Scalable Medical Capacity-Building In Afghanistan

lecturio

EXAMPLE

Doctor coverage Afghanistan

Doctors per 10,000 Population

4.2

2.8

Source: World Bank

Medical Capacity Building

- **Short Term: COVID19 Capacity Building Academy**
- **Medium/Long-Term: National Digital Medical Education Support**

CONTENT

Lecturio has made all its COVID-19-relevant content freely available

EDUCATOR TEAM INCLUDES PROFESSORS FROM

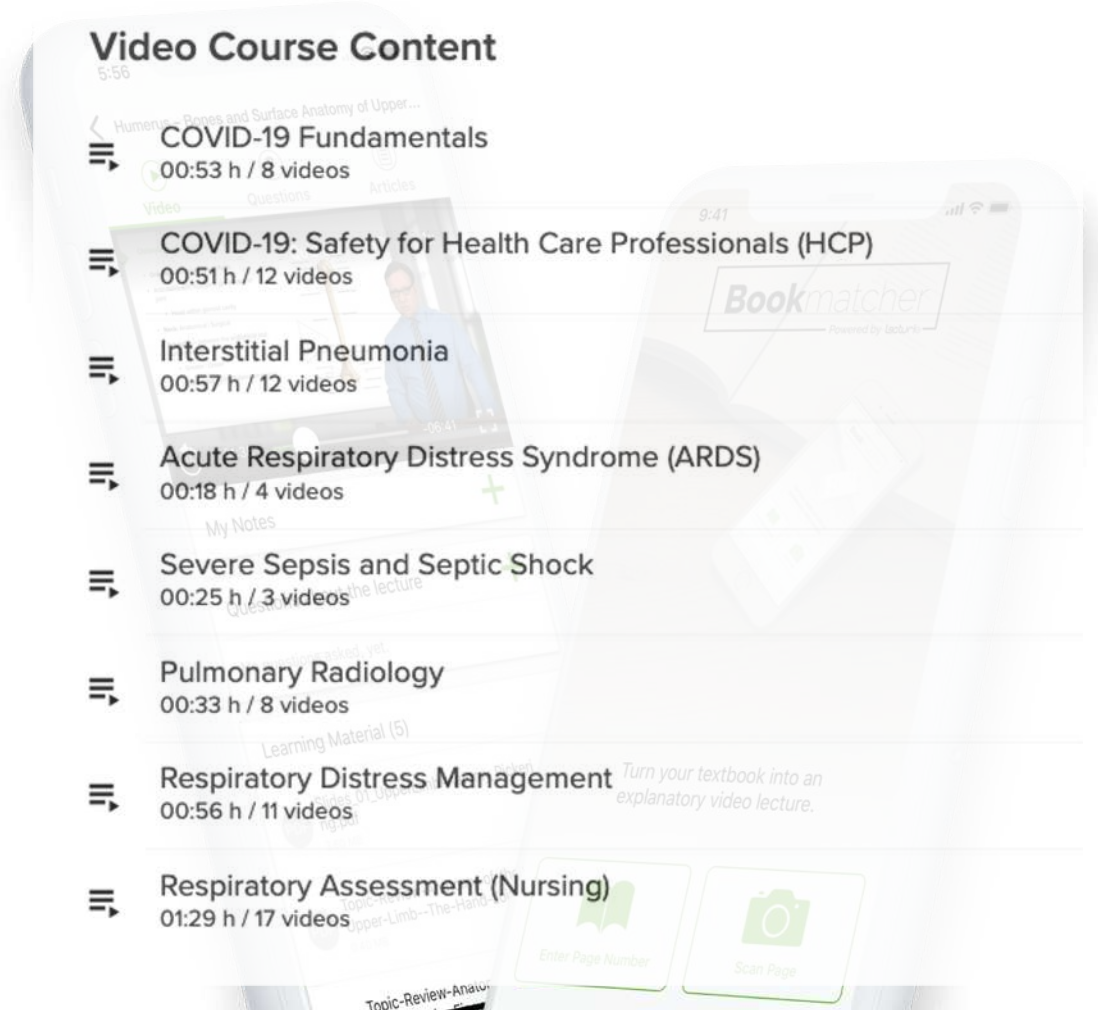
Yale University School of Medicine

HARVARD UNIVERSITY

Imperial College London

BROWN Alpert Medical School

JOHNS HOPKINS SCHOOL of MEDICINE



Comprehensive overview

COVID-19 (Coronavirus disease 2019)

Abstract: COVID-19, also known as Coronavirus disease, is a respiratory infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Transmission mainly occurs via direct contact or aerosol droplets. The infection may present asymptomatically or with fever and dry cough. Individuals who are over 65 years of age, immunosuppressed, or have preexisting conditions have a higher risk of developing severe symptoms and complications. Management is based on supportive care.

Updated April 6, 2020

Table of Contents

Share this concept

Etiology

Coronaviruses (CoV) are a family of enveloped, positive-sense, single-stranded RNA (+ssRNA) viruses. They tend to cause mild upper respiratory diseases in humans. Of the 7 known species of CoV, only 3 are known to cause severe infections in humans:

- Severe acute respiratory disease coronavirus (SARS-CoV): emerged in 2003 in southern China from civet cats.
- Middle East respiratory syndrome coronavirus (MERS-CoV): emerged in 2012 in Saudi Arabia from dromedary camels.
- **SARS-CoV 2**: emerged in December 2019 in China possibly from bats or pangolins (still under investigation).

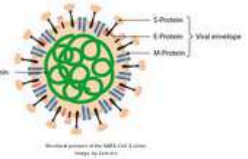
Selected diseases caused by Coronaviruses

	Common cold	All tract infection	Severe acute respiratory syndrome (SARS)	COVID-19 (Wuhan City, China)
Incubation	2 days	3 days	4-6 days	2–14 days
Incidence	Most common	Rare	Rare	~1,000,000 cases (Jan 2020 – April 2020)
Prognosis	Complete resolution	Complete resolution (up to 2% fatal for MEC)	30% resolution 70% severe infection 10% fatal	80% resolution 15% severe infection 5% critical infection 3.4% fatal (based on confirmed cases as of April 6, 2020, may change)
Clinical manifestation	Sneezing, rhinorrhea, headache, sore throat, malaise, fever, chills	Diarrhea, gastroenteritis, neonatal necrotizing enterocolitis	Fever > 100°C (100.0°F), muscle pain, lethargy, cough, sore throat, malaise Shortness of breath/ pneumonia (may not be present in some patients)	Asymptomatic Mild infection: fever, dry cough, malaise, dehydration Severe infection: high fever, shortness of breath, chest pain, hemoptysis Complications: pneumonia, ARDS, sepsis, multi-organ failure

SARS: Severe acute respiratory syndrome; MERS: Middle East respiratory syndrome

The SARS-CoV 2 virion is ~1250 nm in diameter, and its genome ranges from 26 to 32 kilobases, the largest for an RNA virus. **It has 4 structural proteins: spike (S), envelope (E), membrane (M), and nucleocapsid (N).**

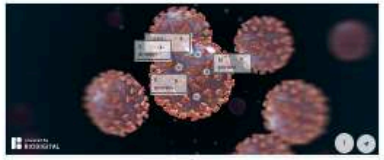
- N protein forms a complex with RNA and aids in the viral assembly after its replication.
- S, E, and M proteins create the viral envelope.
- S protein, is a club-shaped surface projection, giving the virus its characteristic crown-like appearance on electron microscopy. It's responsible for viral entry into the human cell.



Structural proteins of the SARS-CoV 2 virion. Image by Lecturio.

SARS-CoV 2 attaches to the host cell by binding its S proteins to the receptor protein, **angiotensin-converting enzyme 2 (ACE2)**. ACE2 is expressed by epithelial cells of the intestines, kidney, blood vessels, and most abundantly in type II alveolar cells of the lungs. The virus induces a drop of ACE2 in human cells, possibly inducing lung damage.

The human enzyme **transmembrane protease, serine 2 (TMPRSS2)** is also used by the virus for S protein priming and to aid in membrane fusion.



COVID-19 Virus Structure

Related Video Courses:


Coronavirus Infectious Disease 2019 (COVID-19)


COVID-19 Etiology, Epidemiology, Diagnosis

Transmission

CoV are zoonotic or transmitted to humans through animals. It is hypothesized that horseshoe bats are the natural reservoir of SARS-CoV 2 since its genome is 97% identical to that of a bat coronavirus. The intermediate host is still unknown.

Once in humans, **the virus is transmitted mainly via inhalation of aerosol droplets from coughing, sneezing, or talking of symptomatic individuals.** In the air, larger droplets tend to drop towards the ground within 1 m (3 ft), while smaller droplets can travel as an aerosol cloud over 2 m (6 ft) and remain viable in the air for up to 3 hours under certain conditions. Other forms of transmission include:

- Direct transmission through hand-to-face contact from infected surfaces.
- Fecal-oral transmission is hypothesized (observed in SARS infection, but is still under investigation).
- Vertical transmission (mother-to-child) hasn't been reported.

The period of highest infectivity for symptomatic cases ranges from 2 days before the onset of symptoms up to 3 days after their resolution. Exact limits are still under investigation.

