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Invited Review

Engaging trainees within the virtual classroom: Teaching strategies for rheumatologists in a pandemic

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Abstract

Social distancing during the COVID-19 pandemic has led to unprecedented challenges in medical education, including for rheumatology training programs. Many programs have adapted by transitioning educational curricula into virtual classrooms. Herein, we review strategies to optimize learning within the virtual classroom. We introduce the flipped virtual classroom as a framework for facilitating higher-order thinking and improving long-term learning. We provide recommendations to maximize interactions between learners, elevate group discussions, and encourage problem solving. Once implemented, these techniques can lead to more productive teaching and learning experiences while maintaining a sense of community for rheumatology training programs.

Keywords: COVID-19, pandemics, teaching, education, virtual reality

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Introduction

Social distancing during the COVID-19 pandemic has led to unprecedented challenges in medical education, including for rheumatology training programs. Many programs have adapted by transitioning from in-person teaching to educating medical students, internal medicine residents, and rheumatology fellows within virtual classrooms. While a necessary adaptation to the pandemic, this change may impact the sense of community within training programs and may adversely affect trainee development and wellness.[1] Furthermore, it may trigger discomfort among faculty members who have little, if any, virtual teaching experience. Studies have previously identified technical skill deficiencies and negative attitudes about engaging with new technologies as barriers to online learning in medical education.[2]

Fortunately, a set of skills and behaviors to incorporate during virtual teaching has the potential to overcome many of these challenges. This communication will review a range of techniques to employ within the virtual classroom to engage trainees in becoming active participants in their education. We begin by providing tips to prepare for virtual teaching (Table 1). We subsequently offer strategies to invite participation within lectures, and we conclude by reviewing tools for enhancing engagement in the virtual classroom. In addition to considering new strategies, readers may consider reflecting on past teaching methods that may transition well into the remote setting.

Online Platform Considerations

Select an appropriate platform

An appropriate platform should be reliable, support active learning, and provide the proper level of security. As defined by Bonwell and Elison, active learning refers to "anything that involves students in doing things and thinking about the things they are doing."[3–5] Studies have shown that active learning increases performance at all levels of education.[6] Active learning is especially crucial in rheumatology, given its analytical nature. Trainees need to learn how to apply information to new cases, analyze connections between concepts, and justify clinical decisions, which is best achieved through active learning. Active learning is notably underutilized within fellowship programs and is now under threat amidst the global pandemic as we transition to a virtual classroom.[7]

There are multiple virtual learning platforms, and each has its own set of strengths and weaknesses. These authors have experience with StarLeaf (StarLeaf, United Kingdom), WebEx (Cisco Webex, California), and Zoom (Zoom, California). While security and privacy breaches have been reported with Zoom, this platform has several interactive features that can facilitate better active learning–most of which will be highlighted later.[8] Google Classroom (Google LLC, USA) and Microsoft Teams (Microsoft Corporation, USA)

Table 1. Seven tips for successful implementation of a virtual classroom

Tips	Example/Explanation
1. Choose a platform that is reliable and will support active learning while providing the appropriate level of security for your needs	Consider choosing from subscriptions that are already available within your institution
2. Set expectations or "house rules" for your virtual classroom	Trainees are expected to mute their microphones (except when speaking) and leave video on during lectures
3. Assign preparatory material for trainees to review prior to online sessions	This can be used to augment learner curiosity and allow for higher-level discussions within the virtual classroom
4. Familiarize yourself with the virtual platform in advance of your talk	Ideally, the whole division should be oriented to the platform by someone with local expertise
5. Engage your learners by encouraging them to reflect, answer questions, and participate in group discussions	Consider mandating that trainees join with video (in addition to audio) to improve accountability and communication
6. Adopt tools for enhancing learner engagement within the virtual classroom	For example, use the polling feature to determine baseline knowledge anonymously. See Table 2 for a comprehensive list of tools
7. Assign a moderator to monitor to monitor the chat and direct questions to the speaker	Accept that there will be a learning curve and that you may encounter technical difficulties–maintain a positive attitude and seek feedback

have similar functionality to Zoom. In Boston, a cardiology training program notably worked with Microsoft Teams to customize their virtual learning platform to meet their educational needs.[9] While customized platforms may be the way of the future, this is unlikely to be a viable option for most training programs at short notice.

We encourage faculty to weigh the importance of additional features that may increase interaction within the virtual environment, the platform's cost, and available security features. If patients are being discussed, the platform chosen should be compliant with local patient confidentiality regulations, including securing the login process with passwords.[8,10]

Main Points

- Social distancing during the COVID-19 pandemic has led to unprecedented challenges in medical education and simultaneously created opportunities to reassess current teaching strategies within rheumatology training programs.
- The flipped virtual classroom can be used as a framework for facilitating active learning within rheumatology curricula.
- Teaching strategies that foster interaction between learners and provide opportunities for problem solving will facilitate higher-order thinking and improve long-term learning.
- A willingness to embrace new technology will lead to more productive teaching and learning experiences within rheumatology training programs.

