Flipping the book on Biology

Developing an interactive, open, online textbook to flip a large, lecture-based university course

DCDC
DISTANCE COURSE DESIGN & CONSULTING

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TODAY'S TOPIC – New Bio 171 Textbook

UHM Biology Dept / DCDC partnership

Redesigned Bio 171 to use flipped model

Fall 2017 – Summer 2018

Increase student learning outcomes

Adapted an open textbook to accommodate the needs of flipped

BIOLOGY 171

Introductory Biology class

F2F, lecture-based

Large enrollments: 750 per semester

Up to 350 in one lecture hall

Hard copy, expensive required textbook

Critical for students moving on in natural sciences

Students consume content outside of class

Class time spent actively applying concepts

Active learning in large lectures?
Eric Mazur

Describes how he came to peer instruction

Peer instruction in action in large lecture

FLIPPED CHALLENGES

Students fail to spend adequate amounts of time outside of class preparing for in-class activities
(Akçayır & Akçayır, 2018; Lai & Hwang, 2016)

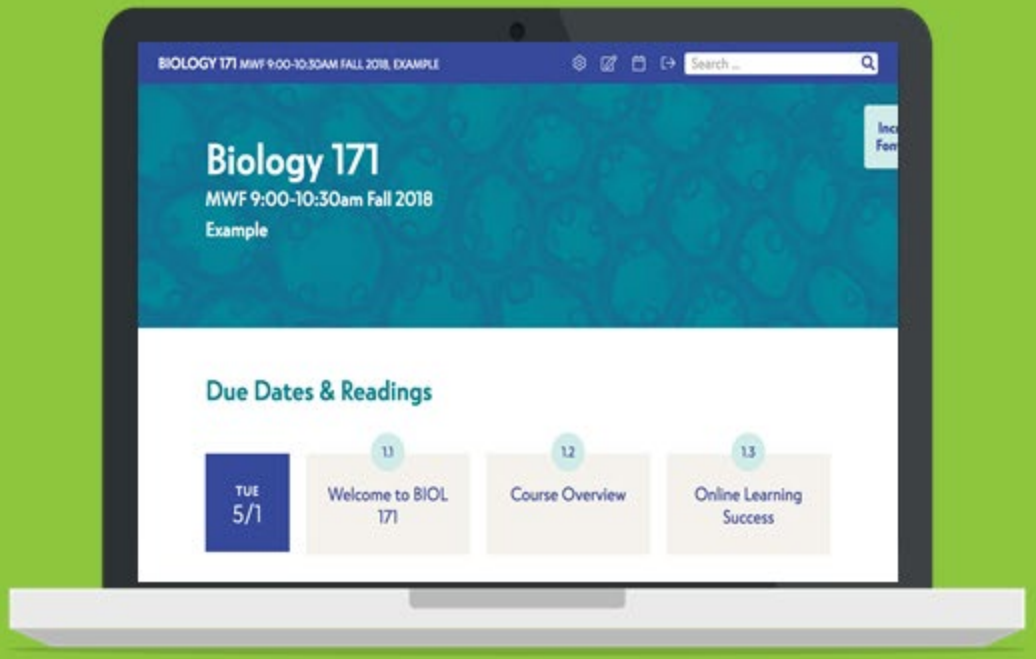
Engage students and keep accountable

Instructors' inability to know if students have completed out-of-class work before they come to class (Fautch, 2015)