The reproductive number (R0), or the number of secondary infections generated from 1 infected individual, is 2 to 2.5, higher than for influenza (1.3–1.5). **COVID-19 is highly contagious** due to the following aspects:

- **Asymptomatic individuals are also infectious**, albeit to a slightly lesser degree, posing a real challenge for contagion prevention.
- Production of high viral loads.
- Efficient and prolonged shedding of virions from the upper respiratory tract (URT).
  - Median duration of viral RNA shedding from URT: 20 days.
- **Can remain infectious on surfaces outside a host from a few hours up to a few days.**
  - Viral life-span depends on the type of surface, temperature, and humidity levels.
  - There is currently no evidence to suggest that COVID-19 can be acquired from mail and packaged goods.

Persistence of coronavirus on surfaces

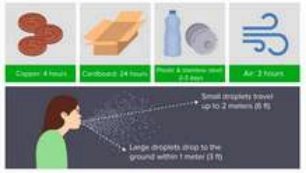


Image by Lecturio. Source: The Journal of Hospital Infection

Epidemiology

The first case of COVID-19 was traced back to Wuhan, China, in late November 2019, with an outbreak developing in December. The virus quickly spread, with widespread ongoing transmission occurring globally. More than 1 million people were infected and over 50,000 died within the first 4 months of global spread. COVID-19 was characterized as a pandemic on March 11, 2020.

Clinical Presentation

The incubation period for COVID-19 ranges from 2–14 days, with an average of 5 days.

- 80% of infections are mild or asymptomatic.
- 15% are severe infections (requiring oxygen therapy).
- 5% are critical infections (requiring ventilation).

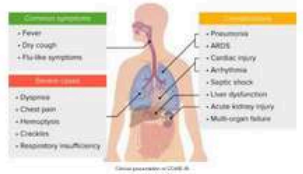
This proportion of severe and critical to mild cases is higher than in influenza infections.

Asymptomatic cases:

- Can transmit the virus.
- **Represent >50% of all infections** (still under investigation).
- May not develop any noticeable symptoms.
- Anosmia, hyposmia, and dysgeusia have been reported in many laboratory-confirmed cases of patients that were otherwise asymptomatic.
- It has not been clearly determined how long asymptomatic individuals remain contagious after initial infection.

Mild cases:

- Dry cough and moderate fever.
- Common flu-like symptoms, including fatigue, malaise, runny nose, nasal congestion, and sore throat.
- Less frequently: diarrhea, nausea, vomiting, diffuse abdominal pain, productive cough, headache, and muscle or joint pain.
- Recovery time: ~2 weeks.



Clinical presentation of COVID-19. Image by Lecturio.

Severe cases and comorbidities:

Table of Contents

Share this concept

- Median time from onset of symptoms to the onset of critical illness: 8 days.
- Patients develop dyspnea, high fever, chest pain, hemoptysis, and respiratory failure.
- Recovery time: ~3–6 weeks.

Common complications of COVID-19: viral/interstitial pneumonia, acute respiratory distress syndrome (ARDS), sepsis, and septic shock. Other complications include cardiac injury, arrhythmia, liver dysfunction, acute kidney injury, and multi-organ failure.

Risk factors for the severe form and complications of COVID-19:

- **Immunosuppression** (from long-term steroid use, cancer, AIDS/HIV infection, congenital immunodeficiency, use of immunosuppressants, etc.)
- **Age > 65 years**
- **Chronic diseases** (especially hypertension, diabetes mellitus, coronary heart disease, and cerebrovascular disease)
- **Pregnancy**

The expression of ACE2 is highly increased in patients being treated with ACE inhibitors or angiotensin II type 1 receptor blockers (ARBs). Contrary to initial reports, the American College of Cardiology has pointed out that there is no data to support the claim that ACE inhibitors and ARBs increase the risk of COVID-19 infection, and recommends that patients who already use these medications should continue to do so while further studies are performed.

Refractory cases:

Nearly 50% of COVID-19 patients did not achieve clinical and radiological remission within 10 days of hospitalization. Patients with male sex, older age, anorexia, and notoxy fever at the time of admission have a higher risk of presenting a refractory progression.

Related Video Courses:


Pneumonia (Including Interstitial)


Acute Respiratory Distress Syndrome (ARDS)


Severe Sepsis and Septic Shock


Pulmonary Radiology

Diagnostics

Polymerase chain reaction (PCR) is currently the only test being used to confirm cases of COVID-19 infection and should be performed as soon as possible once a person under investigation (PUI) is identified. The specimens used for testing include:

- **Nasopharyngeal (NP) and/or oropharyngeal (OP) swab** (for mild or asymptomatic suspected cases)
  - NP is the first choice. OP swabs are acceptable only if other swabs are not available.
  - Can be negative initially. If suspicion of COVID-19 remains, retest every 2–3 days.
  - In severe cases, NP and OP swabs may be negative, while specimens from the lower respiratory tract are positive.
- **Sputum** (for patients with productive cough, inducing is not recommended)
- **Bronchial and tracheal secretions or bronchoalveolar lavage** (for patients receiving invasive mechanical ventilation)

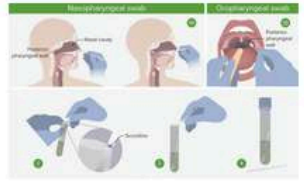


Image by Lecturio.

During an ongoing COVID-19 outbreak, laboratory testing should be prioritized as follows according to the CDC:

1. **Hospitalized patients with compatible signs and symptoms** (especially those presenting with unexplained viral pneumonia or respiratory failure)
2. **Healthcare professionals with compatible signs and symptoms**
3. Symptomatic individuals who are at high risk of developing a severe form of the disease or a complication (e.g., patients who are elderly, immunocompromised, or have chronic conditions).
4. Critical infrastructure workers with compatible signs and symptoms.
5. Any individual, including healthcare professionals, who had close contact with a suspect or laboratory-confirmed COVID-19 patient within 2 weeks of their symptom onset, or has a history of travel from affected geographic areas in the last 2 weeks.
6. Individuals without symptoms.

All persons under investigation (PUI) and confirmed cases should be reported according to regulations set forth by local health authorities and the national surveillance center.

Patients with COVID-19 present with the following laboratory and radiological findings. These are more pronounced and common in severe cases but can be present even in mild infections.

- WBC count: leukopenia, lymphocytosis, and lymphopenia (most common)
- Inflammatory markers: ↑ LDH and ferritin
- Liver markers: ↑ AST and ALT
- Chest x-ray and CT: non-specific imaging findings most commonly found in atypical or organizing pneumonia, with a bilateral, peripheral, and/or basal distribution:
  - Multiple areas of consolidation
  - Ground-glass opacities (GGOs)
  - Crazy paving appearance (GGOs + inter-/intralobular septal thickening)
  - Bronchovascular thickening

In hospitalized COVID-19 patients with severe infections, regular laboratory testing and imaging are necessary for the assessment of disease progression and complications:

- **CBC:** severe cases present with advanced lymphocytopenia and thrombocytopenia.
- **ABG:** to assess levels of hypoxia and acid-base balance
  - ARDS presents initially as hypoxemic respiratory failure with low PaO2 and respiratory alkalosis, later progressing into hypercapnic respiratory failure.
- **Inflammatory markers:**
  - ↑ IL-6 and C-reactive protein in severe cases.
  - ↑ procalcitonin in bacterial coinfection with pneumonia and/or sepsis.
  - ↑ lactate in sepsis and septic shock.

Table of Contents

Share this concept

Incubation period	2–14 days	1–4 days	<3 days
Onset	Gradual	Sudden	Sudden
Fever	Very common	Very common	Rare
Dry cough	Very common (mild to severe)	Very common (mild to severe)	Common (usually mild, can be productive)
Fatigue	Common	Very common	Rare or mild
Myalgia	Common	Very common	Mild
Sneezing	Sometimes	Rare or mild	Very common
Nasal congestion	Rare or mild	Common	Very common
Headache	Sometimes	Very common	Rare or mild
Sore throat	Sometimes	Sometimes	Very common
Diarrhea	Sometimes	Sometimes	Rare
Dyspnea	Common	Rare	Never

Management

No specific treatment for COVID-19 is currently available. As a healthcare professional, one must always implement practices for infection prevention and control (IPC) whenever dealing with a PUI or laboratory-confirmed COVID-19 case.

Patients with mild symptoms and no risk factors do not require hospitalization and are recommended to begin supportive at-home care. In the case of antipyretics, **the use of ibuprofen is now considered safe according to the latest WHO advice (March 17, 2020).** In the outpatient setting, one must seek professional medical assistance if any of the following emergency warning signs develop:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- Confusion or inability to arouse
- Cyanosis (bluish-tint to lips or face)

The decision to monitor a patient in the inpatient setting should be made on a case-by-case basis. Once hospitalized, supportive care and acute measures should be applied as necessary for complications, such as:

- **Oxygen therapy** for patients who develop respiratory distress, hypoxemia, or shock
- **Empiric antimicrobials** in the case of sepsis or secondary pneumonia
- Glucocorticoids have been associated with an increased risk for mortality or severe forms of illness in patients with influenza and MERS-CoV infection. Therefore, the WHO and CDC recommend **glucocorticoids not be used in patients with COVID-19 pneumonia** unless there are indications related to underlying chronic conditions.
- **Advanced oxygen therapy, ventilatory support, and conservative fluid management** in the case of acute respiratory distress syndrome
- **Fluid bolus and vasopressors** in the case of septic shock

For the latest step-by-step management guidelines, see the "**WHO interim guidance on clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected.**"

The mortality rate of COVID-19 varies across different nations and age groups, with a global average of 6.5%; with 1,210,956 cumulative cases and 67,594 deaths according to the WHO Situation Report-77 on April 6, 2020. Patients >80 years of age have a mortality rate of 15%.

