Blackboard
Digital Teaching Symposium 2026

The Empowered Lens: Transforming STEM Education through AI Scaffolding and Gamified Design

PRESENTED BY:

Dr. Eman Elbealy

King Khalid University, Saudi Arabia

Blackboard Digital Teaching Symposium 2026





















+22 Years, 1 Question

- Teaching biology since 2000
- 22 years at King Khalid University (KKU)
- Advanced Professional certification in e-learning Quality Assurance (KSA National eLearning Center)
- QM Master Reviewer (2018), Certified QM Facilitator (2015)
- QM Certification Marks for Chordates (2016) & Cell Biology (2018),
- Blackboard Exemplary Course (2026)
- Awards judge for QS Reimagine Education, QS ImpACT 2026 and SAUDI ESG AWARDS 2026

The question behind all of it:

How do I make hard science reachable?

Blackboard
Digital Teaching Symposium 2026

Abha, Saudi Arabia
King Khalid University

- **Abha**, in the Asir highlands of south-western Saudi Arabia; 2,270 m above sea level, cool, under clouds.
- Locally: the **City of Fog.** 16:00 in Abha
- **King Khalid University (KKU):** Public, founded 1998, more than 60,000 students, 26 colleges, 27 campuses, ranked 251–300 globally (Times Higher Education, 2026)
- **College of Science, Biology Department.**
- Blended teaching on Blackboard Ultra LMS
- Department's Mid-transition: moving instruction from Arabic to English, by plan, in stages





Reach, Teach & Demonstrate:
A Framework I was living in.

Blackboard Digital Teaching Symposium 2026

01 **Reach**: Inclusive by Design

02 **Teach**: Active not Passive

03 **Demonstrate**: Honest evidence

04 Take Away

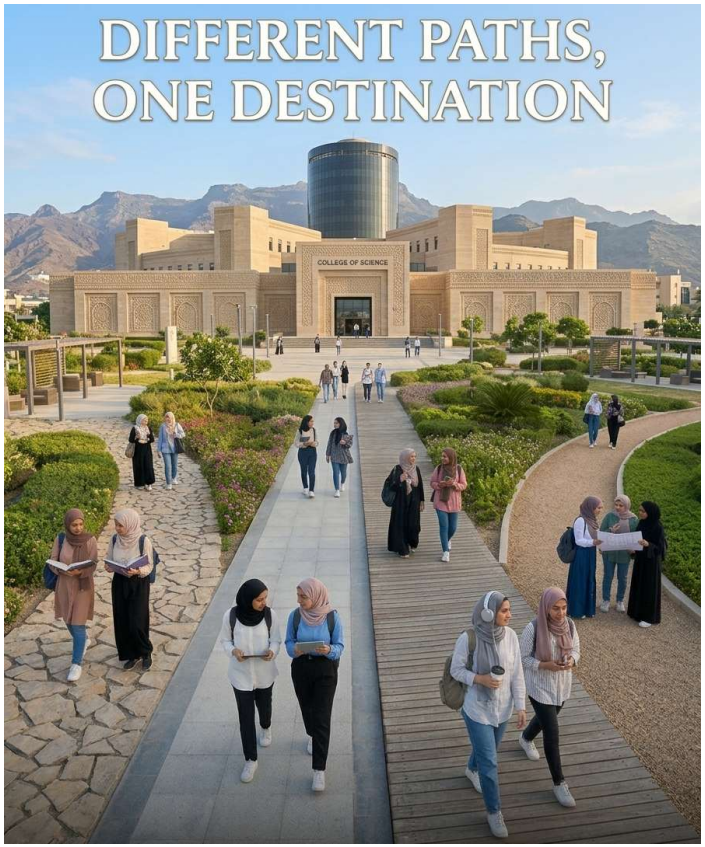


Image: AI-generated.

Terms I will use:
KKU = King Khalid University
LMS = learning management system
ESL = English as a second language
UDL = universal design for learning
QA = quality assurance



Blackboard
Digital Teaching Symposium 2026

Reach

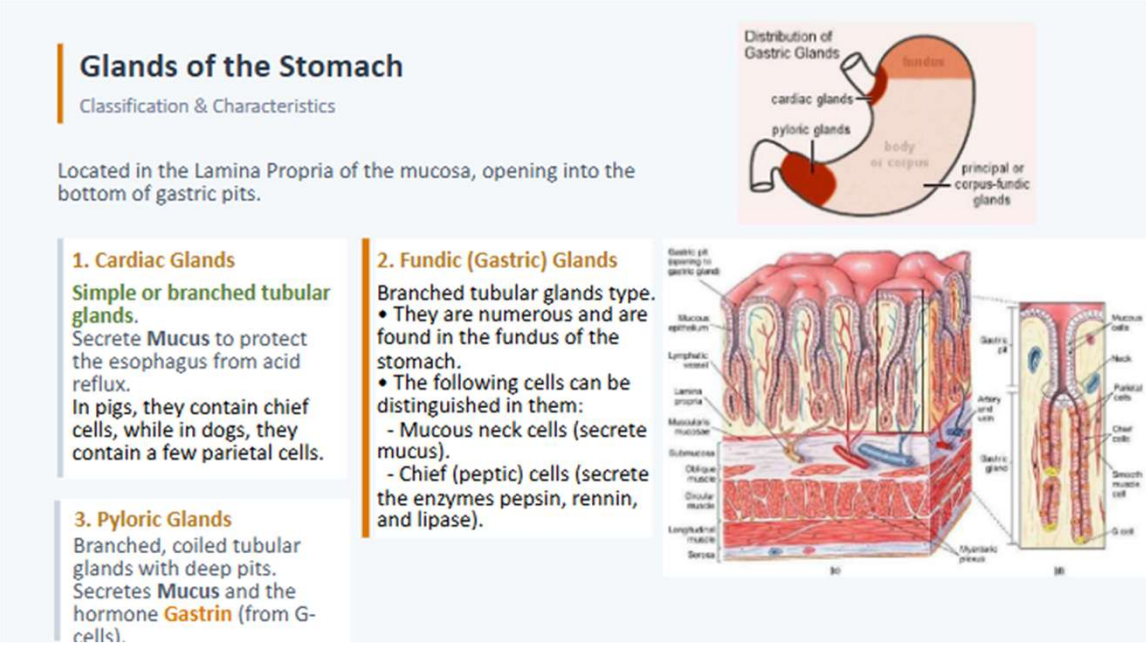
How do we reach every learner?

