

Adapting Classroom Assessment and Other Techniques to a Flipped Classroom

WB Jeffries, University of Vermont College of Medicine

KN Huggett, Creighton University School of Medicine

J Szarek, The Commonwealth Medical College

Techniques that have been useful in increasing classroom engagement can be adapted to create structured “flipped” classroom sessions to encourage higher levels of learning. Many of these are inspired by the work of Angelo and Cross (1993), who compiled effective ways to introduce active learning into an otherwise passive lecture. Additional techniques that we characterize as “Homework in Class” take traditional homework activities and assignments and bring them into the classroom setting. The following handout describes examples of key methods, their original intent in the lecture setting, and suggested ways to adapt these techniques to a flipped classroom. These methods can be used alone, but are probably best in combination.

Homework in Class

Worksheet

Original use: Lecturers have often provided worksheets to students for at-home practice in application of discussed concepts (e.g., mathematics problems, chemical reactions, etc.). Sheets are returned to the instructor for grading.

Adapting for Flipped Classroom: In this most basic of flipping techniques, the classroom becomes the venue for filling out a worksheet based on assigned activities (readings, podcasts, videos, etc.). Students will automatically conduct peer teaching, creating a lively exchange of ideas to arrive at the correct answers.

Suggestions for application:

1. Don't make this the entire session, as students get bored fairly quickly.
2. Hand out the worksheet during class – if you hand it out in advance (or if student have access to it from previous years), students will avoid the session.
3. Allow students to complete it as a group. This allows students with a better grasp of the material to teach those who need help.
4. Combine the worksheet with adapted classroom assessment techniques to maximize the benefit.
5. Consider assigning the exercise for credit. Allow each group to submit one worksheet for credit, or give a short quiz at the end of the session containing similar problems to ensure that all students have achieved session objectives.

Dry Lab

Original use: A common practice among medical science educators is to provide students with the opportunity to design experiments and/or interpret instructor-provided laboratory data based on concepts presented in lecture. Results can be returned to the instructor for grading.

Adapting for Flipped Classroom: If knowledge objectives are assigned and satisfied outside of lecture (e.g., assigned readings, podcasts, videos) the “dry lab” can occupy the space formerly used for the lecture.

Suggestions for application:

1. Give out the dry lab data during class – if you hand it out in advance (or if student have access to it from previous years), students will avoid the session or complete it in advance.
2. Have students work in small groups to complete assigned labs. Weaker students can be helped by peer teaching from stronger students. Faculty can “float” and answer difficult questions (but NOT lecture!).
3. Have students submit completed group work before presentations to ensure everyone participates.
4. Vary lab material from year to year to ensure students won’t use archived material and answers from previous years.
5. Assess achievement of objectives with a short set of relevant problems at the end or shortly after the session.

Case Report

Original use: A common practice among medical science educators is to provide students with a case report scenario, slowly revealing aspects of the case as they unfold chronologically. The case can be on paper or involve a standardized or simulated patient. This format is often used in small groups, based on didactic material from the curriculum. . Results can be returned to the instructor for grading.

Adapting for Flipped Classroom: Many of the concepts discussed for “dry lab” apply here. If knowledge objectives are assigned and satisfied outside of lecture (e.g., assigned readings, podcasts, videos) the case report can occupy the space formerly used for the lecture.

Suggestions for application:

1. Give out some details of the case before class to encourage focused reading. Do NOT give out specific questions before class. It may be beneficial to have some standard questions that go with EVERY case so that students can orient themselves and prepare effectively. If you hand out all material in advance (or if student have access to it from previous year’s students), students will either avoid the session or deliver the answers in rote fashion.

2. Have students work in small groups to complete case questions. Cases can be done in episodes with large group discussion following small group deliberation, or cases can be worked out in small groups in their entirety. Weaker students can be helped by peer teaching from stronger students. Faculty can “float” and answer difficult questions (but NOT lecture!).
3. Students could develop a case note in SOAP or some other standard format as an in class product. The SOAP note could then be used for a case presentation by selected students.
4. Have students submit completed group work before presentations to ensure everyone participates.
5. Vary cases material from year to year to ensure students won’t use material and answers obtained from students from previous years.
6. Assess achievement of objectives with a short set of relevant problems at the end or shortly after the session.