The ongoing pandemic makes it difficult to determine an accurate mortality rate at this time. The mortality rate is assumed to be lower due to many undetected cases (lack of widespread testing in many countries and asymptomatic individuals not seeking to be tested).

Investigational therapies

Several clinical trials are currently being performed to further the development and research of antiviral drugs against SARS-CoV 2. However, it's important to note that **there is no available data as of April 6, 2020, to support the recommendation of any of the following investigational therapeutics** for patients with confirmed/suspected COVID-19:

- **Remdesivir** is reported to have in vitro activity against SARS-CoV and MERS-CoV by incorporating into nascent viral RNA chains and producing premature termination.
- **Chloroquine and hydroxychloroquine**, widely used antimalarial drugs, are reported to block viral entry by inhibiting virus/cell fusion.
  - The combined use of **hydroxychloroquine and azithromycin**, a macrolide antibiotic, was reported to reduce the detection of SARS-CoV-2 RNA in upper respiratory tract specimens. Caution is advised when administering these drugs in patients with chronic medical conditions as both are associated with QT prolongation and may result in life-threatening arrhythmia or sudden death.
- **Lopinavir/ritonavir**, a combined protease inhibitor usually used for HIV infection, was reported as having in vitro inhibitory activity against SARS-CoV. However, no benefit was observed in hospitalized adult patients with severe Covid-19 in trials conducted in China.
- **Tocilizumab** is an anti-IL-6 receptor agent used for rheumatoid arthritis. It is currently being investigated in patients with severe COVID-19 presenting with high IL-6 levels.
- **Camostat mesilate (CM)**, a TMPRSS2 inhibitor, is reported to block viral entry by inhibiting S protein priming.

For more information on international clinical trials, see the **WHO website** and **clinicaltrials.gov**.

Related Videos:


Respiratory Distress Management

Prevention

Individuals who live within an area undergoing an outbreak are advised to prevent the spread of COVID-19 infection. General recommendations include:

- Home isolation and/or avoiding public/crowded areas whenever possible to minimize the chance for exposure
- Covering coughs and sneezes with a tissue or the inner elbow
- **Washing hands regularly for at least 20 seconds with soap and water or with an alcohol-based hand sanitizer that contains at least 60% alcohol**
- Maintain 1–2 m (~6–6 ft) distance from other people, "social distancing"
- Regular cleaning of all "high-touch" surfaces within the home
- Wearing a facemask if one is a healthcare professional, begins to present with symptoms, or when caring for a sick individual. **The use of facemasks is not recommended for the general population.**

Isolation and **quarantine can be discontinued** only after the following criteria has been met:

- **For hospitalized patients:** negative results of PCR testing from at least 2 consecutive sets of paired nasopharyngeal and throat swab specimens collected ≥24 hours apart (total of 4 specimens: 2 nasopharyngeal and 2 throat).

75 relevant videos

Critical COVID-19: Risk Factors

5% of all patients demonstrate progression of:

ARDS → Hypotensive shock → Multiple organ dysfunction

Risk:

- Older age (median age: 60 years old)
- Comorbid conditions (diabetes, cardiovascular disease, hypertension)
- Refractory cases (more at risk: male, older, anorexic, presenting without typical fever)
- $SpO_2 < 90\%$

6:08 / -1:45 2x

Signs of Respiratory Impairment

Each one of these requires a follow-up:

- Patient complaints of shortness of breath at rest or with normal activity
- Change in personality: increased restlessness, irritability, confusion, or decreased level of consciousness (LOC)
- Visibly labored or difficult breathing
- Use of accessory muscles
- Inability to lie down and breathe adequately (orthopnea)
- Abnormal breath sounds
- Increased sputum, or thick, frothy, or blood-tinged sputum
- Paradoxical chest wall movement

1:47 / -3:35 2x

Broad classification of lung infections

Anatomical

Acute pharynx / nose / larynx	UPPER AIRWAYS	"URTI" (common cold, pharyngitis, laryngitis) rare diseases: diphtheria / epiglottitis
Acute bronchial (with no signs of consolidation):	LOWER AIRWAYS	Bronchitis, Influenza
Chronic bronchial (infection over months / years):		Bronchiectasis
Acute alveolar (with signs of consolidation):		**Pneumonia**
Subacute alveolar +/- cavitation:		Tuberculosis, lung abscess (ra… infections are non-tuberculou… Mycobacteria, Nocardia, Asp…

1:32 / -3:19 2x

The Order for PPE Removal

Putting on PPE	Taking off PPE
1 Gown	1 Gloves
2 Mask or respirator	2 Goggles or eye shield
3 Goggles or eye shield	3 Gown
4 Gloves	4 Mask or respirator

0:20 / -8:49 2x

Country-Level Academy offers rapid and trackable capacity building solution

Open Knowledge Pools

IMPORT

Country Academy

ASSIGNMENTS

TRACKING

Learners

Afghan content

WHO Content

Lecturio Content

+ Other helpful content

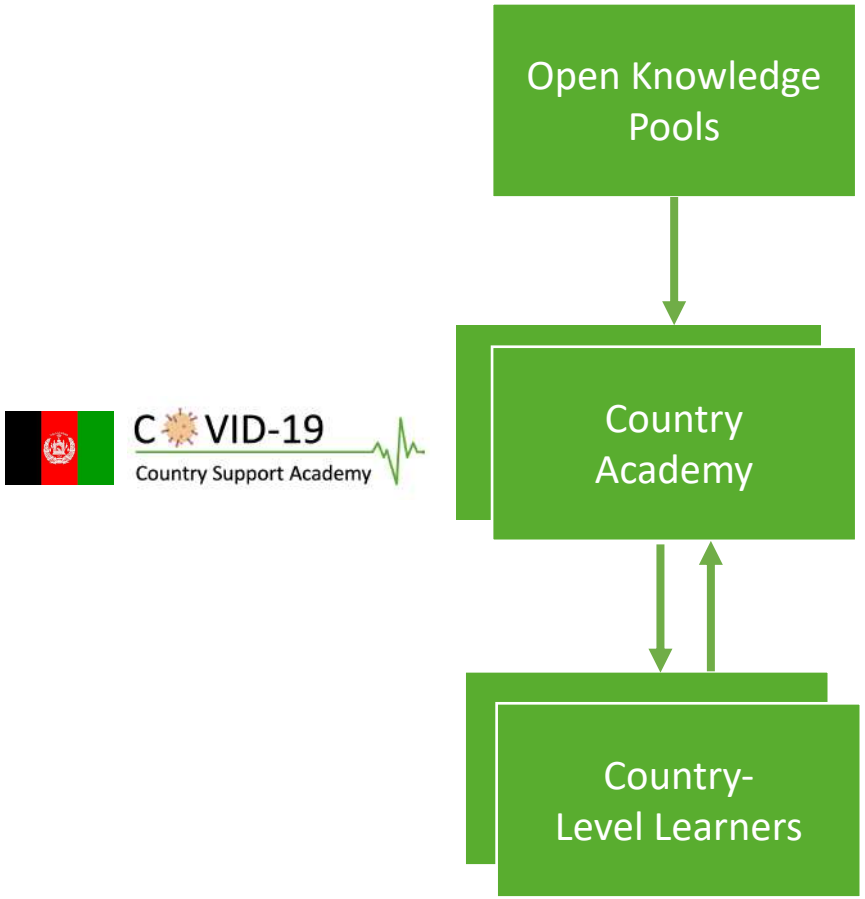
Healthcare Workers

Public Health

Regional / Local Government

Other Specific Target Groups

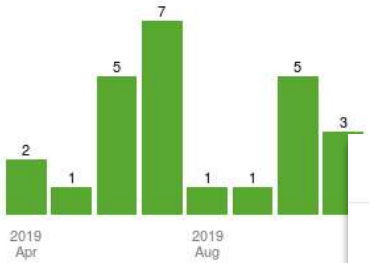
Country Level Academies Role



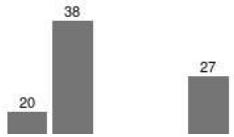
Easy Tracking of all learners & groups

Overview | Performance by Course | Performance by User

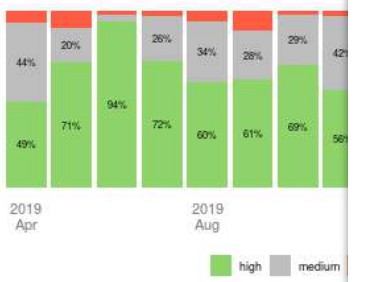
Average Lectures Watched per User



Average Recall Questions Answered per User



Overall Recall Question Confidence



COVID-19 Country Support Academy

ADMINISTRATION
- Statistics
  - Users
  - Content
  - Qbank
  - Dashboard
- Content Management
- Assignments
- User Management
- Settings

