

READING COUNTS! FOR TINDLEY PREPARATORY ACADEMY

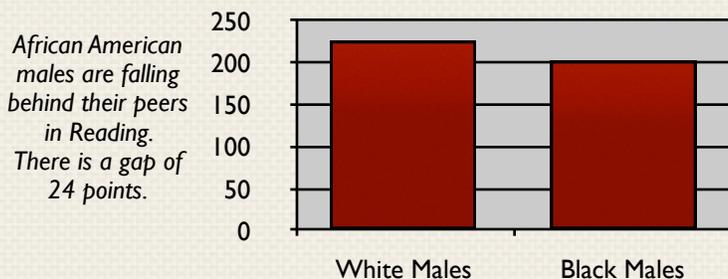
KEENAN KELLEY, 5TH GRADE ELA TEACHER

Vision of Excellence

Tindley Preparatory Academy (Prep) is an all-boys middle school that serves primarily young, African American males. Our school serves young men from the low-socioeconomic Meadows community on the Northeast side of Indianapolis. Through the Reading Counts! program, scholars will improve their fluency, comprehension, vocabulary, and confidence as readers.

Why It's Important for Our Young Men

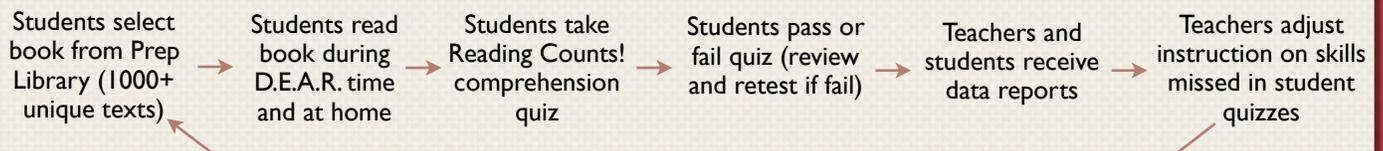
2013 NAEP 4th Grade Reading in Indiana



Reading Counts! will...

- bring a fresh perspective on literacy to our families.
- involve families in the Prep community.
- develops a culture of reading.
- expose scholars to a variety of texts.
- provide positive incentives for reading.

Process for Students & Teachers



Literacy and Data at School & Home



MEN OF TINDLEY PREP

- Bi-weekly reports go home on the number of books read and Reading Counts! points earned
- Quarterly Awards given to the top 3 point scorers & top 3 growers (school-wide)
- Reports on Lexile level, fluency level, NWEA scores sent home 3 times annually
- Rotation of Parent Volunteers in Reading Counts! testing lab
- Volunteer Parent Librarians
- Family book check-out (Families can check out books for anyone in their family)
- Goal of 100% parent participation in program

Good morning ladies and gentlemen of the Institute for Quality Education. I am humbled and honored to have been afforded the opportunity to present this grant proposal before you today. My name is Benjamin Grimes, Roncalli High School Physics teacher, and I'd like to begin by introducing myself as a double Nobel Prize holder in Physics.

This is me, holding two Nobel Prizes in Physics at the Fermi Lab near Chicago, Illinois. Now, granted, neither of these Nobel Prizes actually belongs to me, but there I am, holding two Nobel Prizes. (Hopefully laughter) My point with this introduction is that I know that the students who I teach may not grow up to be Nobel Prize holders in Physics themselves, but I am passionate about seeing them succeed in my classroom and grow in their ability to think and reason scientifically.

I use this graphical representation as an example for my students at the beginning of each academic year. The question that I ask them and that I will ask you all is "Can you tell me, looking at this graph, what variables were measured, which one was controlled, and give me a general explanation of what this graph is describing?" (Wait for any response) "Can you tell me as the linear speed increases, how does the radial force change?"

As a teacher, the challenge I find is that most of the students coming into my classroom are unable to do this type of analysis whether it is on a graph or a table of values, both of which appear on the ACT Science section. And, according to national research, it is not limited to my classroom. Out of 60 plus nations assessed every three years between 2000 and 2012, students in the United States consistently ranked at or just below the 50th percentile among their peers. The reason this should concern all of us is that we, as a nation, face the very real risk of not being able to compete globally in the growing technical and scientific industries, which are going to continue to grow over the next three years. In 2013, Indiana STEM published an action plan in which we as a State asserted we would be the best in the United States. The grant money from this initiative will allow me as a teacher to pursue that objective by giving students the opportunity to do hands-on data collection and analysis in small group settings with some of the most reliable, technical and user-friendly equipment available.

