Formative assessment:

Informally assessing students’ learning
Formative assessment

Sometimes instructors wonder how well their students have understood a particular lesson, or how well they are understanding the course contents. After a lecture, you might wonder if your students really understood what you want them to understand; and you might wonder how you can determine how well they have understood it. Instructors sometimes do not know how they might measure this, and not knowing this, they may simply move on to the next topic or unit in the next class. At the end of the class, they may ask students, “Do you have any questions?” or “Do you now understand concept X?” However, students may not ask questions or verbally indicate that they do not understand, for various reasons. They may be afraid of how classmates or instructors will perceive them (“They’ll think I’m not so smart if I show that I didn’t understand”), or of seeming disrespectful by asking (especially in Asian culture); they may be shy; they may have lost interest; or they may be in a hurry to leave. However, if a significant number of students have not understood, a good part of your class will eventually feel left behind. This is where formative assessment techniques can be useful.

We often use exams and quizzes to assess students’ progress – so-called summative assessment methods – to determine how much and how well they have learned over a period of time, such as at the end of a unit, mid-semester, or at the end of a semester. Sometimes, however, more immediate assessment is needed. After a lecture or series of classes, you might want to gauge their learning by using brief end-of-class response papers (or activities – they need not be written papers), which are explained in the next section. These can address two important issues:

- Did they understand the contents of today’s lecture?
- How can I determine how well they understood?

Response papers are the most typical kind of formative assessment – in fact, when educators speak of formative assessment, they often mean response papers or activities. Such methods are informal and less threatening or stressful than a quiz or exam. They also give students to analyze and apply their new knowledge – they help to further form and develop students’ understanding; hence the term ‘formative assessment.’ For more examples or information on in-class formative assessments, see Angelo & Cross (1993).

This paper also describes another type of informal assessment tool, known as pre-class online quizzes. These can be used for these common issues:

- How do I get my students to actually read the assigned readings or chapters before class?
- How can I tell if they understood the assigned readings?

Originally, these were called “Just-in-time Teaching” (JTT), since they are brief quiz-like assignments given right before class, but instead of this awkward term, they are called “pre-class quizzes” here. For more, see Simkins & Maier (2010).
End-of-class response papers

These are informal, quick assignments that can be given at the end (or start) of class, to see if students have understood the lecture, the concepts discussed that day, or the assigned readings. Students can be given a few minutes to write in class individually, or they can do it via course software or email. These can also be used to assess their previous knowledge or background knowledge of a topic before you start lecturing on it. These can be graded in a simple manner, like short quizzes or short homework assignments, based on how much effort they demonstrate. More importantly, they help you gauge their understanding and what you need to address or review in your class.

1. A simple conceptual question based on the readings, lecture, or concepts discussed in class. For example: “You've learned today about X. But what about Y?” or “How would this apply to Y?” This challenges students to extend or transfer their knowledge by applying it to something new.

2. Explain your understanding of X (ideas, terminology, concepts).

3. Muddiest point: What was one point (idea, concept, term, etc.) that you did not understand in today's lecture? What did you not understand about X?

4. What questions do you have about this? What would you like more explanation about?

5. What was the main idea / main ideas of today's class / lecture?

6. What was the most important thing you learned from my lecture today?

7. Write a summary of the main ideas of today's lecture / class.

8. Have students react to a specific idea discussed in class.

9. Graphic organizers: Construct a graph / concept map / chart / diagram / flow chart / outline to illustrate or explain the contents discussed today (or contents from the textbook chapter).

10. Do you agree with X? Can you come up with a better explanation?

11. How well would X (or X's idea) apply to another case like Y?

12. Can you provide another example of X?

13. How would you explain X in your own words?


15. What would happen if Z were different?
These are better if they are open-ended questions. You can grade them based on two criteria: [1] How well they understood a given concept (relative to the rest of the class), and [2] How much effort they put into it, based on the amount of writing, number of examples, or number of arguments that they provide in the write-up that they submit. For example, you could grade these on a simple scale of 1-5, and add up all the points for these response papers at the end of class for an overall grade, as motivation for students to take the assignment seriously.