Customize platform settings

The "host" of the virtual meeting may customize the default meeting settings. Consider enabling features that will increase engagement (such as polling and breakout rooms, more below). Consider disabling distracting features to decrease the cognitive load of the speaker, such as by ensuring that people "enter" the virtual classroom on "mute," and disabling sound notifications when a participant enters or leaves the room.

Prepare in Advance for Online Sessions

Set expectations, or "house rules," for the virtual classroom

Think about how you want to engage your learners and how you want them to engage with you within the virtual classroom. In our experience, inviting fellows to ask questions aloud (as they historically might have done in person) may be reasonable for small group learning. When larger groups are present, it is less disruptive to invite questions by having participants "raise their hand" virtually or by typing their inquiries into the chat. The audience should keep their microphones on mute when they are not speaking to avoid inadvertent interruptions.

A limitation of the virtual learning environment is that learners may not feel comfortable participating, particularly early in the academic year, if there have been few opportunities to meet faculty in person. In small group settings, encouraging trainees to keep their videos on throughout the session can improve engagement and allow for a better sense of community within the virtual classroom. Adding educational experiences in small groups, or having fellows meet for one-on-one discussions with faculty, may enhance familiarity and increase the psychological safety for trainees. The learning environment likely affects fellows, residents, and medical students differently, and the opportunity to participate more anonymously may be necessary for the psychological safety of students. Thus, rules around the use of video should be made while keeping the psychological safety of trainees in mind.

Circulate clear guidance for trainees regarding behavior within the virtual classroom. These rules of engagement should similarly be shared with guest speakers.

Example: Fellows are expected to interact within the virtual classroom by asking and answering questions and by participating in group discussions. You may ask questions by raising your hand or typing in the chat. To facilitate this, keep your video on during classroom time. Microphones should be muted by default and turned on when you are speaking.

Assign preparatory material for trainees to review before online sessions

One of the simplest ways to increase engagement with a topic is through a flipped classroom. Within this framework, trainees are responsible for completing a predidactic activity before joining the virtual classroom.[11] The predidactic assignment can generate curiosity amongst learners and lift the faculty's burden from having to cover all of the material in their lecture. Within the virtual classroom, faculty provide an opportunity for trainees to apply the knowledge learned in advance of the talk, such as by working through clinical vignettes. In postgraduate medical education, multiple studies have shown better knowledge acquisition and retention using this method than standard lectures.[12,13] The flipped classroom provides an excellent framework for using other interactive strategies within the virtual classroom. Faculty

Table 2. Interactive tools available through zoom.

Tool	Use/Example
Chat function	Allows learners to enter comments or questions Facilitates crowd-sourcing of information and resource-sharing
Breakout rooms	Facilitates small-group discussions and promotes independent thinking Example: Consider dividing into groups of 2-4 learners; groups may subsequently rejoin the main classroom and share their ideas
Audience polling	Allows the speaker to ask questions throughout presentation Used to determine prior knowledge or experience on a topic or to identify areas of confusion Provides opportunity for learners to apply knowledge to new settings Ex: "Given what you learned about relapsing polychondritis, how would you treat this patient?"
Annotate	Facilitates collaboration by allowing the presenter or participants to mark up a PowerPoint slide, a figure, or an article
White board	Used to give "chalk talk" Can also be used as a collaborative tool for group brainstorming

may consider choosing a particularly challenging or important topic for fellows and assign a predidactic assignment focused on this area.[11] This may be part of a book chapter, an article, a podcast, or a recorded lecture.

Example: Rheumatology fellows are assigned an article highlighting pulmonary involvement in limited cutaneous versus diffuse cutaneous systemic sclerosis. Within the virtual classroom, fellows engage in case-based problem solving for patients with systemic sclerosis, including ordering and interpreting relevant diagnostic tests for its cardiopulmonary manifestations.

Familiarize yourself with the technology and communication skills relevant to the virtual platform

Test your speaker and microphone settings and practice sharing your screen at least once in advance of your lecture. If you are using Zoom, you have the option of sharing one application (such as PowerPoint) versus your whole screen (which may be necessary if you intend to switch to a different application during your presentation).

Compensate for the more limited body language online by sitting up straight and making good eye contact (achieved by looking at the camera).[14] This type of engaging body language can convey energy, respect, and interest. Check-in with your learners more frequently than you do during in-person teaching. This can be done by pausing strategically during a lecture and inviting fellow input. After selecting your presentation through "share screen," your face will be minimized. You may toggle between views (e.g., change from only viewing the speaker's face to "gallery view") to see multiple members of the virtual classroom to better engage with your learners.

