

Comparison of Active Learning Technologies vs. Traditional Lecturing

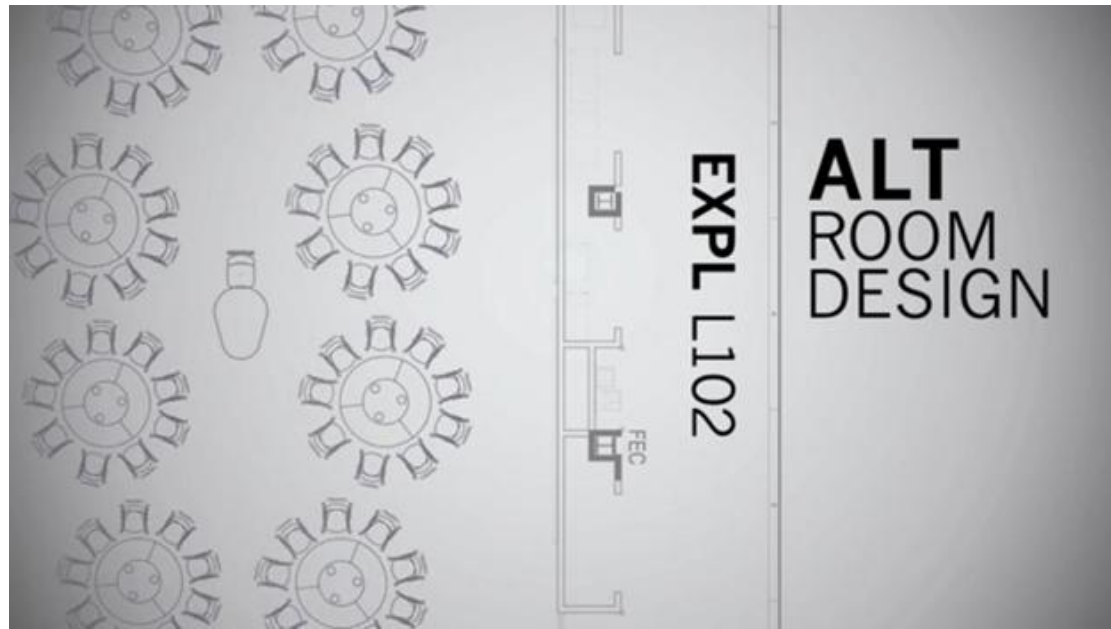
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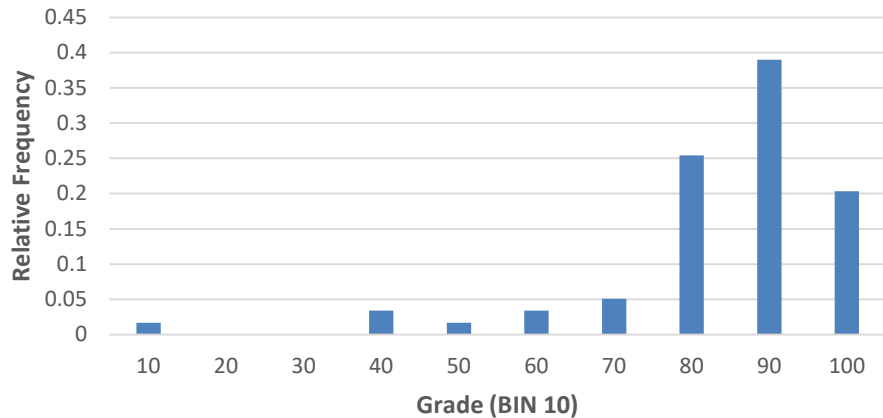
ALT Room Exploratory Hall, L102



