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*Mitosis Sequencing Kit: Plant Cell Mitosis.*

## Overview of Product

As teachers of biology, I think we can agree that when we teach mitosis, we hope our students will do more than just memorize the phases. Unfortunately, that is not the case. When I asked my AP Biology students what mitosis was, they immediately shouted "PMAT." When I asked for some clarification, they were able to recite prophase, metaphase, anaphase, and telophase. When I further asked about the process, I got a lot of blank stares. I had hoped the cell cycle would have been a topic that was covered in enough detail when they were sophomores. No luck. However, I was fortunate to have the Mitosis Sequencing Kit from Cell Zone still sitting in its bag in the back of my room. I had hoped to use the kit with my sophomores, but I decided that my AP biology students needed an intervention. The kit is designed as a Universal Design for Learning System. (UDL is an approach to learning that reaches the most students without watering down the content. To learn more, visit <http://www.CAST.org>.) Knowing a little bit about UDL, I knew the kit would be hands-on, minds-on, and interactive.

## Learning Goals & Standards

Mitosis is one of the universal topics that all biology teachers cover in one form or another during the course of the school year. The National Science Standards for Life Science in High School and Middle School are addressed with the activities found within the guidebook. Depending on what the goal of your course is, this kit can be modified for use in the middle school classroom up to AP Biology or Introductory Biology courses. **Because the kit is UDL, it does reach more learners than the traditional microscope activity that is commonly done.** As found in the guidebook, the UDL approach provides

for a more inclusive classroom that encourages interaction and discussion among students.

## Materials & Preparation

Each kit comes with two different sets of plant-cell photomicrographs. One set is numerical (1–15) and the other alphabetical (A–O). A guidebook is also provided that is full of tips and ideas on how to use the kit. In the guidebook, there is background for instructors, a traditional approach to using the kit, and an inquiry-based learning approach. As for preparation, I was able to have the kit ready to go in about 15 minutes.

## Instruction

What is so great about this kit is the ease with which it takes a complex process such as mitosis and makes it more than just a memorization activity. The Mitosis Sequencing Kit requires students to use knowledge acquired during class and create new knowledge, all the while working as a group.

I used the inquiry-based learning approach with my AP students, who had some previous knowledge about mitosis. I have the luxury of having a small class, so I broke the students up into groups of threes and gave each group a set of cards. I would recommend, as does the guidebook, not to have a group larger than five or six. **I followed the approach laid out in the guidebook, which I found to be really helpful in clearing up some of my students' misconceptions about mitosis and also to reinforce vocabulary.** The students had the cards laid out on their tables, and I had them locate a card where the DNA was condensed, a cell that was not dividing, and so on. Once they had a general sense of how to sequence the cards, I gave them 10 minutes to put them in order. Once the students thought they had the right sequence, I would check it. However, before the students were able to switch, they had to tell me in their own words what was going on

in the pictures. **This is where I just stood back and watched and had one of those moments we get as teachers when we know our students get it. Just listening to the discussion my students were having about mitosis and using the vocabulary really sold me on this kit. I wish I would have found the Mitosis Sequencing Kit about 10 years ago.** I did not realize till we were doing the AP Biology Mitosis/Meiosis Lab what a great pre-lab activity the Mitosis Sequencing Kit was. Sometimes the best lessons are the ones we don't plan on, and this was one of those times.

## Summary

Overall, **the Mitosis Sequencing Kit by Cell Zone is a great investment for \$99.** This kit is meant for student use, not to be sitting on a shelf collecting dust like some of the mitosis models we may have. If you want to make mitosis accessible for every learner, this kit is all you need. I used the kit as what I thought was going to be a review, but later found my students learned much more than I thought they would. Even more importantly, they enjoyed the process; they wanted to use the materials found in the kit. **The kit allowed my students to interact and have conversations that cannot happen when copying notes from an overhead or counting phases under a microscope.** So if you are looking for a new way to approach mitosis, make the content more accessible for all learners, and move beyond memorization, **the Mitosis Sequencing Kit by Cell Zone is the only choice.**

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