

Open online surgical education- the experience with hand surgery

VAIKUNTHAN RAJARATNAM FRCS(ED)** , LOUISE CRAWFORD FRCS**(ED), DOMINIC POWER(ED)**

*DEPARTMENT OF ORTHOPAEDIC SURGERY, KTPH ALEXANDRA HEALTH, SINGAPORE,

** BIRMINGHAM HAND CENTRE, UHB NHS FT & ROH NHS FT, BIRMINGHAM, UK

Introduction

Digital education is changing the landscape of higher education and has the potential to improve education opportunities for surgical trainees as they try to balance the demands of career, work-life and surgical education. The aim of this project was to address these challenges with an online work-based learning framework that offers self-paced, self-directed and on demand learning. The authors conceptualised, developed and deployed an open online hand surgical learning program on the Moodle platform (learning management system).

Problem

- Hand and wrist injuries annually account for US\$740 million and rank first in the order of most expensive injury types in the Netherlands. They account for 1.1 million emergency room cases /year US and 270,000 hand referral/year UK.
- Education and training are vital for quality care/ optimum outcomes of these patients. Current undergraduate curricula are inadequate and do not allow for teaching hand surgery. Postgraduate hand surgery programs are exclusive and are included as part of orthopaedic or plastic surgery programs.

Current Theory

The Massive Open Online Course (MOOC) is the product of the newer theories of networked learning and connectivism. It targets a large audience with large scale interactive participation and open access (free access) via the web. It provides interactive user forums that help build a community for the students and teachers. ("Massive open online course" 2013).

Learning activities can be synchronous or asynchronous, and are usually designed with a flexible structure allowing for self-paced on demand learning. These online courses are universally accessible thereby enabling extensive collaborative and interactive opportunities for students.

The main disadvantage is that they have low teacher interactivity and feedback and this will not be acceptable for some students, who expect or thrive on a high level of teacher interaction. This phenomenon has revolutionised the relationship between learner and instructor and between schools and the wider community (Thompson, K November 2011).

The basic design of MOOC requires instructional design that facilitates large-scale feedback and interaction. It includes ("Massive open online course" 2013) :

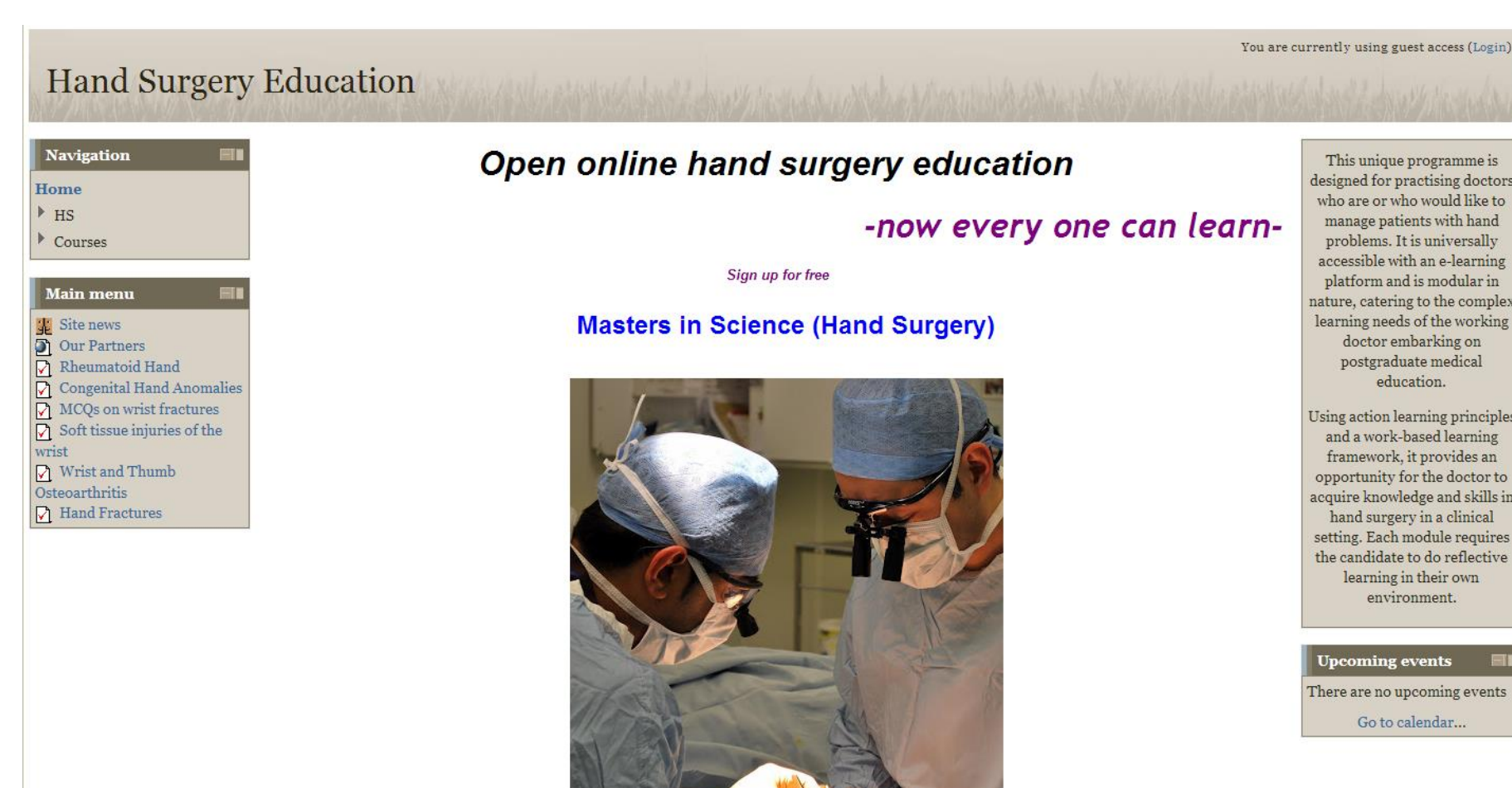
- Crowd sourced interaction and feedback by leveraging the MOOC network, e.g. for peer-review, group collaboration.
- Automated feedback through objective, online assessments, e.g. quizzes and exams.
- The principles of connectivist pedagogy of MOOC include ("Massive open online course" 2013):
- Aggregation - it allows for a massive amount of content to be produced anywhere online, which is later aggregated as content page to participants on a regular basis.
- Remixing - associating materials created within the course with each other and with materials elsewhere.
- Re-purposing of aggregated and remixed materials to suit the goals of each participant.
- Feeding forward and sharing of re-purposed ideas and content with other participants and the world.