Inform instructors, able to monitor progress

Development Priority

Outside of class online resources



DESIGN CONSIDERATIONS

Online - Accessible anywhere, time, any device

Editable by instructors

Free for students

Include enhanced content

Practice with content

Keep students accountable for outside of class work

Instructors able to monitor student activity

BIOLOGY TEXTBOOK ADAPTATIONS

Adapted an open source, online Bio textbook from

OpenStax of Rice University

Built on PressBooks platform

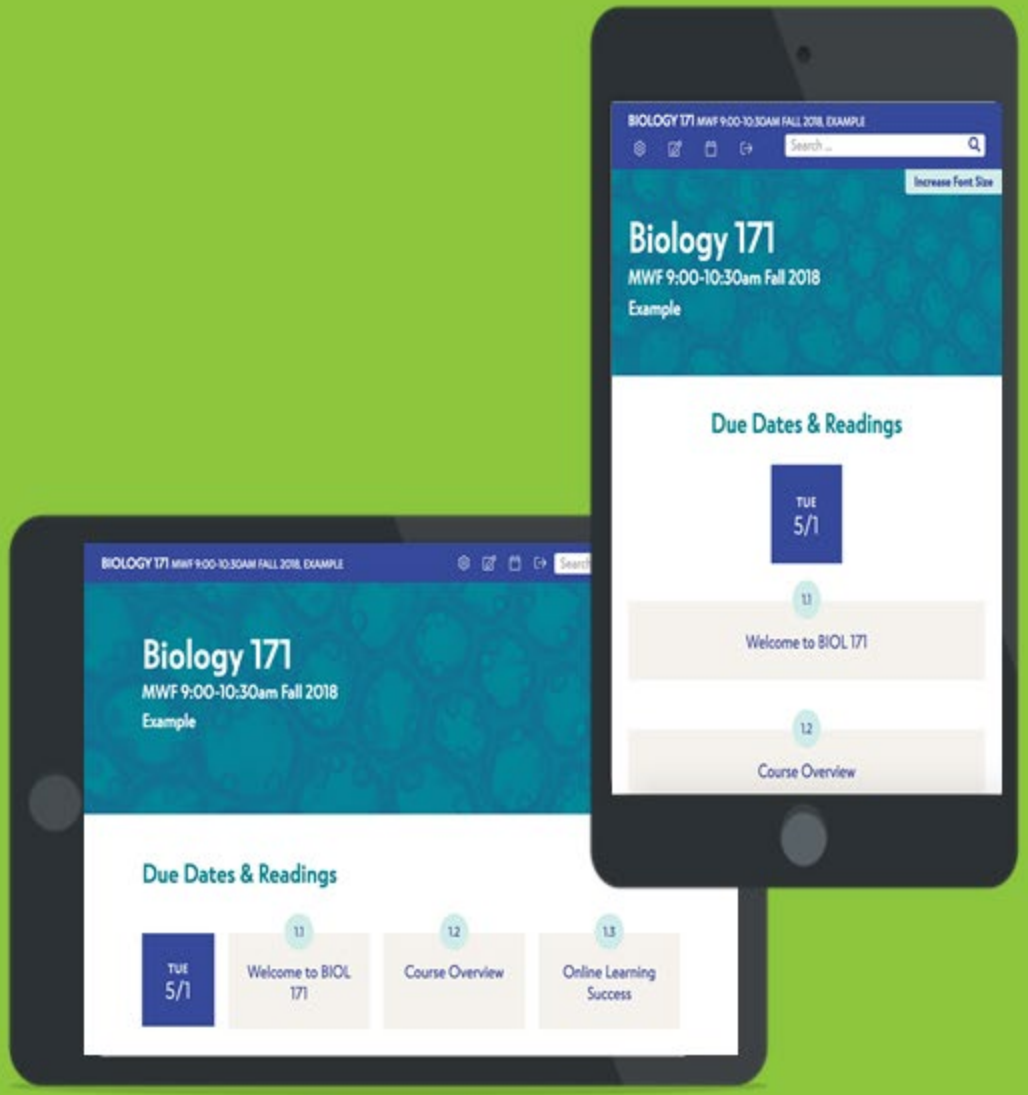
Added interactive quizzes & videos

Instructor & student dashboards

New consistent theme for all materials and sites

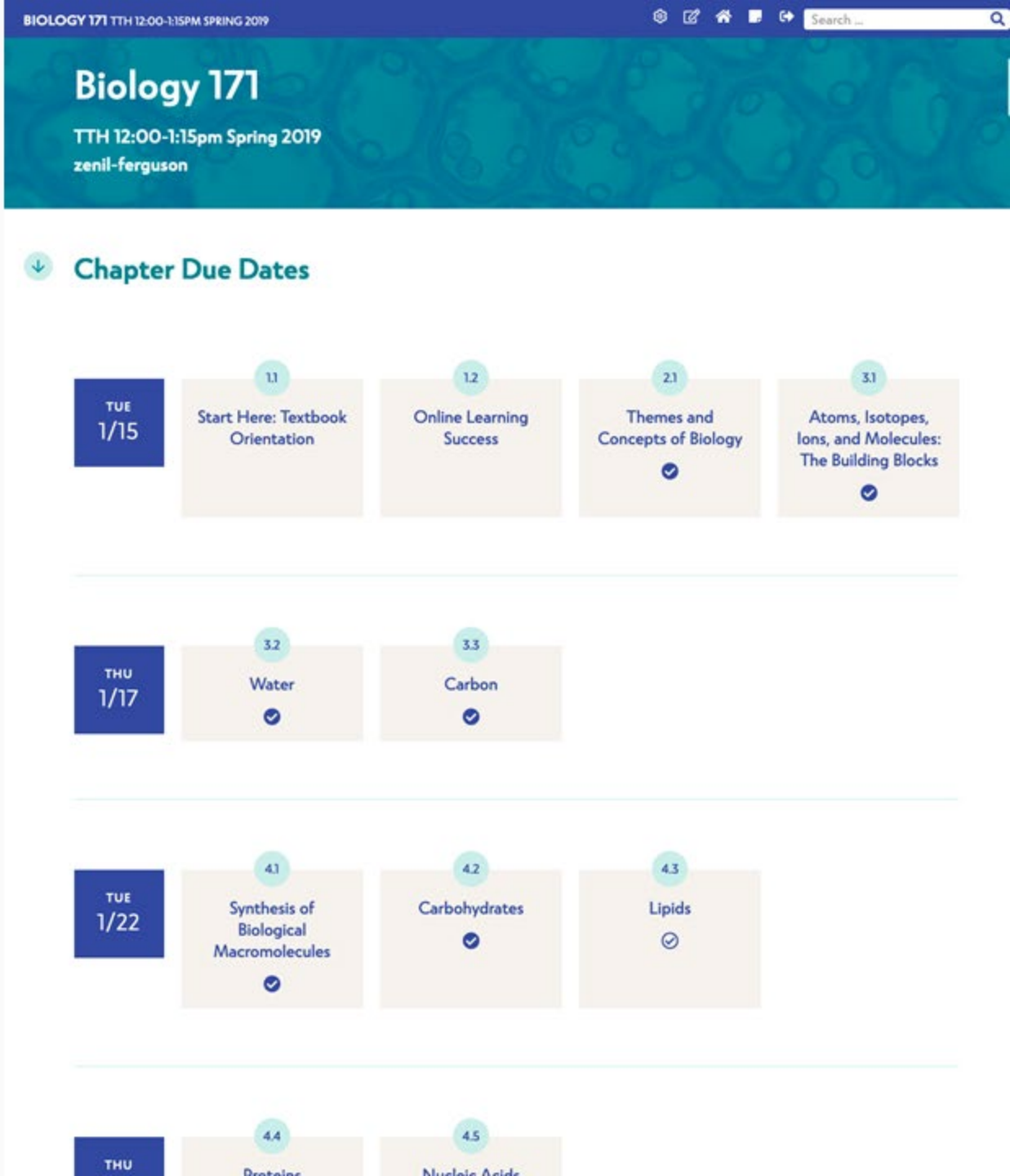
Online Textbook

Mobile Friendly



Textbook

Chapters organized by due dates



Textbook

Chapter page

Disaccharides

Disaccharides (di- = "two") form when two monosaccharides undergo a dehydration reaction (or a condensation reaction or dehydration synthesis). During this process, one monosaccharide's hydroxyl group combines with another monosaccharide's hydrogen, releasing a water molecule and forming a covalent bond. A covalent bond forms between a carbohydrate molecule and another molecule (in this case, between two monosaccharides). Scientists call this a **glycosidic bond** (FIGURE). Glycosidic bonds (or glycosidic linkages) can be an alpha or beta type. An alpha bond is formed when the OH group on the carbon-1 of the first glucose is below the ring plane, and a beta bond is formed when the OH group on the carbon-1 is above the ring plane.