Image: AI-generated.

One page … One lecture … English as a second language.

Blackboard Digital Teaching Symposium 2026

- Biology is dense, visual, and unforgiving of a half-understood term
- This is one page, from one lecture, of fourteen.
- The barrier is unfamiliar systems and two cognitive loads at once:
  - the science
  - the language it is written in
- Students disengage before they ever get to struggle productively



Glands of the Stomach

Classification & Characteristics

Located in the Lamina Propria of the mucosa, opening into the bottom of gastric pits.

Distribution of Gastric Glands

1. Cardiac Glands

Simple or branched tubular glands.
Secrete **Mucus** to protect the esophagus from acid reflux.
In pigs, they contain chief cells, while in dogs, they contain a few parietal cells.

2. Fundic (Gastric) Glands

Branched tubular glands type.
• They are numerous and are found in the fundus of the stomach.
• The following cells can be distinguished in them:
- Mucous neck cells (secrete mucus).
- Chief (peptic) cells (secrete the enzymes pepsin, rennin, and lipase).

3. Pyloric Glands

Branched, coiled tubular glands with deep pits.
Secretes **Mucus** and the hormone **Gastrin** (from G-cells).

The cohort standing on the hinge



Image: AI-generated.

- The first semester this subject was taught primarily in English
- Part of a planned, staged departmental move from Arabic to English

The design question:

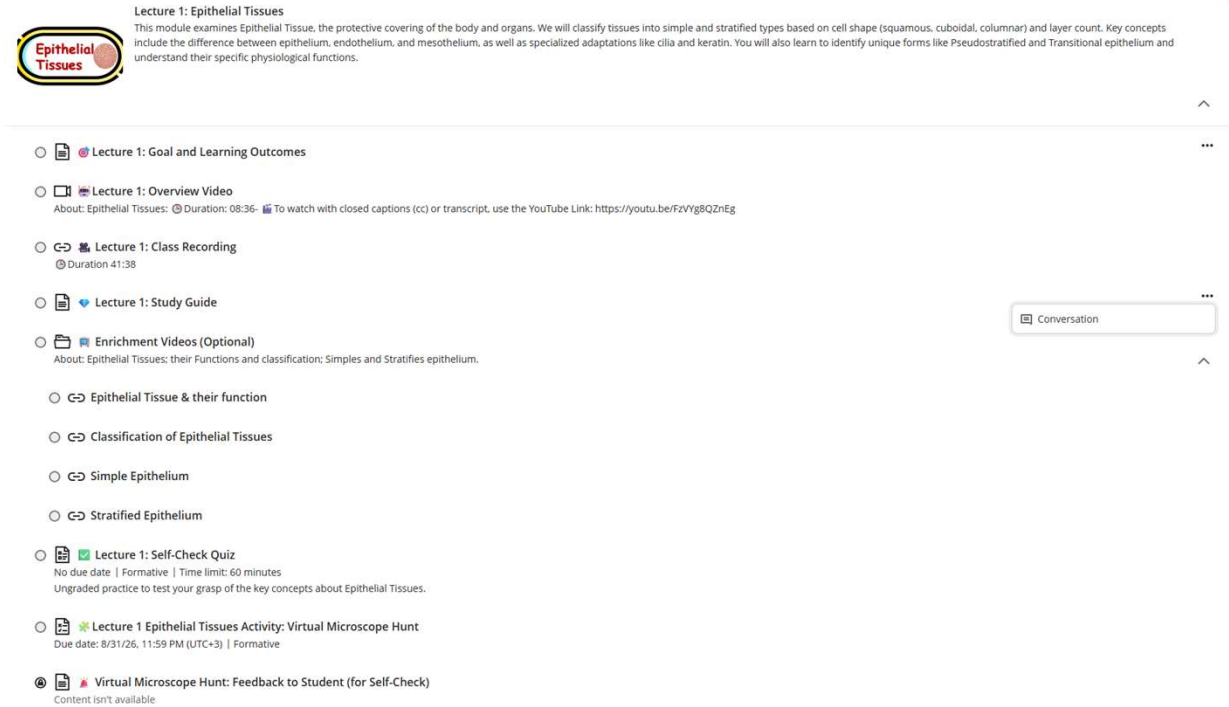
How to remove the language load without removing any of the science?

