Technology Enhanced Education: Using iPads and VR

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Introduction

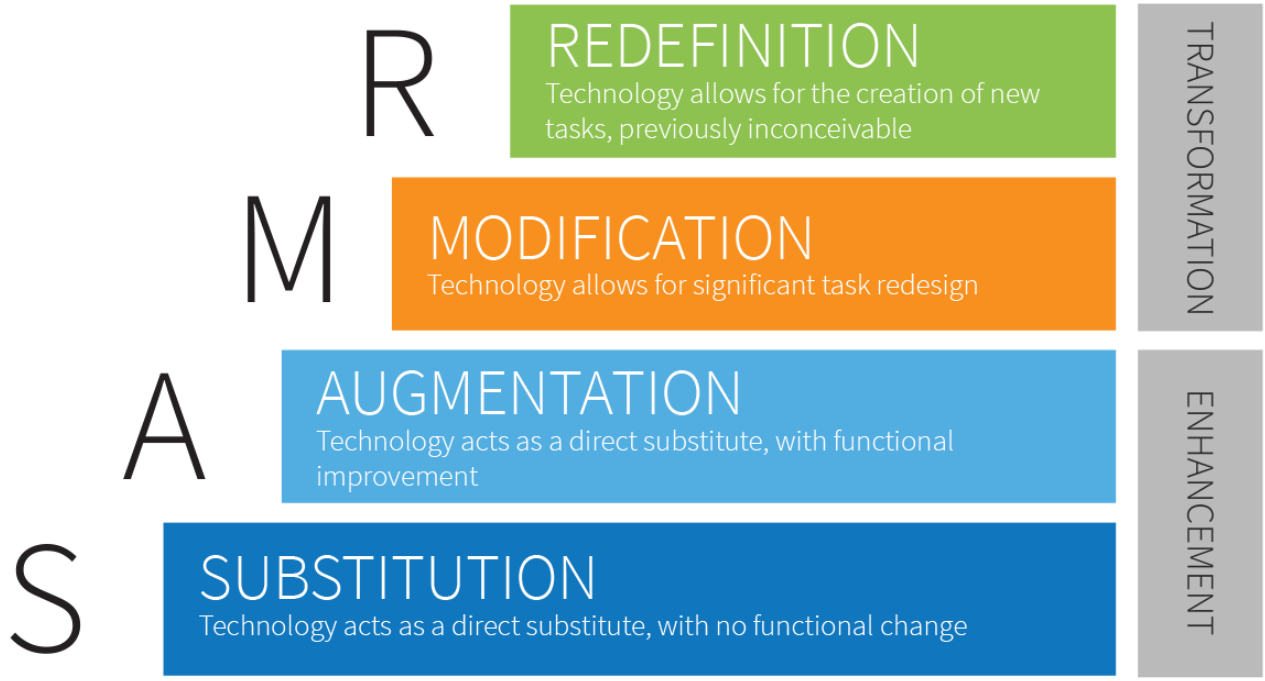
Technology in medical education has provided educators the tools to present interactive and engaging course content. Implementing technology is best done thoughtfully, taking the time to consider how the technology meets educational objectives. In this session we will discuss conceptual frameworks for an approach to implement technology in medical education and apply these methods to a current technology – iPads, and also an emerging technology – virtual reality.

After this session we expect participants to

1. Discuss methods to successfully integrate ipads and virtual reality into medical education.
2. Develop skills to effectively use this technology while teaching.
3. Understand the use of Educational Technology as a process.
4. Define the levels of the SAMR model for implementing technology in medical education.
5. Apply the SAMR model to a technology use case in medical education.
6. Understand applications for use of tablet technology in medical education.
7. Understand potential uses for VR technology in medical education

Model for Implementing Technology into Education

SAMR (Puentedura, 2008) – Substitution, Augmentation, Modification, Redefinition



https://www.schoology.com/blog/samr-model-practical-guide-edtech-integration

Substitution – technology act as a direct tool substitute, but no functional change. Instead of using a typewriter, use a word processor but with no new features. This is an enhancement.