These may also be called 2-minute / 5 minute papers, end-of-class papers, response activities, or such.

**Variations**

1. Some of these types of questions could be given at the beginning of class as a lead-in to that day’s lesson.
2. If you have a 1.5 or 2 hour class, this could be given before a break in the middle of class.
3. These could be adapted to brief group activities, culminating in a group write-up, which would be easier to grade.
4. These need not lead to written papers, and these could be “response activities” instead of “response papers”. For example, students might work in small groups to discuss the question, and then provide verbal feedback instead of a written paper.
5. You could give the question at the end of class and require students to respond by email, if you do not have time in class for the activity.
Assigning online quizzes before a lecture can be used to address these common pedagogical issues:

- How do I get my students to actually read the assigned readings or chapters before class?
- How can I tell if they understood the assigned readings?
- How can I make sure they are learning the main ideas and/or how to apply them, or are thinking intelligently about what they are reading – not just trying to memorize facts?

If students have not read the materials beforehand, you can give quizzes or pop quizzes at the beginning of class to motivate them to do so. You can also have them respond to the reading before class, via email or a short written assignment to be handed in at the beginning of class – e.g., asking them to answer a conceptual question about the reading, to summarize the main ideas, to explain what they had difficulty understanding, or discuss some aspect of the contents of the chapter. You can also use the online pre-class quiz technique (officially known by the odd name of Just-in-time Teaching).

A pre-class quiz can be used by itself, or in conjunction with group activities, to make sure students have read the assigned readings or come prepared. This method was originally developed as a way to get students to read their assigned readings before class. Before the class session, students are required to go online and answer questions related to assigned readings and concepts to be discussed in class. Students give their responses through courseware such as EKU, Moodle, or Whiteboard, say, the day before or the night before class (hence the name, “just in time”). The question could be a multiple choice question, or to discourage copying answers, it is better to give a more open-ended question that requires them to write several sentences in response. The instructor sees their responses before class, and in class addresses problems or misconceptions they have. The instructor can then do a group activity in class related to the JTT exercise. This could be a group activity where they discuss the JTT question from the day before, or it could be a follow-up question designed to further explore the concept being taught, or a more specific question to address their misunderstandings of the material.

Examples

Here are a few examples of some pre-class quiz questions from various fields; most of these are adapted from Simkins and Maier (2010).

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<tr>
<th>Introductory biology</th>
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<td>Allison is driving with her parents, Kate and Bob, when they have a serious car accident. At the emergency room, the doctor tells Allison that her mother is fine, but her father has lost a lot of blood and will need a blood transfusion. Allison volunteers to donate blood, but she is told that her blood is type AB. Her father is type O. (a) Can Allison donate blood to her father? Why or why not? (b) Allison begins to wonder if she was adopted. If you were the doctor, what would you say to her? (S-M, p. 9)</td>
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‘Hagiography’ literally means writing about the saints. When it is applied to historians and biographers, it takes on a pejorative connotation. It implies that they are unduly praising, heroizing, idolizing, or canonizing their subjects. Does J. Green engage in hagiography of Robert Frank in this reading? Or is his account of Frank justified? Explain and defend your answer. (S-M, p. 167)

Using pre-class quizzes

Such pre-class assignments can be done online, usually due one or two nights before the class. Often they require students to read and respond to concepts in their readings, as well as requiring them to think about what they have learned in the course. The purpose is to see how well they understand the materials, and what kinds of problems that they have. They are not be used just for evaluation or assessment like a traditional quiz. They should inform what the instructor will do in the next class; i.e., the instructor needs to make meaningful use of students’ responses. Otherwise, the students may feel it is just another kind of busy work or homework, and may come to resent it.

