



EFFECTS OF THE PHYSICAL ENVIRONMENT ON STUDENT LEARNING

Glen I. Earthman

Virginia Polytechnic Institute & State University

Blacksburg, VA 24061

540-231-9715

earthman@vt.edu

PHYSICAL ENVIRONMENT & STUDENT ACHIEVEMENT

- Research on how school buildings influence student/teacher performance.
- A Decade and a Half of Work.
- So Many of School Buildings in Unsatisfactory Condition in US.
- Particularly Interested in Adverse Conditions and Student Achievement.
- In the Hopes School Authorities Would Act.

GREEN SCHOOL MEASURES

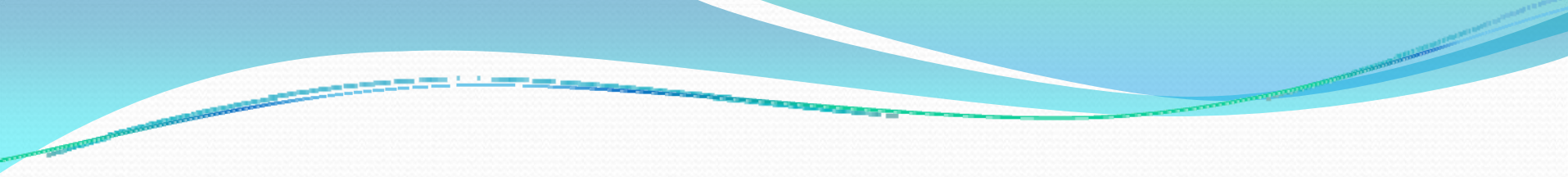
- Instrument Completed before Emphasis upon Green Schools or Sustainability.
- Included Green School Measures of AC, Lighting, Daylighting, Acoustics, Site.
- Other Measures – Condition of ceilings, furniture, lockers, science equipment.
- Wall colors, graffiti evidence, Auxiliary Buildings.

ASSESSMENT OF BUILDINGS

- Commonwealth Appraisal of Physical Environments (CAPE).
- Completed by Principals & Verified by Researcher for Accuracy.
- Were able to Determine Standard and Sub-Standard School Buildings Based upon CAPE.
- Compared Achievement of Students in Both Types of Buildings.

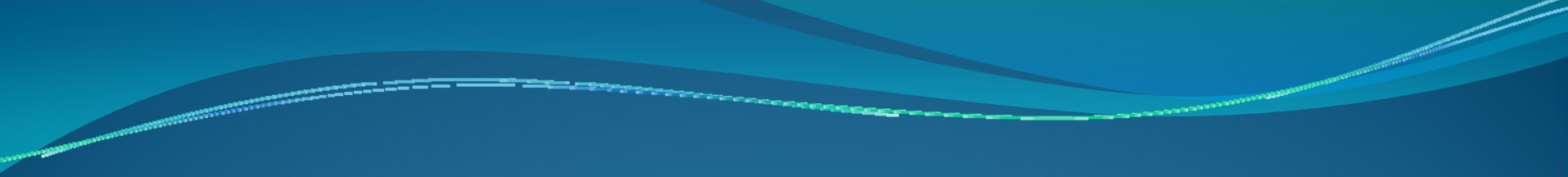
FINDINGS

- Students in Sub-standard Buildings Scored Below Students in Standard Buildings consistently.
- Differences ranged from 2% to 17% Depending upon the Sub-test.
- All Studies Found Significant Differences in Mathematics.
- Most Studies Found Significant differences in English, Science, & Social Studies

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- Lanham (2000) – Elementary Students Grades 3 & 5.
 - Different Statistical Methodology-Regression analysis.
 - SES was Major Contributor to Student Learning.
 - Found AC was the Next Contributing Factor in Student Learning.

FINDINGS

- This Means that Students in Sub-standard Buildings are Falling Behind Students in Standard Buildings.
- Do Students Fall Behind Year by Year?
- No Longitudinal Studies of Influence of Building on Student Achievement.
- Area of needed Research.



AC LONGEVITY & STUDENT ACHIEVEMENT

ACHIEVEMENT

- Control of the Thermal Environment is VERY important to student learning and teacher productivity.
- Previous studies measured bodily functions -
Blood Pressure, Cavities, Breathing, etc.
- Few studies used academic measures directly.
- No study has Looked at Longevity of AC

ACHIEVEMENT

- How does AC Affect Student Performance and is there an Influence over a Period of Years?
- Two purposes of the study:
 1. How much influence does AC have upon student learning?
 2. Is there a long term effect of AC on student achievement?