Augmentation – technology acts as a direct tool substitute, but with functional improvement. Using a word processor with additional features, such as cute/paste, figures, pictures. This is an enhancement

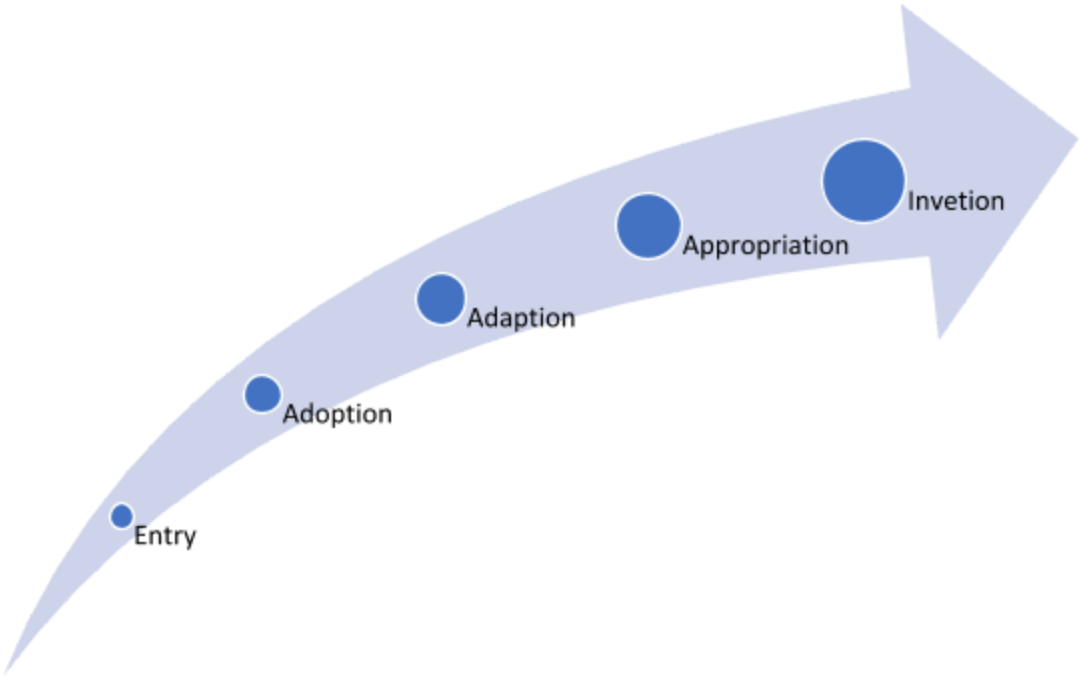
Modification – technology allows for significant task redesign. Using the same metaphor, students could write a paper collaboratively using cloud sharing like google documents. This is a transformation.

Redefinition – technology allows for the creation of new tasks, previously inconceivable. In general this uses the technology to allow the students to create something new. An example would be to create a living document like a wiki page. This is a transformation.

There is nothing wrong with using technology at any of the levels if it's appropriate for the application. The questions to ask-

- is technology well-suited for the task at hand?
- Are there other tools that allow for greater flexibility to explore all aspects of SAMR?
- What can you add or modify with your current teaching to elevate the teaching through the SAMR model to make it more interactive?

In order to be successful, it can be useful to identify your current comfort level with the technology. A model to help understand this progress through the individual educator's ability has been described in ACOT Stages of Technology Integration (Brooks-Young, 2010)



Entry – learn the basics of using the new technology.
Adoption – use new technology to support traditional instruction (Substitution)
Adaption – integrate new technology into traditional practice (Substitution, augmentation)
Appropriation – focus on cooperative project based and interdisciplinary work-incorporating the technology as needed and as one of many tools. (Substitution, augmentation, modification, redefinition)
Invention – discover new uses for technology tools. (Substitution, augmentation, modification, redefinition)