Seven routes through one lecture

Blackboard Digital Teaching Symposium 2026

Every lecture follows the same 7-step path, with fixed iconography

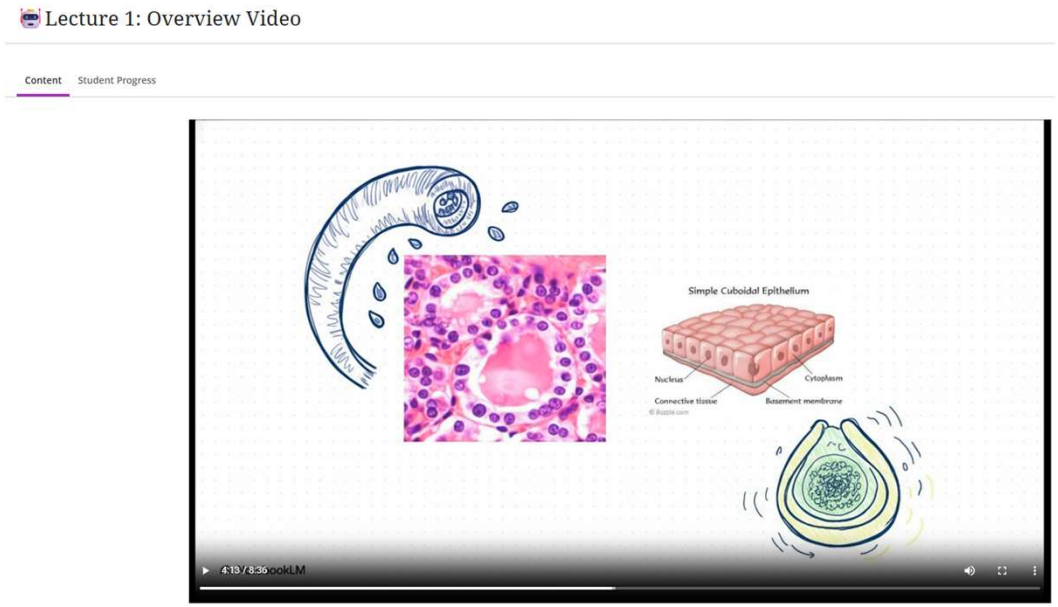
Goal → AI-video → recording → AI-study guide → enrichment → AI-quiz → AI-activity



- **Formative throughout:** the self-check quiz is ungraded and has no due date
- **The Feedback key:** stays locked until the student submits

Repetition through variation

Arabic narration . . . English terminology.



A custom overview video for every lecture, generated with NotebookLM

- Narrated in Arabic, the language which students think in
- Every scientific term delivered in English, by prompt to the AI
- A captioned version linked beside it, for students who would rather read
- Conceptual grounding before the English-only slides — not translation

The Lens

- A compound microscope needs two lenses.
- So does a second-language science student.

Magnification = eyepiece × objective

Neither lens alone gives a clear image.