CONTENT VIEW
- Home
- Video Library

User Statistics

Apr 7, 2019 - Apr 7, 2020

Active Users	Started Lectures	Answered Recall Questions	Answered Qbank Questions	Viewed Articles
7	449	773 (37 % correct)	613	79

Groups | Users

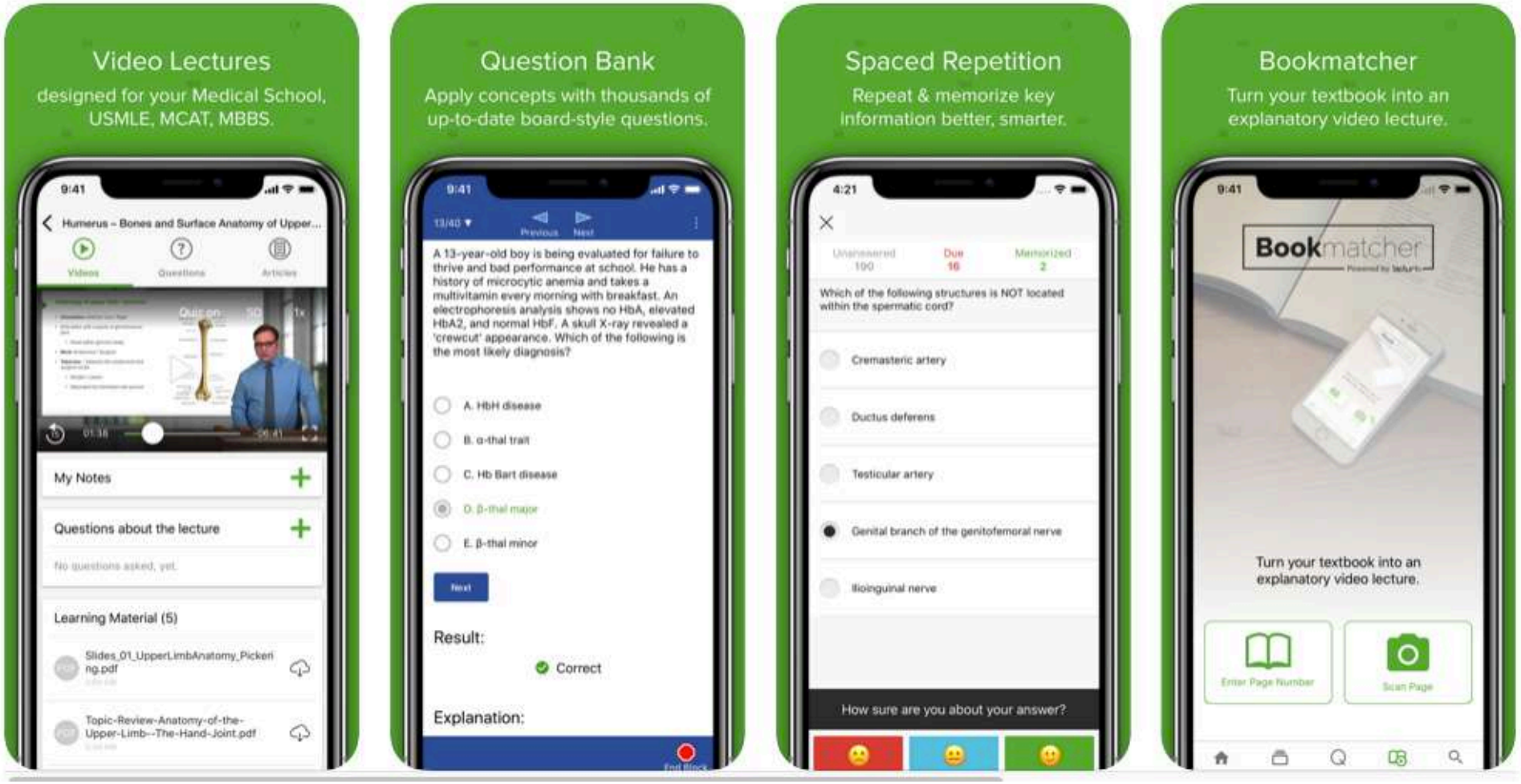
Name	Videos			Recall Question
	Started	Finished	Watched Minutes	Answered
General Nurses	384	127	2,253	484
Hospital Managers	384	127	2,253	484
ICU Nurses	384	127	2,253	484
Intensivists	384	127	2,253	484
Mayors Large Cities	384	127	2,253	484
Physicians	384	127	2,253	484
Public Health Officials	384	127	2,253	484
School Principals	384	127	2,253	484
Test User Group	65	28	1,052	289

Content Performance

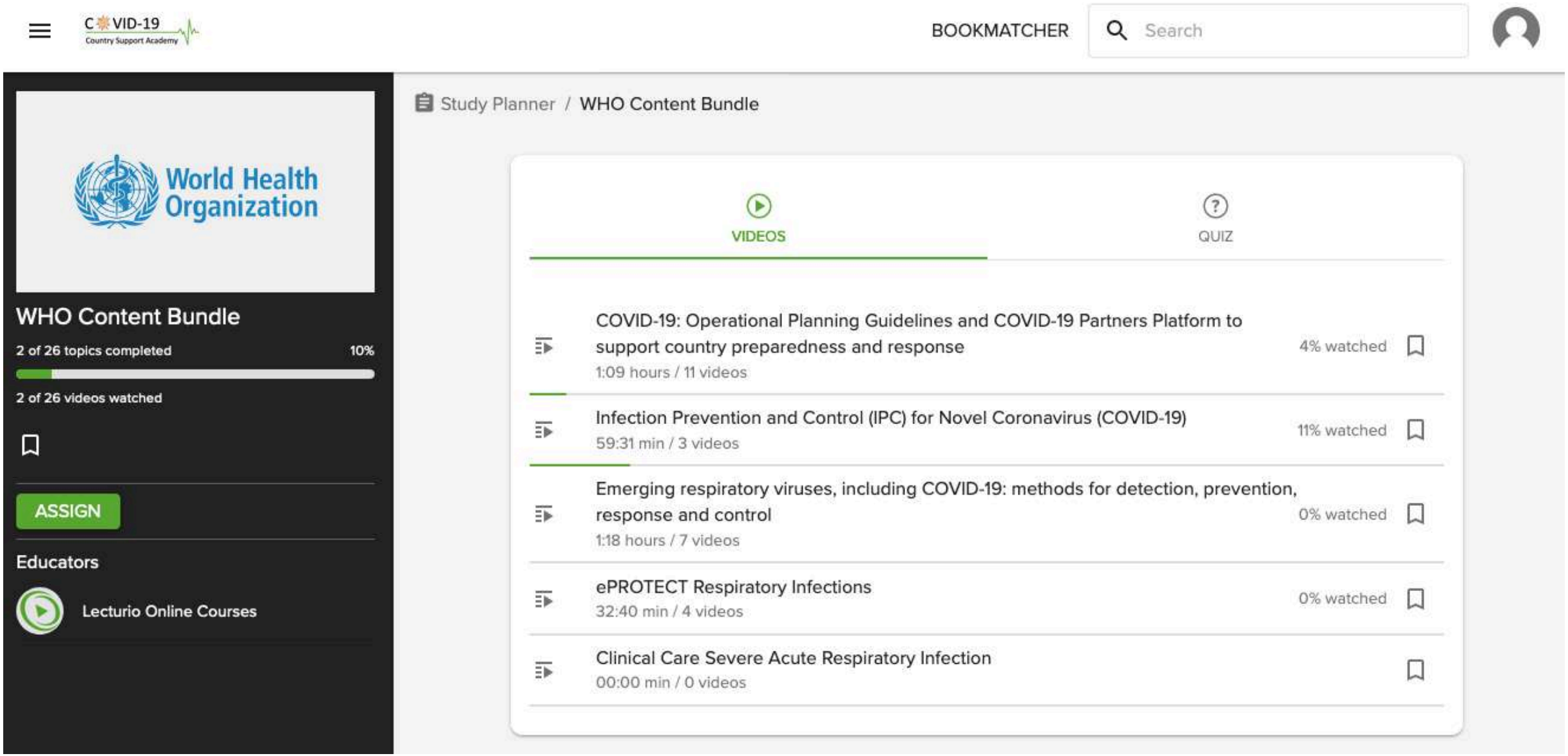
Content	Videos	Questions					
	% Watched...	Correct	(%)	Incorrect	(%)	Unanswere...	(%)
DNA Amplification – Analytical Techniques in Biotechnology	0	0	0	0	0	10	100
Positive-sense Single-stranded RNA (+)ssRNA) Virus – RNA Virus Genomes	0	0	0	0	0	8	100
Detection Bias	0	0	0	0	0	6	100
Polymerase Chain Reaction	0	0	0	0	0	6	100
Disorders of Respiratory Physiology	0	0	0	0	0	6	100
Severe Acute Respiratory Syndrome (SARS) and COVID-19 – Coronaviruses	40	0	0	0	0	6	100
Mortality Rate – Descriptive Epidemiology	0	0	0	0	0	4	100
Coronavirus Infectious Disease 2019 (COVID-19)	3	0	0	0	0	0	100
COVID-19 Pathogenesis and Risk Factors	0	0	0	0	0	0	100
COVID-19 Complications	0	0	0	0	0	0	100
COVID-19 Case: 62-year-old Man with Fever, Dry Cough, and Malaise	0	0	0	0	0	0	100
COVID-19 Case: 62-year-old Man with Severe Cough and Shortness of Breath	0	0	0	0	0	0	100