Instructors should make some use of the quiz or quiz responses in class. This usually involves going over the answers in class, and commenting on students’ responses. Often instructors put up some students’ responses on the screen or PowerPoint – examples of good and poor responses (without mentioning their names, of course). One would then explain why the responses are good or poor, how well they are reasoned, or how students could better work through such questions. Students will also feel appreciated if their responses are displayed anonymously and commented on; even those with poor responses can benefit from feedback and suggestions.

Those who use pre-class quizzes often include group activities or problem-solving activities in class based on the quiz. You can have them work in groups for a while to discuss their answers to the question, or to continue working out a question that they had difficulty with. Or you can also give them a follow-up question to the quiz question to work on in groups. For the first example above on scientific theories, you could have students form groups to discuss their responses and opinions on the question of what theories are. Or you could discuss the question of theories at the start of class (an interactive discussion with the students), and then in groups have them discuss a follow-up question, e.g., what ‘law’ versus ‘theory’ is, or what constitutes a good theory versus a bad theory.

In addition to conceptual questions like those above, you could also use more of the pure formative assessment questions like those in the previous section on response papers.

Assessment

Students should receive some credit or grade for the quiz assignments; otherwise, they will resent it as unnecessary busy work. It could count as homework assignments, or as a separate grade component. If you do it most every week, or at least in more than half the weeks of the semester, then it should be weighted at 5-15% of the course grade, but not more (some report that 10% is ideal). It is best to assign these fairly regularly, about once every 1-2 weeks on average (if less often, then it could constitute 5% of the course grade). You could assign it most weeks, but allow them the option of skipping a few; e.g., requiring them to do 8 out of 10 of them, or such.

Open ended questions work best for such assignments, since open ended questions will invite deeper thinking and application of concepts. Using multiple choice questions may
invite cheating (as they can copy answers from classmates), while open ended responses, e.g., writing at least a full paragraph, makes cheating less likely. Requiring a short paragraph or more of explanation is generally reasonable. For some problems, you could give a multiple choice item, for which they then have to write a paragraph to explain or justify their choice.

Since this is a conceptual exercise to get them to do their readings, work through concepts, and/or apply concepts, and since it is designed to find how well the class as a whole is understanding the materials, grading should primarily be based on effort rather than simply whether it is simply correct or incorrect. Effort does not necessarily mean how much they write, but how much thought they put into it, and how much they tried to work through or work with the concepts and materials. Here is a sample scoring rubric (adapted from Simkins & Maier, 2010:17).

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<th>points</th>
<th>criteria</th>
<th>indicators</th>
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<tbody>
<tr>
<td>1</td>
<td>minimal effort</td>
<td>Student says s/he does not know how to answer, or offers no answer.</td>
</tr>
<tr>
<td>2</td>
<td>incorrect answer; low effort</td>
<td>Student tries to answer but shows no evidence of making use of previous knowledge; shows serious misconceptions; does not use any information from readings or lectures to formulate the response.</td>
</tr>
<tr>
<td>3</td>
<td>partially correct answer, but still incomplete; medium effort</td>
<td>Student shows some prior knowledge and uses some correct terminology, but does not provide a complete explanation for the answer. Student does not use appropriate information from the readings or lectures.</td>
</tr>
<tr>
<td>4</td>
<td>correct or nearly correct; good effort</td>
<td>Student answers the question with few mistakes and with a complete explanation. Student incorporates information from the lectures and readings.</td>
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<tr>
<td>5</td>
<td>correct; high effort</td>
<td>Student provides a very detailed explanation, with information from outside the course materials, e.g., has obtained and incorporated more information from outside sources, and/or shows great creativity or critical thinking skills.</td>
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If you use this kind of assignment fairly regularly, you could tally all their points and sum them up for the pre-class quiz grade. For example, for 12 such assignments, add up all the points scale it up to 100 and enter it into your grading spreadsheet (e.g., 4+5+5+4+3+5+4+4+4+5+4+4=49 → 82). Use whatever numerical scale or grading system that works well for you.

References