



Review article

E-learning in neurology education: Principles, opportunities and challenges in combating neurophobia



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ABSTRACT

Neurophobia, the fear of clinical neurology, affects not only medical students but also non-career neurologists globally. This can have significant implications on patient care, especially given the increasing burden of chronic neurological disorders. The negative perception and lack of confidence amongst general practitioners and hospital physicians may lead to increased referrals to neurology, thereby increasing waiting times and inpatient stay. The onus, therefore, should be on improving training and stimulating interest in neurology. There is emerging evidence that integrating e-learning to traditional pedagogies can improve delivery of neurology education and help combat neurophobia. However, embracing e-learning may be challenging for contemporary neurologists, mostly 'digital immigrants', involved in the training of tomorrow's doctors who are largely 'digital natives'. This paper reviews the principles, opportunities and challenges of incorporating e-learning in neurology education to help improve learners' perception of clinical neurology, facilitate delivery of self-directed experiential learning and perhaps breed 'neurophilia'.

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1. Introduction

Neurology is perceived as the most difficult speciality by medical students and non-specialist doctors, throughout medical school and beyond, globally [1–3]. This endemic fear of neurology is referred to as 'neurophobia' [4]. Neurophobia, like most ailments, unfortunately has significant consequences. It is concerning when students and trainees, the future clinicians, often find neurology less interesting, especially when most neurological conditions are first seen by a general practitioner/family physician or a general medical team [1–3]. The fear and lack of confidence may translate into practice leading to increasing patient referrals to neurology [5,6]. However, it may also make neurology less appealing for medical students or trainees wishing to pursue neurology as a career [7]. It can therefore be argued that neurophobia may not only lead to fewer neurologists but also increase the service demand on the existing few. The educators of tomorrow's doctors are thus confronted with multiple challenges in facilitating delivery of high quality neurology education, particularly when faced with increased clinical workload and administrative burdens [8]. The increasing burden of chronic neurological conditions and rela-

tive shortage of neurologists may consequently aggravate neurophobia. Given this predicament it behooves us, as educators, to focus on enhancing the quality of neurology teaching. Although there is no easy panacea, various strategies including harnessing technological innovations have been recommended to improve students' perception of neurology and hopefully kindle 'neurophilia' – a fascination by neurology [9–11].

Rapid advancements in technology over the last few decades have had a significant impact in the way medicine is taught and learnt. These technological innovations have revolutionized medical education and led to the evolution of e-learning. E-learning or electronic learning is the use of internet or information technology for educational activities [12]. It is a pedagogical strategy that facilitates learner centred approach to education by allowing learners to take control over their own learning and offering the flexibility of studying at their own pace and time [12,13]. This paper aims to identify and critically analyse the opportunities and challenges of integrating e-learning in neurology education.

2. E-learning – an overview

'Distance learning', where the teacher and student may never meet face to face and 'blended learning', where e-learning is used in conjunction with traditional face to face tutorials are commonly

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used methods in e-learning [12]. The use of e-learning has provided huge opportunities in an era where students are “no longer the people our educational system was designed to teach” [14]. Harmonizing diverse teaching and learning needs of individuals born before (digital immigrants) and after (digital natives) the introduction of digital technology, while remaining focussed on the learning outcomes, remains a great challenge [14]. The current generation of students often referred to as ‘digital natives’ are immersed in sophisticated technologies and are unprepared for the traditional teaching methods [14,15]. However, not all learners are confident users of technology and not all medical educators are familiar with the technological advances [16,17]. Medical educationists are therefore faced with the challenge of selecting and filtering appropriate e-learning materials to enhance learning [16]. Nonetheless, it is important to note that rather than the engineering aspect of technology, education that uses theories of adult learning in facilitating lifelong learning is imperative, and this requires a lot of creativity and adaptability amongst medical educationists in designing, delivering and evaluating e-learning [12].

2.1. Incorporating E-pedagogy in neurology education

Given the rapid advances in neurosciences, there is even more neurology to learn and learners are required to incorporate these advances and guidelines into their practice [8]. There is emerging evidence that effective integration of technology into neurology education can enhance learning [10,18,19]. In one study assessing the outcomes of integration of computer assisted learning in medical neurosciences, 99% reported efficient learning and improved test scores [18].