PRODUCT

Apps ensure access any time and anywhere (including offline)



Public WHO content easily integrated



Note: no collaboration with WHO is implied, WHO HQ/Workforce team has been offered country academies but stated it aims to consult with 3rd parties in the middle of May

Medical Capacity Building

- Short Term: COVID19 Capacity Building Academy
- Medium/Long-Term: National Digital Medical Education Support

A GLOBAL PROJECT

A global cooperation of educators has created a complete digital teaching engine for medicine

EDUCATOR TEAM INCLUDES PROFESSORS FROM

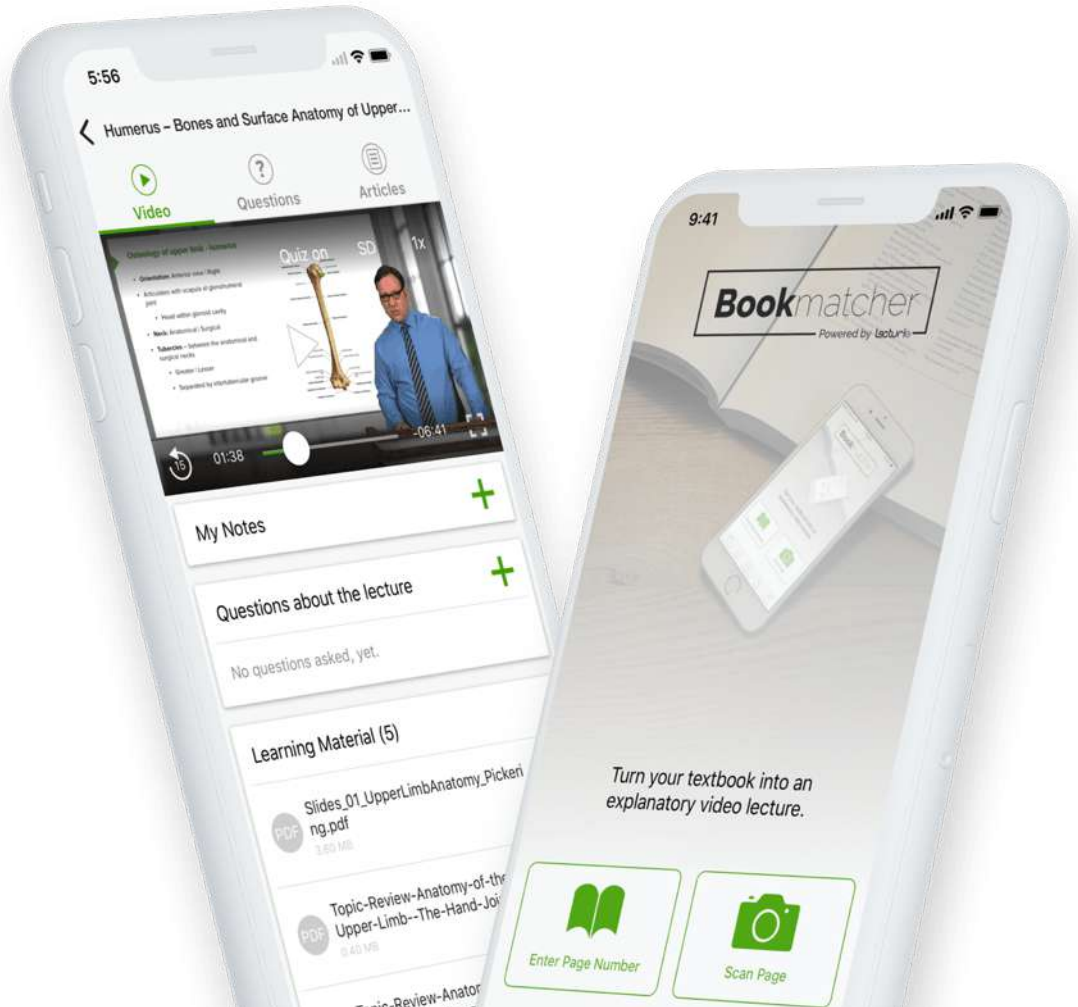
Yale University School of Medicine

HARVARD UNIVERSITY

Imperial College London

BROWN Alpert Medical School

JOHNS HOPKINS SCHOOL of MEDICINE



https://youtu.be/gIJySCGfAz8

PRODUCT

Platform covers the full medical & (soon) nursing curriculum

SCOPE OF LIBRARY

6,500+ Educational Videos

20,000+ Recall Questions

1,300+ Textbook Articles

4,000+ Clinical Case Question Bank

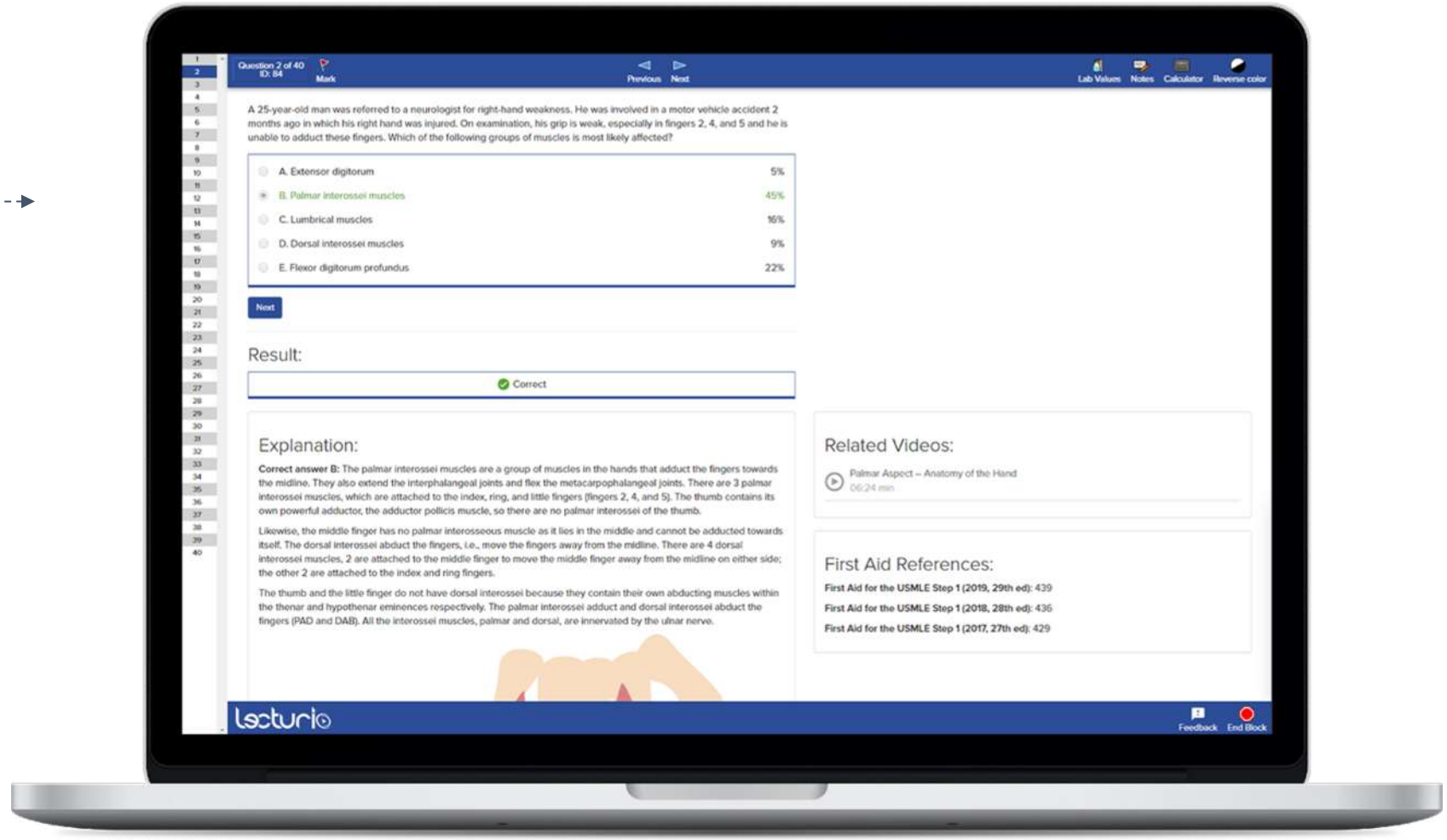
PRODUCT

Concise videos on all key concepts

- All key medical concepts are covered in-depth
- Educators from top global medical schools

