BioPharmaceutical Technology Center
I N S T I T U T E

Maintaining Engagement and Assessing Understanding

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Apollo 13 launched from Kennedy Space Center on April 11, 1970. It was to be the third mission to land on the moon. On the third day of the mission, however, an explosion in one of the oxygen tanks required that engineers at NASA determine how to quickly and safely return the astronauts to Earth. While returning the spacecraft to Earth could be managed by a "sling shot" around the Moon, the astronauts were required to move to the lunar module (LM) and the LM was not built to remove enough carbon dioxide for the rest of the modified trip. Using only parts available to the astronauts, NASA engineers were able to help the astronauts build a modified carbon dioxide scrubbing system. Thankfully, the astronauts were able to return safely to Earth on April 17th.

I have always been amazed at the ingenuity of those NASA engineers. Their brilliance certainly saved lives and the future of the NASA space missions. What gets lost in the story is that the directions had to be read to the astronauts. That's right. No video. Those spoken directions had to be crystal clear so that the astronauts could build something they had never seen before. The communication between engineers and astronauts had to be perfect - there was no other option.

At times, teaching online feels like what the astronauts and engineers must have experienced during those tense moments. To be clear, I am not saying that online teaching is "life or death". However, it has sometimes been really hard to know in the moment if the students are understanding what we are teaching. Despite videos and animations and pleas for "screens to be on" during Google Meets, it is often difficult to know if the communication we are sending is being received and understood. In the classroom, teachers can "check in" with their students. A quick question, a show of hands, even just the look on their faces can be all the feedback that a teacher needs in order to know if the students understand. Those same methods are not as effective online.

I have used multiple tools to help generate feedback and close that communication loop. Two that I will mention here are *Pear Deck* and *Edpuzzle*.

Pear Deck is an application which is used with presentations such as *Google Slides*. It allows teachers to embed questions directly into the presentation and gives the students a chance to respond. While the questions could be multiple choice or short answer, the most powerful ones are built around drawing. For example, students can draw what they anticipate happening in an experiment. These responses are anonymous so students can feel free to respond without judgment from their peers. As a teacher, I can see the data as a class set of responses or as individuals. I can also respond to individual students to best guide their thinking. I can also see who has not responded and who may no longer be engaged in their learning.

Edpuzzle is similar to *Pear Deck* in that it embeds questions, but *Edpuzzle* is designed to work with video. I use this program when I assign presentations. These are the same presentations that I would normally give "live" in the classroom. By embedding questions using *Edpuzzle*, however, I am able to monitor students' learning. Additionally, I can include explanations to these questions so students can reorient their thinking if necessary. Like *Pear Deck*, this resource also allows me to know if there are concepts that need further explanation. Lastly, I close each presentation with the following question: "Do you have any questions about this presentation?". Students will often share specific questions about topics that confused them (great feedback for our next live lesson). Some will share things they wondered about (great evidence that they were applying their learning).

In some ways, I am finding that I actually receive more feedback than I do in the traditional classroom. I know what they understand, what they don't understand, and whether or not they have been paying attention. Oh, it sometimes still feels a bit like what the Apollo 13 engineers and astronauts must have experienced, but these resources have certainly assisted us and I am certainly planning on utilizing them when some of our students return to the classroom in February.

Finally, a brief update: the *BTC Institute*, in partnership with *Embi Tec*, was able to offer an online seminar on online teaching to teachers on the evening of January 12, 2021. We met with teachers from across the nation --some of the teachers in attendance that evening were AP Biology teachers and others were middle school teachers. It was a great evening of sharing different strategies for engaging students in science experiments even if they are still in virtual classrooms. These opportunities to engage with other teachers always remind me of large differences from one school to another. The resources that one school has are not available to others. The background knowledge present in one classroom is not the same as others. Teachers are stepping up to the challenge to constantly learn new concepts and new methods in the interest of their students' learning!