E-learning with its advantages of easy accessibility, flexibility, scalability and opportunities for self-directed learning may potentially facilitate experiential learning [20,21]. Therefore, the question is not whether e-pedagogy has a role in neurology education, but instead ‘when’ and ‘how’ to incorporate it effectively to meet the learning needs of digital natives. Ascertaining the ‘when’ and ‘how’ can be arduous but exciting, if one has a good understanding of the content, process and delivery of e-learning in addition to the intended learning outcomes and learning needs of the target audience.

2.2. E-learning content

E-learning content encompasses various instructional materials including teaching materials, reference lists, research papers, clinical protocols and guidelines [9,12,22]. The content should be guided by the relevant curriculum. The Association of British Neurologists has taken the lead in United Kingdom by providing recommendations for undergraduate neurology teaching [23,24]. However, it is surprising that there is significant discrepancy in course programme structure and duration between medical schools, with nearly a third unable to guarantee teaching being delivered by a neurologist [25]. This discrepancy in curriculum provision and course content between medical schools may result in inadequate undergraduate neurology teaching and contribute to the burden of neurophobia [10].

The teaching materials, based on the core curriculum, may be compiled as e-textbooks and web based material which can be used online by learners, whenever and wherever they want, provided they have the facilities to access them. E-textbook can facilitate effective learning of basic and clinical neurology during a limited timeframe; more than 85% of students in one study felt that e-textbook met their educational needs, learning time was well-spent and liked to see similar e-textbooks for other speciality rotations [21]. Similarly, an online symptom-based neurology course has been shown to improve students’ perception of teaching

and performance on a standardized neurology shelf examination [26].

The online electronic resources are extensively used for clinical purposes, for instance google and user-generated encyclopedia like Wikipedia are used by 80% and 70% of junior doctors respectively, at least once over the course of a week, as compared to less than 35% usage of other medical sites like pubmed and uptodate [27]. Electronic tools not specifically designed for medical use, for instance google, are often seen as an easy and accessible search hub to identify and navigate to other relevant sites [27]. Moreover, easy accessibility to information using various search engines including google and wikipedia have made the search for clinician’s queries relatively straightforward [12,27]. In one study, google search revealed the correct medical diagnoses in 58% of the challenging New England Journal of Medicine case records [28]. The power of search engines can therefore no longer be ignored and has led to democratization of knowledge, but may provoke anxiety in those who are accustomed to traditional watertight student-teacher hierarchy [8]. For instance, attending physicians, including an eminent professor, were taken aback when a resident diagnosed an extremely rare case in the ward rounds using google [29].

It is important to note that the reliability and quality of information gained from search engines are doubtful, as the search system typically identifies the most viewed and searched contents rather than the best quality subject matter [12,27]. Although the use of Wikipedia and weblogs have facilitated collaborative learning by allowing facilities for editing, correcting, updating and sharing information, they may be a vulnerable source of information as they are superficial and sometimes may be consensus rather than evidence based [13,27]. Teaching learners about evidence based medicine including literature searching skills and critical appraisal will play an important role in addressing these issues. Similarly, signposting key evidence based information sources are vital in encouraging effective e-learning [30]. Hyperlinking e-learning materials to key information sources is one way of signposting information as it allows learners to scan, link and further research the information that interests them [13].

2.3. E-Learning process and delivery

The delivery of e-learning content can either be synchronous or asynchronous [12,22,31]. Synchronous delivery refers to real time learning where the instructor and learners communicate or acquire information simultaneously [22]. Examples include teleconferencing (audio, video or both), instant messaging and chat forums. Synchronous learning using teleconferencing and chat forums offer an effective means of developing learning communities by increasing social interactions [31]. It also provides the opportunity to discuss and clarify doubts in a real time context, thereby reducing frustrations that may be caused by feelings of isolation in an asynchronous communication [31]. However, chat rooms used for synchronous communication are extremely difficult to manage as many learners contribute at the same time, making chat room noisy and disorganized [12,22,31].

In asynchronous delivery, the transmission and reception of information does not take place simultaneously and the instructor and learner communicate in their own time [22]. Examples include correspondence via email, online forums, blogs and discussion boards. Asynchronous communication plays a significant role when the teacher and learner find face to face communication difficult, due to time constraints or complex geographical dispersal of the students [10,20,28]. Some learners also argue that asynchronous communication provides time to read the content in their own time and then post opinions in blogs which facilitates effective participation in discussions [31,32]. Asynchronous

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