

Alexandria Paley

Elective 9: Exploring Physics Education Research

I. Content

- The new technique that I am planning to implement with my students from physport.org is Cooperative Group Problem-solving. The link to the technique is here: <http://groups.physics.umn.edu/physed/Research/CGPS/CGPSintro.htm>
- I feel that this is an important technique for me to implement in my classroom because far too often students do not have a concept of whether the calculated answer to their question makes sense after they completed their plug and chug math. This method will allow students the opportunity to work collaboratively to solve more complex problems and then talk out the misconceptions and problems that arise along the way as they solve more complex challenges that don't easily align with plug and chug. By teaching my students to work to solve problems collaboratively I hope to teach them not only mathematical reasoning skills but also group work/task skills that will benefit them when they have to tackle harder tasks in their future learning endeavors and work environments. Additionally, teaching this technique will benefit my students because they will learn to productively work alone when completing their individual tasks but also how to share and communicate their findings when explaining their results within the larger group. When students have the support of completing a task with their peers collaboratively, they are less fearful of getting the wrong answer because it was generated by an entire group and not one individual person. It is my ultimate goal that by teaching my students this technique I will be teaching them how to analyze and tackle more challenging problems, how to divide work among themselves, how to reason if their answer makes sense within the context of the question by checking and referring back to the original problem, and being able to communicate their answers and misconceptions effectively to their collaborative group. I also see the benefits of this technique outside of physics class settings.

II. Professional Learning Plan

- Goal for the resource: Students will be able to effectively individually solve smaller components of larger complex problems in physics by working collaboratively to analyze the problem and concepts being addressed, design a solution where each member engages in solving and evaluating their component, then work collaboratively to synthesize their

smaller component answers into the completed final answer addressing any misconceptions throughout the process and effectively communicating their final result with mathematical and analytical reasoning.

- Next steps for implementation: The next steps for me to be able to implement this technique are listed below.
 - o I will gather a resource bank of appropriate questions that are complex enough to be solved using this collaborative group method but are not too advanced for the students individual learning levels. There will be a variety of questions related to each of the topics we learn about aligned with the standards to evaluate the students learning and application of the content.
 - o As a class we will identify and outline the steps/process of the collaborative group problem solving technique so that each step of the process is understood by all students. They will then put the technique in their own words as a group to use as a reference for the future.
 - o To outline the technique as a class I will do the following:
 - Take one complex problem and work through the initial 3 steps of the technique together as a class
 - Once the class together completes the “planning solution” stage of the technique I will assign students in pairs to solve one part of the problem.
 - Once the pairs have solved their individual part we will come back together as a class and explain how the answers they obtained should be evaluated as well as how they should share their results with the larger collaborative group.
 - I will break the pairs up into the larger groups so they can practice explaining their answers to their peers and have them evaluate if all of the combined calculated results make logical sense to solving the problem.
 - Then we will again as a class work through what the last step of the process is: evaluating the answers they calculated and combine it all together to answer the original problem.
 - At this point I will teach them how to argue/support their answers using evidence they obtained and then combine their results together and communicate their solution from each of the individual components.

necessarily show the initial learning/teaching of the technique, but it does show the benefits of utilizing the technique. <https://www.youtube.com/watch?v=QxsjpI6OfJQ>

- o I can also ask my colleagues who teach honors and AP physics what some of the strategies they need to know to solve more complex problems and introduce them to those types of problems now, so they become more comfortable and confident in trying those types of problems. I can also ask these colleagues for help when identifying and obtaining problems that would work well for utilizing this technique.