AC LONGEVITY & STUDENT ACHIEVEMENT

- Surveyed principals – Find out if AC in the classrooms. Mailed survey to high schools.
- Principals asked if AC was in the classrooms.
- School Visitation.
- Result of Survey – 10 schools – 5 with AC and 5 without AC in Classrooms.
- Population of the study 10 small schools.

AC LONGEVITY & STUDENT ACHIEVEMENT

- Each school was small – R = 500-900 students.
- Each school located in a small community.
- Schools not subject to much immigration or emigration – Key to the population.
- Population was for most purposes same over six years of schooling.
- Schools were demographically similar- drop-outs, teacher preparation, minority, SES, pupil-teacher ratio.

AC LONGEVITY & STUDENT ACHIEVEMENT

- Mean scaled scores on Stanford Achievement Test used as Measures of Achievement.
- Ten sub-tests – Among them: English, Math, Science, Social Studies.
- Obtained scores for 4th, 6th, and 9th grades.
- Same students over 6 years of learning.

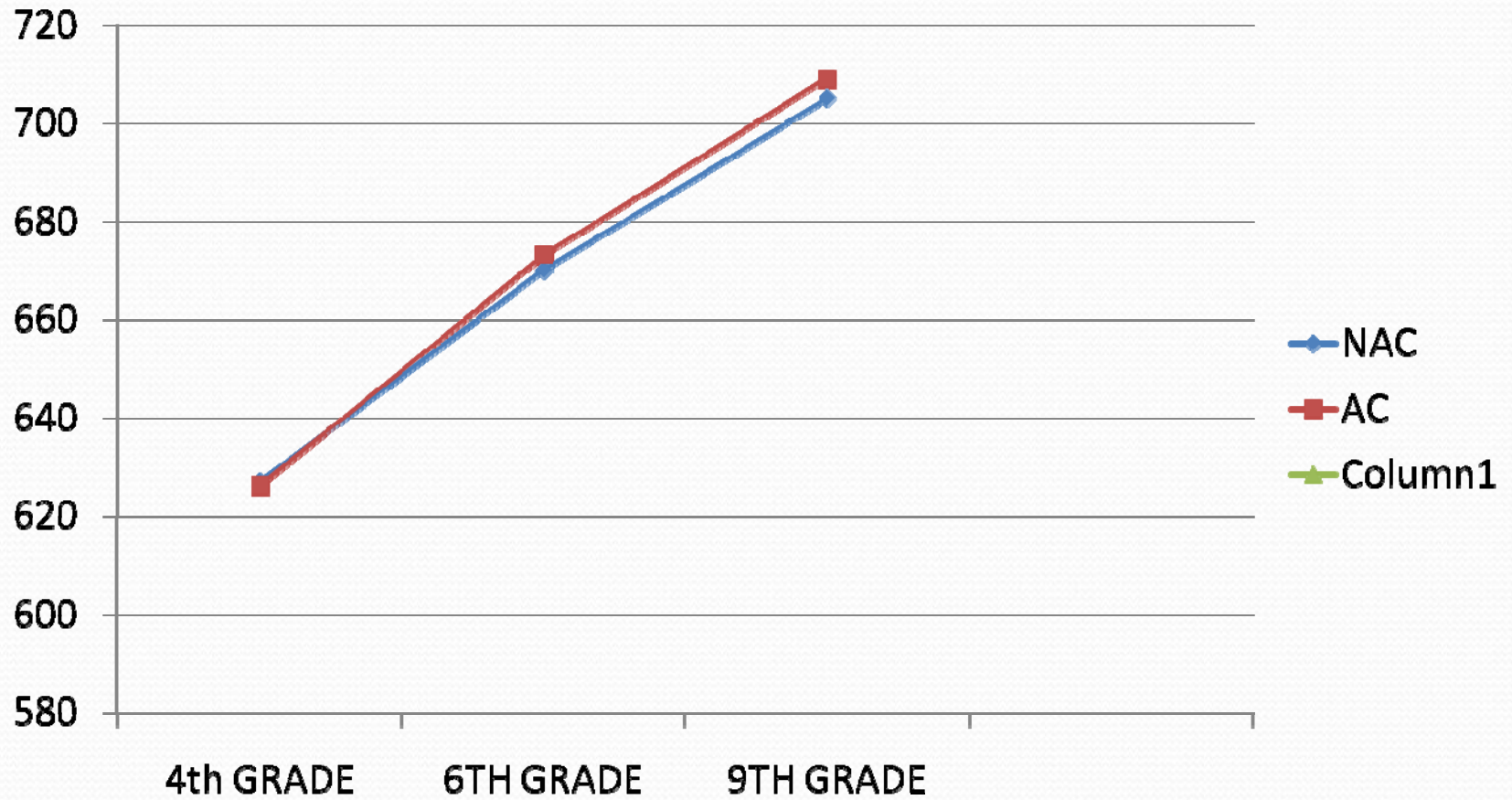
FINDINGS

- Time 1 was comparison between the scores of students in AC and Non-AC schools for each grade.
- Mean scores were higher in AC schools in all subtests, but not statistically significant.
- Some Mean scores in 4th grade not higher in AC schools.

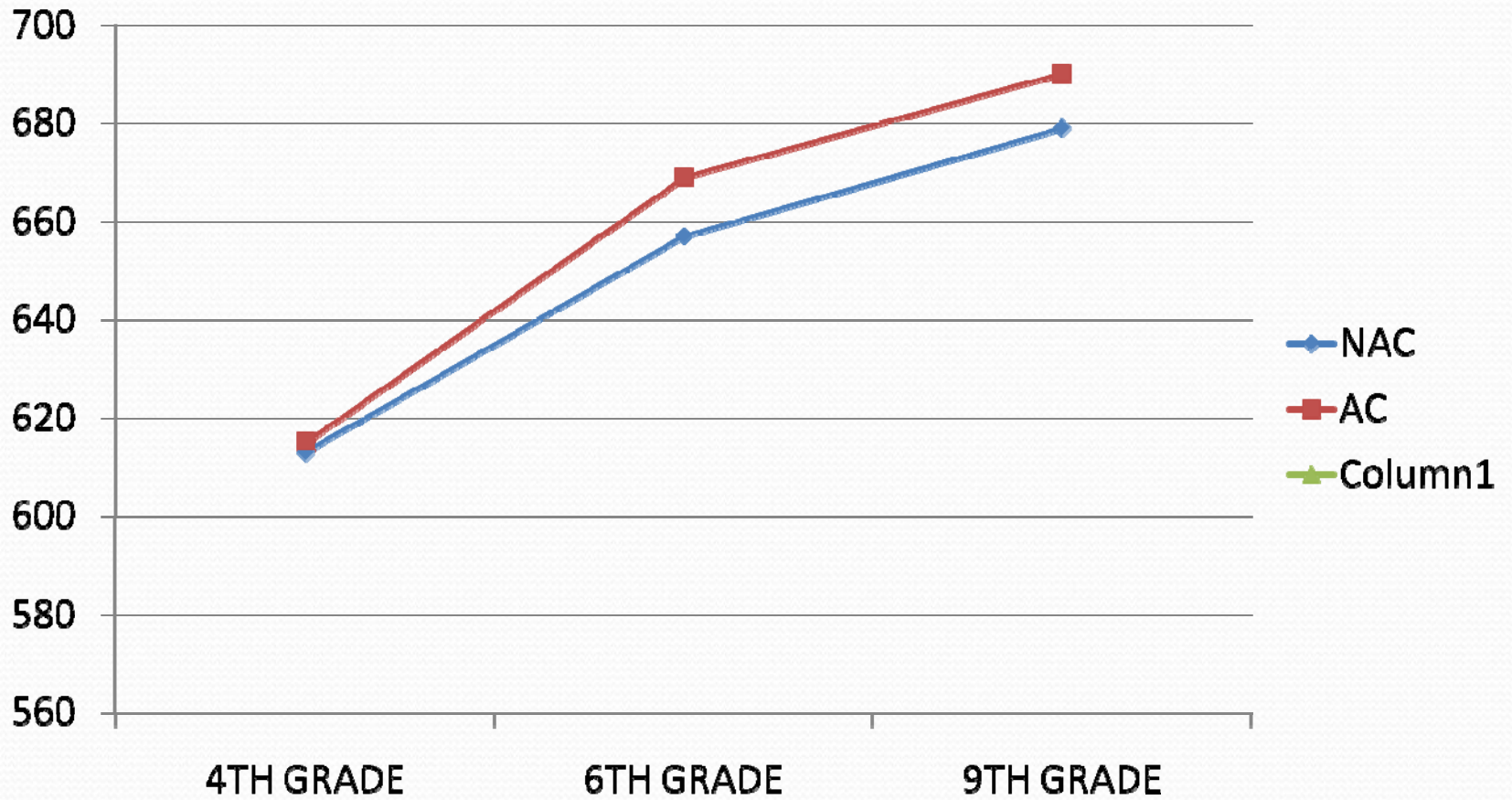
AC LONGEVITY & STUDENT ACHIEVEMENT

- Time 2 – comparison of scores between:
 - 4th Grade & 6th Grade
 - 6th Grade & 9th Grade
 - 4th Grade & 9th GradePlotted on Graph for better viewing.
Provides a better comparison over several years.

