Commentary

Harnessing the IT Factor in Medical Education

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Abstract

Escalating healthcare costs in Singapore have produced a significant movement of patients into ambulatory care, and the consequent dearth of clinical teaching materials. This deficiency has likewise prompted the creation of ambulatory teaching clinics and the use of standardised patients and simulators. In the last few decades, educators have utilised digital technology, for instance, digitally recorded heart and breath sounds, and digitised video vignettes, in medical education. We describe several pedagogical initiatives that we have undertaken at our university school of medicine.

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"Boredom will always remain the greatest enemy of school disciplines. If we remember that children are bored, not only when they don't happen to be interested in the subject or when the teacher doesn't make it interesting, but also when certain working conditions are out of focus with their basic needs, then we can realize what a great contributor to discipline problems boredom really is. Research has shown that boredom is closely related to frustration and that the effect of too much frustration is invariably irritability, withdrawal, rebellious opposition or aggressive rejection of the whole show".

Fritz Redl: When We Deal With Children

Introduction

In this digital age, we are constantly inundated with breathtaking images worthy of an Ansel Adams photograph or a Zhang Yimou film. Is it any wonder, then, that we educationists feel compelled to "wow" our students, who may have become jaded by this daily barrage of digital wizardry to which they are exposed? Who among us does not shudder at the prospect of row upon row of bored undergraduates, heads bobbing somnambulistically, as we strive to deliver a lecture? Worse yet, to have that scene captured for posterity on-camera and posted on YouTube?

We are fortunate to have, at our disposal, an armamentarium of soft- and hard-ware that allows us to capture (duly-consented) digital images and video vignettes of patients, and the ability to replay them during lectures at the click of a mouse key. Thanks to the magic of the worldwide web, we are able to download digitised scans, clinical images and even patient videos from many institutions that share their intellectual property freely in the name of academic egalitarianism. Brave, then, is the university academic who defies convention by delivering a lecture using ancient photographic projection slides or acetate transparencies, replete with unidentifiable fungus casting a filigree of shadows on the screen, and by relying on the ability to captivate his audience with the sheer force of wit, intellect and charm.

Of course, there are those intellectual giants amongst us, whose sheer personality and magnetism allows them to hold their audiences spellbound without any frippery or "bag of tricks". Such speakers are, unfortunately, rare indeed. Most speakers should, instead, heed the advice of Rockwood et al, who concluded that characteristics such as monotonous tone of voice, poor slide quality and a tendency to ramble predisposes listeners to nod off at scientific presentations,[1] and strive to entertain, at least a little.

Ironically, we unfailingly keep our presentations simple when speaking at major conferences, preferring to "let our work speak for itself," and refrain from any hint of frivolity, lest we be viewed as "showmen" or, worse, charlatans who rely on smoke and mirrors. Why the double standard? Are we, perhaps, underestimating our students?

Ricer et al surveyed student-stakeholders in a bid to ascertain if they valued entertainment over substance in

their lectures, and found that students did not prefer a high-tech, multimedia presentation to a low-tech (blackboard or overhead projection slide) lecture, nor did they retain the material any better with the former type.[2] This finding was echoed by a colleague, who related how he gave what he felt was one of his best-ever lectures, in which the students laughed in all the right places and applauded at the end (rare indeed in this age of jaded teenagers), only to have the warm, fuzzy feeling disappear when he returned to his room to mark the pop quiz he had administered at the end of the session. Despite quizzing them almost immediately on what he had taught, it was obvious that most of the students had not grasped any of the salient points of the lecture. Is being "entertaining", then, an overrated virtue? Certainly not, for there is a definite place for being able to engage and interest one's audience.

Teachers who induce mass catatonic torpor through sheer boredom are certainly ineffectual; the converse is also largely true. Who cannot recall the lecturer who keeps his class in stitches throughout his lively, entertaining lectures, but fails to cover the syllabus within the stipulated time, simply because he digresses at every turn? The dictum, "everything in moderation", would certainly apply here. As educationists, we are not clowns hired to entertain the bored youth of today. Our duty is to teach, and teach well. Certainly, we should beware of boring our students to death-lest the sleeping body of students awaken, to rise up in revolt.