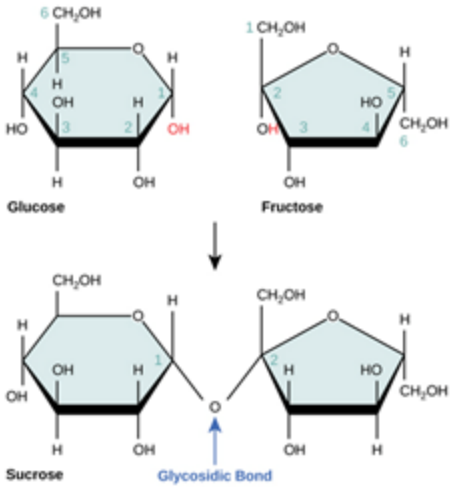
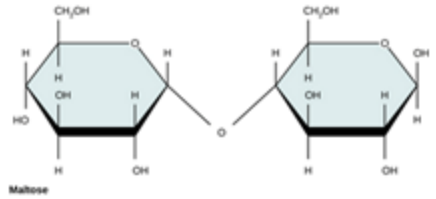


Figure 4: *Sucrose forms when a glucose monomer and a fructose monomer join in a dehydration reaction to form a glycosidic bond. In the process, a water molecule is lost. By convention, the carbon atoms in a monosaccharide are numbered from the terminal carbon closest to the carbonyl group. In sucrose, a glycosidic linkage forms between carbon 1 in glucose and carbon 2 in fructose.*

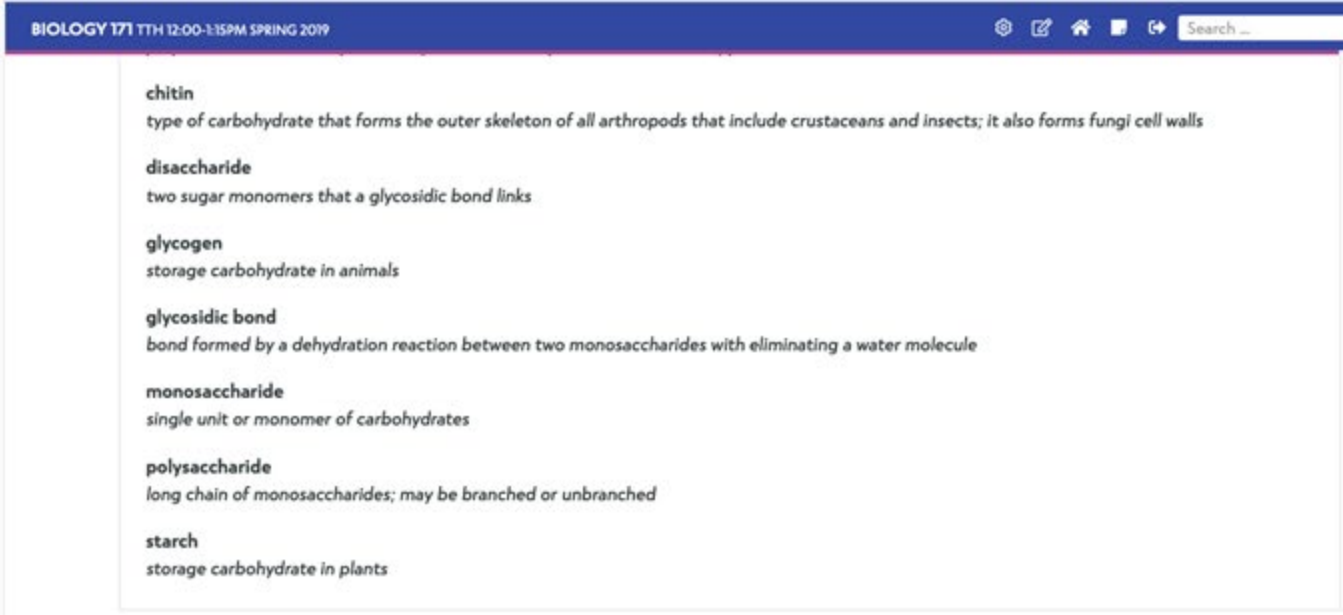
Common disaccharides include lactose, maltose, and sucrose (FIGURE). Lactose is a disaccharide consisting of the monomers glucose and galactose. It is naturally in milk. Maltose, or malt sugar, is a disaccharide formed by a dehydration reaction between two glucose molecules. The most common disaccharide is sucrose, or table sugar, which is comprised of glucose and fructose monomers.