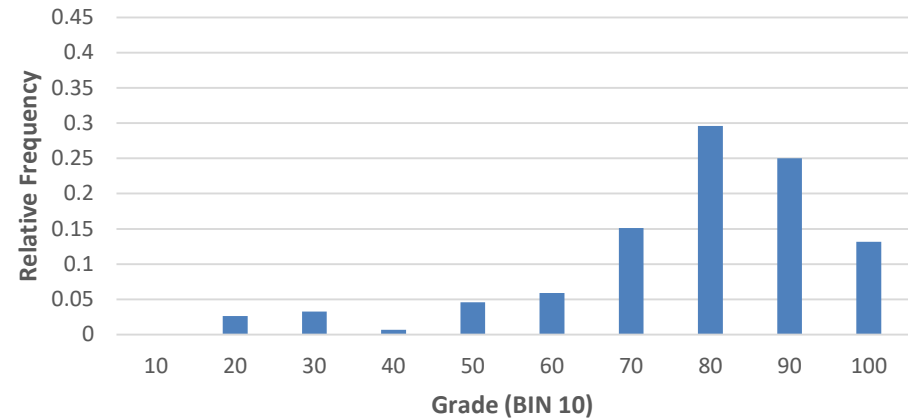
- Beginning with the Fall 2013 semester George Mason University began teaching first semester (PHYS-160) and second semester (PHYS-260) calculus-based physics courses in an ALT (active learning technologies) environment simultaneously with traditional lectures.
- Average final grades, as well as the average exam grades in ALT courses regularly surpassed grades in traditional courses by 10-15%.
- The next two slides show “horizontal” comparison of students’ performance in ALT and TRAD formats of PHYS-160 1 and PHYS-260 2 courses.

“HORIZONTAL” COMPARISON for PHYS-160

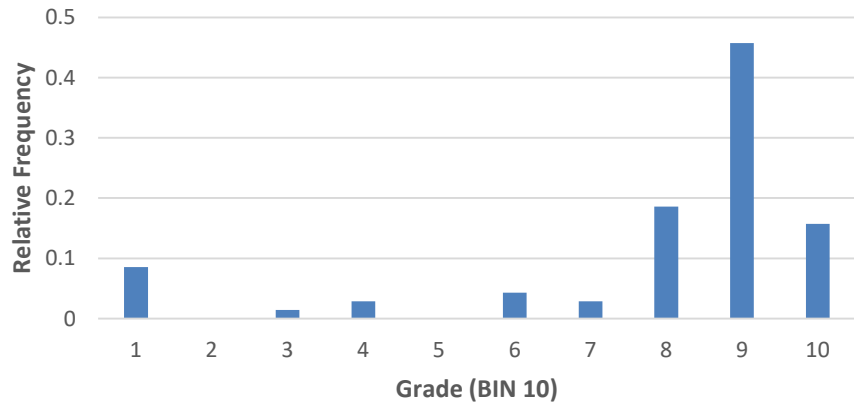
PHYS 160 ALT F13 Histogram Frequency vs Grade



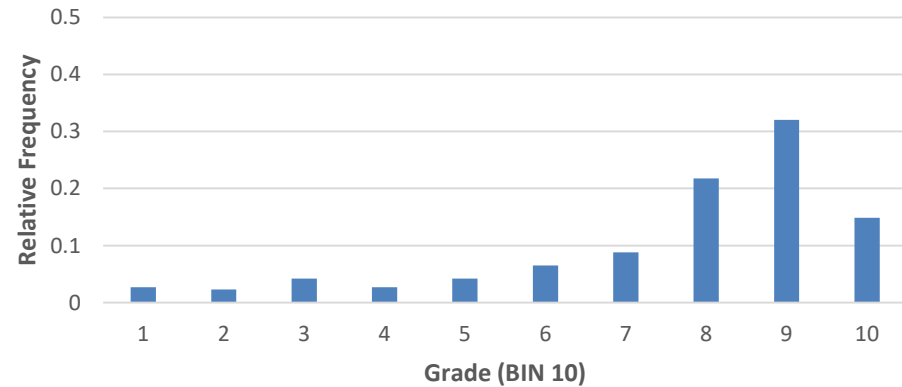
PHYS 160 T F13 Histogram Frequency vs Grade