The Impetus for Pedagogic Creativity: Dearth of Clinical (Teaching) Material

The upward spiral of healthcare costs worldwide has prompted the introduction of healthcare management systems, such as the casemix classification system.[3,4] Developed in the 1960s, casemix groups all diseases into clinically meaningful diagnostic clusters (diagnosis-related groups, DRG) which require similar utilisation of resources. Each DRG describes a group of patients with related diagnoses that incur similar health management costs.[5]

The casemix classification system, whilst ostensibly resulting in better allocation and utilisation of resources, has brought about shortened inpatient care, with a move to outpatient and ambulatory care.[6,7] This has resulted in a paucity of clinical teaching material in hospitals,[8] and a move from ward-based to ambulatory teaching.[9-11] With the increase in healthcare requirements worldwide, medical schools have proliferated to train more doctors, further burdening the limited pool of clinician-teachers, juggling service demands with teaching duties and research interests. In response to these limitations, some teaching hospitals have organised ambulatory teaching clinics within outpatient clinics, day surgeries, radiology suites and clinical investigation units with great success, in addition to utilising paramedical staff and junior doctors as teaching faculty.

Pedagogical Innovations

In addition to adopting the above operational measures, medical educationists have taken to using live standardised patients to assess medical students, as well as teach them communication and clinical examination skills, ethics and professionalism.[12,13] Patient simulators or mannequins, once used solely in basic cardiac life support (BCLS) training, are now widely used to teach trainee doctors and nurses to perform the cardiac[14] and respiratory[15] examinations and assist in delivering a baby.[16] In addition, simulators are now *de rigeur* in the acquisition of surgical skills.[17,18]

The internet, i.e. Bob Dole's "great way to get on the Net", is also a great way to obtain information (and multimedia resources) for teaching purposes. The e-learning unit at St George's (University of London) has launched a "clinical skills online" website (http://www.elu.sgul.ac.uk/cso/), featuring video vignettes which demonstrate standard clinical examination skills to undergraduate medical students and postgraduate trainees. These videos are also available on the immensely popular "YouTube" website (http://www.youtube.com/sgulcso).

Movement disorders journals, which have provided patient video vignettes on videotape and digital video disc (DVD) to readers since the 1980s, have now been joined by the Canadian Medical Association Journal (www.cmaj.ca), Journal of Neurology, Neurosurgery and Psychiatry and New England Journal of Medicine (http://content.nejm.org/misc/videos.shtml?ssource=recentVideos), in featuring videos and video case reports.

Of course, the value of using encrypted television programmes and videotapes has been recognised for 40 years.[19] It is no wonder this technology has been harnessed for medical education purposes. With the advent of compact digital cameras that can capture both still and video images, creating a digital video archive is, essentially, a snap. Clinical phenomena, which may be ephemeral, are easily captured for teaching purposes. In addition, the diminution in numbers of teaching staff and patients, coupled with the move to ambulatory teaching, makes it increasingly difficult for trainees to be exposed to clinically important but rare phenomena. This allows us to overcome the opportunistic nature of clinical teaching. The electronic stethoscope, which digitally records cardiac and pulmonary sounds, has allowed educators to teach trainees to recognise abnormal heart and breath sounds without the need for a live patient.[20,21] Several institutions, including the David Geffen School of medicine, UCLA (http://www.med.ucla.edu/wilkes/intro.html) and Texas Heart Institute (http://www.texasheartinstitute.org/Education/CME/explore/events/eventdetail_5056-

presentation.cfm), have created online teaching modules using digitised heart and breath sounds. Students have, in turn, embraced computer-assisted[22] and online[23] teaching.

At the National University of Singapore, we have tried to harness information technology (IT) in our pedagogical endeavours. Since 2003, we have conducted high-stakes examinations (such as the modified essay question, MEQ) online, using our in-house integrated virtual learning environment, IVLE.[24,25] Capitalising on the advantages of the online MEQ format, we have developed a neurologic localisation game that allows students to interview, "examine" and investigate (via videotaped vignettes and digitised still images) a virtual patient (Fig. 1), after which they are tasked to interpret the information obtained. This online neurologic localisation game (eNLG) has been well received by undergraduates,[26] and more online modules are planned. In addition, computer-based interactive tools for the learning of anatomy[27,28] and e-learning tools to teach clinical radiology (http://courseware.nus.edu.sg/radiology)

and to integrate radiology and anatomy (http://medicine.nus.edu.sg/meddnr/anat-chest.htm) have also featured in our educational initiatives. Since the 1990s, the university has introduced the human simulator into the undergraduate curriculum, a move which has proven efficacious and popular with the students.[29] Of course, these innovations are merely adjuncts to traditional teaching, in the form of lectures incorporating videotaped vignettes, clinical bedside teaching and ad-hoc clinical courses or modules,[30] which form the backbone of our pedagogic armamentarium.