With these models in mind, iPad integration and Virtual Reality can serve as technology examples to show what is useful now and what to expect in the near future.

iPad (and other tablets)

The SAMR Model Applied to Tablets and Presentation Apps

	Level	Tablet/Presentation App Example
Transformation	*Redefinition* – tech allows for the creation of new tasks, previously inconceivable	Presenters or learners can draw within the presentation in real-time to explore concepts
	Modification – tech allows for significant task redesign	Individual or group work can be captured and displayed in real-time in the presentation
Enhancement	*Augmentation* – tech acts as a direct tool substitute, with functional improvement	The tablet replaces the remote and is able to jump to specific slides when questions are asked
	Substitution – tech acts as a direct tool substitute, with no functional change	The tablet replaces the remote to progress through slides

Understand the connectivity options

While there are many different apps and presentation software available via tablets (and even smartphones) to aid in large group presentations, the options for connectivity are generally the same. The option chosen is largely based on availability, but also presenter comfort, and the desired features to be utilized during the presentation.

Connect the tablet directly to the projector (via wires or wirelessly). This method creates a direct connection to the projector and essentially "mirrors" the tablet screen through the projector. This is a *direct interface* as the presentation app, media, or other materials to be presented are found on the tablet itself. This method is the most commonly available and requires that the educator prepare the iPad primarily when delivering presentation.

Connect the computer to the projector (via wires or wirelessly) while also connecting the tablet to the computer (usually wirelessly). This method represents an *indirect interface* where the tablet may act as a remote for the computer. This method is less common and technically more difficult. However, because the tablet acts as a remote for the computer connected to the projector and adds functionality in the presentations, there is a little less of a learning curve. In general, the computer usually has more functionality than the iPad alone, as well.

Understand the available features for the presentation

After deciding *how* to connect to present, the next question is *what to use* to present. There are many different options that are primarily affected by the method of connectivity. An exhaustive list of features found in apps and software is beyond the scope of this article, but there are several common features to be familiar with.

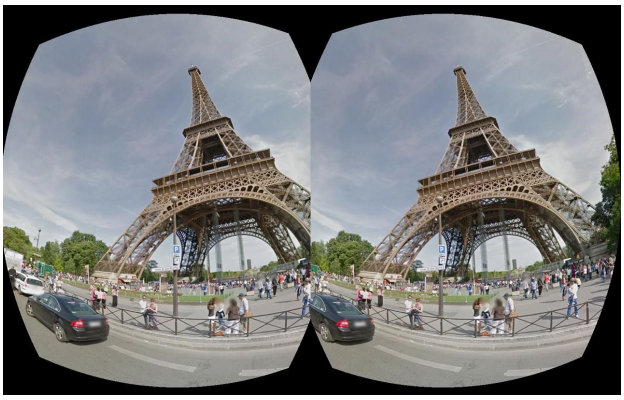
- **Classic presentation software/apps** – these are the most commonly used features found in software such as Powerpoint, Keynote, Slideshark, etc. Users progress through pre-prepared slides.
- **Whiteboard functions** – some software and apps allow the educator to create a digital whiteboard and write or draw on the screen.
- **Annotation functions** – similar to whiteboarding, but this allows the user to write directly on the slides or other media being presented.
- **Camera functions** – allows the user to take pictures and immediately integrate them into presentations.
- **Web search functions** – users can either use native browsers, or in app browsers to find content in real time.
- **Cloud server synchronization** – anecdotally, almost every presentation software or app now comes with synchronization capabilities for a variety of cloud servers.

Virtual Reality

One of the best types of learning is with actual patients. Bedside rounds have changed little in the last 100 years. Most of what we do in education is trying to replicate this type of learning. How often when teaching a clinical pearl does real patient encounter come to mind? Or a patient case that you still remember from early in your clinical training? Now try to recall a similar experience when sitting in a lecture hall. One of the reasons clinical experiences stick with us is they are immersive. All of our senses are engaged in the experience with real patients. We are finding that didactic learning is a poor substitute. Many in medical education have moved to implement more interactive experiences with small groups, simulation and hands-on teaching.

