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Classroom activities for providing opportunities for medical students

Actuality. The growth of medical knowledge is accelerating exponentially, making it impossible for prospective physicians to learn everything they need to know during medical school, and making it essential for them to learn the skills related to lifelong learning that will serve them for their entire medical careers. Prospective physicians must learn how to identify their own learning needs, identify appropriate sources for addressing those needs, and learn how to apply the information and skills acquired to the care of patients during medical school and beyond. In addition, traditional models that feature pre-clinical training followed by 2 years of clinical training are giving way to newer models, which emphasize early application of basic science knowledge to clinical problems (e.g., through problem-based learning), as well as revisiting basic science content in the clinical years.

While growth in knowledge creates the need for lifelong learning, characteristics of students and their access to technology have changed as well. For example, incoming students have grown up with access to technology, and are accustomed to using it in their daily lives. This creates advantages as well as challenges for the medical educator.

No matter what strategy is used, it is important to maintain students' natural curiosity about how the human body works and about how to take care of patients. Most students come to medical school with high levels of curiosity, but the more they are required to memorize isolated facts or engage in very deep learning about relatively esoteric principles, the less likely they are to maintain that enthusiasm.

How students learn is affected by how teachers teach. Knowledge must be organized around important concepts, which improves understanding and ability to apply the knowledge to other contexts.

Main part. The following activities provide opportunities for students to engage with content in the classroom. These techniques can provide instructors with immediate feedback about student learning, helping identify student misconceptions, confusions, etc. They can also be used as practice exercises that help prepare students for formal assessments such as homework assignments, exams, etc. Many take 5 minutes or less to complete.

Brainstorming Steps:

1. Present an open-ended question for students to discuss or solve.
2. Students can work individually, in pairs or small groups, or as a class (or combination of these).
3. Have students share ideas with class, making notes on the board.
4. Challenge their responses or have other students challenge the responses on the board.
5. At the end, correct any misconceptions, note opposing points of view, and summarize main points.

Value: promotes critical and creative thinking and imagination

Concept Map Steps:

1. Provide students with a list of terms relative to their course work (either from the previous class, last several classes or most recent lecture segment). Terms may be provided as a list or given out as a stack of cards.
2. Ask students to create a meaningful pattern with these terms (i.e. food web—how are different organisms linked, cardiovascular system blood flow, etc.). There may be one “right” answer or the concepts may promote creative exploration of the topic.
3. If time allows, ask one group to share concept map with the whole class. Or alternatively, ask groups to explain their pattern to another group in the class.

Value: promotes integration of ideas, provides immediate feedback about student understanding,

Decision Making Steps:

1. Provide students with problem that they need to work on for example “Imagine you are the director of the antibiotic discovery unit in a major pharmaceutical company and you are asked for a five-year plan to develop new antibiotics. You are told that the plan will be funded only if you can convince your managers that you will be able to develop the five new drugs with entirely new modes of action. Can you do it? What is your plan and how will you defend it?”

2. Ask students to work in groups (2-4 students) to develop a plan based on what they have learned in class.

3. Have students share ideas with class, making notes on the board.

4. Ask other students in the class to comment on each group’s proposal and suggest changes.

Value: promotes integration of ideas, critical, creative thinking, provides immediate feedback about student understanding,

Item Clarification Steps:

1. Give students a handout or post a slide that lists key terms or items for discussion.

2. Ask students to review the list and select a few items for clarification.

3. Next have students get into pairs and select a particular item for immediate clarification.

4. Call a student at random and clarify the chosen item (or, better yet, ask if another student can offer clarification).

5. Call on additional students and continue to clarify items.

6. Near the end, if time allows, ask participants if there are of your responses or those of other students they want to challenge or debate.

7. Conclude with a brief review of the items.

Value: provides immediate feedback about student understanding, and it helps prioritize items for review or discussion

Group Graphic Steps:

1. Have students get in pairs or small groups.

2. Ask the pairs or groups to illustrate lecture content by constructing a picture, diagram, flowchart, concept map, or some other visual illustration that represents their understanding of the content.

3. Have students report on their group graphic to the rest of the class, explaining what is represented and why (their representation might also include questions, unknowns, etc.).

