Efforts to Improve Student Engagement in Introductory Physics (Phys 121 & 221)

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Efforts to Improve Student Engagement in Phys 121 & 221

John McGill

PROJECT GOALS

To improve student understanding in the physics 121 & 221 series using Evidence-Based Teaching (EBT) practices. Specifically, use of a Student Response System (SRS) [i.e. iClickers] and modified Think Pair Share (TPS) was increased over previous quarters in order to increase student attendance and engagement. Active engagement in learning has been shown to improve student understanding and outcomes. It is expected that the implementation of these EBT practice will improve student outcomes.

PROJECT ACTIVITIES

I have used the iClicker SRS in previous quarters to record student responses to in-class multiple choice questions in Phys 121 and 221. The class participation part of the grade (5%) is based on responses to the iClicker questions. The students receive 75% credit for any attempt and full credit for correct answers. In Fall 2019, I increased the frequency of iClicker questions from roughly 2 per lecture to roughly 6. I encourage the students to pair up and work on the questions together and ask questions in a modified TPS scenario. Most of the iClicker questions were drawn from question sets available from the textbook publisher. Below are some example iClicker questions.

EXAMPLE ICLICKER QUESTIONS

1. A hollow tube lies flat on a table. A ball is shot through the tube. As the ball emerges from the other end, which path does it follow?
   A. n > mg.
   B. n = mg.
   C. n < mg.
   D. n = 0.
   E. Not enough information to tell.

2. The box is sitting on the floor of an elevator. The elevator is accelerating upward. The magnitude of the normal force on the box is
   A. $n > mg$.
   B. $n = mg$.
   C. $n < mg$.
   D. $n = 0$.
   E. Not enough information to tell.

3. The same force is applied to different masses. In the graph, the resulting acceleration is plotted vs. the mass. What is the force?
   A. 3.0 N
   B. 12 N
   C. 1.0 N
   D. 1.33 N
   E. None of the Above

4. The cart is initially at rest. Force $\vec{F}$ is applied to the cart for time $\Delta t$, after which the car has speed $v$. Suppose the same force is applied for the same time to a second cart with twice the mass. Friction is negligible. Afterward, the second cart's speed will be
   A. $v$
   B. $\frac{1}{2}v$
   C. $\frac{1}{2}v$
   D. $2v$
   E. $4v$