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# Ball And Ramp, How Far Can You Move It?

Lynn Panton
*The College at Brockport*

## ABSTRACT

**Using Interactive Physics 4 eighth grade students explored the question "What are the best combination of variables to move a 2 kilogram mass 20 meters?" This was the first introduction for these students to this program. As part of the NYS 8th grade Performance Test students must run an experiment using a golf ball and ramp to move a cup. They have to run 3 trials by rolling the golf ball down a ramp from a 25 cm release point. They then record the distance the cup was moved. On the Performance Test they are instructed to use the distance recorded to show a general pattern of movement and explain why this pattern could be observed. They are then asked to extrapolate this data to other variables that may effect movement.**

**This Interactive Physics exercise was used to help students prepare for this Performance Test. It allowed students to explore several variables over a short period of time. It allowed students to manipulate variables of their choice. Interactive Physics allowed students to track and explain the patterns that resulted from their chosen manipulated variable.**

**After participating in this activity these students expressed an interest in sharing this experience with other students. They also indicated they would like to work with Interactive Physics on a more regular basis. As all four students said "When can we do this again?"**

## SOFTWARE JUSTIFICATION

**Interactive Physics is an appropriate software program to allow students to prepare for the Ball and Ramp Performance Test. The State allows practice tests to be run as long as they are not exactly like the Ball and Ramp Performance Test. Interactive Physics allows for this by letting students to perform similar tests and more importantly develop the critical thinking skills that will be needed on the actual Ball and Ramp Performance Test.**

**This software can be used as an inquiry tool to allow students to set up their own parameters. It allows students to build patterns using small**

**variable increments that could not be explored using a "real life" ball and ramp lab. This software allows students to visually track the movement that is not easily seen in real life experiments. By putting the students in control it increased their**

- **motivation to find an answer to their question**
- **to explore several variables**
- **to visually compare patterns of movement**
- **and to easily share their results with other students.**

## LOG FILES

- **Week of November 7, 2005 project was explained to students and asked to sign up if interested. From my two 8th grade classes 15 students signed up. If this 15 only four students followed through. Due to curriculum time constraints the project had to be run after school.**

- **The first meeting was scheduled for the Library Computer Lab after school on Thursday December 8. This had to be canceled because when I went to the computer lab before hand several problems occurred in running the software.**

- **Problems could not be solved in the Library Computer Lab but I was able to reserve the Math Computer Lab for after school on Monday December 12 and Tuesday December 13. Students ran their programs on these dates from 2:00 to 4:00 p.m.**

- **Met with students during class the week of December 19 to process what they had learned and find out their reactions to the program.**

## PROBLEM DEFINITION

**Using Interactive Physics, 4 eighth grade students explored the question "What are the best combination of variables to move a 2 kilogram mass 20 meters?" This was the first introduction for these students to this program. The problem was developed to allow students to practice for the Ball and Ramp portion of the NYS Science Performance Test.**

**The problem was set up as an inquiry activity. Students were given the conditions that they had to move a 2 kilogram mass over a horizontal surface exactly 20 meters. They had to move this mass by rolling a ball down a ramp. Students were able to manipulate any conditions within these criteria.**

**The first day students simply became used to the program and explored several conditions. As they indicated to me they "played" with the program. On the second day students used a more scientific approach. They chose a variable to manipulate, decided on the procedures to follow and ran several trials until they had moved the mass 20 meters. While running the trials they recorded resulting data. When they had solved the problem they observed the pattern that resulted from their data. They graphed the data and came to a conclusion.**

## PROBLEMS ENCOUNTERED

**One major problem was my own hesitation with using the program. I have only used Interactive Physics on a limited basis and did not feel very confident in embarking on an activity that I was not very familiar with…yet having seen what Interactive Physics could do I knew it was right for my goals. The positive reaction of my students to this experience has assured that I will continue to work with Interactive Physics. I very much appreciated Southone Vattana meeting with me to develop my activity. He also stopped by to trouble shoot with my students. I believe this is one of the strengths of the CMST program – having mentors to call upon when needed. I guess it is the comforting idea that "we are not alone".**

**A more major problem was the difficulties in the computer lab. It was very difficult to get lab time for the time line that was set for us. I was finally able to set up lab time after school. After reserving the Library Computer Lab I checked the software out ahead of time only to find there were major problems in running the software. Interactive Physics had been installed but on some computers the software would not run or even open. On other computers I could not save student work. Through Brian DiNitto, another CMST colleague, I found out that he had installed Interactive Physics in the Math Computer Lab. There were no problems in running the program in this lab and I was able to reserve time to use it after school. Since it is used for classes during the day it meant I had to use it after school which limited the number of students that participated.**

## SUMMARY EVALUATION

**I believe this was a positive experience for these students on several levels.**

- **First it met the goal of allowing students to become familiar with the State Assessment Ball and Ramp Task. When it comes time for the actual assessment these students will feel more comfortable in running the actual activity.**

- **Secondly it allowed students to develop an organized method of approaching a problem. Using this software program they were able to change a variable in very small increments until they had met their goal. After exploring changes in ramp angle, surface material of ramp and mass of ball rolled down the ramp most students chose to manipulate the mass of the ball. It was interesting to see the patience and methodical approach developed by the students. They ran several trials until they solved the problem. These students ran 30 or more trials by changing the mass in very small increments.**

- **I also was interested in the self-talk of the students. They were very focused on figuring out what would be the next best step to take in order to solve the problem. Their self-talk indicated they**

**were forming thought patterns that would lead to an understanding of how they solved the problem. Unfortunately I did not record their exact comments but when doing this activity with other students I will do so.**

- **Lastly I observed that all the students felt very positive with their experience and are anxious to share what they have learned with other students. Three of these four students are not very outgoing but have indicated they are ready to present their findings to other students and help others learn how to run this activity.**

## SOFTWARE INSTRUCTION

**I did not have specific instructions for how to run the program and at this level the students did not have a problem with this. I do see a need for instruction when I develop a more complicated program or when teaching students how to set up their own program.**

**I developed an activity with three 4 objects – horizontal surface, box to move, inclined ramp and rolling ball. I included a start, stop and reset button.**

**I demonstrated to the students how to run the program including**

1. **how to change the conditions for the angle of the ramp, surface material of the ramp and mass and material of the rolling ball.**
2. **how they could turn on tracking to observe actual movement.**
3. **I provide them with a data to record the following information:**
    - **Angle of Inclined Plane**
    - **Mass of Circle**
    - **Surface Material of Inclined Plane**
    - **Static Friction of Inclined Plane**
    - **Kinetic Friction of Inclined Plane**
    - **Distance Moved**