

Remote Teaching of Histopathology Using Scanned Slides via Skype Between the United Kingdom and Nigeria

Olorunda Rotimi, MSc, FRCPath; Nnamdi Orah, FMCPATH; Abeer Shaaban, FRCPath; Adetola O. Daramola, FMCPATH; Fatimah B. Abdulkareem, FMCPATH

• **Context.**—Web-based learning is a major component of distance education.

Objective.—To explore Web-based applications for pathology teaching in resource-limited sub-Saharan Africa.

Design.—The participants were consultant pathologists and trainees drawn from tertiary institutions in Nigeria. They viewed the digital slides via the Leeds virtual pathology Web site, after which, interactive lectures were given via Skype (Skype Communications, Luxembourg City, Luxembourg). Questionnaires were administered via SurveyMonkey (Palo Alto, California) to all participants of 12 sessions between 2014 and 2015.

Results.—Nine consultant pathologists and 33 trainees participated in this survey. Of all respondents, 29 (69%) thought it was *fairly easy* to navigate the system, 11 (26.2%) thought it was *easy*, whereas 2 (4.8%) felt it was

difficult. In addition, 26 respondents (61.9%) found it fairly easy to make a diagnosis, 13 (31%) thought it was easy, and 3 (7.1%) noted that it was difficult. Twenty-four respondents (57.1%) had a fairly smooth user experience, 12 (28.6%) experienced occasional crashes, whereas 6 (14.3%) reported a smooth experience. Almost all (41 of 42; 97.6%) respondents felt the pathology teaching was beneficial to their local pathology practice, and all (100%) indicated the need for additional, similar sessions.

Conclusion.—The beneficial applications of Internet-based lectures make them a viable, cheaper, and cost-effective alternative to face-to-face lectures in our environment.

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Electronic/Web-based learning (WBL) is a major component of distance education. In the literature, perhaps the most commonly cited definition for distance education is that of Keegan¹ in 1996. He defined distance education as involving the separation of teacher and learner, the influence of an educational organization, the use of technical media, the provision of 2-way communication, and the absence of learning groups. In addition, WBL has been defined as the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance.²

Medical educators today are facing challenges different from those of their predecessors. Changes in the scope of health care delivery and advances in medicine have made

traditional teaching methods less adaptable. Among others, the challenges to the traditional methods involve inclusion of recent advances in an already congested curriculum, availability and adequacy of teaching venues, and the logistics required for inviting foreign faculty. The limitation of time and funding make alternative ways of teaching more attractive.

In sub-Saharan Africa, the challenges to traditional learning methods are many. A dearth of qualified manpower, the enormous student to instructor ratio, inadequate or unavailable lecture venues, and a lack of continuously updated medical teaching curriculum are examples.

In this paper, using our own experience with pathology teaching via WBL, we discuss the opportunities offered by WBL, the challenges faced, and suggestions to its role in improving medical education in the resource limited sub-Saharan Africa.

MATERIALS AND METHODS

There were 12 sessions of remote, digital, pathology lectures delivered between 2014 and 2015 via the Internet. The technology was used about 6 times in small-group sessions between St James's University Hospital (Leeds, West Yorkshire, United Kingdom) and 2 tertiary hospitals in Lagos (Lagos University Teaching Hospital) and Ibadan (University College Hospital), Nigeria (Figure 1, A through D). These lectures were for the purpose of continuing medical education (Figure 1, C and D). The series was then expanded, and 4 sessions were held during the residential 2-week, postgraduate-pathology course for pathology residents taking their exit examinations from the Nigerian National Postgraduate Medical College (Lagos, Nigeria) (Figure 1, A and B). These sessions were between the Lagos center and 2 centers in the United

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From the Department of Cellular Pathology, St James's University Hospital, Leeds, West Yorkshire, United Kingdom (Dr Rotimi); the Department of Anatomic and Molecular Pathology, Lagos University Teaching Hospital, Lagos, Nigeria (Drs Orah, Daramola, and Abdulkareem); and the Department of Cellular Pathology Queen Elizabeth Hospital, Birmingham, and the University of Birmingham, Birmingham, United Kingdom (Dr Shaaban).

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Reprints: Olorunda Rotimi, MSc, FRCPath, Department of Cellular Pathology, St. James's University Hospital, Level 5 Bexley Wing, Beckett St, Leeds, West Yorkshire LS9 7TF United Kingdom (email: olorunda.rotimi@nhs.net).



Figure 1. A, A cross-section of pathology residents in a session at Lagos University Teaching Hospital (Lagos, Nigeria). B, A close-up view of the screen in A. C, Participants attending the Web-based learning sessions at the revision course (Lagos, Nigeria). D, A close-up view of the screen in C.