Despite the many challenges faced by medical educationists, much can be achieved by harnessing the power of the information age. The plethora of multimedia available allows the tech-savvy academic teacher to create entertaining and spectacular presentations. Nonetheless it remains important to recognise the need to instruct rather than entertain, and to focus on substance rather than style.
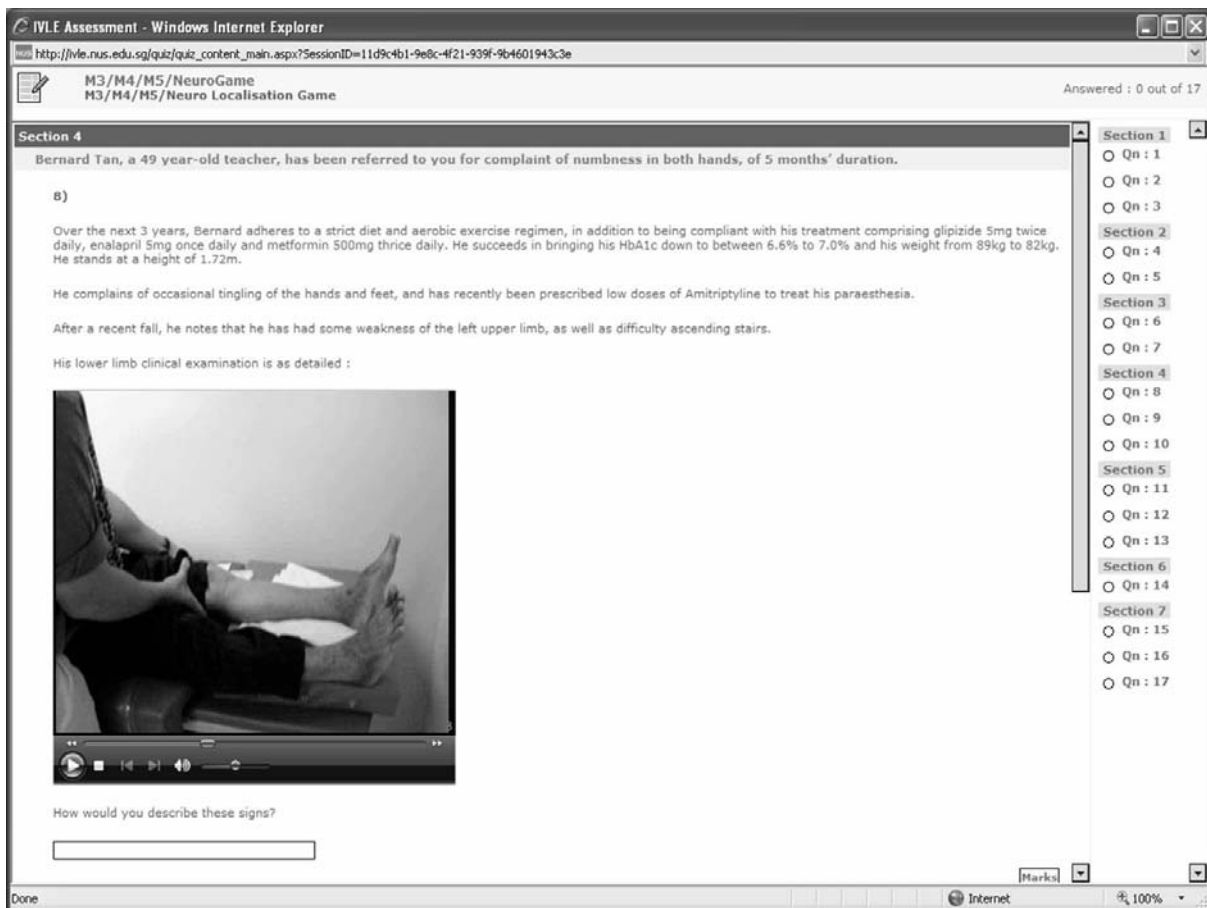

Fig. 1. Webshot taken from the neurologic localisation game.

REFERENCES

1. Rockwood K, Patterson CJ, Hogan DB. Nodding and napping in medical lectures: an instructive systematic review. CMAJ 2005;173:1502-3.

2. Ricer RE, Filak AT, Short J. Does a high tech (computerized, animated, PowerPoint) presentation increase retention of material compared to a low tech (black on clear overheads) presentation? Teach Learn Med 2005;17:107-11.

3. Vertrees JC. Funding and future diagnosis related group development. Ann Acad Med Singapore 2001;30(4 Suppl):13-6.

4. Gong Z, Duckett SJ, Legge DG, Pei L. Describing Chinese hospital activity with diagnosis related groups (DRGs). A case study in Chengdu. Health Policy 2004;69:93-100.