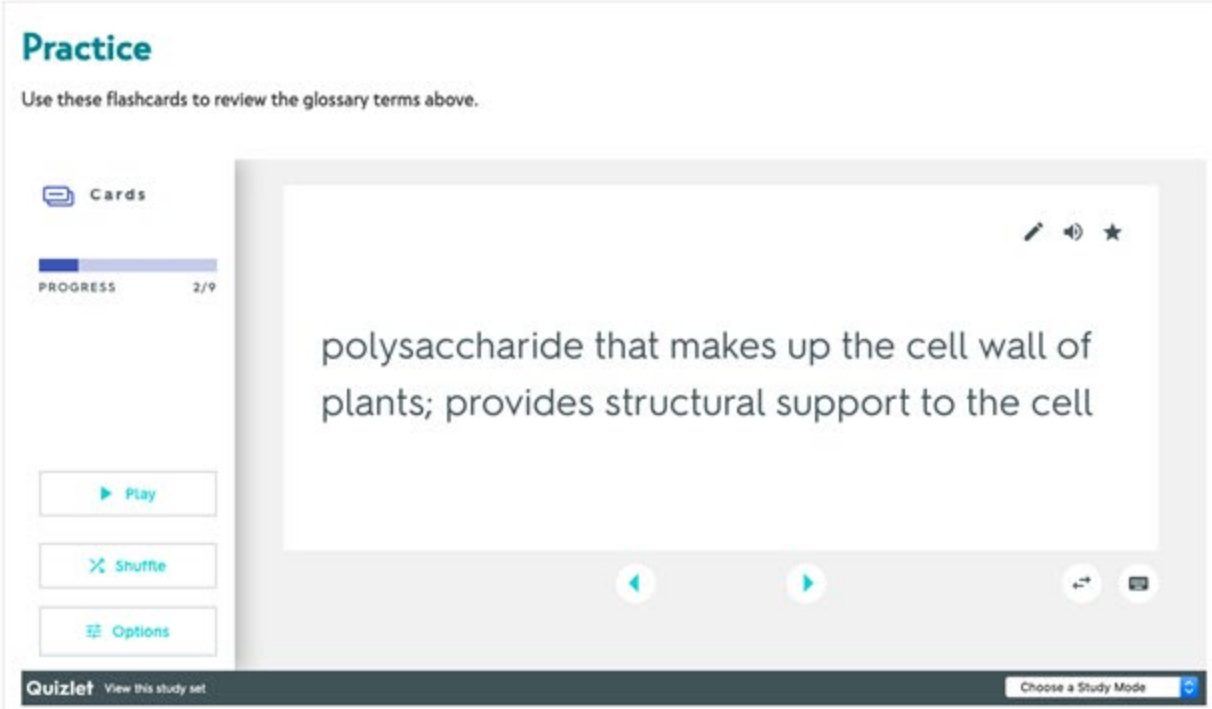


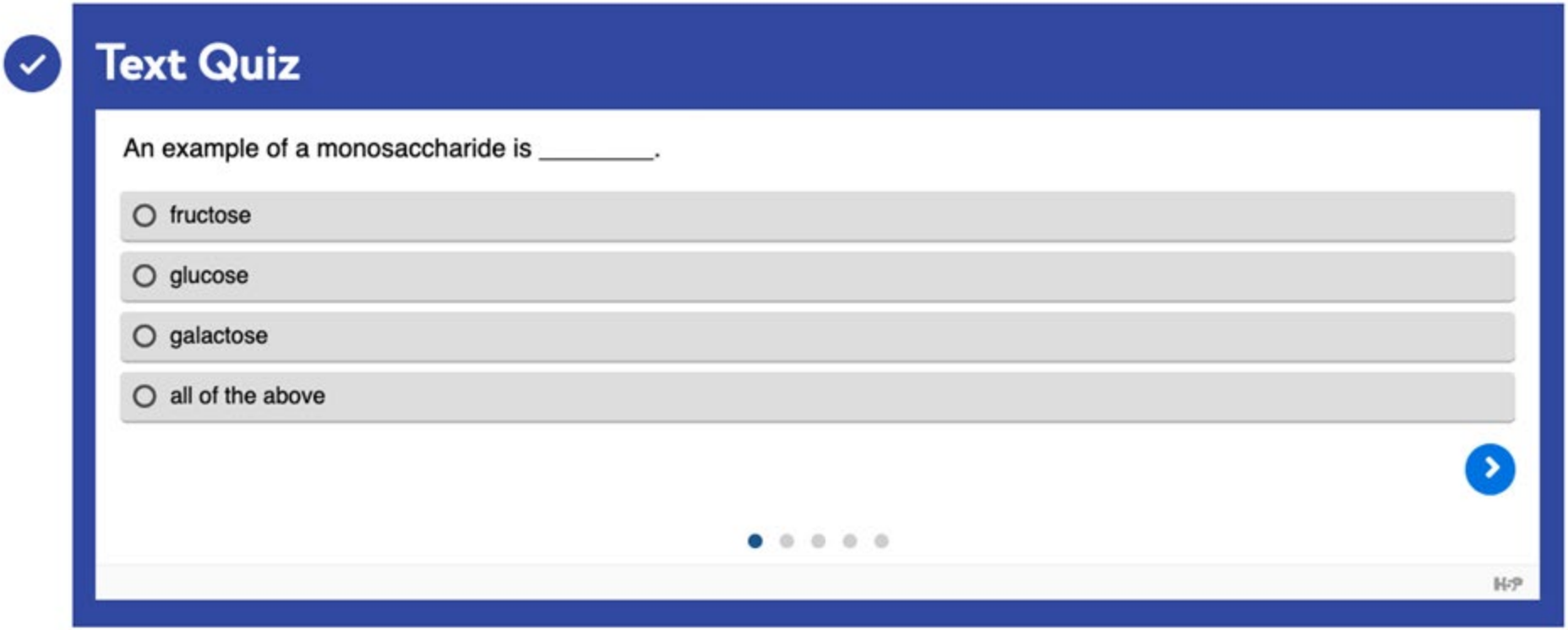
Textbook

Glossary practice flashcards

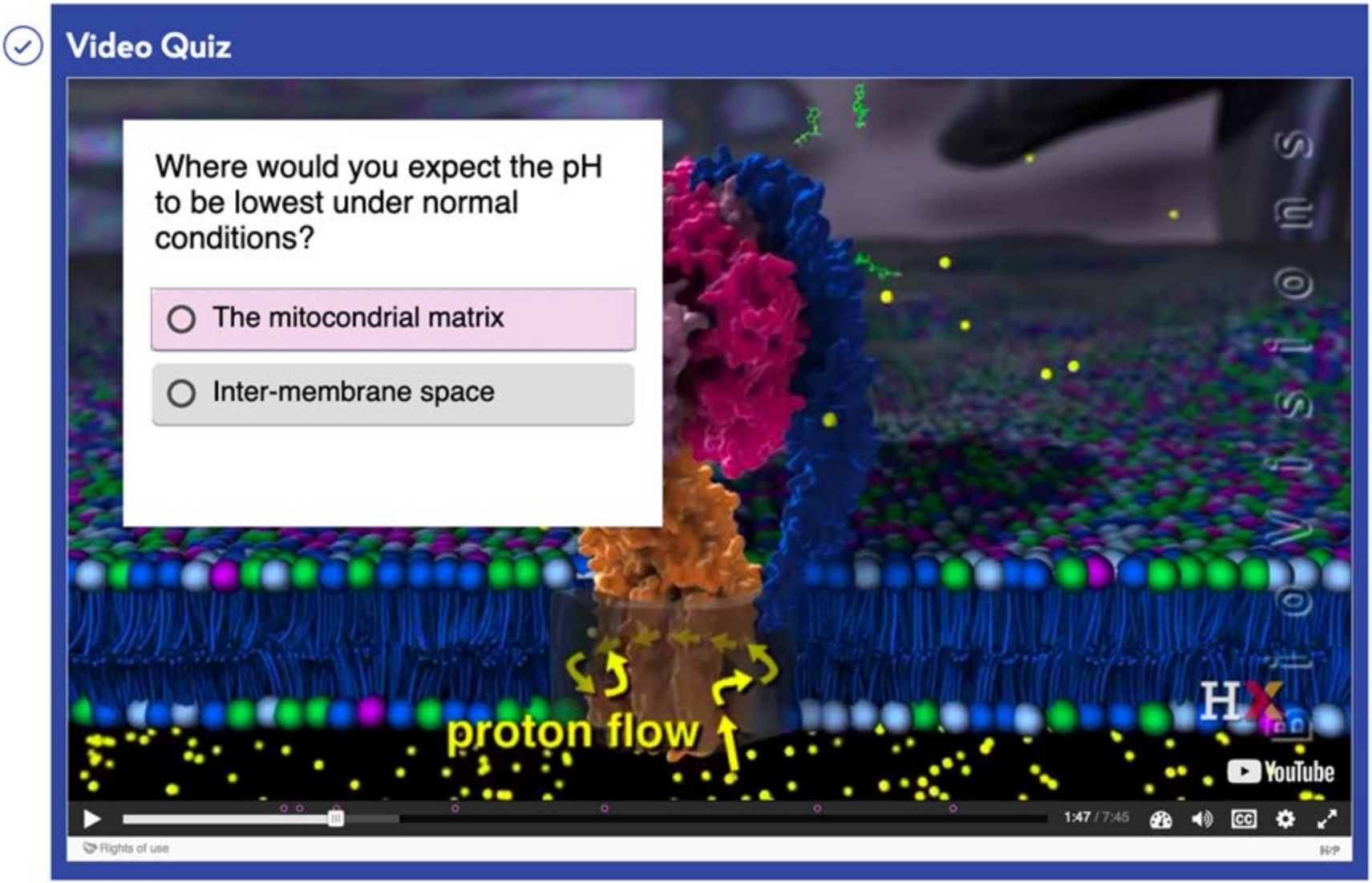
Quizlet





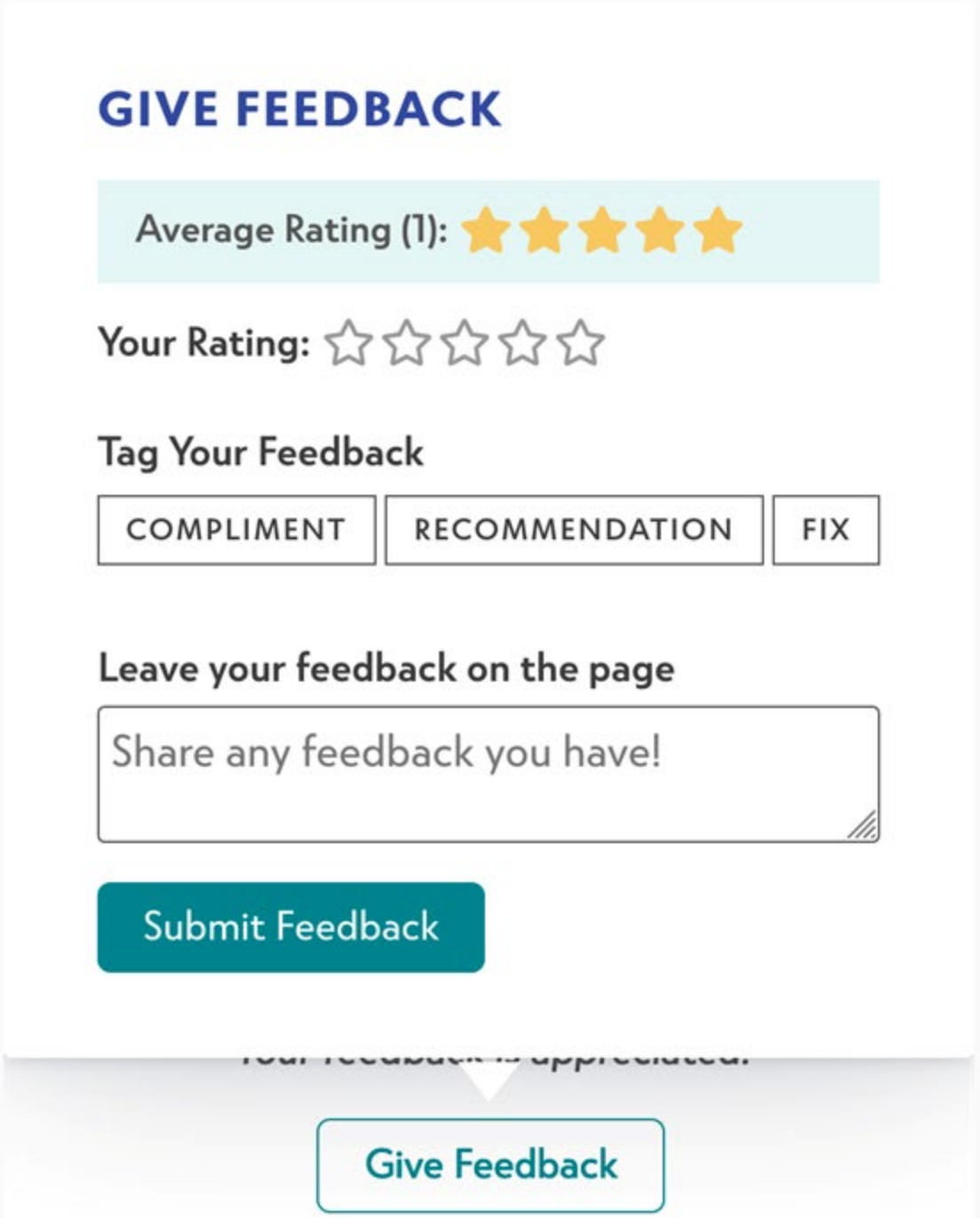


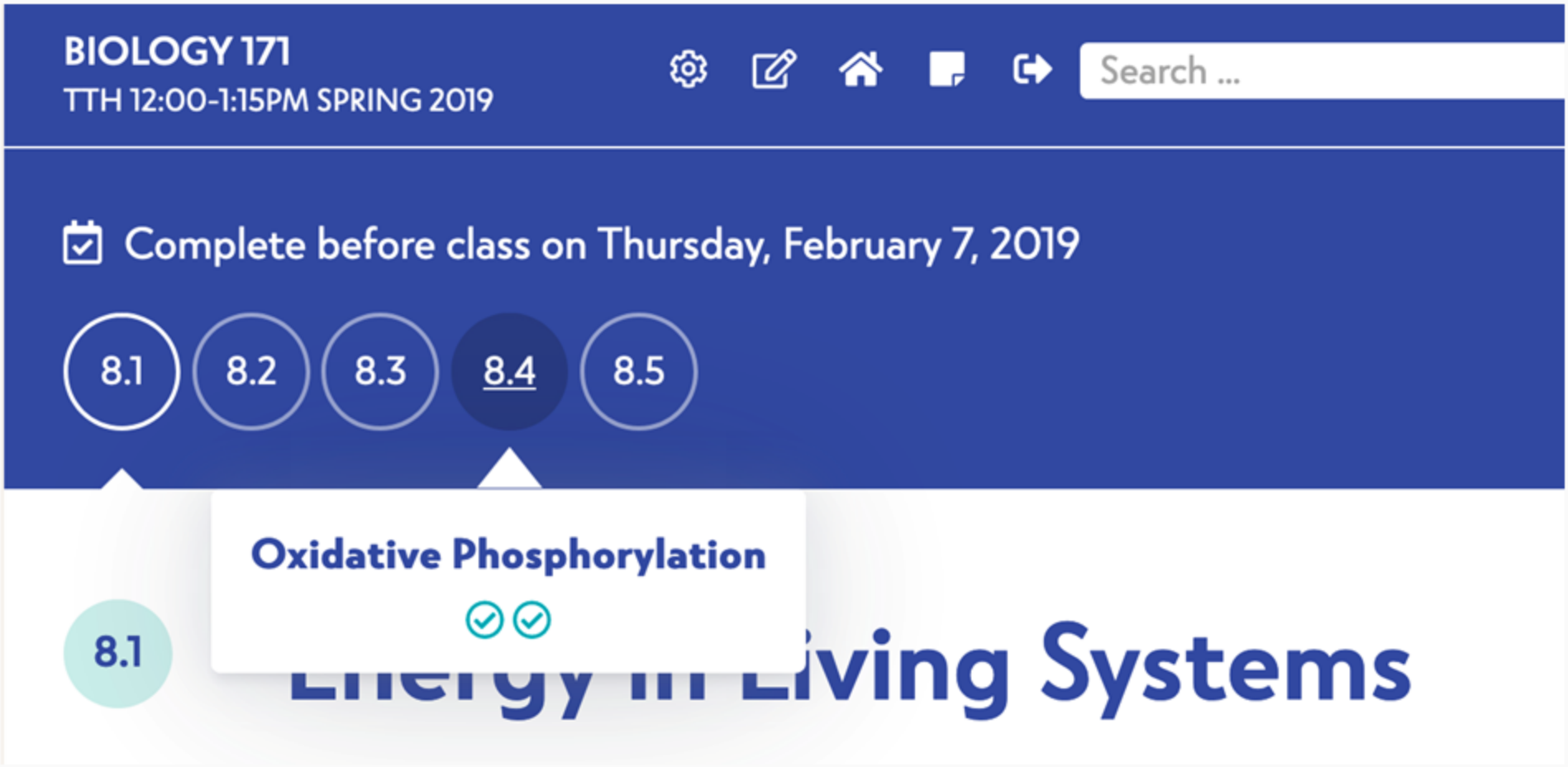