Clinical cases teach the application of concepts

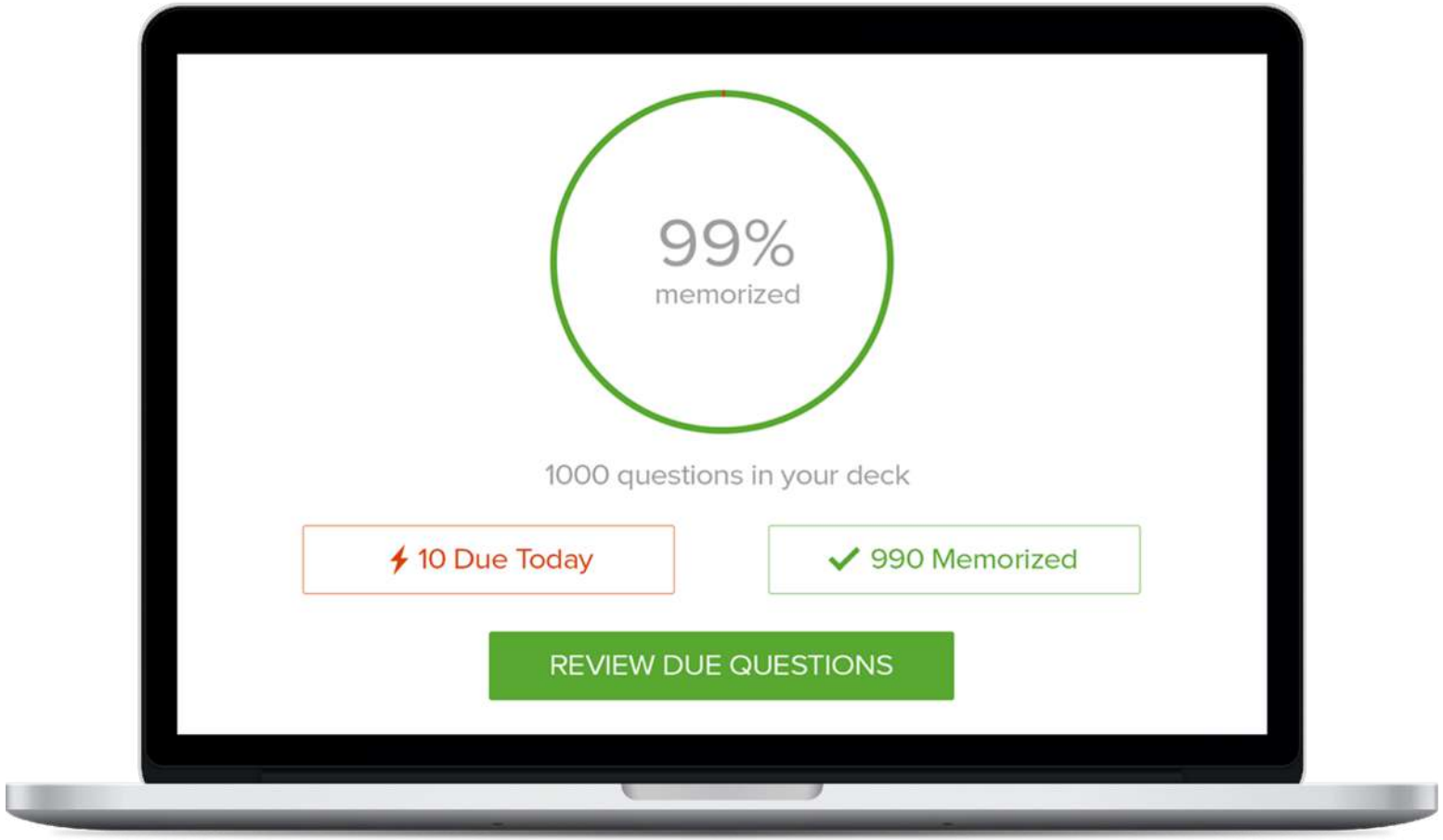
- Explanations on all answer options
- Linked videos
- Real-life clinical scenarios
- Use for self-directed learning or exams



PRODUCT

Adaptive spaced retrieval algorithm embeds learning science in the teaching process

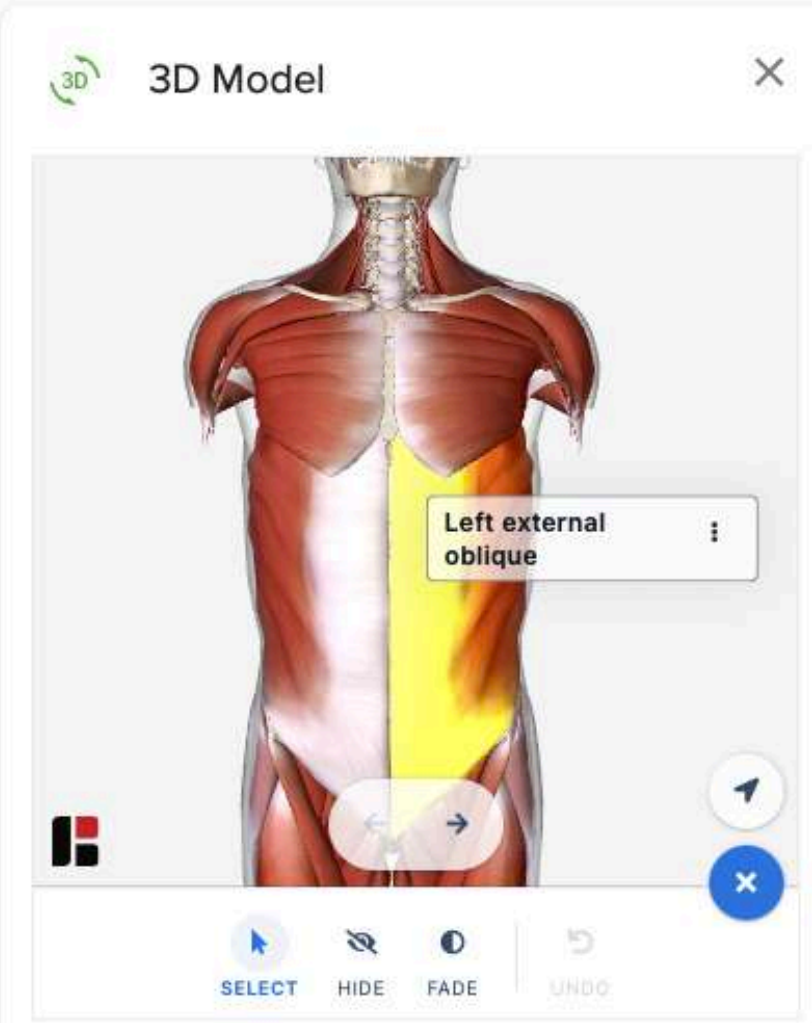
- Adaptive algorithm improves information recall
- Regular notifications for questions due