Back in 2009, I was introduced to the modeling approach to the curriculum, a particular pedagogy developed by David Hestenes and partners at Arizona State University in the 1980's. Its founding principle is that Physics is about understanding the relationships between independent and dependent variables measured in a controlled system through data collection and analysis. This is a picture of one of my student groups collecting and analyzing data to determine how changing the length of a piece of string swinging back and forth affects the time it takes to complete a swing. You can see here the graph of their data and the students will learn how to make the curved line into a straight one to build the overall equation rather than being given the equation and asked to solve a few problems. Students in this environment are free to make mistakes, allowing them to learn from and correct those mistakes while building their self-confidence in their abilities to "do" science.

One of the most challenging units my Introductory and AP Physics I students focus on during the academic year is rotational motion. Unfortunately, collecting data for that particular unit is equally challenging. However, Vernier has developed two devices which will make that data collection go very smoothly. The first is the rotary motion sensor, which will allow students to collect data on a rotating system moving at either constant velocity or constant acceleration which costs \$169 dollars. Students will build their graphical representations in groups to construct a basic model which describes the rotational motion of an object. The second is the Centripetal Force Apparatus, at \$399 dollars each, which will allow students to build the relationship between radial forces, the mass of a rotating object, its speed and the length of string, or radius, of the circle. Both of these are considerably advanced for a Physics classroom, but mirror exactly what students will be using in college or even in any career where collecting and analyzing data are required tasks.

In the AP Physics 2 classroom, students transition from analyzing the behavior of mechanical systems to analyzing and describing the behavior of light as it interacts with various optical systems. Here, a group of students is analyzing laser light as it passes through a liquid at various angles. This is probably one of my favorite quarters that I teach between the two years because, as you can see, it's both very visual and very concrete. Data is easy to collect given the right equipment and students are able to develop some fairly complex linear relationships in their small groups.

However, one of the classic units that students need to have a fundamental understanding of is the formation of reflections by curved mirrors. Students have pictorial representations available to show how and where the images should form, but without actually developing the relationships themselves, the pictures have no real meaning. The Vernier Mirror Optics system will allow students to use mirrors in a guided inquiry activity to build the relationship between image distance and object distance similar to what they currently use the Vernier Lens Optics System for. Each of these systems is \$59 dollars.

The success of this approach to the curriculum can be backed up with pre-test and post-test results as shown here. This particular set shows student performance on a set of 20 questions focusing on accelerated linear motion during the academic year 2014-2015. Students are told that they are expected to get between a forty and fifty percent on the pre-test based on prior knowledge and skills developed in the class which are transferrable to the current unit. At the end of the unit, the target is an eighty percent average. These results shown for one unit are consistent with student performances throughout the academic year.

Another set of evidence showing the success of the modeling approach and the methods used in my classroom is student performance on the science section of the ACT taken in 2015. This graphical representation shows the percentage of students who scored 21 or higher on that section. As you can see here, nearly 85% of the students who take Physics at Roncalli High School score 21 or higher, while only about half of the students who have not taken Physics at Roncalli score that high. As the cut score is raised, the discrepancy between taking Physics or not becomes even more pronounced. While Physics is not their only science class and many of these students are quite capable, it does show a statistically significant difference in performance when students have the opportunity to learn science by doing science, something I intend to continue to grow in my own classroom.

Here I have cited a few sources used in constructing this presentation. I appreciate your attention. Rest assured that, if selected as a recipient of this grant, every dollar will be used towards providing students with resources to continue to learn science in a hands on, collaborative, guided inquiry classroom. If you have any questions, I would be happy to entertain those at this time.

INDIANA STEM INITIATIVE

IT'S NOT ABOUT BECOMING A SCIENTIST,
IT'S ABOUT BEING ABLE TO THINK LIKE ONE.