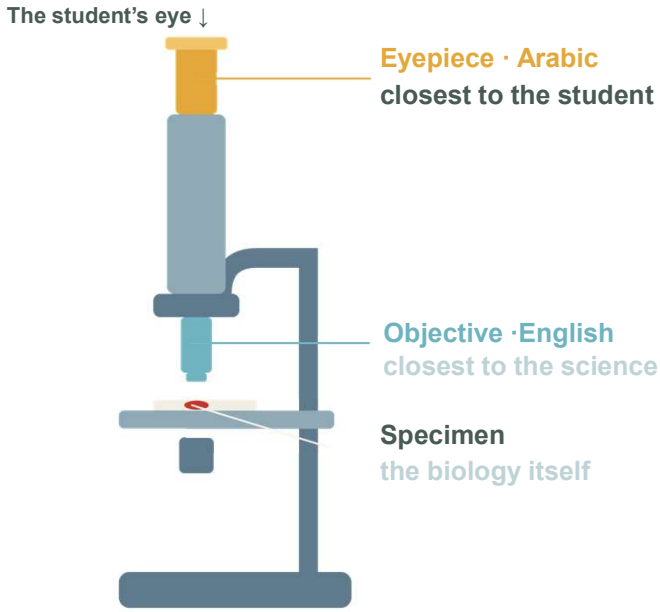
Empowered

means that the student turns the focus by herself

Retry any practice activity, as often as she needs

Pace her study: when, and how fast

Choose version: Arabic-narrated video, class recording, or both



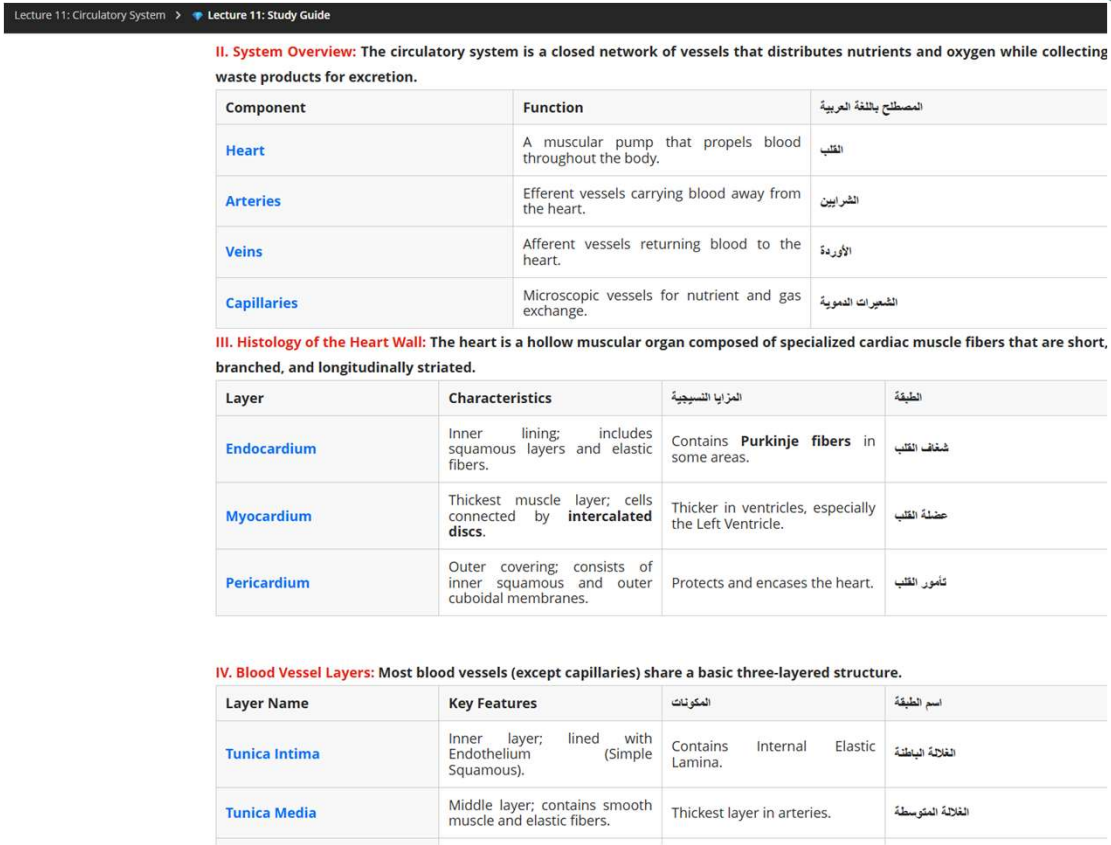
Two lenses, one clear image:
bilingual, mastery-first course design for ESL science learners

A translation I can vouch for

Blackboard Digital Teaching Symposium 2026

A custom study guide for every lecture

- The explanation stays in English — only the term carries a validated Arabic anchor
- Terms are translated in the context they actually appear in, not in general
- Built so students stop verifying terminology with whatever tool is open



Lecture 11: Circulatory System › Lecture 11: Study Guide

II. System Overview: **The circulatory system is a closed network of vessels that distributes nutrients and oxygen while collecting waste products for excretion.**

Component	Function	المصطلح باللغة العربية
Heart	A muscular pump that propels blood throughout the body.	القلب
Arteries	Efferent vessels carrying blood away from the heart.	الشرايين
Veins	Afferent vessels returning blood to the heart.	الأوردة
Capillaries	Microscopic vessels for nutrient and gas exchange.	الشعيرات الدموية

III. Histology of the Heart Wall: **The heart is a hollow muscular organ composed of specialized cardiac muscle fibers that are short, branched, and longitudinally striated.**

Layer	Characteristics	المزايا النسيجية	الطبقة
Endocardium	Inner lining; includes squamous layers and elastic fibers.	Contains **Purkinje fibers** in some areas.	شغاف القلب
Myocardium	Thickest muscle layer; cells connected by **intercalated discs**.	Thicker in ventricles, especially the Left Ventricle.	عضلة القلب
Pericardium	Outer covering; consists of inner squamous and outer cuboidal membranes.	Protects and encases the heart.	تأمور القلب

IV. Blood Vessel Layers: **Most blood vessels (except capillaries) share a basic three-layered structure.**

Layer Name	Key Features	المكونات	اسم الطبقة
Tunica Intima	Inner layer; lined with Endothelium (Simple Squamous).	Contains Internal Elastic Lamina.	الغلالة الباطنة
Tunica Media	Middle layer; contains smooth muscle and elastic fibers.	Thickest layer in arteries.	الغلالة المتوسطة

Tell them why

Histology 2210 Biol-2: *Course Activity Map*

Unit & Learning Outcome (LO)	Practice Ungraded Quiz	Alternative Activity	Activity Instructions for Student	Arabic Translation of Instructions (تعليمات الطالب)	How This Helps You Study
Lecture 10: Respiratory System **LO 4: Explain the functional significance of the C-shaped cartilage rings and the trachealis muscle in the Trachea.**	**Respiratory system Quiz** *(MCQ / True-False)*	**The Trachea Tube Model** *(File Upload)* **Interaction:** Learner-to-Content & Learner-to-Instructor **Time:** 15 Minutes *(Drawing and writing the rationale)*	-Draw a cross-section of the Trachea immediately in front of the Esophagus. -You must clearly illustrate: 1. The "C" shape of the hyaline cartilage. 2. The Trachealis muscle closing the gap at the back. 3. The Esophagus positioned right behind this muscle. - Write a one-sentence caption explaining *why* the ring is not a complete circle. -Upload your sketch.	النشاط: نموذج أنبوب القصبة الهوائية التعليمات: -ارسم مقطعاً عرضياً للقصبة الهوائية الموجودة أمام المريء مباشرة. -يجب توضيح ما يلي: 1.شكل حرف "C" للغضروف الزجاجي. 2.العضلة الرغامية التي تغلق الفجوة في الخلف. 3.المريء الموجود خلف هذه العضلة مباشرة. -اكتب تعليقاً من جملة واحدة يوضح لماذا لا تكون الحلقة دائرة كاملة. -قم برفع رسمتك.	-The Quiz tests structural facts. -Sketching the relationship between the trachea and esophagus solidifies the *functional* reason behind histology, bridging gross anatomy and histology.
Lecture 11: Circulatory System **LO 3: Compare and contrast the structure of Arteries and Veins, focusing on the thickness of the Tunica Media and the presence of the Internal Elastic Lamina.**	**Circulatory system Quiz** *(MCQ / True-False)*	**Vessel Match-Up** *(Discussion)* **Interaction:** Learner-to-Learner & Learner-to-Content **Time:** 20 Minutes (Building comparison list and replying)	- Create a side-by-side comparison list for a medium-sized Artery versus its companion Vein. - For each vessel, describe: 1. The shape of the lumen (Round vs. Collapsed/Irregular). 2. Which tunic layer is the thickest (Media vs. Adventitia). 3. Is a wavy Internal Elastic Lamina clearly visible? (Yes/No).	النشاط: مقارنة الأوعية الدموية التعليمات: -أنشئ قائمة مقارنة جنباً إلى جنب بين شريان متوسط الحجم والوريد المرافق له لكل وعاء، صف ما يلي: 1.شكل التجويف (دائري مقابل منهار/غير منتظم). 2.أي طبقة (Tunic) هي الأكثر سمكاً (Media مقابل Adventitia). 3.هل الصفيحة المرنة الداخلية المتموجة مرئية بوضوح؟ (نعم/لا).	-The Quiz tests individual facts. -The Match-Up exercise forces you to compare the vessels simultaneously, which is exactly how you must identify them when viewing a slide containing both.
Lecture 12: Urinary System	**Urinary system Quiz**	**Map the Nephron Journey**	-Draw a simple schematic of a Nephron.	النشاط: خريطة رحلة النيفرون	-The Quiz tests isolated structures.