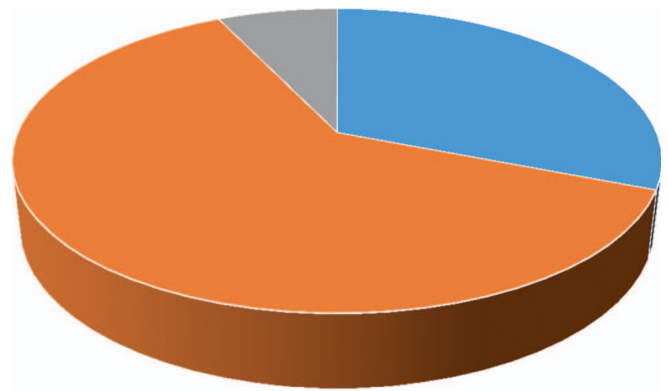
Kingdom (St James's University Hospital and University Hospitals [Birmingham, Birmingham]).

The lectures focused mainly on gastrointestinal and breast pathology topics. Slides were digitally scanned (Aperio scanner, Leica Biosystems, Nussloch, Germany) and stored on the Leeds University virtual pathology Web site, and the links to the slides were precirculated some days before the discussions and lectures. The participants were encouraged to submit opinions on the slides before the teaching sessions using a form on SurveyMonkey (Palo Alto, California) to guide the discussions.

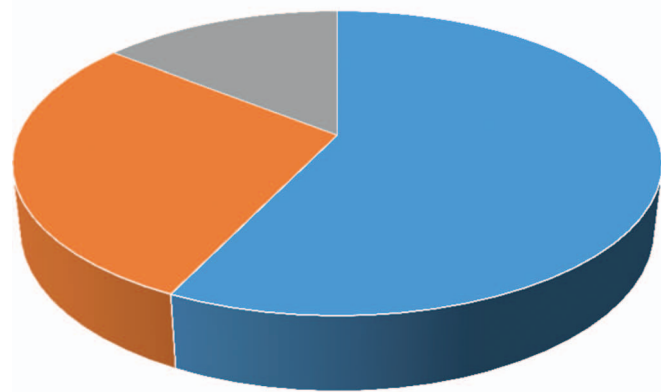
The teaching sessions involved both online, live reviewing of scanned slides and online lectures via a freely available Internet-calling application (Skype, Microsoft, Redmond, Washington). The features of the computer used in Nigeria were Intel (Intel Corporation, Palo Alto, California) core i3, 3-GB RAM (random access memory) with Windows 8.1 operating system (Microsoft), deployed over the local GSM (Groupe Spécial Mobile, now Global System for Mobile Communications) 4G networks. In the United Kingdom, a computer featuring Intel Pentium Dual CPU (central processing unit), 2-GB RAM, and a Windows XP Professional operating system was deployed over a wide area network (NHS N3; broadband network for the English National Health Service). Lectures given via Skype were done with the screen-sharing function from the United Kingdom end and projected via a large screen monitor at the Lagos and Ibadan ends. The teaching was interactive, with opportunities for questions and answers between the participants and the faculty. The presenter was able to see the audience during the seminar, subject to the strength of the Internet connection. The views of the participants on the value and ease of use of the system were evaluated upon completion using a SurveyMonkey questionnaire.

RESULTS

There were 42 respondents out of 50 participants (84%) in all the sessions who were sent a questionnaire via an Internet-based survey. Nine consultant histopathologists and 33 residents participated in the survey (see Figure 1). Twenty-nine (69%) of the respondents thought it was fairly easy to view the online digitized slides, 11 (26.2%) thought it was easy, whereas 2 (4.8%) felt it was difficult. Concerning the ease of making a diagnosis, 26 respondents (61.9%) found it fairly easy, 13 (31%) thought it was easy, whereas 3 (7.1%) felt it was difficult (Figure 2). Enquiries about the technical



2. ■ Easy ■ Fairly easy ■ Difficult



3. ■ Fairly Smooth ■ Occasional crashes ■ Smooth

Figure 2. Pie chart reflecting the ease of making a diagnosis.

Figure 3. Pie chart reflecting the technical issues experienced by the participants.

issues experienced revealed that 24 respondents (57.1%) had a fairly smooth experience, 12 (28.6%) experienced occasional crashes, whereas 6 (14.3%) reported a smooth experience (Figure 3). An assessment of the real-time lecturing experience via Skype revealed that 19 respondents (45.2%) felt it was "good" for slide discussions and lectures, 17 (40.5%) reported an "excellent" experience, whereas 6 (14.3%) felt it was "just okay." Forty-one respondents (97.6%) felt the pathology teaching was beneficial to their local pathology practice. In the free comments, many also hoped that the number of sessions would be increased and that they would occur more regularly.

DISCUSSION

We report our experience in delivering distant pathology teaching from the United Kingdom using an effective, timely, and cost-neutral system with free online applications. Both specialist pathologists and those in specialty training were surveyed to assess the value and benefit of this novel method of teaching, thus covering the impressions of both local trainers and trainees in the survey.

