, 194-200

CASP, Critical Appraisal Skills Programme (2018): Systematic Review Checklist. https://casp-uk.net

Cochrane (2020): About us. https://www.cochrane.org/about-us

Cochrane Oral Health (2019): Our Evidence. https://oralhealth. cochrane.org/our-evidence

Hendricson, W.D., Rugh, J.D., Hatch, J.P., Stark, D.L., Deahl, T. and Wallmann, E.R. (2011): Validation of an instrument to assess evidence-based practice knowledge, attitudes, access, and confidence in the dental environment. *Journal of Dental Education* **75**, 131-144.

Lai, S., Tan, L., Radford, J., Innes, N., Mossey, P., Hector, M., Clarkson, J. and Geres, N. (2019): The Wikipedia Collaboration of Dental Schools - Poster Presentation at the BASCD Autumn Scientific Meeting 2019. https://www.cochrane.org/ sites/default/files/public/uploads/wcods_dundee_final.pdf

Maggio, L., Willinsky, J., Costello, J., Skinner, N., Martin, P. and Dawson, J. (2020): Integrating Wikipedia editing into health professions education: a curricular inventory and review of the literature. *Perspectives on Medical Education* **9**, 333-342

Salbach, N.M., Jaglal, S.B. and Williams, J.I. (2013): Reliability and validity of the evidence-based practice confidence (EPIC) scale. *Journal of Continuing Education for Health Professionals* **33**, 33-40.

Smith, D. (2020): Situating Wikipedia as a health information resource in various contexts: A scoping review. *PLOS ONE* **15**: https://journals.plos.org/plosone/article?id=10.1371/ journal.pone.0228786

Wikipedia Outreach Dashboard (2018): Wikipedia Collaboration of Dental Schools Programs and Events Dashboard. https:// outreachdashboard.wmflabs.org/campaigns/wikipedia_collaboration_of_dental_schools_/programs

Wikipedia (2008): WikiProject Dentistry Articles. https:// en.wikipedia.org/wiki/Category:WikiProject_Dentistry_articles

Wikipedia (2007): Wikiproject. https://en.wikipedia.org/wiki/ Wikipedia:WikiProject

Wikipedia (2006): Wikiproject Dentistry. https://en.wikipedia. org/wiki/Wikipedia:WikiProject_Dentistry