Benjamin G. Grimes, M.ED

Physics Teacher, Roncalli High School

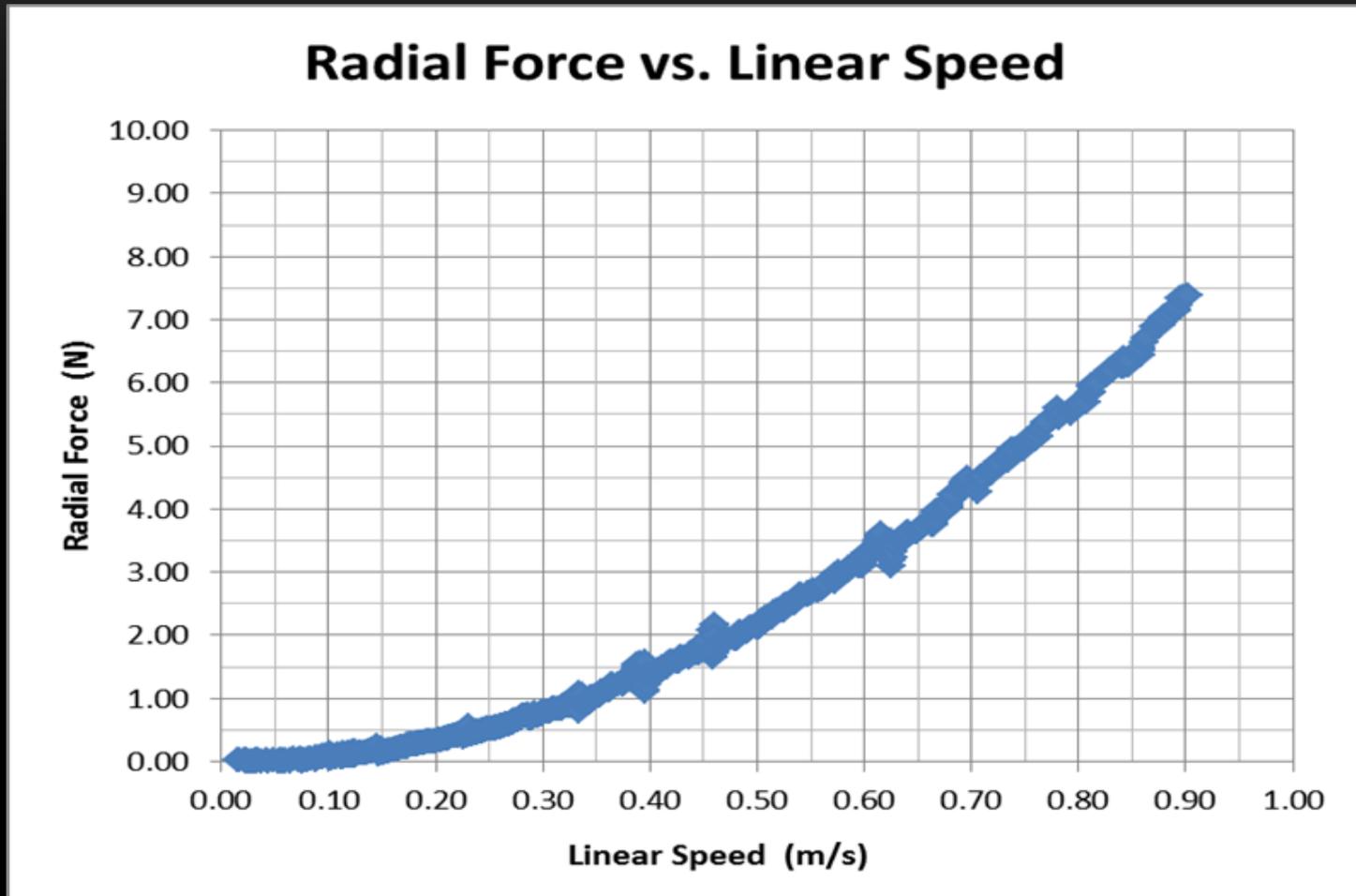
Indianapolis, IN

August 4, 2015

EXPECTATIONS OF STUDENTS



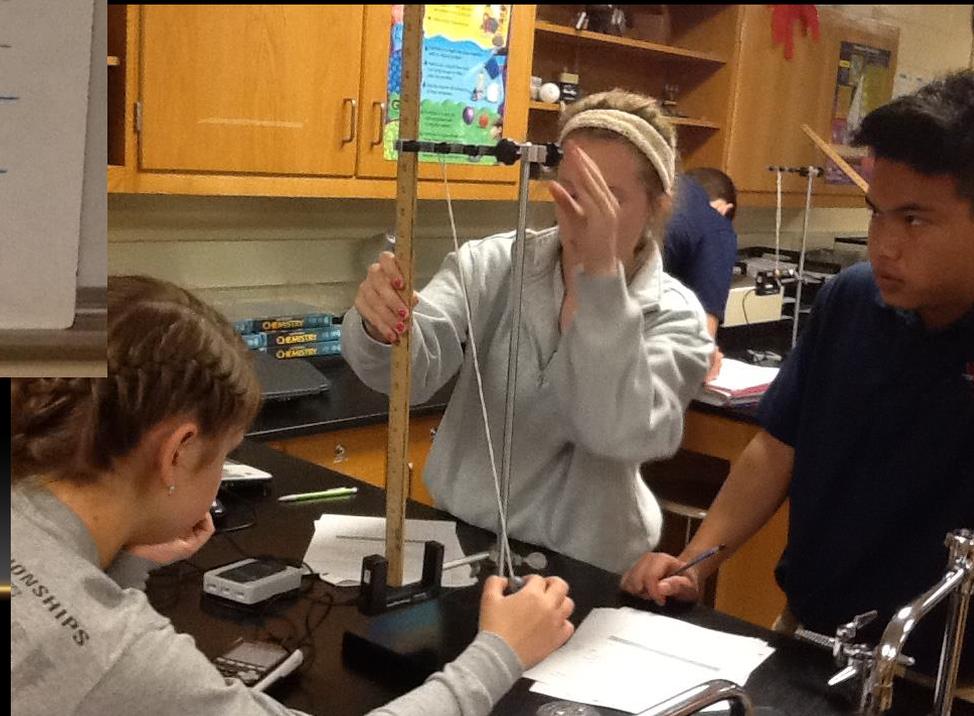
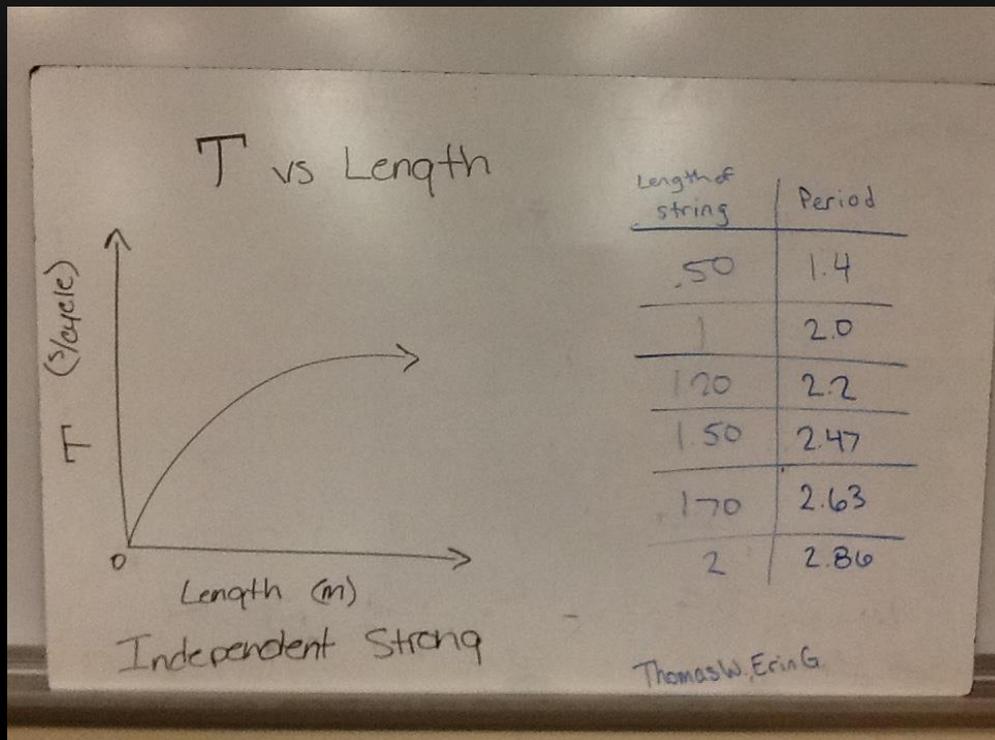
STUDENTS ANALYZING SCIENTIFIC DATA



CHALLENGES AND GOALS

- United States has ranked at or below the 50th percentile out of 60+ nations in science education (NCES)
- Indiana STEM Initiative: “Indiana students will be the best in the United States and on par with the most competitive countries in the world” in the fields of science and math education
- Job demand for students who can think and analyze scientifically will increase 10% in three years. (GU)