Most of the respondents felt it was fairly easy/easy to navigate the online platform on the Leeds virtual pathology Web site. Learners' satisfaction rates have been found to increase with perceived ease of use and access, navigation, interactivity, and user-friendly interface design.^{3,4} Most of

the respondents (92.9%; 39 of 42) also found it easy/fairly easy to make a diagnosis on the scanned slides, thereby implying that their diagnostic precision was not affected by this virtual learning system. This corroborates findings by Goldberg and McKhann,⁵ who reported that a virtual learning environment did not negatively affect their students' test scores. Technical problems have been found to be inevitable with most instructional media; as instructional media have become more dependent on technology, the impact of technical problems has increased.⁶ Thirty-six (85.7%) of the respondents indicated some level of technical difficulty, which was mainly due to Web site crashes. These technical issues were mainly the result of poor and unreliable Internet connectivity and power supply problems, which are endemic to some developing countries. The term *crashes* is used to refer to the Web site ceasing to function in the browser. Crashes were easily resolved by a quick restart. The crashes seemed to originate from Leeds after 1 hour or from the Nigerian end because of slow Internet connectivity. It has been reported that even minor problems can decrease satisfaction and course participation, which may in turn impede learning.⁶ The impression of most respondents (85.7%, 36 of 42) about the real-time Skype lectures ranged from *excellent* to *good*. Comparisons of effectiveness between face-to-face lectures and WBLs have been inconclusive, with contradictory findings.⁶ However, participants in WBL do not see e-learning as replacing traditional instructor-led training but as a complement to it.^{3,4}

There are numerous advantages of WBL, including overcoming distance barriers between faculty and students, thus making it possible to share information between collaborating institutions at the convenience of the faculty and without the added cost of travel fees and logistics. It also implements economies of scale by delivering the same lecture to a diverse group of individuals at different centers at the same scheduled times, thus lectures can be given to participants in various centers in the same country, for example, Lagos, Ibadan, Benin, and Kano in Nigeria and to centers in different countries with the same time zone, such as the center in Nigeria and Ghana, all at the same time with real-time feedback. The WBL schedules are flexible, the

resources are perpetual, and there is an opportunity for individualized learning with each participant viewing the virtual slides at his or her own pace.⁶ The computer can also be programmed to use information about the participant to optimize the individual learning experience.⁷ In Africa, these advantages are crucial to the improvement in pathology practice and teaching. This is seen in our results in which 97.6% respondents (41 of 42) stated that the teachings were beneficial to their practice.

The problem with WBL in developing countries is mainly a lack of infrastructure, including power supply and Internet connectivity. These can be overcome with acquisition of power backup systems and the provision of Internet bandwidth. Presently, Internet connectivity is growing at a rapid rate in sub-Saharan Africa, thus increasing the possibilities for use of WBL. There have been improvements in these areas, but more needs to be done if WBL is to become integrated into the curriculum in medical schools and residency training programs.

CONCLUSIONS

The beneficial applications of WBL are immense and make WBL a cheap and viable alternative to face-to-face lectures in Africa. With development of needed social infrastructure, WBL can become an integral part of the curriculum in medical schools and postgraduate programs.

References

1. Keegan D. *Foundations of Distance Education*. 3rd ed. London, England: Routledge; 1996.
2. Rosenberg M. *E-Learning: Strategies for Delivering Knowledge in the Digital Age*. New York, NY: McGraw-Hill; 2001.
3. Gibbons A, Fairweather P. Computer-based instruction. In: Tobias S, Fletcher J, eds. *Training & Retraining: A Handbook for Business, Industry, Government, and the Military*. New York, NY: Macmillan Reference USA; 2000:410–442.
4. Chumley-Jones HS, Dobbie A, Alford CL. Web-based learning: sound educational method or hype?: a review of the evaluation literature. *Acad Med*. 2002;77(10)(suppl):S86S93.
5. Goldberg HR, McKhann GM. Student test scores are improved in a virtual learning environment. *Adv Physiol Educ*. 2000;23(1):59–66.
6. Cook DA. Web-based learning: pros, cons and controversies. *Clin Med*. 2007;7(1):37–42.
7. Chen SY, Paul RJ. Editorial: individual differences in Web-based instruction—an overview. *Br J Educ Technol*. 2003;34(4):385–392.

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Abstract and case study submissions to the College of American Pathologists (CAP) 2017 Abstract Program are now being accepted. Submissions will be accepted until 5 p.m. Central time Friday, March 10, 2017.

Accepted submissions will appear on the *Archives of Pathology & Laboratory Medicine* Web site as a Web-only supplement to the September 2017 issue. The CAP17 meeting will be held from October 8 to 11 in National Harbor, Maryland.

For a link to the submission site and detailed program information visit the CAP17 Web site (www.cap.org/cap17) and the *Archives* Web site (www.archivesofpathology.org).