A course activity map:

- **Every outcome, its ungraded quiz, and an alternative activity**
- Instructions in English and Arabic, side by side
- Type of Interaction
- The time each task takes
- **"How this helps you study":** A column explaining what the activity does that the quiz cannot



Blackboard
Digital Teaching Symposium 2026

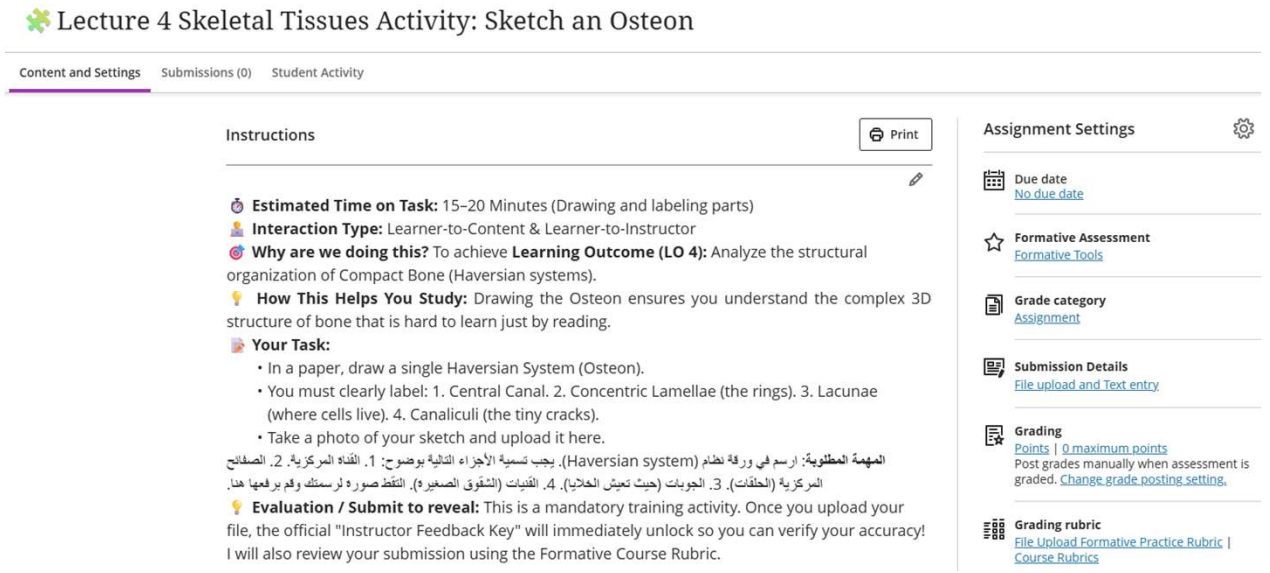
Teach

How do we teach well in a world of AI?

Image: AI-generated.

The anatomy of one activity

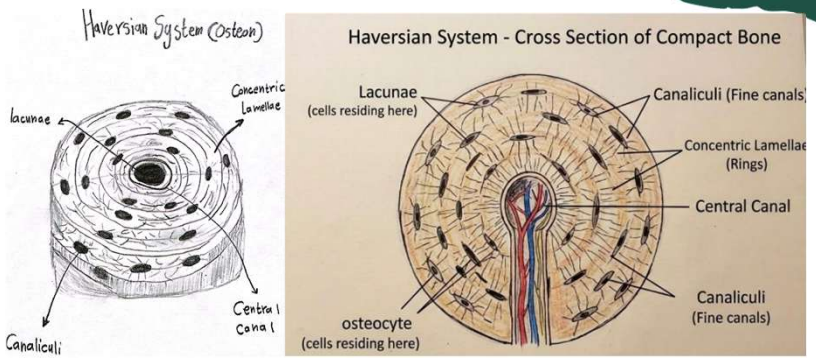
- Every activity opens by saying why it exists, and names the learning outcome it serves
- **“How this helps you study & learn”**
- Estimated time on task
- Zero maximum points
- No due date
- Rubric attached
- Instructions in English
- Arabic support underneath