INTRODUCTORY PHYSICS STUDENTS MASS-STRING SYSTEM GUIDED INQUIRY



ANALYSIS OF ROTATIONAL MOTION

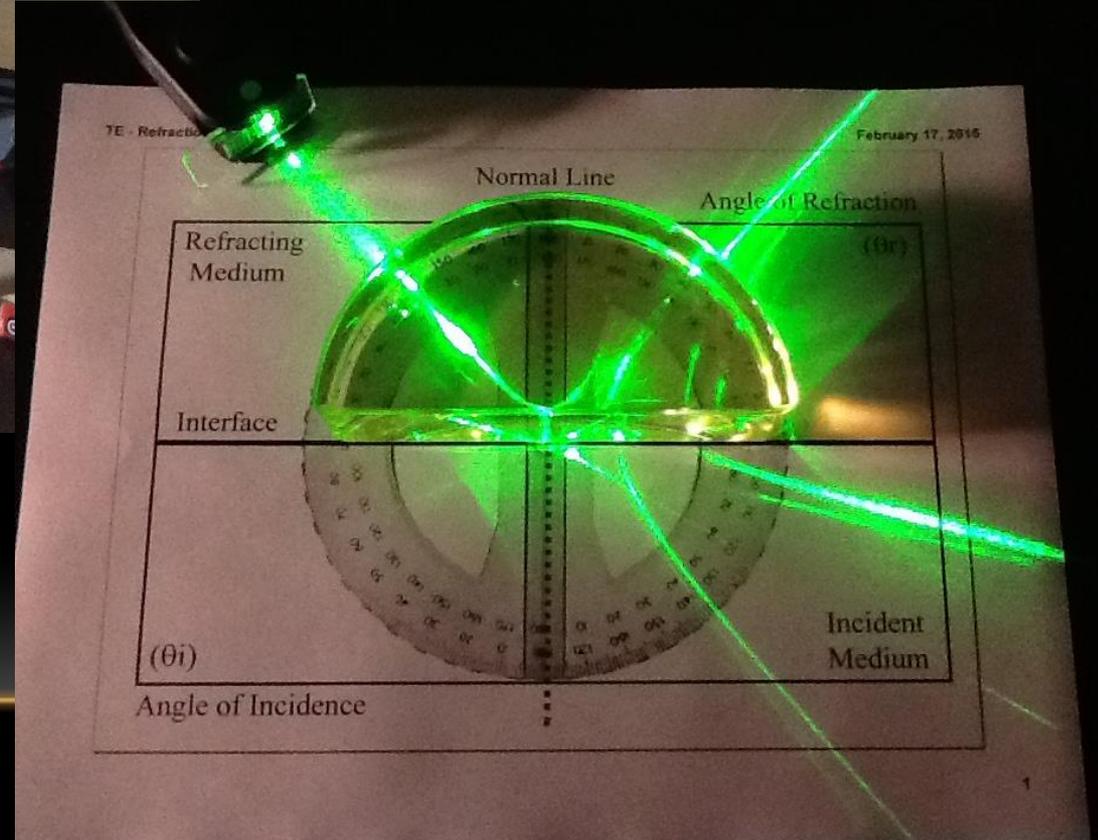


Rotary Motion Sensor - \$169 Each



Centripetal Force Apparatus - \$399 each

AP PHYSICS 2 STUDENTS REFRACTION GUIDED INQUIRY



GEOMETRIC OPTICS – MIRRORS

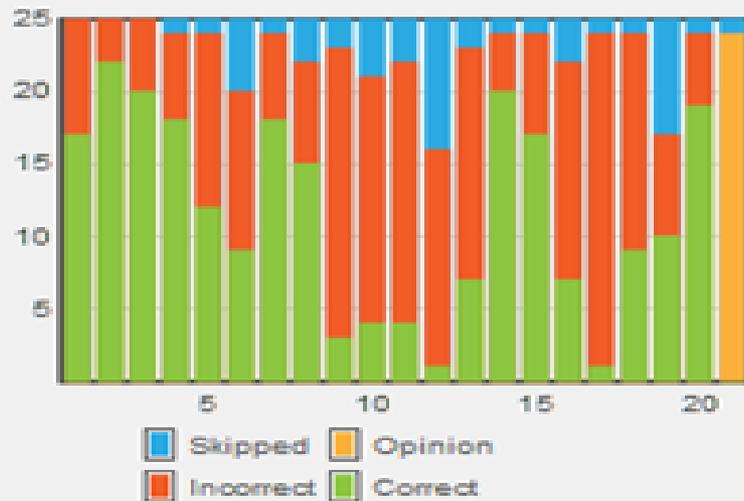


Vernier Mirror Set - \$59 each

PRE-TEST AND POST-TEST RESULTS

Summary

Duration: 00:13:24
Passed: 1
Failed: 24
Absent: 5
Average: 9.32/20 (46.6%)
Standard deviation: ± 3.13 (15.66%)