4. Have other groups respond with questions, feedback or suggestions, and you can also provide feedback to help clarify questions, point out misconceptions or oversimplifications, or correct errors. You can also have groups turn in their illustrations for you to scrutinize after class and later hand back with feedback.

Variation for Large Classes: Have small groups assign roles such as recorder (person drawing), facilitator (ensures everyone participates), reporter (will report on illustration), and participants (contribute to discussion). Once the graphic complete, have the reporters from each group go to a different group and report on the illustration, receiving feedback from the other group. Some instructors provide markers and large post-it notes or pieces of paper and tape to adhere illustrations to a wall.

Value: promotes integration of ideas and thinking, facilitates attention on the “big picture” and relationships among ideas, and allows for creativity in thinking and expression

Matrix Steps:

1. Students should create a table with information to compare (i.e. pros/con, two different processes)

2. Ask students to work in groups (2-4 students) to fill out the table

3. Have groups share their ideas with the class and make notes on the board.

Value: promotes integration of ideas, allows students to easily compare ideas and reduce complexity.

Minute Paper Steps:

1. At the end of a lecture segment or the end of the lecture class, have students spend two or three minutes writing a summary of the main points.
2. Ask at least one student to share what he/she wrote.
3. Collect the papers for review (but not for a grade).
4. You can also use the minute paper to have students to write down questions they have about the lecture, 3 key points of the day, indicate points they don't understand, or share feedback about your delivery, use of slides, etc.

Value: provides immediate feedback about student understanding, helps prioritize items for review or discussion, and allows students to put material into their own words

Learning activity	Value of activity	Limitation of activity	When would you use this in class
Matrix			
Minute paper, etc.			

Multiple-Choice Survey Steps:

1. Put a multiple-choice item, preferably conceptual in nature, related to your mini-lecture on the board, a slide, or an overhead, and give four response options.
2. Survey student responses (have them raise hands, use colored cards, or use electronic response system – ‘clicker’).
3. Next have them get into pairs and take a couple of minutes to convince each other of their responses.
4. Then re-survey the students.
5. Clarify any misconceptions before proceeding.

Value: makes students apply and discuss material while fresh in their minds, and it provides immediate feedback about student understanding

Quick Case Study Steps:

1. Display a very brief case on an overhead or slide

2. Pose specific questions for students to answer based on the case [For example, “What is the problem? What is the remedy? What is the prevention?]
3. Have students write down their answers.
4. Students can work individually or in pairs or small groups.
5. If time allows, select a few students to share aloud their answers

Value: makes students apply material to a realistic situation, and it promotes critical and creative thinking.

Quick Thinks

For each of the following, use immediate material from lecture, and allow students a couple of minutes to reflect before surveying their responses (have students share aloud, and you can collect written responses for participation points):

- *Correct the Error:* Present students with a statement, equation, or visual that you have intentionally made incorrect and have them correct the error. The error may be an illogical or inaccurate statement, premise, inference, prediction, or implication.
- *Complete a Sentence Stem:* Present students with a sentence starter and have them complete the sentence. The completed statement may be a definition, category, cause-and-effect relationship, rationale, controversy, etc. Try to avoid statements that ask for rote knowledge.
- *Reorder the Steps:* Present sequence items in the wrong order and have students re-order the sequence correctly. This might be a process, cycle, method, plan, technique, etc.
- *Interpretation/Paraphrase:* Let students know that you will be calling on them at random during your lecture and asking them to interpret what you’ve said, putting the material in their own words. When you are ready, pause for a moment to signal that you are about to call on someone. Once a student has shared, you can have another student add more. You can also have students work and share in pairs.

- *What do You See?* Present students with an image, such as a picture, symbol, graphic, equation, etc., and ask them “what do you see?” The image can be something new or familiar to students. The idea is to ascertain if they can identify noticeable patterns, discrepancies, unusual features, and so on. You can also present an intentionally altered image to determine if students can identify what is wrong or missing or suggest how to correct it.

- *Reach a Conclusion:* Present students with some data, opinion, event, or solution and have them infer logically the implications of the facts, concepts or principles involved. Their conclusions can be probably results, probable causes or outcomes.

