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Traditional teaching is a method that is commonly used, and it involves the teacher lecturing from a textbook or a presentation which typically does not allow for inquiry from the students. Biology is a topic rich in information and with the right tools, like inquiry-based learning, students will be able to be engaged and form a deep understanding of the topic. According to student responses done through research of what makes biology difficult and easy to learn, they stated that the teacher reading from books makes it difficult to learn while using 3-D materials, experimenting/observing, and learning in a fun way makes it easier to learn (Çimer, 2012). Inquiry-based learning allows students to learn in a way that allows them to solve for the answers rather than just looking up the answers. This type of learning allows students to engage by making connections to real-world problems through exploration of the topic (Santa Ana College, n.d.).

"Mitosis Mystery!" is an example of a place-based, inquiry lesson in biology that talks about mitosis and the errors that can occur in the process. In this lesson, students are detectives trying to solve the mitosis mystery which is "There is an error in students' mitosis.". Students must discover clues throughout the lesson to find out what the result of the mitosis is. The clues are embedded in matching cards, round one, an analogy, a riddle, and images containing errors which are all part of a 5E lesson plan.

After the Engage, but before the Explore, most students will be introduced to mitosis for the first time. As an inquiry-based lesson, students use matching cards to learn about the mitosis process by matching the labeled image of the mitosis phase with the description of the corresponding phase. The matching cards go from prophase to telophase and include cytokinesis. In the Explore, round 1 consists of 3 variations of the phases which include the correct order of mitosis phases and two that are in an incorrect order. For students to solve this, they would have to refer back to the matching cards activity. At this point of the lesson, students know the phases by name and description, as well as the order, which is prophase, metaphase, anaphase, and telophase, or PMAT. The lesson continues to the results portion, which would be the formation of the daughter cells with and without errors. In the Explain, an analogy is presented, and it's used for students to understand why it's important for chromosomes to un-condense, so interphase is mentioned as well. This analogy consists of students separating cooked pasta, which represents the condensed chromosomes, and uncooked pasta which represents the un-condensed chromosomes. This allows students to understand what would happen if there was an error in prophase. The Elaborate portion consists of students working on a worksheet that will have them draw how the daughter cells look with an error. To get this result, more clues are given through a riddle.

This lesson is place-based because it includes the theme of mystery solving as detectives as well as involving students when saying "There is an error in students' mitosis." This is a valuable

lesson for teachers and future teachers as it promotes higher-order thinking from students, especially since this is an introductory lesson. By the time the lesson is finished, students will know the mitosis phases, the correct order, the mitosis phases affected by errors, and the end result of mitosis with errors.

Through this lesson, viewers will be able to experience what an inquiry lesson is and how it can impact the learning of students as well as give ideas as to how to teach Mitosis in a non-traditional way. This presentation will also include techniques used in an inquiry-based lesson which will help viewers understand the importance of visuals in a lesson. Teachers will be able to see the significance that the adoption of inquiry-based learning will change things from teacher-led to student-led learning and allow students to learn in different ways but still get the same answer (Goodnough & Cahsion, 2003).

Critical Reflection

The lesson being presented was created by both Damaris Alaniz and I, but unfortunately, she was not able to attend the presentation. This meant that I was "teaching" this lesson plan on my own for the first time as we had co-taught the lesson. The audience consisted of high school students in grades 9^{th}-12^{th} which I was a mentor to during the summer, a doctorate student, 3 future teachers, and 2 undergraduate students who were interested in education.

I started the presentation by explaining that the lesson was intended for grades 8-12 and that I would be demonstrating the lesson. As I got into the explore part of the lesson, the students were asking questions as if we were in a real classroom which allowed me the opportunity to see a different ink-formal scenario of teaching. The students were not stressed, and they seemed to be enjoying the work they were doing.

One of the questions that was asked by a student was, *what happens to the person when they get sick?* This is where I was stuck, I hadn't thought of that question coming up. This meant that I was underprepared for my lesson, and I had to tell them "I'm not sure" Then the doctoral student stepped in and answered the question for me and then explained to me in greater detail how the person would be sick depending on the phase.

Fast-forward a couple of months to June, the opportunity to present at the UTeach STEM Educators Conference came up and I took it! Presenting my lesson to the audience I had at the STEM Ed conference, which was all interested in education, allowed me to have the confidence to be able to present to other UTeach students as well as STEM professors from all over the nation. It also allowed me to see multiple views of how a lesson can be interpreted. I decided to tweak the lesson I was going to submit for presentation with the interaction I had with the high school student and doctorate student in mind.

After I finished presenting my lesson plan at the UTeach conference, a professor in biology told me that my lesson was really good and that I should publish it. At first, I was taken by surprise because I thought only research could be published but, that's not the case. I decided to take her word on it and started writing a journal publication about my lesson plan, but I felt like something was missing. Then in September the 7^{th} Annual STEM Ed Conference call for proposals opened and I was determined to submit a proposal to be able to present again, but I had no idea what to do.

I thought back on the interactions I had with my presentation at the 6^{th} Annual STEM Ed conference, and that's when I knew what my proposal was going to be. Knowing that the high school students were going to return, I decided to make a proposal for an interactive workshop. If accepted, I will be teaching my DNA replication lesson, but with the intention of gathering pre and post-data from the students, while also asking for constructive criticism. With this in mind, I

finally have a way to finish my journal article with data to back up the efficiency of the lesson plan. Without the opportunity to present at the 6th Annual STEM Ed conference, I would have never had a chance to teach/present to an audience other than high school students. It also helped me learn that I should always take an opportunity when presented because you never know where it might take you. And although many have probably heard that, including myself, I had never experienced it until the conference.

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