Solution

The current need is for a program that is:-

- flexible
- Student-centred
- allows for on-demand learning
- universally accessible
- affordable
- locally relevant

With this background the authors developed the Moodle website, open online learning platform, www.handsurgeryedu.com



The curriculum for the program was designed on a community oriented and outcome based framework. Data from a tertiary referral centre in Birmingham was used to determine the content of the curriculum. A survey of stakeholders in hand surgery was also used to augment the curriculum design. An open online platform was chosen to deploy the curriculum founded on the work based learning framework. The learning management system allowed for various resource material which included content produced by the authors and other digital assets produced by various teachers internationally with permission.

Registration was required to participate but no fee was imposed.

Assessment was provided by automated online tools, together with real-life based reflective assignments to ensure high order learning had taken place.

The faculty of international hand surgeons was recruited using the authors' network, to assist with the reflective assignments for those learners who chose to be assessed.

Currently the program is being accredited by a University.

Results

An online modular program was created with three levels of qualifications:

- 1) PG Certificate
- 2) Diploma
- 3) Master's degree

It was deployed on a MOODLE LMS (handsurgeryedu.com) with an international faculty of eight surgeons.

There are 202 users currently registered on the site. Activity of the users are variable as shown on the chart below:

Country	Last Access
Singapore	12 secs
Burkina Faso	4 hours 41 minutes
Seychelles	8 days 20 hours
Ireland	10 days 2 hours
United States	12 days 13 hours
Bangladesh	34 days 19 hours
Croatia	47 days 16 hours

Effects

The platform is currently being utilised by the authors for teaching hand surgery in a blended approach and by learners from around the world to augment their knowledge.

Conclusion

From the feedback of participants of the blended learning programs, we found this platform augmented post-graduate and undergraduate medical education and can be used to enhance the learning experience of students. It allows for better utilisation of face to face synchronous teaching. It also allows for universal access to media rich digital assets.

Some excerpts from the platform

Sample of online resources

Nerve Injuries, Repair and Classifications

Acute Nerve Injuries
Chapter on Acute Nerve Injuries, abstracted with permission from *Understanding Hand Surgery: A guide for junior doctors* by M Cheema, S Nadir Ali & V Rajaratnam

Biology of nerve injury and repair

At the end of the lecture the participant will be able to:

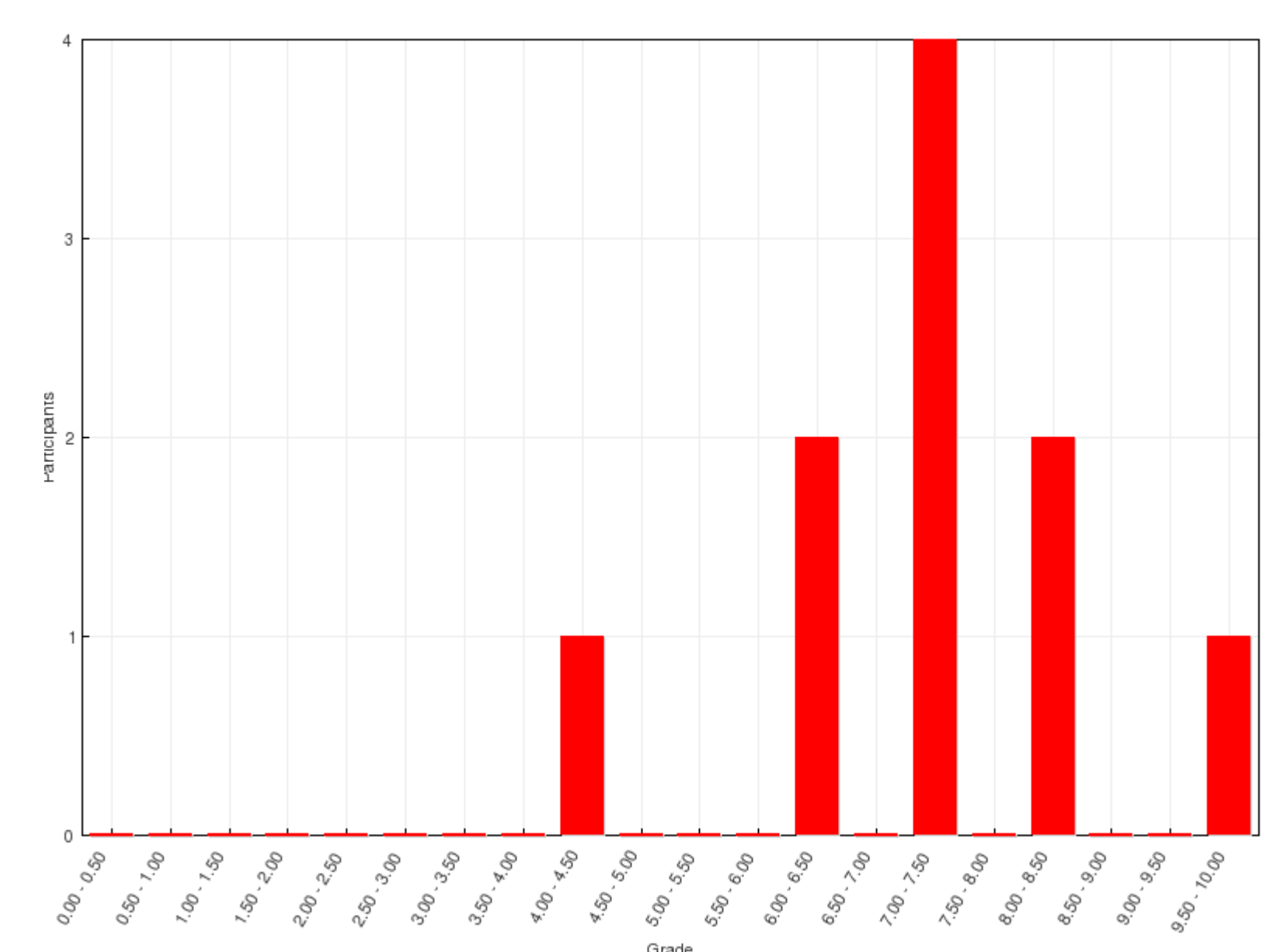
1. Understand the intracellular and extracellular processes that occur after a nerve injury, including Wallerian degeneration
2. Describe the classification of peripheral nerve injuries in relation to management and prognosis
3. Understand the physiology of nerve regeneration and its implication in modern nerve surgery

Pathophysiology of peripheral nerve injury: a brief review

In this article, the authors briefly review peripheral nerve injury (PNI) types, discuss the common injury classification schemes, and describe the dynamic processes of degeneration and reinnervation that characterize the PNI response.

Results of an automated online test

Overall number of students achieving grade ranges



Sample of a written assignment

Assessment

At the end of the module you will be required to write two 1,000 word assignments based on your work environment on the principles and theory covered in the module.

Nerve

Test your knowledge on peripheral nerve surgery

Nerve Injuries and their Management

Choose two only from:

1. Discuss your management of a 35 year old male with closed displaced spiral fracture of the distal humerus with dense radial nerve palsy that got worse after manipulation. Explain your rationale for it.
2. Discuss the principle of selective nerve transfer in brachial plexus surgery.
3. A 26 year old male sustained a laceration over the radial side of his wrist that was sutured in casualty and was told no vital structures were divided. He has been having persistent pain for 6 weeks post treatment and has not been working. His employer has brought him to see you and would like a second opinion. Describe how you would examine him, work him up, your diagnosis and management.
4. A 63 year old male has sustained a radial nerve injury following a humeral fracture fixation which was noted and repaired at the time of surgery. It is 6 months post-surgery, there is no recovery and he has full wrist drop. Describe your clinical approach and management.

Bibliography

Goodyear, P.(2001) . Effective networked learning in higher education: notes and guidance. Publication of JCALT 2001.

Massive open online course (n.d.). In *Wikipedia*. Retrieved March 11, 2013, from http://en.wikipedia.org/wiki/Massive_open_online_course
Pettenati, M. C., & Cigognini, M. E. (2007). Social Networking Theories and Tools to Support Connectivist Learning Activities. *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT)*, 2(3), 42-60.

Thompson, K (November 2011). Citing Website. In 7 things you should know about MOOCs. Retrieved April 4, 2013, from <http://net.educause.edu/ir/library/pdf/ELI7078.pdf>