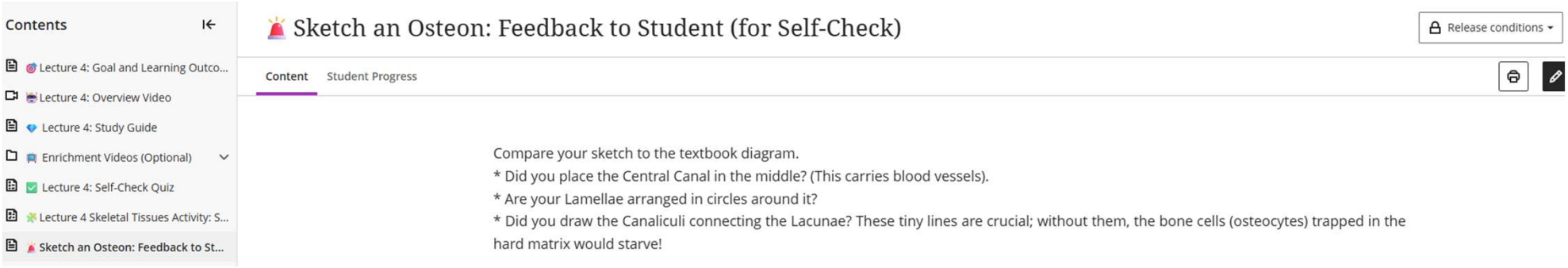
Construct first . . . Unlock second.

Blackboard Digital Teaching Symposium 2026

- The student draws it by hand, then uploads a photograph
- Only then does the instructor feedback key unlock;
  a release condition does it
- The key gives no grade.
  It asks questions: “did you put the central canal in the middle?”
- **Feedback at the moment of cognitive need**



Student work, shared anonymously



Practice that looks like the exam

- The Virtual Microscope Hunt: find a real example of tissue
- Students search an open virtual-microscopy library, screenshot the tissue, circle the feature that identified it, and upload
- “The Hunt proves you can identify them on a real microscope slide, just like the exam”
- **Authentic task, zero stakes, as many attempts as they want before the practical**



🧩 Lecture 1 Epithelial Tissues Activity: Virtual Microscope Hunt

Content and Settings | Submissions (0) | Student Activity

Instructions — Print

⏱️ **Estimated Time on Task:** 15–20 Minutes (Navigating, screenshotting, labeling)
🧑‍🤝‍🧑 **Interaction Type:** Learner-to-Content & Learner-to-Instructor
🎯 **Why are we doing this?** This activity is specifically designed to help you achieve:
Learning Outcome (LO 3): Identify Simple and Stratified Epithelia and link them to their specific anatomical locations.
💡 **How This Helps You Study:** The Hunt proves you can identify them on a real microscope slide just like the Exam.
📝 **Your Task:**

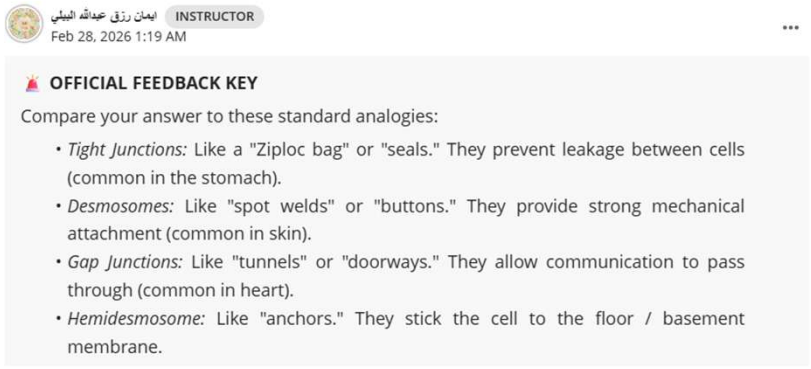
- Visit a virtual histology website such as the Histology Guide.
- Your mission is to find an example of Transitional Epithelium or Pseudostratified Columnar Epithelium.
- 1. Take a screenshot of the tissue. 2. Use a drawing tool to circle one key feature that helped you identify it (e.g., cilia or dome-shaped cells). 3. Upload your labeled image here.