Text quizzes - H5P



Video quizzes - H5P

Chapter Feedback

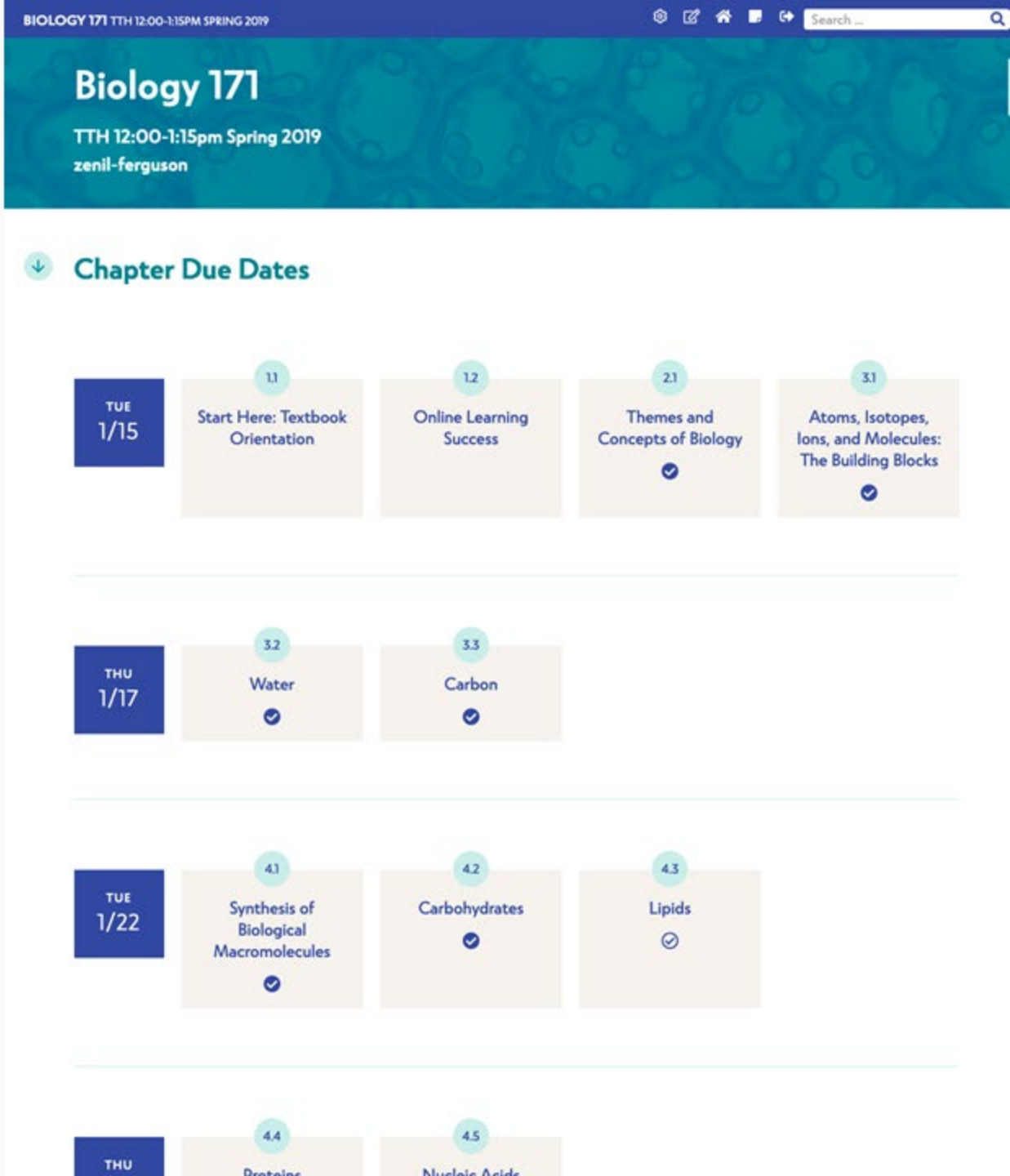




New navigation elements,
based on due dates

Status Icons

Students monitor their quiz progress



Learning analytics + dashboard

Instructor Dashboards

