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PERSONAL VIEW

Middle school meets MedEd: Five K-12 teaching strategies medical educators should know

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ABSTRACT
While the COVID-19 pandemic has challenged the way medical educators develop and deliver content, it has also presented an opportunity for innovation. As students, trainees, and faculty design new curricula and employ new learning modalities, primary and secondary school offer a wealth of teaching strategies and ideas for medical education. In this *Personal View*, the authors share their experience as former middle school teachers and current medical students to offer five valuable teaching strategies – backwards planning, the 5E model, setting norms, scaffoldings, and checks for understanding (CFUs) – for medical educators to incorporate into their practice.

KEYWORDS
Medical education; teaching strategies; undergraduate medical education; 5E model

It is a universal feeling – realizing your students do not understand the lesson you spent hours preparing. As former middle school science teachers and current medical students, we have experienced this frustration from both sides. Numerous teaching strategies exist within primary and secondary education to help prevent student misunderstanding and redirect when it occurs. However, reports of utilization of these approaches in the medical education literature are limited. As the world was upended by the COVID-19 pandemic, educational settings changed drastically overnight. Despite its challenges, from making hands-on activities virtual to engaging students amid 'Zoom fatigue,' this time presents the exciting opportunity to explore new education practices. This article provides medical educators with five K-12 teaching tools that can be easily implemented into medical education settings with minimal change to an individual's current teaching approach.

Tip: Backwards planning

Definition

Creating lesson(s) by starting with the end goal and designing learning activities to reach this benchmark (Wiggins and McTighe 1998). Piece-by-piece, students gain the knowledge they are expected to demonstrate by the end of the learning period.

K-12 application

A unit on forces uses model bridge building as its final project. Utilizing backwards planning, the teacher plans a progressive lesson series that teaches each of the individual steps required to perform this model bridge building end-of-unit activity.

MedEd crossover

When teaching patient history-taking to preclinical students, considering the full interview a student is expected to perform on clinical rotations on clerkships can guide planning of course activities. For example, educators might divide history-taking into the separate components of agenda setting, history of present illness, and additional history (e.g. medical, surgical, social, and review of systems) before creating a progressive series of workshops that build on each component.

Tip: 5E model

Definition

An inquiry-based lesson-planning model that progresses through well-defined stages of learning and testing knowledge: engage, explore, explain, extend, and evaluate (Bybee et al. 2006). The model can span one lesson or a series that build on each other.

K-12 Application

A 5E lesson on mitosis might include: (1) Engage – students are asked how tall they were 5 years ago and whether this differs from their height today. They discuss with classmates and make predictions about how living organisms grow. (2) Explore – students watch a video showing mitosis without narration and write observations about what they see. (3) Explain – the teacher gives a short (<10 min) presentation on mitosis while students take notes. (4) Extend – in small groups, students create mitosis models using pipe-cleaners and write each stage in their

own words. (5) Evaluate – in the final 5 minutes, students fill out an "exit ticket," an end-of-lesson quiz, with three key questions about mitosis for the teacher to evaluate comprehension.

MedEd crossover

The 5E Model can be employed to teach the pulmonary exam: (1) Engage – students individually listen to classical music songs with headphones, take notes on which instruments they hear, and then discuss with nearby classmates. (2) Explore – as a large group, students listen to normal and abnormal lung sounds without being told which is which, and write down guesses on a worksheet and share ideas with classmates. (3) Explain – professor gives a 10-min didactic on lung exam technique and associated sounds. (4) Extend – students individually listen to a new set of sounds and categorize them as normal or abnormal, specifying the abnormality. (5) Evaluate – students complete an exit quiz so the medical educator can assess student understanding of lung sounds to inform future sessions.

Tip: Setting norms

Definition

Providing clear directions and expectations by thinking from the perspective of the learner (Zuckerman 2007). Setting clear expectations for student behavior and deliverables at the beginning of a lesson can reduce learner anxiety and encourages positive engagement.

K-12 application

Every middle school teacher learns that asking a student to 'please sit down' will result in them taking a seat immediately wherever they are standing, dropping to the floor dramatically for comedic effect. Instead, teachers provide specific, student-centered directions, '[Name] please go back to your desk and sit quietly in your chair while we finish reviewing homework.'

MedEd crossover

Sharing preferences for student behaviors (e.g. hand-raising, question timing, and technology use) at a lesson's outset empowers students who want to be engaged, eliminating concern about appropriate participation. This is especially important in virtual classrooms, where students have added participation decisions like using the chat or turning on cameras. For example, when utilizing Zoom breakout rooms, educators should explain exactly what the expectations are (e.g. 'for the next three minutes, your group will create a list of your top five diagnoses in order from most to least likely. At the end, one volunteer from each small group will share their differential with the rest of the class'). Adjuncts to clear verbal instructions are useful, such as displaying instructions while speaking the directions, including instructions on worksheets, and using the 'broadcast' feature to check in with students while they are in breakout rooms.

Tip: Scaffolding

Definition

Providing differing levels of support as student's progress through levels of mastery of a skill (The IRIS Center 2005). Scaffolds can involve providing physical supports (e.g. graphic organizer), utilizing accessible content, or modeling with gradual release of responsibility (The IRIS Center 2005).

K-12 application

When teaching students about constructing hypotheses, the K-12 teacher provides content scaffolding through examples using situations familiar to the students – for example, making hypotheses about the weather. Similarly, the use of sentence stems – providing the start of a sentence to help students format their hypotheses correctly – acts as a physical scaffold.

MedEd crossover

Scaffolds can be employed when teaching clinical students how to frame a differential diagnosis based on the students' experience level. An early third-year student would benefit from an organ-system-based schema (e.g. cardiac, pulmonary, and neurological). A sub-internship-level student can use advanced, physiology-based schema for a differential (e.g. prerenal, intrarenal, and postrenal causes of acute kidney injury). By contrast, senior residents may no longer need any scaffolds to be able to articulate their differential.

Tip: Check for understanding (CFU)

Definition

In-the-moment assessment of student understanding that is used to support learners, reduce misunderstanding, and modify future teaching (Rosenshine 2012).

K-12 application

CFUs for a whole class might include asking students to give a 'thumbs up' or 'thumbs down' for a true or false question, sharing how comfortable they feel with a topic by showing a number 1–5, or writing answers to a mid-lesson quiz on individual dry-erase boards.

MedEd crossover

CFUs may be even more important in the rapid pace of health professions schools with medical educators having less flexibility to re-teach if students have not mastered a concept by the end of a session. For example, a professor teaching a preclinical lesson on cardiac physiology might pause after initially discussing cardiac output to display anonymous poll questions, then engage in clarification as needed before moving on to discuss the cardiac cycle.

Medical educators invest significant time, effort, and dedication into preparing their materials, admirably balancing high-volume content, varying learner needs, and changing expectations in content delivery (e.g. virtual). With these strategies borrowed from K-12 education in their toolbox, medical educators may find novel ways of engaging learners, making material more accessible, and evaluating their lesson's effectiveness in real time.

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