Lesson 3

HOW AUGMENTED REALITY COULD CHANGE THE FUTURE OF SURGERY[25] (BY NADINE HACHACH-HARAM)

Level C1

If you are undergoing surgery, you want the best surgical team to collaborate on your case, no matter where they are. Surgeon and entrepreneur Nadine Hachach-Haram is developing a new system that helps surgeons operate together and train one another on new techniques — from remote locations using low-cost augmented reality tools. Watch the system live in action on her laptop from the TED stage in New Orleans as she joins a surgeon in Minnesota performing knee surgery. As Hachach-Haram said: "Through simple, everyday devices that we take for granted, we can really do miraculous things."

In this lesson, you will learn how:

1) technological advances like telemedicine and remote surgery can benefit the health of global populations;

2) connecting experienced surgeons with local practitioners in remote places where their expertise and specialist knowledge can make a huge difference;

3) through AR-assisted remote collaboration, surgeons can provide their patients with the best surgical procedures possible.

The video for this lesson is available at:

https://www.ted.com/talks/nadine_hachach_haram_how_augmented_reality_could_change_the_future_of_surgery

[25] *Hachach-Haram, N.* How augmented reality could change the future of surgery //TED. November 2017. URL: https://www.ted.com/talks/nadine_hachach_haram_how_augmented_reality_could_change_the_future_of_surgery

1. Warm-up

1.1 Discuss the following questions with your partner.

1. How accessible is health care in your country?
2. What is telemedicine and how does it work?
3. What are the benefits of using new technologies in healthcare?
4. What are the disadvantages of using new technologies in healthcare?

2. Vocabulary

2.1 Match the words with their definitions.

1) arthroscopy a) a strong piece of tissue in the body connecting a muscle to a bone

2) augmented reality b) to transmit or receive data, especially video and audio material over the Internet as a steady, continuous flow

3) blight c) a medical operation in which a very small hole is made in a person's body to reach an organ or tissue inside

4) cleft lip d) a person who goes to a hospital for treatment, but who does not stay there [26] [27] [28]

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26 complication e) an opening that is made in something with a sharp tool, especially in someone's body during an operation

27 consent f) to imitate

28 incision g) a damaged area of the body, such as a cut or hole in the skin or flesh

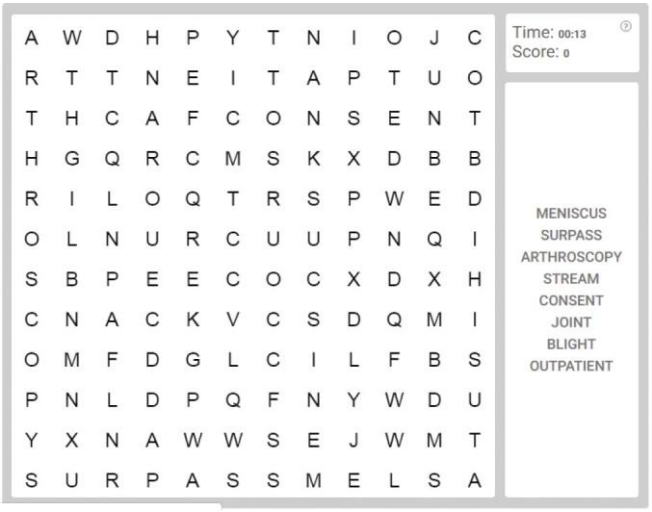
8) joint	h) a type of surgery in which a very small hole is made in a person's body in order to look at a joint using a special instrument and sometimes to repair the joint at the same time
9) keyhole	i) an upper lip that does not join in the middle because it did not develop normally before birth
10) meniscus	j) a structure in the human or animal body at which two parts of the skeleton are fitted together
11) mimic	k) to do or be better or more than something else
12) outpatient	l) an extra medical problem that makes it more difficult to treat an existing illness
13) patellar	m) permission or agreement
14) stream	n) an enhanced view of the world, created by the use of technology to overlay digital information on an image of something being viewed through a device (such as a smartphone camera)
15) surpass	o) to cause damage to or have a bad effect on something
16) tendon	p) a fibrous cartilage within a joint especially of the knee
17) wound	q) the bone shaped like a triangle at the front of the knee