Review Session

Original use: Students often gather in informal groups to review course material prior to exams. In addition, instructors sometimes include scheduled review sessions before exams to ensure students can bring their questions regarding the course material to faculty.

Adapting for Flipped Classroom: If students have achieved knowledge objectives without attending lecture, all or part of a scheduled lecture time can be devoted to answering students’ questions and posing additional questions.

Suggestions for application:

1. Avoid being drawn into giving a “mini-lecture.” Students must be prepared to ask specific questions and the instructor must resist the desire to facilitate passive learning methods.
2. Prepare questions that require higher order thinking that can be posed to students during the session. This will encourage collaboration and stimulate application rather than simple knowledge rehearsal.
3. A review session is best combined with or replaced by classroom assessment techniques (see below) to ensure maximum participation and learning.

Classroom Assessment Techniques:

Background Knowledge Probe

Original Use: The background knowledge probe is designed to determine student’s prior knowledge, their recall and understanding of material key to success in a course or unit. The probe is usually in the form of a multiple choice or short answer test.

Adapting for Flipped Classroom: Students can be assigned one or more prior readings, podcasts or videos to gain subject knowledge. The large group class meeting can then begin with an assessment. That can be taken individually or in groups (or in the case of Team Based Learning, both).

Suggestions for application:

1. Use this to start a flipped classroom session to ensure readiness to participate.
2. In multiple choice format, an audience response system can be used by the instructor to quickly gauge student understanding of key concepts. Discussion can center around points of low understanding.
3. Short answer format can be effective for recall not based on word recognition. The probe can be quickly graded by neighboring student
4. The exam can be used as a tool to encourage group learning and peer teaching. In Team-Based Learning, students complete initial assessments alone and then complete the same exam within a small group. This enables students to help each other clarify unclear points for each other and stimulates all students to participate in application of their knowledge.
5. Students take the exercise much more seriously if the assessment counts toward their grade.

The One-Minute Paper

Original use: The one minute paper is used to assess prior knowledge, recall and understanding of key concepts. It can be used at the beginning or at any point during class when an important concept needs to be emphasized and imprinted into long-term memory. The paper is often in response to a question like “what is the most salient feature of the process we discussed today” or “what concepts covered today are key to the treatment of X disease,” etc. The papers are graded and returned to students at the next session.

Adapting for Flipped Classroom: Students can be tasked to either summarize the key concepts derived from class preparation (e.g., reading, podcast, video) or can summarize portions of a group discussion related to the application of a topic during the flipped classroom session.

Suggestions for application:

1. Can be used to start a session, or at any time during the active session.
2. The essay can be handed in for credit or graded by neighboring student to stimulate discussion.
3. Students can be called on to read their short essays, to stimulate discussion.
4. Students can be assigned to develop an essay together, based on an assigned discussion or problem set that draws on their knowledge.
5. A variation involves groups of students creating a presentation during a learning session that summarizes key points. The presentation can be delivered near the end of the session or posted or podcast for further use by all students. The faculty challenge is to ensure expectations of accuracy and presentation quality.

6. Students take the exercise much more seriously if the assessment counts toward their grade.

The Muddiest Point

Original use: The muddiest point is a technique whereby students quickly note the greatest area(s) of difficulty (“the muddiest point”) that they have with lecture material or assigned readings. Often this is compiled at the end of class and the teacher returns in the following session to clarify the most frequent difficulties.

Adapting for Flipped Classroom: Students can be given the routine assignment of specifying the muddiest point from assigned material and bringing those questions to the active session. If bringing a muddy point to class is required, it improves engagement and preparation.

Suggestions for application:

1. Best used in the middle or at the end of the session (“muddy points” can sometimes develop into lengthy diversions!)
2. The question can be introduced into a small group formed among neighbors to stimulate discussion and peer teaching
3. Difficult questions not solved by the group can be presented to the larger group for resolution. Resist the temptation to break into a spontaneous lecture in response to a muddy point – peer discussion is better.
4. Students can be assigned to develop a group response that summarizes key points. The response can be presented near the end of the session or posted or podcast for further use by all students. The faculty challenge is to ensure expectations of accuracy and presentation quality.
5. Students take the exercise much more seriously if the assessment counts toward their grade.