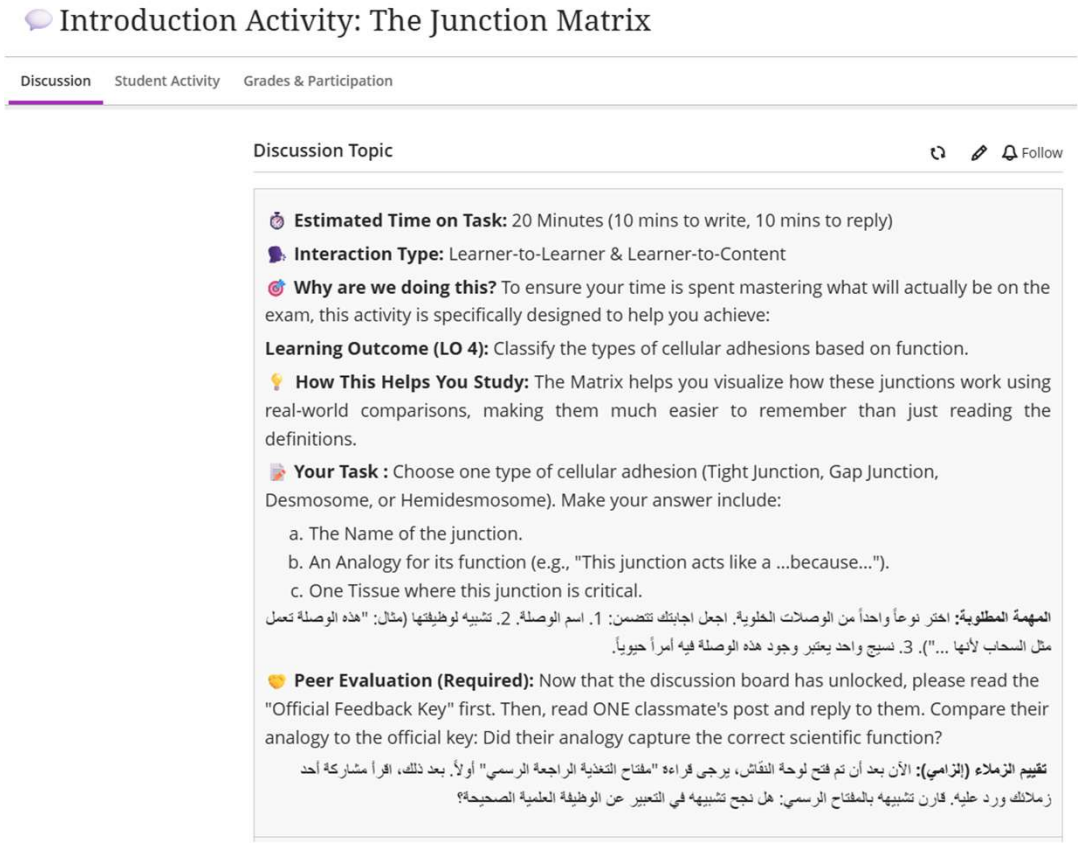
المهمة المطلوبة: قم بزيارة موقع للمجهر الافتراضي.
مهمتك هي العثور على مثال لنسيج. 1. التقط صورة للشاشة للنسيج. 2. استخدم أداة الرسم لوضع دائرة حول ميزة رئيسية واحدة ساعدتك في التعرف عليه (مثل: الأهداب أو الخلايا القبة الشكل). 3. قم برفع الصورة التي وضعت عليها العلامات هنا.

💡 **Evaluation / Submit to reveal:** This is a mandatory training activity.
Once you upload your file, the official "Instructor Feedback Key" will immediately unlock so you can verify your accuracy!
I will also review your submission using the Formative Course Rubric.

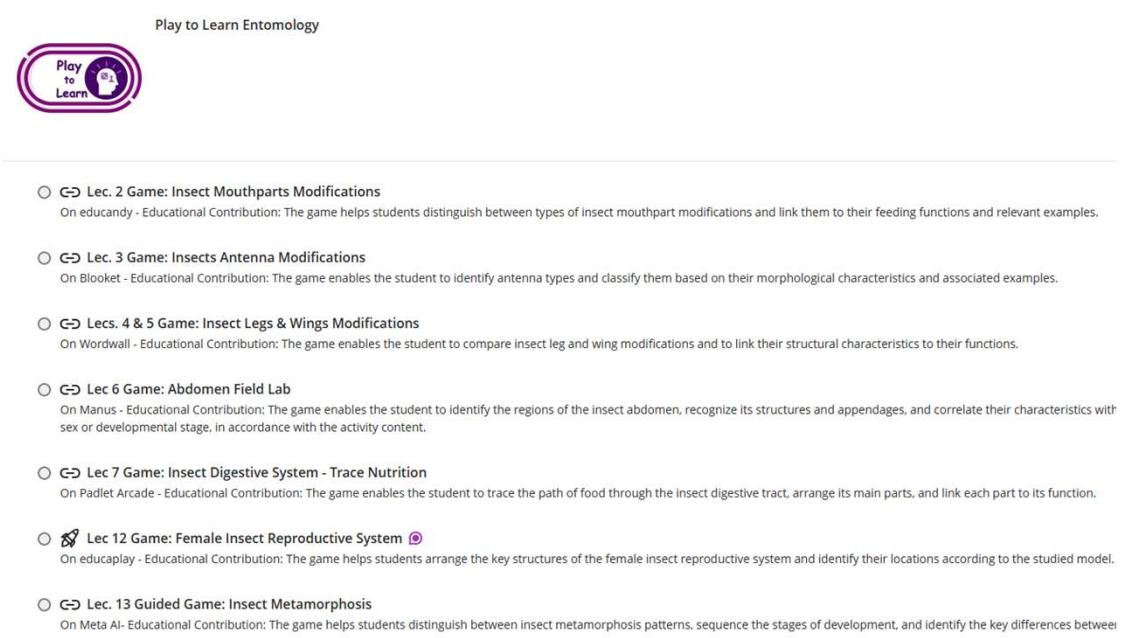
Peer evaluation, against my key

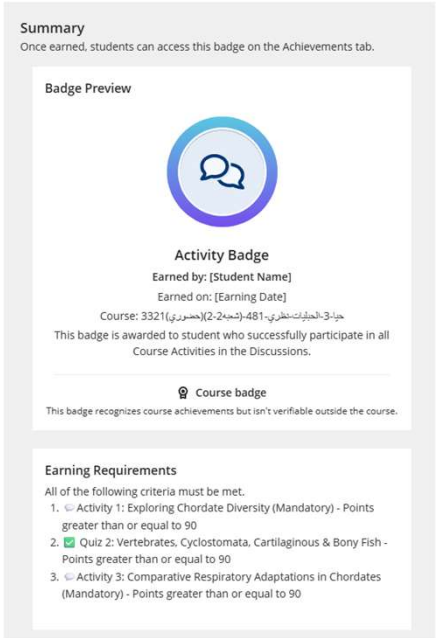
- The Junction Matrix: name one cellular adhesion, give an analogy for its function, name a tissue where it matters
- **Post-first:** the board stays shut until the student has written their own answer
- **Peer evaluation**: judge a classmate's analogy against my key