Class

Broad temperature of class progress

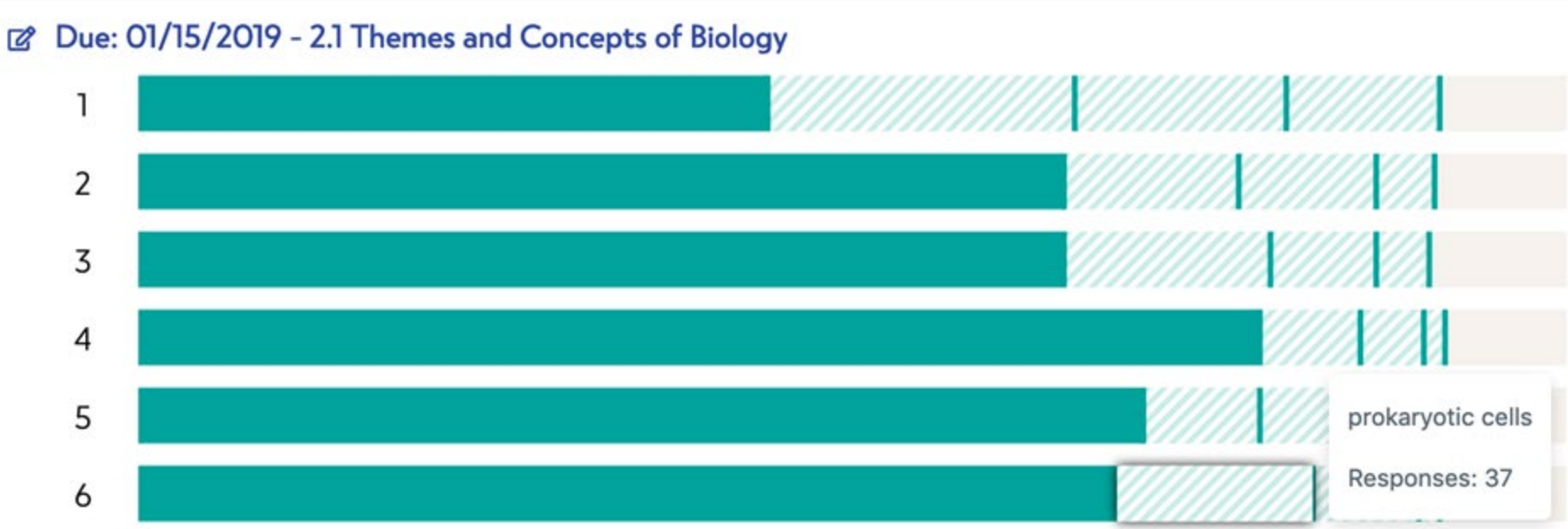
Content

Identify content interaction and potential learning issues

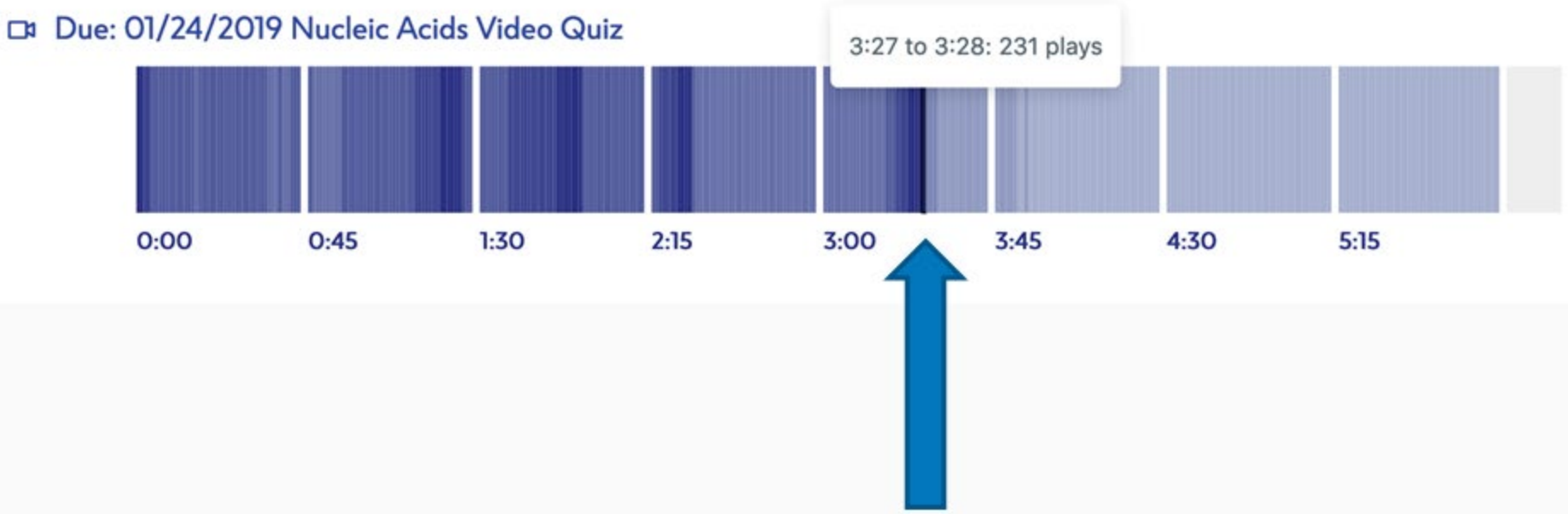
Student

Quickly identify students by key metrics for targeted interventions