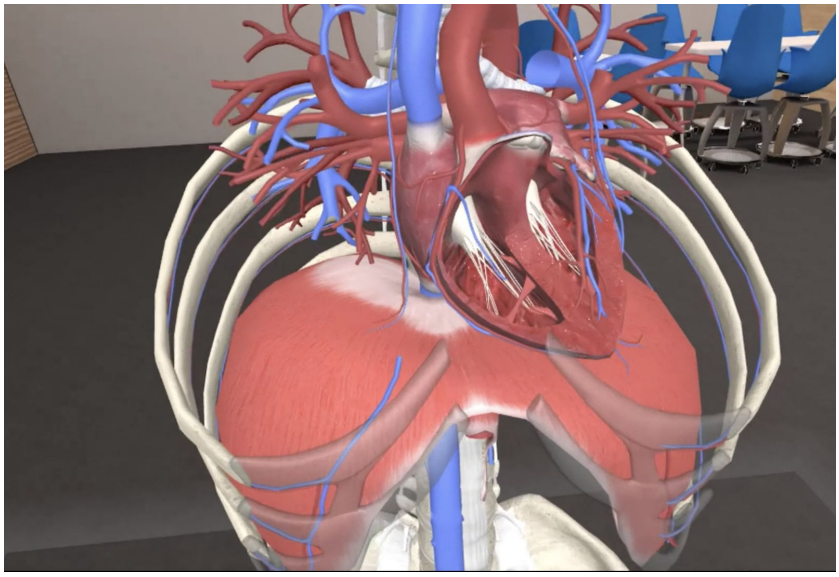
Virtual reality is an emerging technology that can be a relatively inexpensive way to explore immersive educational experiences. To best implement the technology, it is important to consider educational modules such as SAMR to use the technology to its best educational potential.

What is Virtual Reality (VR)?

1. VR is an immersive experience that simulates presence in the scene. It takes visual and sound input to immerse the individual in a sensory experience that mimics reality. The experience takes the leap of watching a video game to being in the game.
2. For any VR immersive experience to work, the video display needs a "stereoscopic" head mounted display. This delivers a slightly different image to each eye to create a 3D visual experience.
    a. Stereoscopic images: 
3. The headset needs a gyroscope to be able to detect head movements to change the images appropriately.
4. Headphones can deliver surround audio to allow auditory immersion. This is not required but can add that extra element of immersion to help suspend disbelief.

What are some examples of VR being used in medical education?

1. 360 movie - record a 360 degree movie of a patient encounter, such as a trauma scenario. Learners can then watch the immersive movie for training.
2. Gaming platform - develop teaching scenarios in a gaming platform, such as Unity. Could create simulation exercises that create a simulation that is difficult to replicate in real life simulation, such as a subway bombing scene for first responders to triage and perform tasks on patients for teaching disaster triage.
3. Teaching anatomy an interactive, immersive 3d model.

a. 

What are examples of devices or platforms that medical educators can use to teach students and residents?

1. Headsets used with a smartphone– these headsets have lenses that allow for the two images to focus on the split screen of the phone. The phone acts as the gyroscope detecting motion. Plug in headphones for immersive audio. Some phones allow other accessories such as controllers. Note: prices listed below are likely to change quickly - they are getting cheaper and cheaper!
    a. Google Cardboard - $15. Works with any smartphone.

        i. Google Cardboard:
    b. Air VR – works with ipad $49 (in development)

c. Google Daydream with Pixel android phone. $80

i. Google Daydream

d. Samsung Gear VR – only works with Samsung phones. $30-$80 depending on controllers

i. Samsung Gear VR

2. <u>Non-headset phone</u> - augmented reality
    a. This is one step away from immersive reality. This is like Pokemon Go, where the user holds the phone more typically, and brings components of the digital world into a person's perception of the real world. There is less content currently for augmented reality in medical education, and less opportunity to create your own content.
    b. For augmented reality, the Microsoft hololens is one of the main players, but doesn't actually use a smartphone. Does comes with a high price tag - $3,000 to $5,000

