



# A Review Of MOOCs (Massive Open Online Courses) and Other Online Educational Resources in Radiology



## Authors:

Michelle LaRosa MD, Ross Myers MD, Jennifer Wu MD MPH, William Gao MD, Tariq Rashid MD, Ajay Patel MD, Charles Lugo MD, Adele Brudnicki MD, Perry Gerard MD MBA FACR

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**Westchester  
Medical Center**

Westchester Medical Center Health Network

# Introduction

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In the last decade, MOOCs (Massive Open Online Courses) emerged as an affordable, self-paced, innovative and interactive learning platform. The majority of courses are supported by reputable institutions and have the potential to reach a large number of learners who might be interested in undergraduate and graduate level courses in any field.

Medical education is not an exception. Khan Academy, a non-profit, online educational organization that initially gained recognition in 2008 as a math tutoring service, has since created health and medicine content, including lectures on the physics of MRI and how to approach reading CT and Xray scans.

# Introduction

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There is an array of MOOCs, institutional and personal websites, as well as sites on popular social media platforms that were created for radiology education. Our exhibit aims to review MOOCs and other online resources for radiology education and explore their role in the future of radiology education.

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The Following is an **overview and categorization** of MOOCs and online resources available for radiology education.

\*This is just a representation of the vast material on the internet and by no means an exclusive list.

# 01| Institution based resources

## ▲ Lieberman's eRadiology

*Harvard Medical School*

Includes curricula on primary care radiology, interactive tutorials, classics collection, learning labs consisting of seminar presentations, and anatomy.

<http://www.liebermansradiology.com>

## ▲ Radiology teaching files

*University of Rochester Medical Center*

Includes 11 subspecialties of teaching files with over 600 cases.

<https://www.urmc.rochester.edu/imaging/education/educational-resources/radiology-teaching-files.aspx>

## ▲ Introduction to radiology

*University of Virginia Health systems*

Interactive tutorial covering thoracic, abdominal, MSK, neuroradiology, nuclear medicine, pediatric radiology, and physics.

<https://www.med-ed.virginia.edu/courses/rad/>

## ▲ Interactive CT Sinus Anatomy and Teaching files portal

*University of Washington*

Teaching files on breast imaging and neuroradiology, online musculoskeletal radiology books, nuclear medicine lectures, and liver and muscle atlas.

<http://www.uwmsk.org/sinusanatomy2>  
<https://rad.washington.edu/education/teaching-files-portal/>

## 02| Personal Websites

▲	Radiology masterclass	<ul style="list-style-type: none"><li>• UK-based site with courses and tutorials that awards CPD/CME credits.</li><li>• <a href="https://www.radiologymasterclass.co.uk/">https://www.radiologymasterclass.co.uk/</a></li></ul>
▲	Learning radiology	<ul style="list-style-type: none"><li>• A frequently updated website and social media accounts that publish lectures, unknown cases, flashcards, and other educational resources.</li><li>• <a href="http://learningradiology.com">http://learningradiology.com</a></li></ul>
▲	VirtualMedStudent	<ul style="list-style-type: none"><li>• Covers all medical topics including relevant content on radiology.</li><li>• <a href="http://www.virtualmedstudent.com/index.html">http://www.virtualmedstudent.com/index.html</a></li></ul>
▲	CTisus	<ul style="list-style-type: none"><li>• Everything to know about CT.</li><li>• <a href="https://www.ctisus.com/">https://www.ctisus.com/</a></li></ul>
▲	Questions and Answers in MRI	<ul style="list-style-type: none"><li>• Q&amp;A forum on MRI physics with quizzes and self-tests.</li><li>• <a href="https://mriquestions.com/index.html">https://mriquestions.com/index.html</a></li></ul>

# 03| Social Media Accounts

Figure 1, Facebook, Tumblr, Instagram, Youtube, Twitter, etc.