How many have completed each quiz?

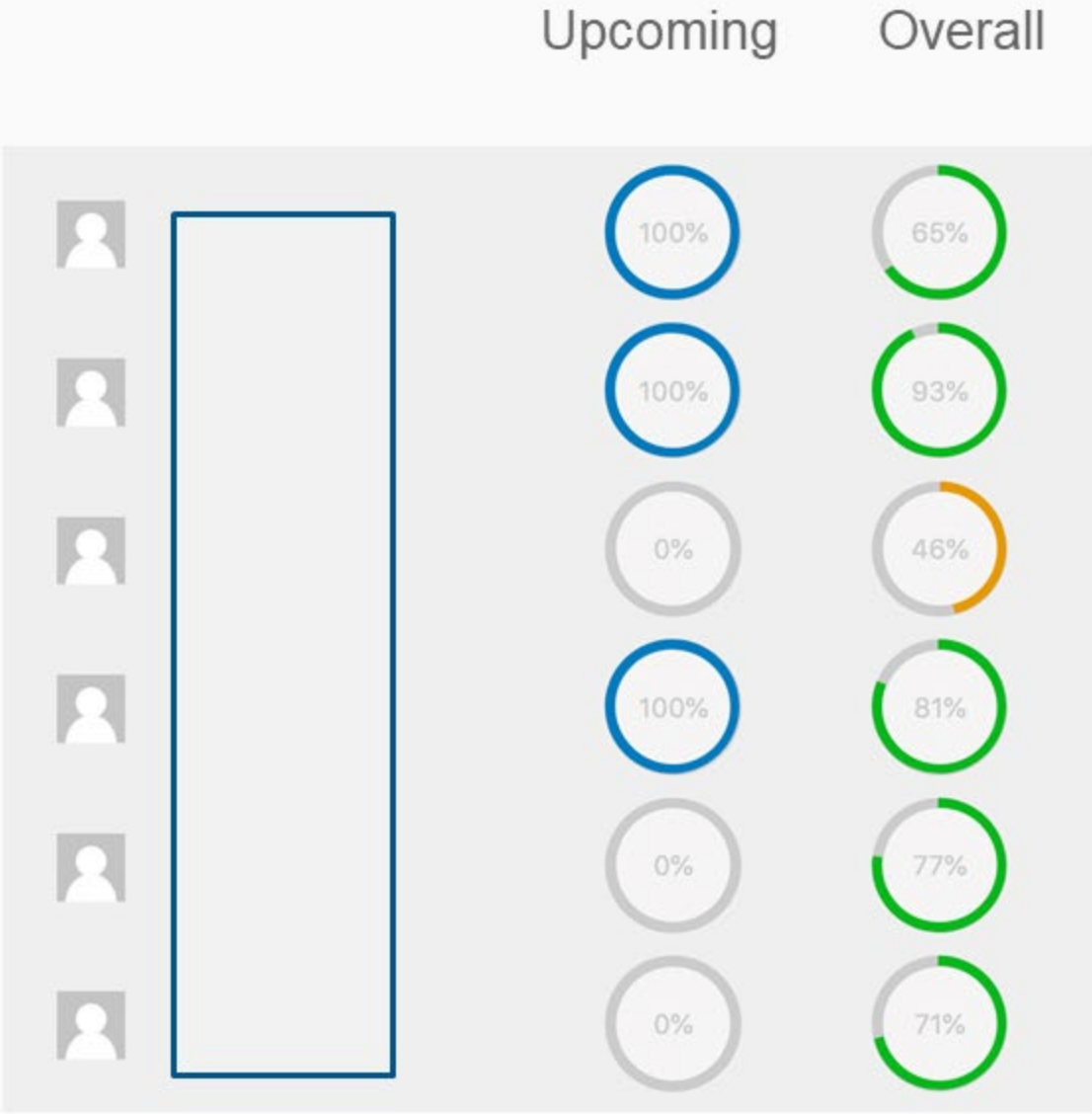


How did they do on each quiz question?



How many watched the video and what sections were viewed most?

How are individual students doing?



Conclusion

Over 600 students have used

Some technical and implementation issues, esp in pilot semester

Made some mods based on student experience and faculty request

Been well received by students

Overall a success

MAHALO

Questions?

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