3. Headsets that work with a computer or console. These have dedicated headsets for VR that include the needed stereoscopic images, gyroscope and 3-D audio, and then link to a computer or console. This allows for more powerful computing to give a richer VR experience or to store VR content on a larger hard drive than is available on a smartphone. These systems have much higher resolution graphics, sophisticated input devices, and importantly they track your position in space making the VR experience much more realistic.
    a. HTC vive – has tether or cord to the headset. User can walk around a 15x15 space. $499 with controllers and base stations as other accessories.
    b. HTC Vive pro – cordless! More tracking area 33x33 feet. $799 for headset only.

    c. Oculus rift. $400. Does not allow you to walk around in the space, easily. New hand controllers and sensors allow for some tracking, but does not allow walking through as much space compared to HTC pro.
    d. Computers needed to support a VR are $800-$2000
    e. PlayStation VR system ($350) and requires the PlayStation ($300).
4. Stand-alone VR headsets – no need for a phone or a computer. This is the latest development in the technology
    a. Oculus Go - $199. Set to arrive 'early 2018'

Why VR over more standard simulation?

1. The cost for an immersive type simulation is much cheaper compared to sim man or other types of immersive environments such as projection. For $2000 can have a highly powered VR system, and newer technology will likely continue to push cost down.
2. VR allows more creativity with scenarios that are impractical or unrealistic with a more traditional simulator.
3. Students can 'play' the experience asynchronously, potentially at home with their own equipment.
4. Downsides of a VR simulator
    a. Currently systems are made for one person to be in the immersive environment at a time. They are not optimized for "multiplayer" type scenarios. This is not a technology to assess team work or group dynamics.

b. Currently, 360 degree videos and digital environments can feel low quality, which hinders the user feeling fully immersed. It is not difficult to create a basic 3D environment in a game platform, or even using still 360 degree images to map to a game platform, but to make it fully rich to feel "real" is much more time intensive.

If an educator wanted to start using VR tomorrow, what would be the steps?

1. The easiest way to develop an immersive experience would be to record a 360 degree movie and have students watch the movie. Yi360 is a camera that can even stream VR video. This camera automatically "stitches" the video together for editing.
   a. 
2. After capturing the 360 video, export to a video editing software such as Final Cut Pro ($299). It is even possible to add text, 2D images or 2D video embedded within the 360 video.
3. If you want to create a 3D space, like a video game, you'll need a 3D gaming engine. The most popular is Unity, which claims to power over 2/3 of VR and AR experiences. It's free to download.
   a. But, it takes skill and time to create a realistic scenario. This is where the real cost in developing a VR scenario is involved. Right now, there is money for game developers to make VR games for a broad audience, but not yet the market share needed to drive VR development for medical education.
   b. Most of the innovation with developing VR "games" for medical education will likely come from grants and research. The results of this will likely be shared for free, with potentially paid "supported" options. This is your call to develop a VR lab at your institution and start building content for everyone!

Examples of implementing VR immersive experience using the SAMR model.

	Level	VR Example
Transformation	*Redefinition* – tech allows for the creation of new tasks, previously inconceivable	Give students 360 degree video recorder and task them to create a teaching simulation of a trauma scenario and upload to youtube for FOAMed
	Modification – tech allows for significant task redesign	360 recorded movie of a simulated trauma activation with viewer interaction with the scenario to decide next steps, "choose your own adventure"
Enhancement	*Augmentation* – tech acts as a direct tool substitute, with functional improvement	Embedded vital signs monitor and teaching text in a 360 recorded movie of a trauma activation.
	Substitution – tech acts as a direct tool substitute, with no functional change	360 degree recorded movie of a trauma activation. New staff and residents can view as primer.

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