A “flipped” approach to electroencephalography (EEG) education in neurology residency

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OBJECTIVE

To support the learning of foundational principles of EEG interpretation using a “flipped” learning model.

BACKGROUND

Accurate interpretation of EEG is essential to the care of patients with epilepsy and related disorders, and misinterpretation of EEG can lead to harm[1].

Challenges in both faculty and resident scheduling limit the time available for one-on-one EEG teaching. As a result, residents are spending EEG reading time becoming acquainted with basic concepts, and do not have time to engage more deeply in practicing EEG interpretation.

Prober and Khan have proposed a “reimagination” of medical education in which “foundational” material is reviewed online, using short videos or other educational materials, and interactive time is used for deeper learning and consolidation[2].

Using this model, we developed an EEG education curriculum supported by 10 short teaching videos based on the ACGME neurology milestones.

METHOD

16 residents (8 PGY2 and 8 PGY3) in our program participated in the curriculum. Each resident spends 1 month on the clinical neurophysiology rotation, and half of that time is in EEG interpretation.

10 teaching videos were developed using Camtasia® screen-capture software, and were made available to residents through either DropBox® or the Yale School of Medicine Instructional Video Website. Each video was linked to a set of 3-4 multiple choice questions.

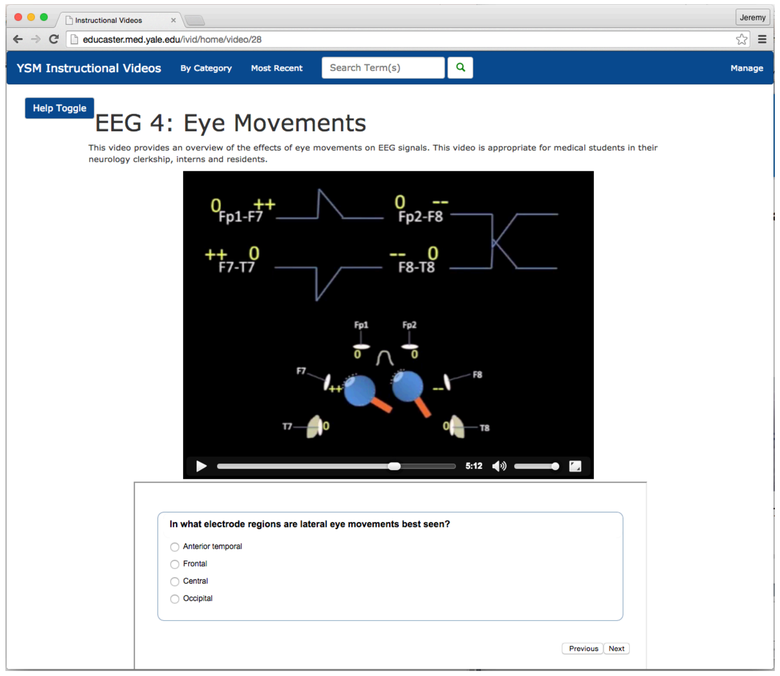
Residents were instructed to review the videos on their own, and then review concepts during EEG reading sessions.

Outline of a typical day on the clinical neurophysiology rotation, incorporating the use of EEG teaching video and post-quiz.

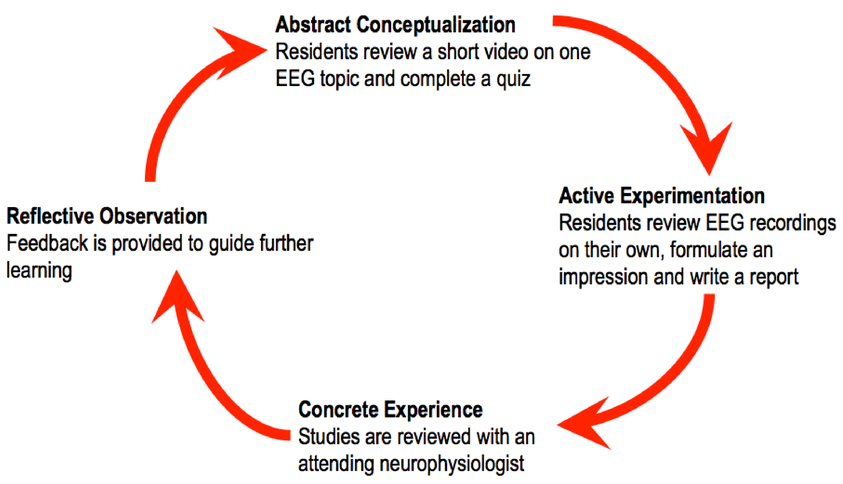
Time	Activity
08:00 – 09:00	Review of EEG teaching video and completion of the post-video quiz
09:00 – 10:00	Review of one overnight video-EEG recording, including generation of a written report/impression
10:00 – Noon	Group EEG review with attending EEGer, resident and other EEG staff
Noon	Regularly scheduled didactic lectures (not necessarily EEG/EMG related)
Afternoon	Electromyography/Neuromuscular Clinic

Blueprint of teaching videos mapped to the ACGME EEG Sub-competencies

		Video Tutorial and Quiz									
Level of competency	**ACGME/ABPN EEG Milestones**	Nomenclature	EEG Polarity Rules	Technical Factors	Eye Movements	Normal EEG			Abnormal EEG		
						Awake	Asleep	Variants	Focal slowing	Inter-ictal	Diffuse slow and periodic discharges
1	Explains an EEG procedure in non-technical terms	X									
2	Uses appropriate terminology related to EEG (e.g. montage, amplitude, frequency)		X	X							
3	• Describes normal EEG features of wake and sleep states • Recognizes EEG patterns of status epilepticus • Recognizes common EEG artifacts		X	X	X	X	X				X
4	• Interprets common EEG abnormalities • Creates a report • Recognizes normal EEG variants		X		X	X	X	X	X	X	X
5	• Interprets uncommon EEG abnormalities • Describes normal and some abnormal EEG features of wake and		X	X		X	X	X	X	X	X



Screenshot of the Instructional Video Website, showing the video and associated multiple choice questions



EEG learning within the flipped curriculum in the context of experiential learning theory[3]

RESULTS

This curriculum is being evaluated during the 2014-2015 academic year with all PGY3 and PGY4 residents.

A version of this curriculum is also being evaluated at a smaller neurology residency program in Canada.

At the end of the academic year, residents and attending neurophysiologists will complete a survey with questions about the impact of this curriculum on learning, patterns of usage of teaching videos, and recommendations for improvement o f the curriculum.

FUTURE DIRECTIONS

We have several goals beyond this initial study:

1. Refining the curriculum and testing it in other neurology residency programs in North America.
2. Exploring how similar tools could be used to facilitate education in other highly technical fields within neurology (e.g. electromyography) and medicine.
3. Exploring how similar curricula could be designed with roots in the theory of “threshold concepts”[4].

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ACKNOWLEDGEMENTS

The authors would like to thank

- The residents, faculty and staff of the Department of Neurology, and in particular the members of the division of Epilepsy and EEG for supporting this change in curriculum.
- Dr. Janet Hafler and the staff of the Teaching and Learning Center of YSM
- Dr. Mark Sadler of Dalhousie University Faculty of Medicine
- The faculty of the MSc Clinical Education Programme at the University of Edinburgh.

Link to Dropbox containing all videos

Link to instructional video website (Yale School of Medicine only)