The One-Sentence Summary

Original use: The instructor asks each student to prepare a declarative sentence that summarizes a key point. This works well when summarizing factual information such as pathways or reasoning paradigms (e.g., “When assessing hyponatremia one must first ascertain volume status...”)

Adapting for Flipped Classroom: Students can be given the routine assignment of developing one sentence summaries for specific topics that they can look up, development from recalled knowledge or from the active session. If bringing a one sentence summary to class is required, it improves engagement and preparation.

Suggestions for application:

1. Can be used to summarize prepared or discussed material.

2. Can be the result of a group small group discussion formed among neighbors to stimulate discussion and peer teaching.
3. Students can be assigned to develop a group sentence that summarizes a key point. The sentence can be presented near the end of the session or posted or podcast for further use by all students. The faculty challenge is to ensure expectations of accuracy and presentation quality.
4. Sentences from different students/groups on similar topics can be read aloud and students can vote on the best ones using an audience response system.
5. Students take the exercise much more seriously if the assessment counts toward their grade.

Directed Paraphrasing

Original use: Students are asked to paraphrase a specific part of a lesson in their own words. This makes the learner directly apply and present their newly acquired knowledge and reasoning skills.

Adapting for Flipped Classroom: Students can be asked to take a small amount of time to summarize a portion of an assigned lesson or repeat key points from the discussion. The latter aspect of this is already in routine use in clerkship presentations of patients on rounds.

Suggestions for application:

1. Can be used to summarize prepared or discussed material.
2. Students can be called on to summarize for an assembled peer group the key points of the assignment. DANGER: students could internally assign the task of preparing for the session on a rotating basis, thus eliminating the need for all students to prepare for the session.
3. The best use of this technique is to assign students to work on a specific problem or case, then have one of them summarize the findings for the large group.
4. Students can be assessed on their participation and presentation skills, as well as content knowledge. Peers can participate in the assessment process.

Application Cards

Original use: After learning a concept, students are given card to write down possible real world applications of this knowledge. Cards are assessed on a Likert scale with feedback.

Adapting for Flipped Classroom: Students can understand basic science concepts and their relevance better when presented in the context on clinical medicine. Thus, assigned preparation material can be more readily understood if students are expected to relate it to a relevant disease process, or wellness concept. Students can be asked to produce a short written description of the application of a particular basic science topic.

Suggestions for application:

1. Can be used for prepared or discussed material,
2. Students can be assigned the task of developing individual, non-overlapping cards based on key discussion points. The instructor can then call for unique applications from selected groups. .
3. Cards from different students/groups on similar topics can be read aloud and students can vote on the best ones using an audience response system.
4. Students take the exercise much more seriously if the assessment counts toward their grade.

Student-generated Test Questions

Original use: Students are asked to develop several exam questions with one best answer. This method develops comprehension and application skills.

Adapting for Flipped Classroom: Students can be assigned the task of preparing exam questions based on assigned material or developing them in class. Caution: since many students use commercially available question banks for their studies, plagiarism is a concern. Students generally prefer preparing for exams by using practice questions, so this method can be very popular

Suggestions for application:

1. Students should be oriented to the principles of valid examination formats and question styles.
2. Students could be assigned the task of individually generating 3 exam questions. Working in groups students discuss the questions and attempt to modify and merge their group's question pool into a comprehensive 10 question quiz.
3. Generated (and accurate) questions can be posted on a student bulletin board or other suitable venue for their study.
4. Students could be further motivated by the promised use of a small number of their questions on an actual exam.

Pro and Con Grid

Original use: Learners are asked to chart the pros and cons of a specific issue or topic, which is useful in developing and assessing critical thinking skills.

Adapting for Flipped Classroom: Students can be asked to develop a chart of the pros and cons regarding ethical or risk/benefit of certain treatments or public health approaches to societal problems, etc.

Suggestions for application:

1. Students can be assigned to apply assigned knowledge objectives to real world problems before coming to class. Students can work in groups to discuss specific cases and discuss to refine their grids.
2. Grids can be developed by individual groups, and presented for large group discussion, comparing and contrasting the work of individual groups. A consensus grid can be developed for the entire class and posted online for later assessment.