2.2 Practice the words online.
https://quizlet.com/_6w5v5s

2.3 Fill in the gaps with the words from Ex.1. in the appropriate form.

1. Using _____ collaboration software, an expert surgeon can virtually transport him or herself into any clinical setting simply by using a phone or tablet or computer, and can visually and practically interact in an operation from start to finish, guiding and mentoring a local doctor through the procedure step by step.
2. We have just identified that small_____ tear there, but otherwise the fluid around the_____ looks OK.
3. Dr. Marc Tompkins is going to perform an _____surgery for us, and I'd like to disclose that this patient has _____to having their operation _____ .
4. Arthroscopic or _____surgery combines video technology and precision instruments to make surgery less invasive.
5. So, let us start with our _____ and where we are going to make these, on either side of the _____ . So, if you can make your _____ there and there, that should hopefully get us into the knee.
6. Now, patients can access care at a local level. This reduces their travel time, improves their access, and saves money. We have even started seeing its use in _____ care management with nurses and in_____ management.
7. I have seen firsthand how lack of access to safe and affordable healthcare can _____ the lives of ordinary people.
8. One of the most heartwarming stories I can recall is from the town of Trujillo in the north of Lima in Peru, where this technology was used to support the provision of _____and palate surgery to children from poor backgrounds who did not have access to health insurance.
9. Within a few months, Dr. Soraya and her team were able to perform 30 percent more operations with fewer and fewer _____ . Now they can perform these operations independently, competently and confidently.
10. We are used to using digital technology to communicate through voice and text and video, but augmented reality can do something so much deeper. It allows two people to virtually interact in a way that _____how they would collaborate in person.
11. Robotics brings to surgery ultraprecision, the ability to carry out procedures at the tiniest scales with a degree of accuracy that _____ the human hand.

2.4 Find the words from this lesson in the word search box.



3. Comprehension

3.1 Watch the TED talk and make notes. Decide on how you are going to make notes. For methods of note-taking, refer to Appendix 3.

3.2. Using your notes, answer the following questions:

1. What are the problems in delivering global surgery in the 21st century?
2. How can lack of access to safe and affordable healthcare blight the lives of ordinary people?
3. What is the solution to the shortage of access to vital surgical services?
4. What does keyhole or arthroscopic surgery mean? Is it less invasive?
5. What idea does Nadine Hachach-Haram introduce to remote surgery?
6. What are essential components for remote surgery?
7. How can augmented reality collaboration software guide a local doctor through the surgical procedure?
8. What kind of surgery was demonstrated by Dr. Marc Tompkins as an example?
9. What problem was identified in the patient's knee? How was it identified?

10. What is the new technology introduced by Nadine Hachach-Haram based on?
11. How was this technology implemented in Peru?
12. What was the result of the implementation?
13. What is the power of this technology?

4. Reading

4.1 Read the article "Six ways Augmented Reality is transforming the future of healthcare" and choose the most suitable heading A—G for each section 1—7 from the list of the headings below.

A. Empowering patients
B. Delivering treatment
C. Speeding up the adoption of new technology
D. Improving access
E. Boosting training
F. Assisting practice
G. The role of technology in healthcare

Six ways Augmented Reality is transforming the future of healthcare[29]

As populations continue to boom and people live longer and longer, healthcare services the world over are coming under ever- increasing pressure. Coupled with rising expectations about access to and quality of healthcare provision, increased demand is seeing resources stretched and costs skyrocket.

1. Healthcare provision is one of the cornerstones of modern society. Being able to adequately meet increasing demand is the key challenge the medical profession faces both now and in the foreseeable future. It is a puzzle that healthcare providers the world over are applying their time, energy and talent to solve. And technology is playing a critical role.

Out of all the many technologies now being applied to healthcare delivery, Augmented Reality (AR) is one of the most exciting. The ability to seamlessly blend direct sensory experience of the real world with all the power and potential of digital information technology is groundbreaking.

Put it this way. We all know how important digital resources have

[29] URL: https://www.proximie.com/six-ways-augmented-reality-is- transforming-the-future-of-healthcare/ Retrieved 2 July, 2019

become, especially in the Internet age, for looking up resources, help and advice as we work. But what if we didn't have to break off from what we are doing to go to our laptop or tablet to find what we are looking for? Imagine if it was there immediately in our field of vision, or in our ears, as we were working?

This is what AR does. It is this immediacy which is helping to establish AR as a breakthrough technology in healthcare. When time and resources are of the essence, AR allows medical knowledge, skills and expertise to be shared remotely in the moment, ensuring they get where they are needed most.

Here are six ways that AR is helping to transform the face of healthcare so we can better meet the challenges we face.

2. How do you meet the medical needs of seven billion people when there are not enough doctors to go around? Access to healthcare has traditionally been limited by the availability of a practitioner for each patient to see face-to-face — long queues in surgery waiting rooms and so on. The concept of telemedicine is removing these limitations by normalising the concept of medical consultations over distance, via smart devices and the Internet.

AR has a key role to play in guaranteeing the quality of such consultations. This is especially true in our own field of surgery. Rather than simply being about diagnostics, the Proximie app uses AR to allow complete surgical procedures to be carried out over distance, with a specialist using the AR tools to guide and collaborate with a colleague in real time. The immediacy of this knowledge sharing means expertise can reach further than ever before, improving access to surgery.

3. The longer-term solution of there not being enough medical professionals to go around is, of course, to train more. AR is already having a profound impact on medical training, with applications ranging from 3D visualizations to bring anatomical learning to life, to helping trainee nurses to master techniques for checking vital signs.

A key benefit of AR as a learning tool is that it creates a highly engaging, immersive educational experience which, by combining different sensory inputs, aids retention and how well complex concepts can be grasped. Used in surgical classes for medical students at Yale, faculty staff praised Proximie for the interactive, "hands-on" educational experience it provided.