5. Lim EK. Casemix in Singapore – 5 years on. Ann Acad Med Singapore 2004;33:660-1.

6. Choo J. Critical success factors in implementing clinical pathways/case management. Ann Acad Med Singapore 2001;30(4 Suppl):17-21.

7. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol 2000;106: 493-9.

8. Seabrook MA, Lawson M, Baskerville PA. Teaching and learning in day surgery units: a UK survey. Med Educ 1997;31:105-8.

9. Fincher RM, Albritton TA. The ambulatory experience for junior medical students at the medical college of Georgia. Teach Learn Med 1993;5: 210-3.

10. Harden RM, Davis MH, Crosby JR. The new Dundee medical curriculum: A whole that is greater than the sum of the parts. Med Educ 1997;31: 264-71.

11. Dent JA. AMEE Guide No 26: clinical teaching in ambulatory care settings: making the most of learning opportunities with outpatients. Med Teach 2005;27:302-15.

12. Barrows HS. An overview of the uses of standardized patients for teaching and evaluating clinical skills. AAMC. Acad Med 1993;68: 443-51.

13. Lim EC, Oh VM, Seet RC. Overcoming preconceptions and perceived barriers to medical communication using a 'dual role-play' training course. Intern Med J 2008 Feb 20. [Epub ahead of print]

14. Issenberg SB, McGaghie WC, Petrusa ER, Lee Gordon D, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Med Teach 2005;27: 10-28.

15. Euliano TY. Teaching respiratory physiology: clinical correlation with a human patient simulator. J Clin Monit Comput 2000;16:465-70.

16. Moreau R, Jardin A, Pham MT, Redarce T, Olaby O, Dupuis O. A new kind of training for obstetric residents: simulator training. Conf Proc IEEE Eng Med Biol Soc 2006;1:4416-9.

17. Kanumuri P, Ganai S, Wohaibi EM, Bush RW, Grow DR, Seymour NE. Virtual reality and computer-enhanced training devices equally improve laparoscopic surgical skill in novices. JSLS 2008;12:219-26.

18. Sweet RM, McDougall EM. Simulation and Computer-Animated Devices: The New Minimally Invasive Skills Training Paradigm. Urol Clin North Am 2008;35:519-531.

19. Brayton D, Getz RR, Sachs D. Encoded broadcast and video recorders: two television modalities useful in continuing medical education. Can Med Assoc J 1968;98:1133-6.

20. Lam CS, Cheong PY, Ong BK, Ho KY. Teaching cardiac auscultation without patient contact. Med Educ 2004;38:1184-5.

21. Kraman SS, Pressler GA, Pasterkamp H, Wodicka GR. Design, construction, and evaluation of a bioacoustic transducer testing (BATT) system for respiratory sounds. IEEE Trans Biomed Eng 2006;53: 1711-5.

22. Plasschaert AJ, Wilson NH, Cailleteau JG, Verdonschot EH. Opinions and experiences of dental students and faculty concerning computer-assisted learning. J Dent Educ 1995;59:1034-40.

23. Reynolds PA, Rice S, Uddin M. Online learning in dentistry: the changes in undergraduate perceptions and attitudes over a four year period. Br Dent J 2007;203:419-23.

24. Lim EC, Ong BK, Wilder-Smith EP, Seet RC. Computer-based versus pen-and-paper testing: students' perception. Ann Acad Med Singapore 2006;35:599-603.

25. Lim EC, Seet RC, Oh VM, Chia BL, Aw M, Quak SH, et al. Computer-based testing of the modified essay question: the Singapore experience. Med Teach 2007;29:e261-8.

26. Lim EC, Seet RC. Using an online neurological localisation game. Med Educ 2008 Sep 27. [Epub ahead of print]

27. Voon FC, Tan CK, Rajendran K. The integration of knowledge through interactive Computer-Enhanced Learning in medicine. Ann Acad Med Singapore 1990;19:752-7.

28. Yip GW, Rajendran K. SnapAnatomy, a computer-based interactive tool for independent learning of human anatomy. J Vis Commun Med 2008;31:46-50.

29. Ti LK, Tan GM, Khoo SG, Chen FG. The impact of experiential learning on NUS medical students: our experience with task trainers and human-patient simulation. Ann Acad Med Singapore 2006;35:619-23.

30. Lim EC, Seet RC. Demystifying neurology: preventing 'neurophobia' among medical students. Nat Clin Pract Neurol 2008;4:462-3.