Many professors provide opportunities in the classroom for students to review course material before a midterm or final exam. To promote student learning, it is important that class review sessions be engaging and encourage student participation. Games such as Pictionary work well as review tools, especially for courses that involve terms, structures, and models like biology. Pictionary is a classic board game where players take turns drawing words while their teammates try to guess the word within a limited amount of time (1). Adaptations of Pictionary in the classroom across different subjects and levels of education are described on various teaching-based websites including the teacher toolkit (http://www.theteachertoolkit.com/index.php/tool/pictionary) and betterlesson (https://betterlesson.com/lesson/506559/unit-review-game-pictionary). Here, I describe a modified version of Pictionary that I use as a review in an introductory biology class and an upper-division microbiology class during our last meeting before the final exam. The Pictionary review game is designed to help students recall important vocabulary words and make connections between terms and concepts. Furthermore, it helps students visualize concepts and promotes positive group dynamics. The game is designed for small class sizes of about 10 to 25 students.

PROCEDURE

Preparation

A list of important terms covered in class is compiled and each term is written on a small sheet of paper and placed in a box. Appendices 1 and 2 provide sample words for a college-level introductory biology course that focuses on evolution and organism diversity and an upper-division microbiology class. The box of words and a timer are brought to class the day of the review.

Rules and modifications

The Pictionary review uses a point system rather than a board, and requires students to not only draw the word or phrase on the whiteboard but to define it, provide examples, and/or connect it to other course content. At the start of class, the rules of the game are projected (Appendix 3) and teams of three to five students are randomly assigned. Students choose or are assigned a name for their team that applies to the subject of the class. One year in my microbiology class the three teams were named Archaea, Bacteria, and Viruses. Team names are written on the board, where the scores will be tallied.

To begin the game, one student from the first team (chosen by any method) comes to the front of the room and selects a word from the box, being careful not to show the word to the class. The student is provided 15 to 30 seconds to think about how to draw the term. Then the student is given up to one minute to draw the term on the board. Only the student’s team members can guess the answer by calling out words. As with traditional Pictionary, the student is not allowed to write words or numbers and cannot use verbal cues. If someone in the team states the correct answer, the team gets a point. If the drawer’s team is unable to correctly identify the illustration within the minute, the next team can provide one guess as to what the word is. If this team identifies the correct term, they receive the point. If the second team does not get the correct answer, the next team can provide one guess and this pattern continues until the term is identified. If no teams are able to identify the term, no points are awarded and the instructor continues the illustration with more detail until someone (from any team) answers correctly.

Once a term is identified correctly by a team, the class as a whole is asked to define and/or provide examples of the term to encourage deeper understanding. For example, if the term is allopatric speciation, students may be asked to describe how it differs from sympatric speciation, what examples were discussed in class, and any other information they can remember about the term. If the term is exotoxin, students may be asked to describe its composition and provide specific examples and mechanisms of action. Questions may also address higher levels of cognition (2). For example, if the word is obligate anaerobe, higher-order

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†Supplemental materials available at http://asmscience.org/jmbe
thinking questions could be “how would you test whether a microorganism is an obligate anaerobe?” or “what are advantages/disadvantages of being an obligate anaerobe?” Depending on class size and the level of participation, you may want to call on students to provide answers. During the discussion of the term, I allow students to consult their notes if needed.

The game continues, rotating teams and drawers. All teams should have the same number of opportunities to draw and each student in a team should draw at least once. If there is extra time, you can consider providing a “lightning round” where the instructor selects words to draw and students from any team can call out answers.

How the points are awarded is up to the instructor. The points can be used as extra credit or the team with the highest points can receive a prize. Since during the game students are not allowed to consult their notes or textbooks, this activity works best if students review their notes before class. Informing students that extra credit is involved provides incentive for them to study ahead of time.

**Common problems with solutions**

Some students will not remember the term they select and/or are unsure how to draw it. To overcome this obstacle, step aside (or outside the classroom) and discuss the term with the student before they draw it. Another solution is to allow students the option of discarding the first word chosen from the box if they feel it is too difficult. Some students are eager to draw while others prefer not to. Encouragement from the instructor (usually followed by those in the team) helps build confidence for those afraid to approach the board and draw.

**CONCLUSION**

The modified version of Pictionary described in this article helps students review a semester of material in preparation for the final exam. Unlike an instructor-centered review lecture, students are actively engaged and topics are reviewed randomly (not in the order of chapters in the textbook), preparing students for the random order of questions on the final exam. Unlike a question-and-answer review session, a variety of topics from the entire semester is reviewed and the review is not dominated by one or two students asking questions. Although the Pictionary aspect of the activity tests lower levels of learning (remembering and understanding), questions during the discussion can address higher-order thinking as described in the procedure (2).

I have been using this Pictionary review game for close to ten years now, and although I have not formally assessed its success in helping students prepare for the final exam, students are always eager to participate and enjoy the activity. When discussing terms, I often observe those “aha” moments where students recall a term taught early in the course and connect it to examples, images, or other terms/concepts.

**SUPPLEMENTAL MATERIALS**

- Appendix 1: Sample words for an introductory biology course focusing on evolution and organism diversity
- Appendix 2: Sample words for an upper-division microbiology course
- Appendix 3: Student instructions

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**REFERENCES**