PRODUCT

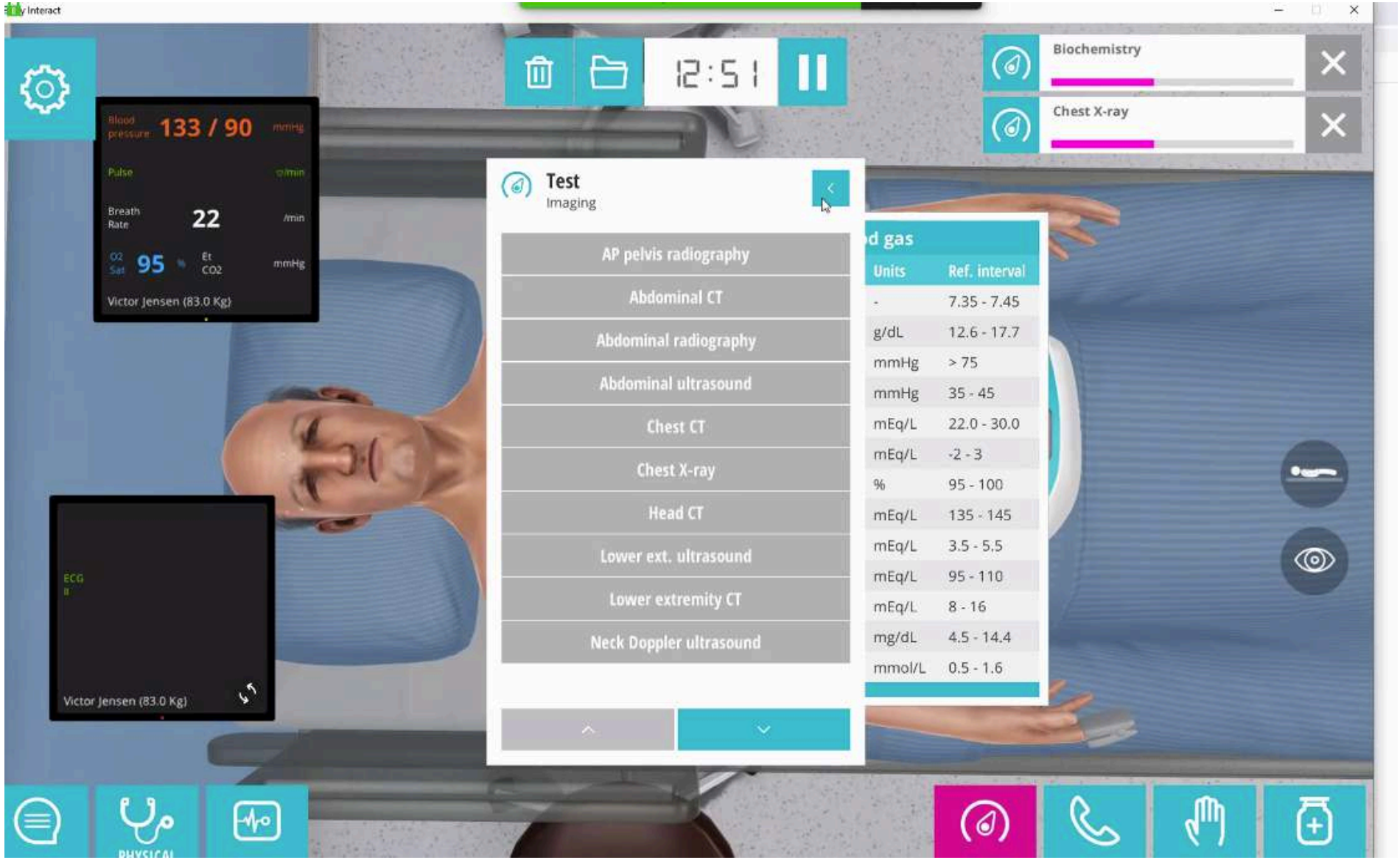
3D Anatomy with 400 pre-mapped views

Abdominal Regions and Reference Planes – Surface Anatomy of the Abdomen



PRODUCT

Clinical simulation

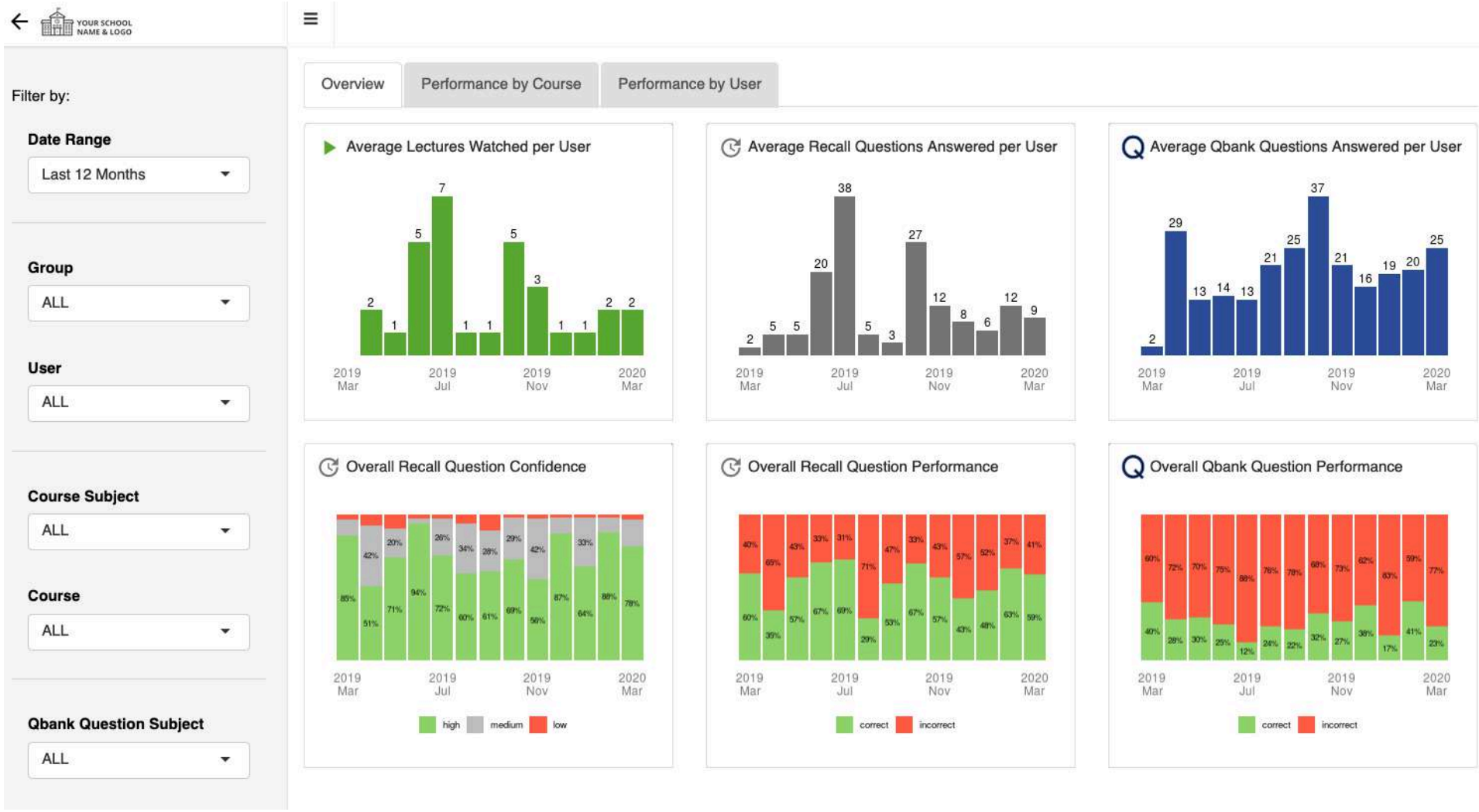


PRODUCT

Clinical simulation

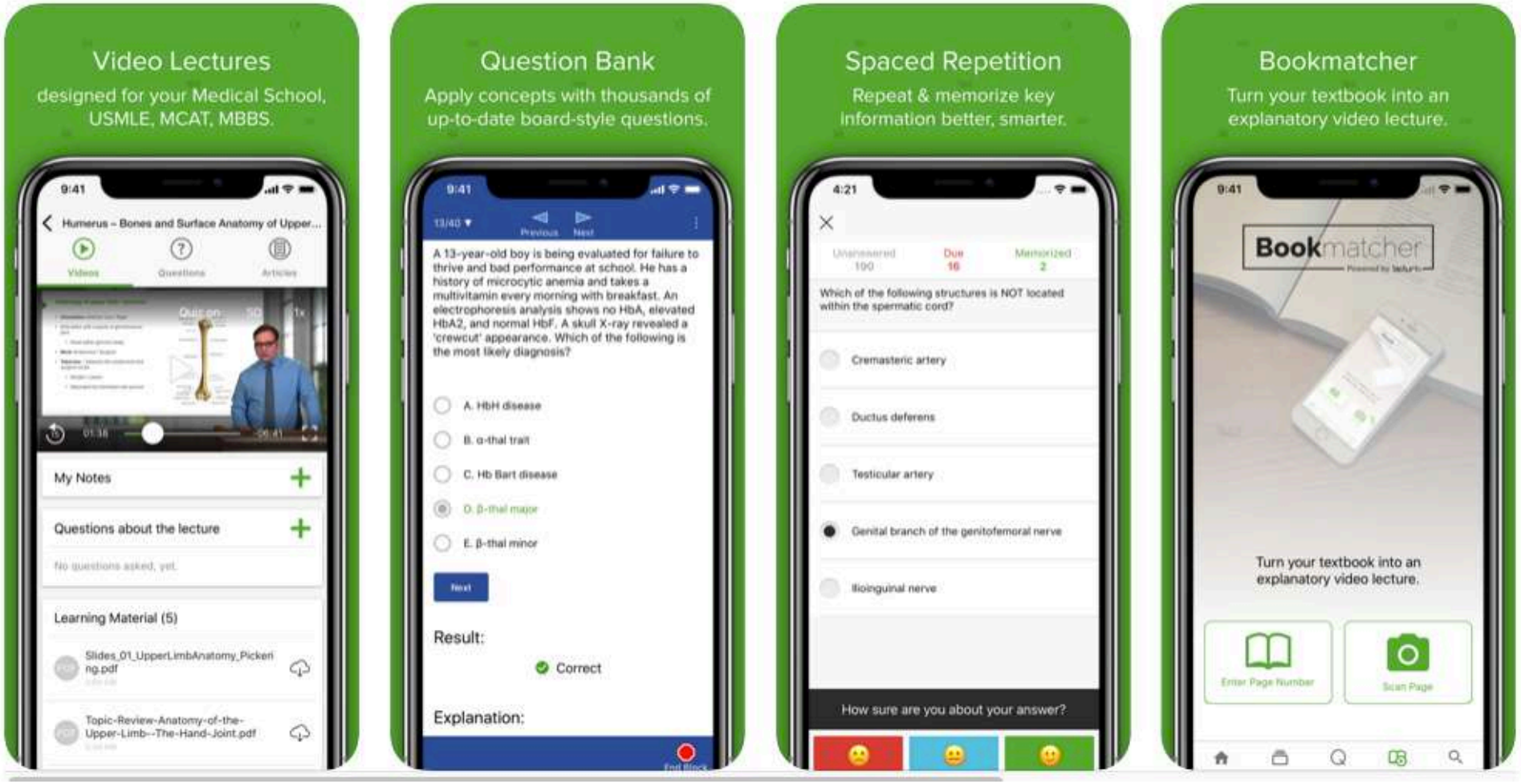
PRODUCT

Customizable teaching engine with analytics supports any curriculum and learning modality