PHYS 160 ALT S14 Histogram Frequency vs Grade

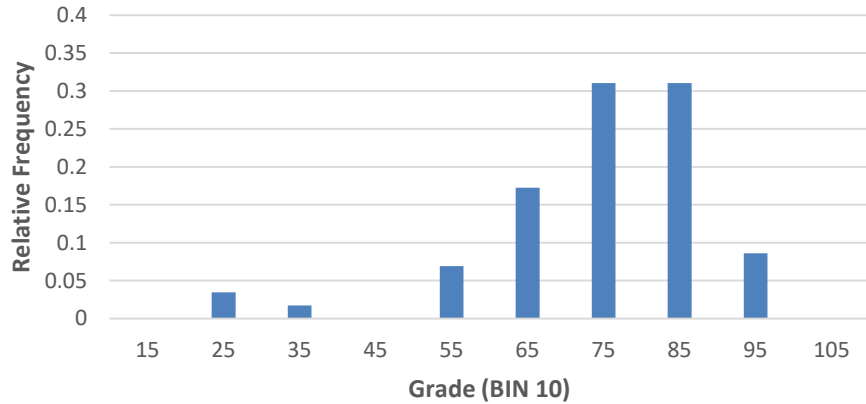


PHYS 160 T S14 Histogram Frequency vs Grade

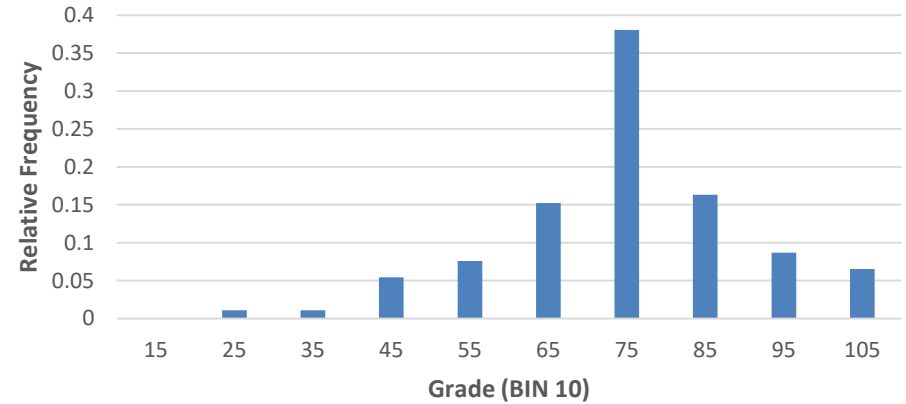


“HORIZONTAL” COMPARISON for PHYS-260

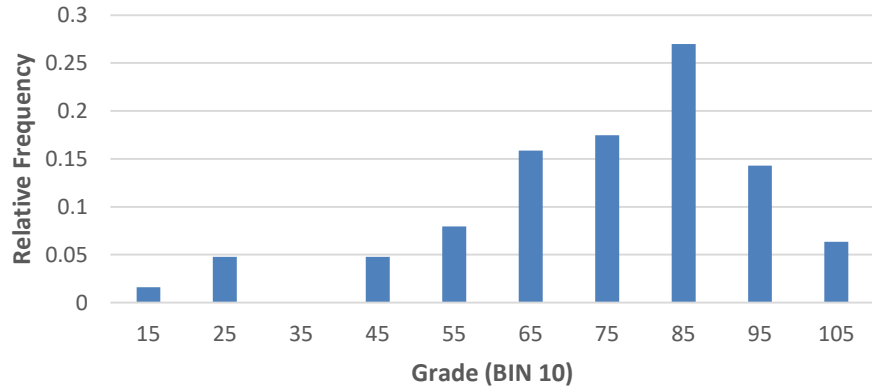
PHYS 260 ALT S14 Histogram Frequency vs Grade