Value: these exercises foster attentiveness, provide immediate feedback about student understanding, and promote critical thinking skills

Plus/Delta (+/Δ) Steps:

1. At the end of class ask students to take a sheet of paper and divide it into two columns.

2. In column 1(+) students write down what was very positive about the class, an activity, or instructional materials. In column 2(Δ) students write what they would like to change for the future.

3. Collect student responses.

4. Read student responses and make changes for next class accordingly.

5. In the next class share some of the highlights with students and make changes as necessary.

Value: provides immediate feedback to the instructor, allows for quick changes even in the middle of a term.

Reflection Steps:

1. Have students take a few minutes to think and write down their thoughts about the lecture material just

presented or a particular question or problem that has been posed

2. Collect student papers, if you wish, and review their responses to assess their understanding and identify areas that need clarification at the

beginning of the next lecture (you can also assign participation points for responses or allow students to submit them anonymously)

Value: allows students to think through material and put it in their own words

Stretch Break Steps:

1. At any time you sense students are losing focus or energy, you can pause your lecture and have students stand and stretch or move about. Research indicates that the simple act of stretching or moving can refocus student attention and enhance their learning. You can add content by having students discuss a particular question or summarize a particular idea together while they stretch or move. Some instructors play music while students are moving about.

Value: promotes alertness and adds variety to the classroom experience

Strip Sequence Steps:

1. Provide students with an out of order list of step in a multi-stepped process (can be written on small strips of paper or on the class screen).

2. In groups or individually, have students put the “strips” into the correct order from beginning to end.

3. Have student groups compare answers with another group.

4. Review order and answer questions (especially to clarify misconceptions) for the whole class.

Value: promotes critical thinking and collaborative learning.

Think Aloud Inquiry Steps:

1. Present a particular problem, ideally an appropriate discipline-related problem that can be solved in a relatively short time frame (or, for a more complex problem, the method of inquiry via which you would go about solving the problem can be presented).

2. Next, literally talk aloud in front of students how you would go about engaging the problem. You might say, for example, “Okay, for this particular problem, first I need to clarify the nature of the problem. Do I understand what is at stake? From what is given here, I understand it to involve x,y,z . Given this, the

next thing I need to do is consider....” And so on. The idea is to demonstrate explicitly your thinking process (or a formal process of inquiry) so that students can literally observe/hear “thinking in action” as one moves through a basic process of inquiry or problem-solving (e.g. identify the nature of the problem, analyze the knowledge or skills required to engage it, identify potential solutions, choose the best solution, evaluate potential outcomes, report on findings, etc.).

3. Next, have student form pairs and assume the roles of “problem-solver” and “listener.” Then present a problem for them to solve. The “problem-solver” is to read the problem aloud and talk through the reasoning process in attempting to solve it. The role of the listener is to encourage the problem-solver to think aloud, describing the steps to solve the problem. The listener can also ask clarifying questions or offer suggestions but should not actually solve the problem.

4. Present yet another problem and have students switch roles.

5. After an allotted amount of time, have student pairs share their experience. Did they actually solve the problems? What obstacles or breakthroughs did they encounter? How did it feel to talk aloud or listen to “thinking in action”?

Value: promotes critical thinking and inquiry, attentiveness, and collaborative learning

Think – Pair – Share Steps:

1. Pose a question.
2. Students get into pairs and discuss question, coming to some resolution.

3. Each student pair then shares conclusions with entire class (in large classes or when time is limited, call on as many pairs as time allows).

Value: promotes critical thinking and collaborative learning.

Conclusion. Thus exponential growth in medical knowledge requires new approaches in medical education. That is why long-term retention of knowledge requires active processing of information and use of higher-order thinking skills. And medical students have choices about their learning and can maintain intrinsic motivation will learn better and be able to apply their knowledge outside the

classroom. And of course teachers have an important role in designing learning activities and assessment strategies that foster independent learning and higher-order thinking skills. That is why teachers have to create a supportive learning environment with new interactive methods that reinforces self-directed learning and professional behavior that can enhance student learning.

References

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