Example 1: Ask "What questions do you have?" rather than "Do you have questions?" This makes it more psychologically safe by assuming they must have questions.

Example 2: "That was a lot of information, so I'm going to pause here to take questions."

Numerous educational studies have shown that waiting more than 3 seconds after asking a question increases the likelihood and quality of responses.[15] Additional wait time is likely needed over virtual platforms because trainees also need to unmute themselves after they have thought about what they want to say.

Familiarize yourself with virtual tools for improving engagement

Consider using a moderator to assist in engaging trainees

A designated moderator could be anyone interested in medical education, such as the program director, a senior fellow, or a faculty member. The moderator can monitor the chat and note when trainees use the "Raise Hand" feature, respond to comments by typing in the chat, or invite participants to "un-mute" and respond to the speaker's questions. Utilizing a moderator may be particularly important in larger group meetings, such as when the entire division is present. The moderator may be less critical in smaller group formats; however, there may still be a role in supporting the speaker by reducing the speaker's cognitive load in managing the virtual environment and troubleshoot technical issues (Table 2).

Encourage participation in group discussions

Many rheumatology fellowship programs are ripe for small-group learning as they may range in size from two to six fellows. Small-group learning fosters shared leadership and provides opportunities to develop critical thinking and decision-making skills.[16] As the group's size increases, the opportunity for interaction decreases. Larger groups may be split into breakout rooms, which are an excellent way to operationalize small-group learning within the virtual classroom.

Example: You present a clinical vignette of a middle-aged woman with rheumatoid arthritis and class IV heart failure who has ongoing disease activity despite maximum oral doses of methotrexate. You decide to break up the group, consisting of five fellows, two residents, and one student, into three smaller groups and ask them to develop a plan for managing this patient, including what treatment options are available and what laboratory parameters would need to be monitored.

When thinking about the types of tasks for the breakout room, questions should be aimed at enhancing critical thinking skills, which are often underutilized in medical education.[17] Asking higher-order, open-ended questions that begin with "how does…" or "why does…" better allow learners to show their comprehension of the materials than lower-order questions that have a single right answer, such as those that begin with "what is…." Higher-order questions typically require critical thinking skills to answer, whereas closed-ended questions may only test for memorization. Asking follow-up questions that require learners to explain their reasoning is also an excellent way to probe for correct understanding and allow learners to reflect on their knowledge.

Ask: "Why do patients with inflammatory arthritis experience morning stiffness?" Rather than "What is the length of time that patients with inflammatory arthritis experience morning stiffness?" Ask: "How would you manage the above patient with ongoing disease activity despite methotrexate use?" Rather than "What is the contraindication to adding a TNF inhibitor in her case?"

When participants are sent into breakout rooms, they will not see the main room's screen share (Figure 1). If the groups have been given a complex assignment, they may forget what they were sent there to do, and the speaker will not be immediately available