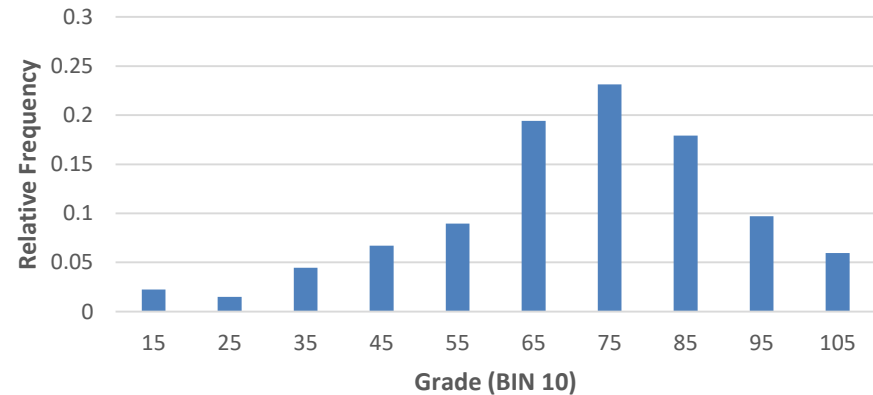
PHYS 260 T S14 Histogram Frequency vs Grade



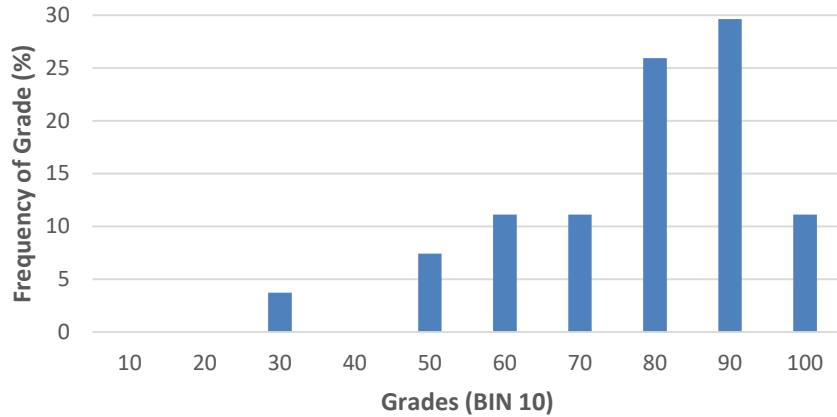
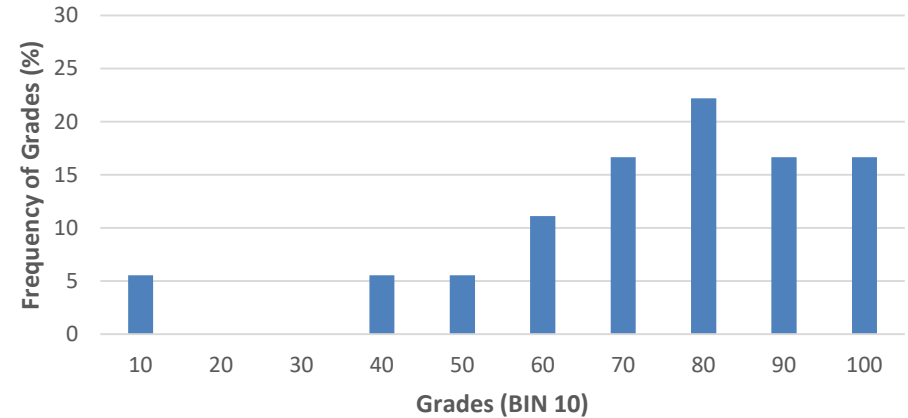
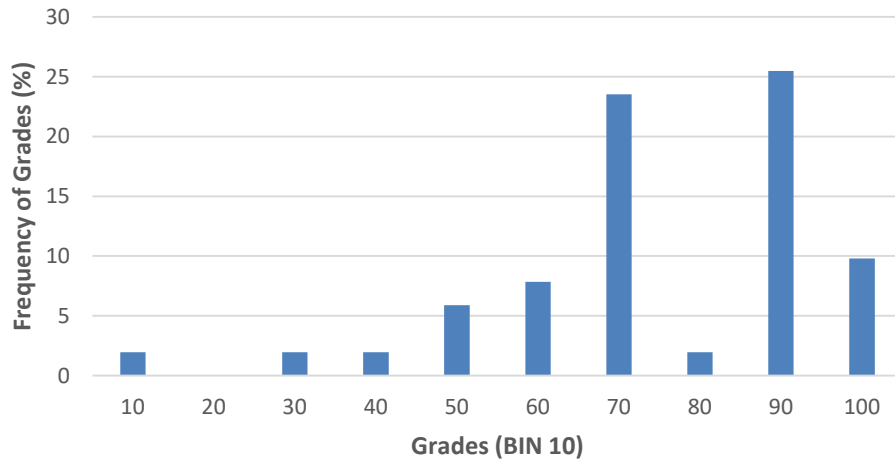
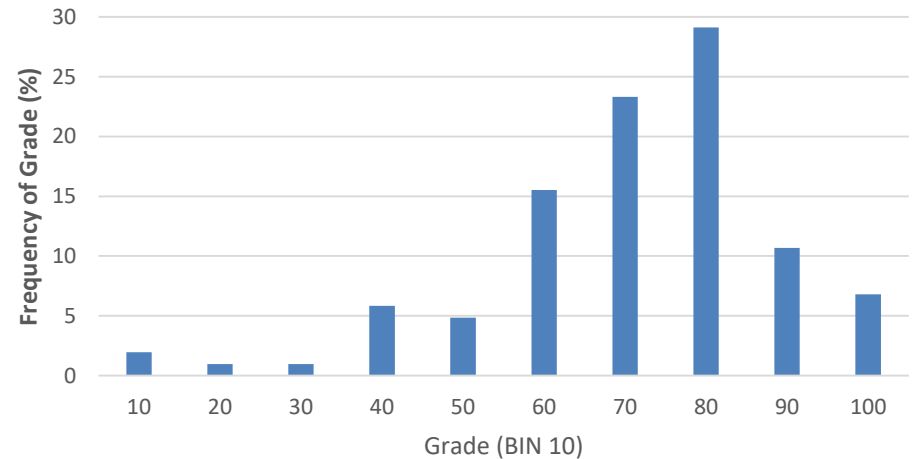
PHYS 260 ALT F14 Histogram Frequency vs Grade