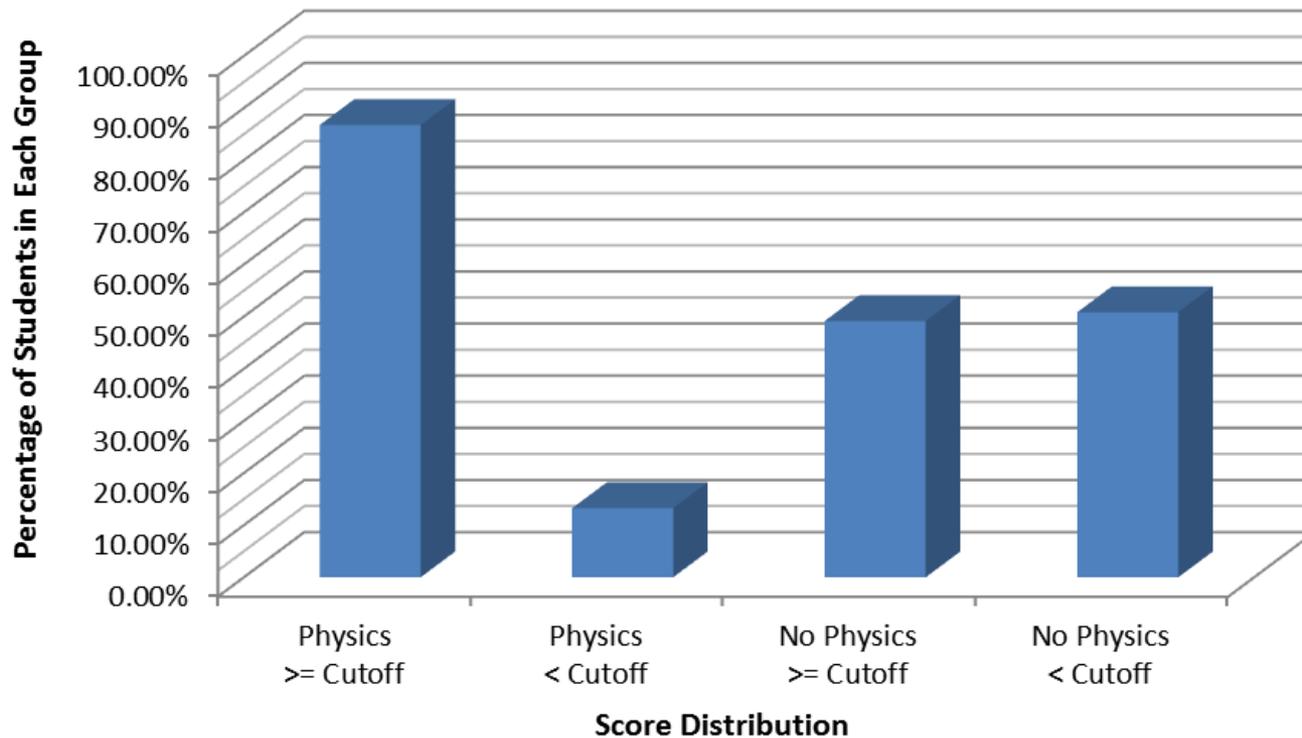
Summary

Duration: 00:13:31
Passed: 18
Failed: 7
Absent: 5
Average: 16.93/20 (84.65%)
Standard deviation: ± 2.72 (13.61%)



ACT TEST SCORE RESULTS (2015)

ACT Score Correlation To Physics (AY 2015, Cutoff Score 21)



QUESTIONS AND RESOURCES

- Hestenes, D., Swackhamer, G., & Wells, M. (1995). A modeling method for high school physics instruction. *American Journal of Physics* (63), 606-619. Retrieved from http://modeling.asu.edu/R&E/ModelingMethod-Physics_1995.pdf
- IDOE. (2013). Indiana's Science, Technology, Engineering and Mathematics (STEM) Initiative Plan. Retrieved from <http://www.doe.in.gov/sites/default/files/ccr/indiana-framework-stem-educationv2.pdf>
- NCES. (2015). International Comparisons of Achievements. Retrieved from <https://nces.ed.gov/fastfacts/display.asp?id=1>