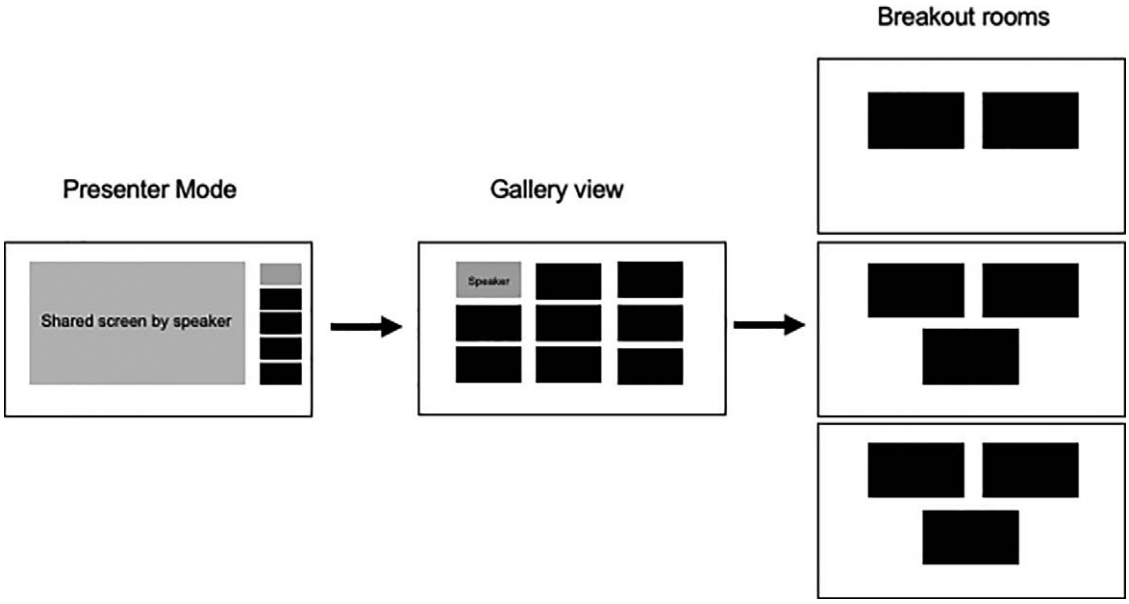

Figure 1. Transitioning from presenter mode to breakout rooms. Left: shared presentation via "screen share." Middle: gallery view after "share screen" has been stopped. Right: breakout room scenario depicting three separate breakout classrooms, each of which has been assigned two or three participants. The speaker can move virtually from room to room to check on individual groups if desired.

for clarification questions. To counter these limitations, one strategy is to provide everyone with a link to a shared document (e.g., google slides) that has the assignment before sending participants into their breakout rooms. One participant can "share screen" with the other members of the breakout room, so that everyone is on the same page about the assignment. Consider setting an exact end time (e.g., at 8:30, I will bring us back into the main room for discussion).

When breakout groups are larger than two or three people, or if the people in the group do not know each other, time may be wasted while negotiating their roles. Therefore, you may want to designate a "team captain" ahead of time to share their screen and lead the small group discussion. This person can also be appointed to "report out" when the small groups reconvene in the larger group. In these small groups, everyone's participation should be encouraged in order to get the benefits from small-group learning. After reconvening with the larger group, having learners reflect, identify, and share key learning points from each small group session may provide further learning benefits for trainees.[18]

Note that only the meeting "host" can create, "open," and "close" breakout rooms. The designated "co-host" can move amongst breakout rooms but cannot generate the room assignments.

Chat function

The chat function may allow participants to ask or answer questions or allow for a group discussion of a topic. The chat function can also help troubleshoot technical difficulties (such as if a participant is having problems with their microphone). It can sometimes be difficult for a junior learner to speak up in a large group, but the chat can be an easier way to add a comment or ask a question without feeling the spotlight is on them. In our experience, it is challenging to monitor the chat while actively engaged in teaching, and it may be an excellent strategy to designate a moderator to monitor the chat, particularly in larger group settings.

Audience response systems

Audience response systems allow instructors to identify areas of confusion and address misconceptions in real-time.[19] This may be easily done in the virtual classroom through polling. An additional benefit of polling is that it can allow participants to commit to an answer anonymously.

Example 1: Polling feature on Zoom. This allows for participants to answer multiple-choice or yes/no questions.

Example 2: Direct poll QR codes allow learners to link to live polls easily during lectures.

Example 3: Other external polling programs, such as PollEverywhere, can allow respondents to enter a customized answer.

Polling via Zoom has less features than external polling platforms; however, it is technically easier to use.

Annotate

The annotate feature can be turned on during "screen share" and allows either the presenter or participants to annotate the screen. This feature may be useful to highlight areas of interest on imaging and pathology slides. Alternatively, this may be useful for presenters when presenting a figure or table as part of a journal club, where the presenter may highlight areas of particular interest. Remember to "clear annotations" before moving to the next slide of your presentation.

Whiteboard

The whiteboard can be set up through "screen share," and it allows you to share a blank screen that can function similarly to a traditional whiteboard in the classroom. This can be used to give "chalk talks" on a particular topic. Additionally, when used with the "annotate tool," this can be used for collaborative brainstorming. Participants may type onto the whiteboard (e.g., when building a differential diagnosis for a case).

A virtual whiteboard does not allow the same degree of engagement as an actual whiteboard, in the authors' experience. In person, the speaker can use their body language and gestures to call attention to parts of the board at the appropriate time; however, with a virtual whiteboard, new words or figures appear seemingly at random from the audience's point of view.

If using the virtual whiteboard, the authors encourage using a tablet computer with a

stylus, since writing with a mouse can be unnatural and slow. Using a prebuilt template to annotate is another strategy for making the virtual board more effective.

Conclusion

The COVID-19 pandemic has transformed medical education for all trainees and increased reliance on remote learning. These changes have generated an opportunity to reassess current teaching strategies and implement new techniques within subspecialty training programs. Virtual learning will be successful if trainees participate during didactics by asking and answering questions, contributing to group discussions, and solving clinical problems, rather than sitting and listening quietly. While there will likely be growing pains and technical issues during this transformation, a willingness to educate ourselves and embrace new technology will lead to more productive teaching and learning experiences and maintain a sense of community for rheumatology training programs.

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