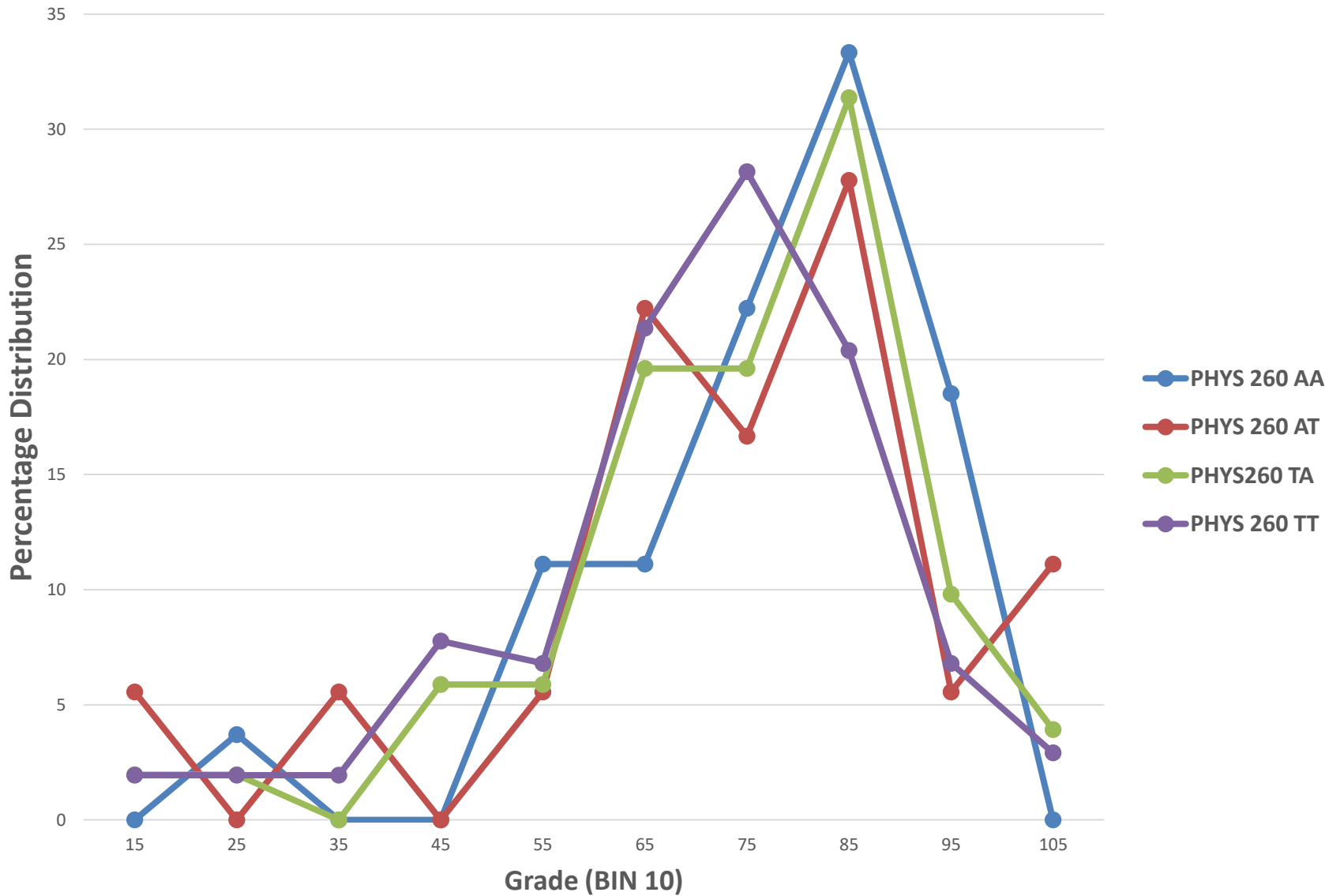
PHYS 260 T F14 Histogram Frequency vs Grade