4. Innovative new technologies which promise great benefits to healthcare provision are continually arriving on the market at a rate of knots. However, one challenge the healthcare sector faces is that there is often a lag between a promising technology coming out of its

development phase and achieving widespread adoption.

Reasons for this delay include things like the costs of purchasing new tech, the time it takes to raise awareness, and the need to integrate new systems, from installation to training staff.

Time lost to these delays is time wasted in providing a potentially better service to patients. AR can help. Instead of waiting for those all-to-rare opportunities to demonstrate new products face-to-face, apps like Proximie can help vendors reach potential customers all over the world any time they like, offering in-depth demonstrations. Following a purchase, AR can also be used to train staff remotely and to form the basis of long-term aftercare services.

5. AR is an extremely helpful tool in aiding medical professionals complete day-to-day tasks more accurately and efficiently, from aiding diagnosis to assisting with procedures. Putting aside the remote collaboration aspect of Proximie, the AR tools it provides are very useful in their own right for a surgeon in theatre. The app allows you to do things like project anatomical cross sections onto a patient, or show 3D visualisations of internal organs, so the surgeon gets a 'see-through' view as they plan a procedure.

Similar applications include AccuVein, an AR tool which helps practitioners locate veins for cannulation. Future uses of AR may include electronic medical records (EMR) being automatically displayed on a device as a doctor examines or consults with a patient, again highlighting the immediacy that AR can bring to medical practice.

6. Another intriguing trend we are seeing with the use of AR in healthcare is the development of applications that empower patients to play a more proactive role in their own care. The EyeDecide app, for example, is on the one hand another example of a 3D anatomical visualization tool, this time demonstrating the structure of the eyeball.

But beyond that, it also offers visual simulations of different eye conditions. Free on iPhone or iPad, users can self-diagnose by matching the simulation to any distortion they are experiencing in their own vision, and the app then even offers a list of suggested eye specialists in their area to consult further.

7. Finally, AR is even being used to treat patients in its own right, especially in relation to physiotherapy and physical rehabilitation. The basic principle behind the use of AR in this field is that digital demonstrations can be mapped directly onto the motions people perform as part of their therapy. By watching themselves in tandem with the demonstration, they can refine their movements accordingly.

This can be done either with an entirely computer-generated image, or with a therapist making the demonstration, as in the "Ghostman" system developed by the University of Tasmania. The study conducted by researchers in Tasmania found that fine motor skills developed much faster using the AR tool compared to traditional face-to-face demonstration. An AR tool also offers the added benefit of allowing therapy to be delivered remotely.

4.2 Read the script of the TED talk and find the facts that refer to the following numbers. Fill in the table as in the example.

Number	**Factual information**
30 %	Within a few months, Dr. Soraya and her team were able to perform 30 % more operations with fewer and fewer complications.
70 %	
100,000	
600,000	
1 million	
6 million	
billion	

4.3 Extensive reading. Read about the Lebanese doctor Nadine Hachach-Haram, who developed a medical platform called "Proxemie". These texts may give you more ideas for the Speaking section.

https://www.abouther.com/node/14631/people/leading-ladies/lebanese-doctor-nadine-hachach-haram-wins-award-her-brilliant

https://www.proximie.com/

https://www.proximie.com/reaching-out-to-help-how-proximie-is-empowering-surgeons-to-make-a-difference/

5. Speaking

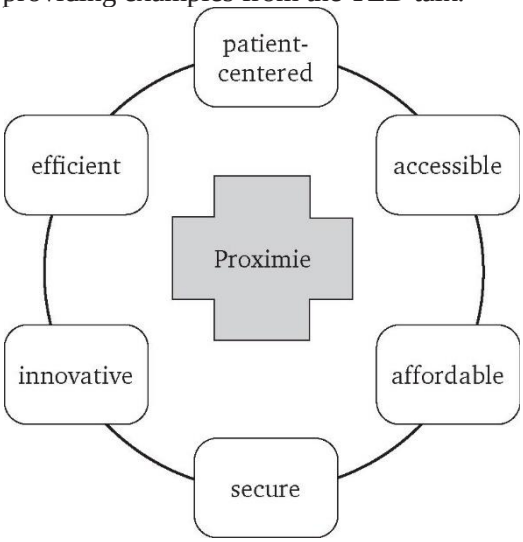
5.1 Using your notes reconstruct the TED talk with your partner.

5.2 Give the talk to another partner or pair.

5.3 In pairs or in small groups discuss the following

questions:

1. How can technological advances help to make the world a fairer and more equal place in terms of healthcare?
2. What is an example of software that enables remote surgical practices?
3. Who are the potential users of Proximie?
4. Talk about the benefits of Proximie in healthcare using this diagram and providing examples from the TED talk.



6. Writing

6.1 Write an essay (200—250 words). For a writing plan, refer to Appendix 2.

How can technological advances benefit the health of global populations?

Lesson 4

HOW WE NEED TO REMAKE THE INTERNET[30] (BY JARON LANIER)

Level C2

[30] *Lanier, J.* How we need to remake the internet. TED. April 2018. URL: https://