MONTANA STATE UNIVERSITY
Master of Science in Science Education

Crafting the Ideal Physics Classroom

Cal Wilkens, Aurora, CO, July 2024

Background

- Worked as a graduate teaching assistant for two years at Montana State University in Bozeman, MT.
- Not currently employed as an educator but wanted to create a plan that leads to a successful first year teaching physics.

Aspects of an Ideal Classroom

- Utilizing modern technology, such as educational simulations or video games, results in engaged students.
- Having an inclusive classroom environment where both male and female students feel comfortable and are willing to work with their peers on conceptually difficult problems.
- Including activities that implement hands-on learning, or kinesthetic learning, leading to deeper student understanding of difficult topics.
- Transitioning away from the traditional lecture-focused classroom to an active learning environment where students guide their own learning.

Research Question

How can I use inquiry teaching strategies to create an in-depth, active learning environment in the classroom?

Kinematics Storyline

The idea behind the kinematics storyline is to have students be excited to learn about kinematics and physics. To achieve this goal, students are shown a video of projectile motion at the beginning of the unit. They are then tasked with gathering conceptual tools throughout the unit. Students will use these tools to craft their own projectile launchers and hit a target as the final project in this unit.

In the storyline unit lesson plan, seen in the anchor model, students can expect to learn about the following concepts (Figure 1).

- Understanding uniform motion – displacement and velocity
- Graphing uniform motion – displacement-time and velocity-time graphs
- Vectors and trigonometric functions –in one- and two-dimensions
- Understanding nonuniform motion – acceleration
- Graphing nonuniform motion – acceleration-time graphs
- Basic calculus concepts – derivatives and the area under a curve
- Kinematics equations and how to derive them from motion graphs
- Freefall and the significance of gravitational acceleration
- Projectile motion

Professional Development

- It is hard to say whether I have changed as a practitioner because I do not yet lead my own classroom, but I certainly am equipped with more skills than I would have been had I never went through the MSSE program.
- An important part of my project that I can use in every future classroom is the idea that referencing past units and working those concepts into the current unit is an incredible way to increase student understanding.

Instructional Strategy

The idea behind implementing the aspects of the classroom that were researched was based on experience working in entry-level physics labs. In those lab sections, students were expected to take the lead as they explored different phenomena. Students stated that this active learning environment helped reinforce the conceptually difficult topics talked about in the lecture.

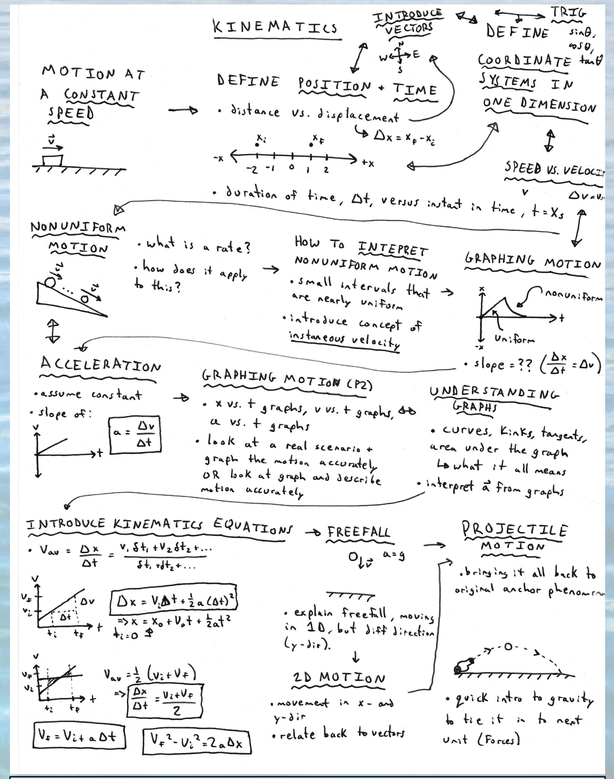

Figure 1. Anchor Model for the kinematics storyline unit lesson plan.