- We also cross-compared performance of our students in the PHY-260 course in all 4 combinations of students coming from PHYS-160 TRAD, or ALT course to either style of the PHYS-260 courses. 3
- **Results from this analysis clearly indicate that students' performance is greatly improved through the ALT experience.**

“VERTICAL” COMPARISON: “AA”, “AT”, “TA”, and “TT”**PYS 260 AA Histogram Frequency vs Grade****PHYS 260 AT Histogram Frequency vs Grade****PHYS 260 TA Histogram Frequency vs Grade****PHYS 260 TT Histogram Frequency vs Grade**

All sections Percentage Distribution vs Grade



RESULTS

(A) We compared students performance (course average grades, and course grade distributions) between TRAD and ALT sessions, for both PHYS-160, and PHYS-260 courses, in Fall 2013, Spring 2014 semesters. The first 4+4 graphs show that the average grade in ALT courses was always higher than in TRAD courses. **As shown on graphs 1 and 2 the relative number of students with high grades was larger in ALT course.**

(B) We analyzed individual student's performance in Spring 2014 semester PHYS-260 TRAD and ALT courses keeping track of whether student completed TRAD, or ALT PHYS-160 course in the preceding, Fall 2013, semester. **Students' names were coded,** and all possible transitions between the two courses (TT, TA, AT, and AA) were analyzed. **The next set of graphs, 3 shows that AA students performed the best, while TT students performed the worst.**

We are currently analyzing additional data from Spring 2015, and are collecting new data from this semester, for PHYS-260, to improve our statistics. **We plan to redo this analysis to include only exam performance, because our exams were the most suitable graded categories for this kind of comparison. We are currently having only one grader who grades BOTH ALT and T courses. The benefits of ALT classroom will be then even more convincing.**

ACKNOWLEDGEMENTS

We are thankful to the **GMU Center for Teaching and Faculty Excellence** for giving us the opportunity to use this **ALT** room and conduct our research over several consecutive semesters.

THE END

THANK YOU