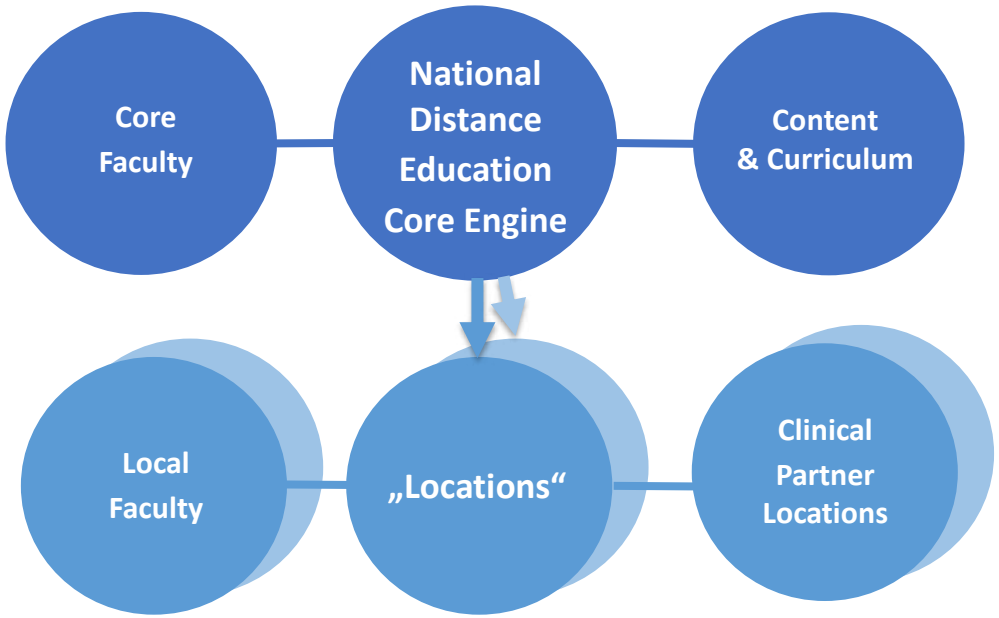
PRODUCT

Apps ensure access any time and anywhere (including offline)



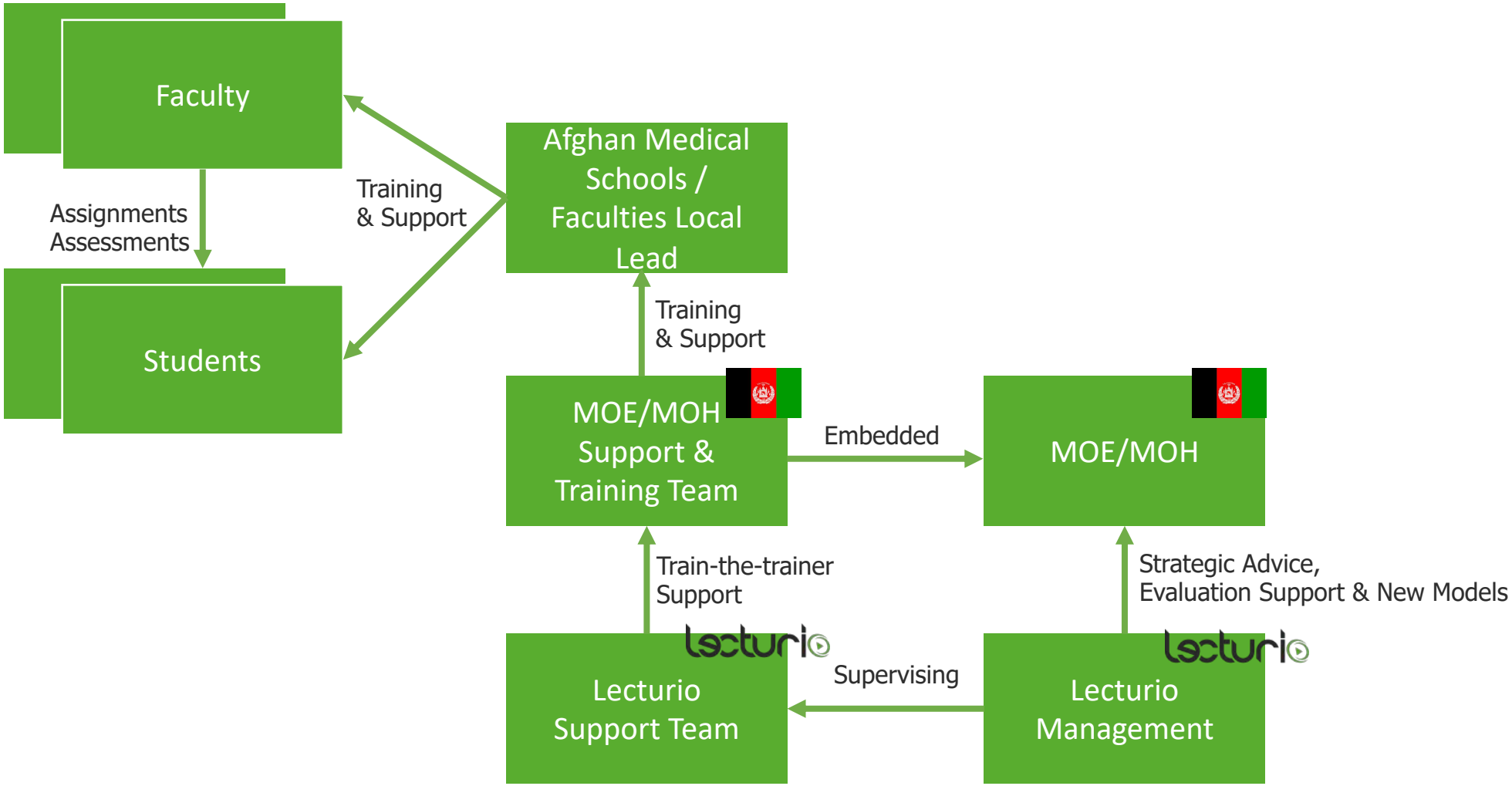
PHASE 1

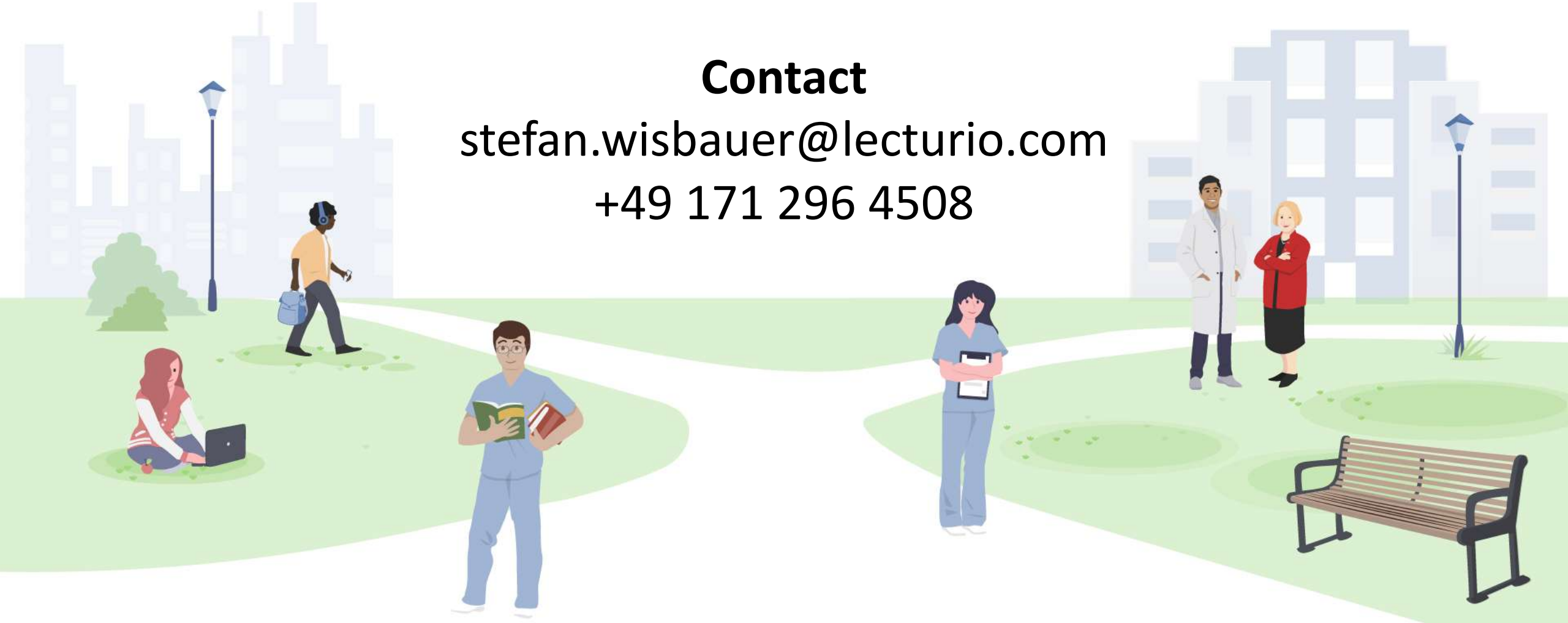
Distance education model - typically with a national core team



OUTLOOK

Suggested Team Setup





Contact

stefan.wisbauer@lecturio.com
+49 171 296 4508