SUNY Cortland

Physics Department

January 20th, 2021

On Friday, October 9th, 2020, I attended Dr. Eric Edlund's Physics 105 lecture class. This class was held online, via *Microsoft Teams* from 1:50 – 2:40 pm. There were approximately 45 students in attendance. The topic discussed was "Centripetal Force". His pedagogical methods included a "flipped classroom" model, PowerPoint slides, interactive polling questions, guided problem solving, and discussions.

To add a little more context to this class, it is being taught using a "flipped classroom" model, where students watch videos going through the content at home, and lecture time is used for discussions and problem solving. This model allows students to take control of their own learning, and allows the instructor to act as a moderator instead of an orator. The overall structure, content, and presentation of this course was a collaborative effort among the three lecture instructors: Dr. Edlund, Dr. David Kornreich, and myself.

Now, encouraging and maintaining student engagement in a large enrollment class is definitely challenging, especially in a course that is not in a student's "wheelhouse". This challenge is compounded even more by the lecture being taught online. In order to encourage and maintain student engagement, Dr. Edlund consistently utilized the method of positive reinforcement, as well as, incorporating a polling platform called *Wooclap*. In order to ensure that these polling questions do not take up too much class time, he gives the students a reasonable time limit in which to answer. He also encouraged students to turn on their web cameras so as to give the feeling of an in-person class, type their questions and comments in the chat, and to speak freely to the class when needed.

At the start of class, three multiple choice questions that reviewed the previous week's topic of Newton's Laws of Motion were asked, in succession, via *Wooclap*. I thought these particular questions were an excellent pedagogical choice on his part. Not only do they serve as a check for a fundamental understanding of Newton's Laws, they also help to address common misconceptions around the term "net force" in physics. In fact, the last question in the sequence directly addressed this misconception, and surprisingly, only 35% of the students in attendance got it correct. Since, *Wooclap* allows for seeing responses in real-time, upon revealing the answer, Dr. Edlund used an analogy of net income to better explain how net force is equal to the sum of all the forces. This analogy worked really well, since money and income are such integral parts of every one's lives. In a post-observation conference, Dr. Edlund explained to me that his reasoning for asking these review questions was influenced by reflecting upon previous lessons. He noticed that students' overall comprehension of Newton's laws was weak, and that readdressing them was necessary in order to ensure their comprehension of force analysis problems.

Next, Dr. Edlund transitioned into the lesson's main learning objective of discussing and solving problems involving centripetal forces. A multiple choice *Wooclap* question asked the students to identify the direction of the centripetal force. In my opinion, this conceptual question accomplishes two things: first, it serves as a direct assessment on whether students are prepared for class, and secondly, it asks the students to identify what is so special about the centripetal acceleration. A fact that is so crucial in solving problems involving centripetal forces.

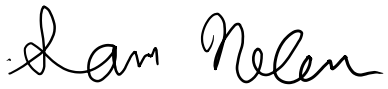
After the conceptual question, an analytical problem was asked: find the normal force acting on a person in a car that is going over a semicircular hump at a constant speed. I really liked this question, because it does not directly ask to find the centripetal force or acceleration, but I think doing a simpler problem where students were asked to calculate the centripetal force or acceleration would have been a good way of scaffolding the material. Regardless, I got the feeling that he knew students would need time on this problem, and he did scaffold the methodology needed in order to solve this particular problem.

One of the key takeaways I got from this observation, was that Dr. Edlund does reflect on this teaching, and he listens to his students. In previous classes, students addressed that they could not see his writing on paper through the document camera; it was too small and blurry. To improve upon the quality of his writing, Dr. Edlund switched to larger paper and magic markers. Students in the class were very thankful for this change. This improvement became apparent when he started to draw the free-body diagram for the forces acting on the person in the car. Rather than just the draw the diagram, he encouraged students to participate by identifying a force as well as in which direction it should be drawn. After enough students had offered up suggestions, a complete diagram was constructed. From there, he allowed time for students to apply Newton's 2^{nd} law to set up the equations of motion, and then solve for the normal force on their own. Afterwards, he went through the solution in a slow, methodical pace that was easy to follow. One of the things that I thought was an excellent pedagogical decision was to ask the students to offer up their answer. One student offered up an incorrect answer, but Dr. Edlund turned the negative into a positive by stating that the answer the student provided happens to be the weight of the person in the car. Also, when writing out the full solution mathematically, he plugged in the numbers with units as to show how, from a unit perspective, it does yield the correct units of Newtons for the answer.

After this problem, a similar question was asked for a person on a swing. Dr. Edlund utilized the same methodology and pedagogy as the previous question, but ran out of time at the end, and so had to work out the solution on paper for the students. Although I think asking the students to finish the problem at home and then submit their answers at the next class would have been better. It would have provided a great exercise for the students to practice and improve their force analysis skills, as well as reinforce the concepts pertaining to centripetal forces.

Overall, the class was well planned, organized, and seemingly a success at reaching the day's learning objective(s). If I could offer areas of improvement it would be to be mindful of time, and

to identify where scaffolding a problem would be beneficial to the students. Overall, I was very impressed in his organization, presentation, and enthusiasm of the class. I feel as though he is doing an admirable job, and is a great asset to the Physics Department.



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