- **Play to Learn**: a named game for every lecture, each stating what it teaches
- **Activity Badge**: students earn by clearing three mandatory activities

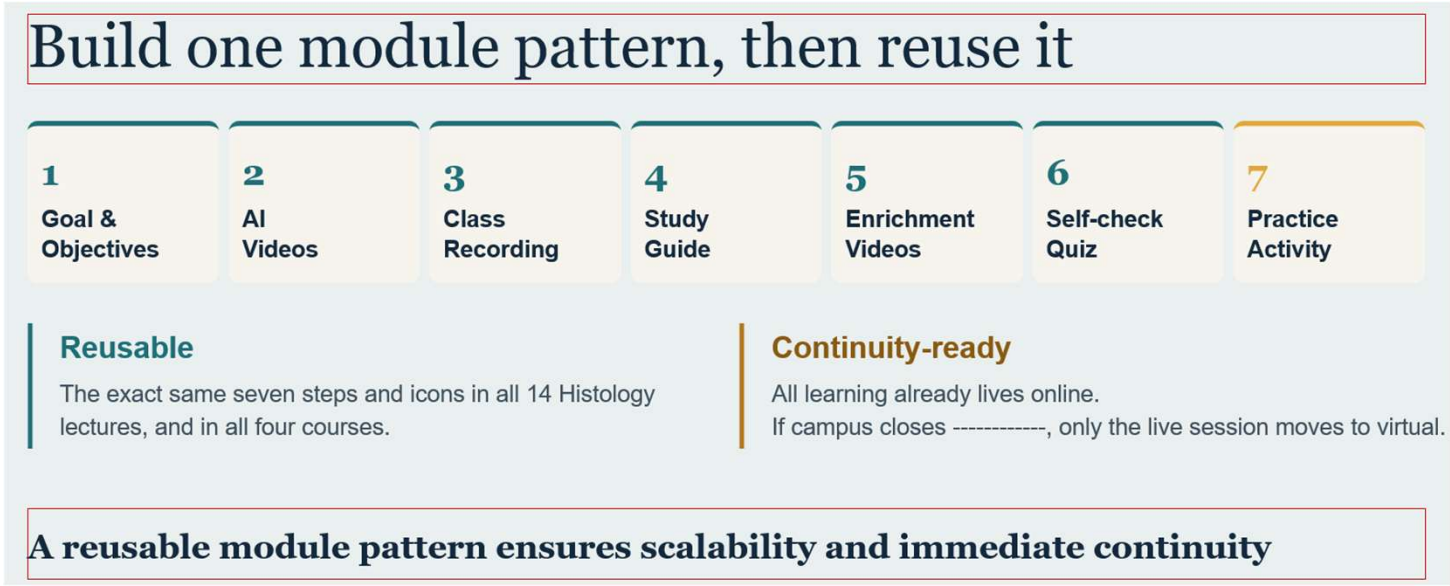




The Same Design . . . Different Courses

Blackboard Digital Teaching Symposium 2026

- **Framework**: **Same structure, same iconography, same promise.**





Blackboard Digital Teaching Symposium 2026

Demonstrate

How do we demonstrate that it was worth it?

Image: AI-generated.

Judged by others

Blackboard Digital Teaching Symposium 2026

- **Six recognitions in ten years, judged by three different bodies**
- The Quality Matters rubric and Blackboard's rubric align
- AI deliberate use in the design and the content sharpened the courses

EXTERNAL CERTIFICATION

2016
Quality Matters Certification Mark
Chordates 252

2018
Quality Matters Certification Mark
Cell Biology 212

2026
Blackboard Exemplary Course
Histology 2210

INSTITUTIONAL RECOGNITION — KING KHALID UNIVERSITY

2020
First place
Education Excellence Award

2022
First place
E-Learning Excellence Award

2025
Second place
Quality of Education Award

Students as quality-assurance partners

Blackboard Digital Teaching Symposium 2026

Before the end

- An anonymous mid-semester survey
- Read while there was still time to change where they were stuck
- Design gaps repaired in the same semester, not the next cohort



Image: AI-generated.

Against a standard

- Peer evaluation using the feedback key
- Students judge a classmate's answer the way a reviewer would
- Quality assurance becomes something students do, not something done to them

Limitations

Blackboard Digital Teaching Symposium 2026

What I cannot show you

- Student assessment data sits inside our institutional quality system, in course reports and outcome measurement. It is not mine to publish
- No employability data: teaching the terminology in English is a bet on students' futures, not a result

What I will measure next

- Terminology mastery, before and after the bilingual scaffolding
- Whether self-check quiz performance predicts the practical exam
- Participation in the optional Atlas, as a measure of voluntary engagement

Instructor Observations vs Course Correction

- Some leaned on the Arabic → English first, Arabic one click away
- Unlimited attempts invited guessing →Require a one-line reason before each retry

Three things you can do

Blackboard Digital Teaching Symposium 2026

1

REACH

Pick the one concept your students always struggle with.

Give it a second route in a different form, not a louder version of the same one.



2

TEACH

Take one activity and write a single sentence on it, telling the student what it buys them that the quiz cannot.



3

DEMONSTRATE

Name one thing you cannot yet claim. Then write down what you would have to measure before you could claim it.



Blackboard
Digital Teaching Symposium 2026

Thank you

Dr. Eman Elbealy · King Khalid University, Abha, Saudi Arabia

erbeely@kku.edu.sa · ORCID 0000-0001-6196-5840

#DTS26