Online social networking service for healthcare professionals



▲ **Radiodiagnosis** - Knowledge sharing platform with over 45k members

▲ **Radiology Golden Points and MCQs** - focuses on exam preparation, but also shares cases and spotters (over 220K members)



▲ **Radiology signs** - a Radiopaedia.org project, updates every Monday, Wednesday, and Friday

<https://radiologysigns.tumblr.com/>



▲ **Theradiologistpage**

▲ **Radiology.cafe**

▲ **Radiology\_learning\_together**

▲ **Radiology.nation**



▲ **Easy Radiology**

▲ **Radiology Channel** - a Radiopaedia.org project

## 02| The benefits of internet-based education for students

### Affordability

- Many options are free or at a reduced cost for participants from the developing world
- Significant time and cost savings for maintaining accreditation by participating in online CME

### Building Relationships

- Networking opportunities for participants
- According to El-Hmoudova's research, the use of YouTube videos allows for deeper interaction outside of the online classroom

### Supplementation

- Supplement daily case exposure for radiologists who practice in isolation
- Provide expert resources to smaller residency programs that may have limited faculty resources
  - For example, in physics, or in pediatric radiology when the hospital does not have affiliated pediatric department
- Promote learning globally. West Africa, for example, does not have subspecialty radiology training programs.

### Self-set Pace

- Help participants to review topics, improve knowledge and understanding, and prepare for new challenges
- Empower students to teach themselves

### Availability

- No geographical limitation
- Learn anytime, anywhere with mobile access

## 02| Benefits for **instructors** and **institutions**

- **Reach** a larger, diverse audience at a national or international level
- **Improve the reputation** of the instructor and institution by offering high-quality content
- **Complement** traditional learning and help reinforce instruction
  - ◆ In the Khan Academy and the Robert Wood Johnson Foundation collaboration, Stanford Medical School set up a “flipped” classroom by using Khan-style videos before small group discussions
- **Provide a platform** for all levels of instructors who have a passion to teach
  - ◆ No rigorous regulation on instructors on social media platforms
  - ◆ Requires minimal human and financial resources to start
- **Disseminate** important, updated information quickly via continuing education courses

# A study showed that education supplemented with MOOC can be as effective as a traditional clinical rotation:

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A vertically-integrated radiology clerkship was designed with one week of contact with radiologists over the M2 and M3 years, combined with MOOC-like radiology materials that include podcasts, online modules, required readings, and presentations.

Students who completed the clerkship performed comparably to students from multiple schools who went through the traditional radiology rotation with respect to performance on the Alliance of Medical Student Educators in Radiology (AMSER) standardized examination.

# Still, we need to be aware of challenges facing internet-based education:

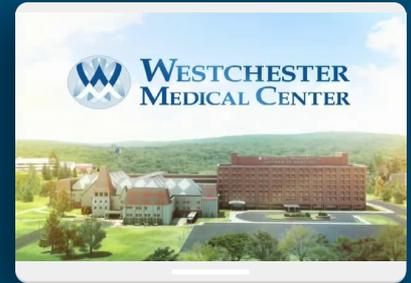
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- Lacks a high-quality **support system** that is typically found in face-to-face environments
  - Difficult for students to receive feedback and assistance in a timely manner
  - Clinical competencies other than medical knowledge are difficult to convey or model to students in an online format
  - Engagement can vary by participants
- **Little quality assurance**
  - Lack of standard accreditation
  - Content may be lacking in rigor, accuracy, or relevancy
- Potential influence in patient empowerment that could impact the dynamic between patients and healthcare professionals

## 03| What is the future of open online resources?

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- Ever-expanding content and resources online, especially on social media
  - ◆ Search Google and social media platforms using the hashtag **#radiology**
- Increase visibility of radiology. Effective means of exposing interested non-radiologists to radiological content and supporting participants' learning goals.
  - ◆ Audience includes radiology technologists, nurses, pre-med undergraduates, engineers, and medical students
- Facilitate communication and collaboration with referring physicians as well as patients
  - ◆ Can increase marketing value and return for radiology practices



# Results and Conclusions

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MOOCs and other open online resources can be a valuable supplement to traditional didactic and clinical radiology education. They can help to facilitate contemporary flipped-classroom learning for medical students and radiology residents, as well as to provide an easily accessible means for lifelong learning and CME accreditation for attending physicians.

The quality of the online material and teaching can, however, be a major concern when the individual learner needs to critically assess the content.

In conclusion, open online resources are progressing continuously and educators should embrace them as an opportunity to advance global radiology education.

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