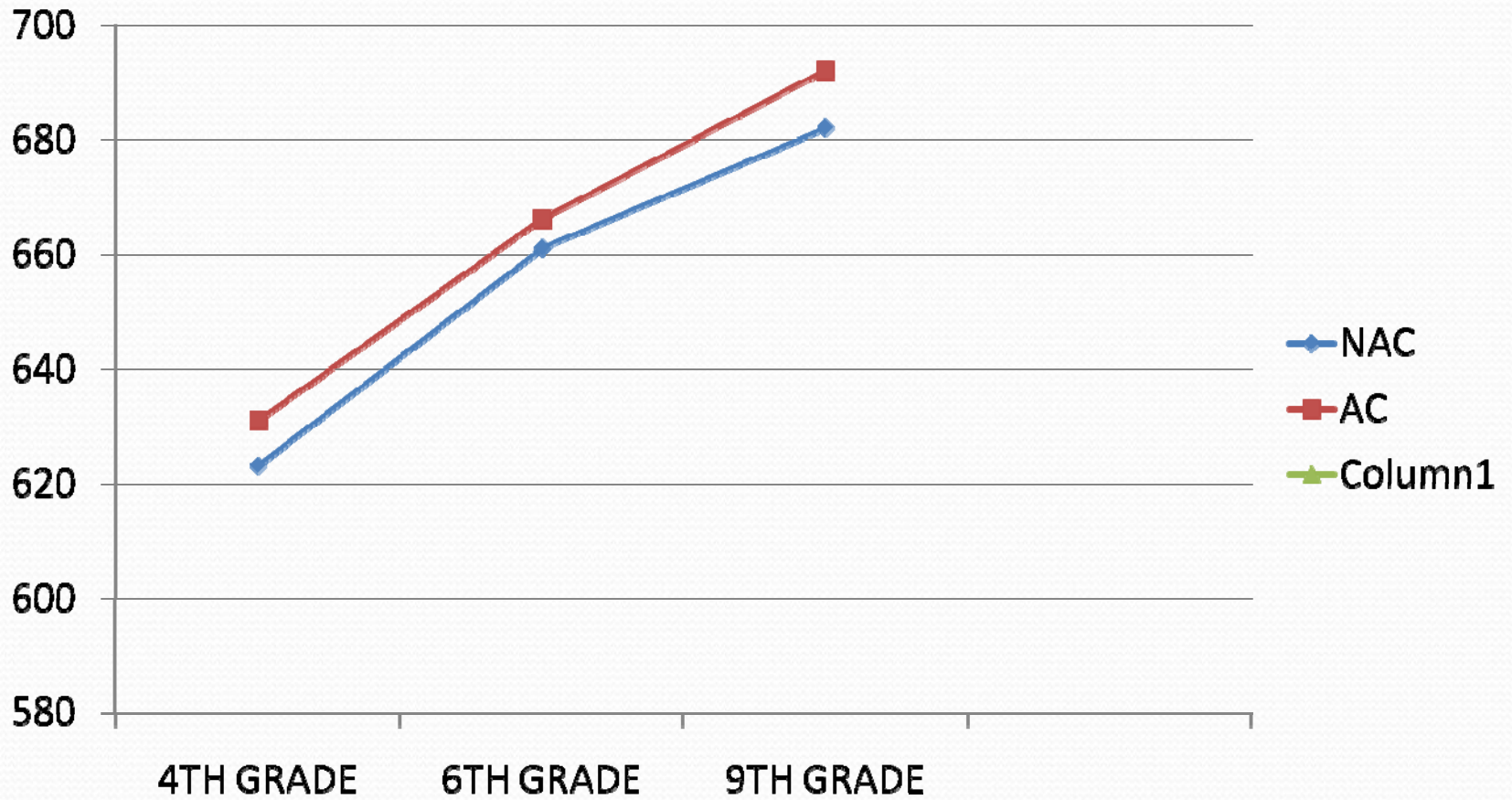
Reading Vocabulary



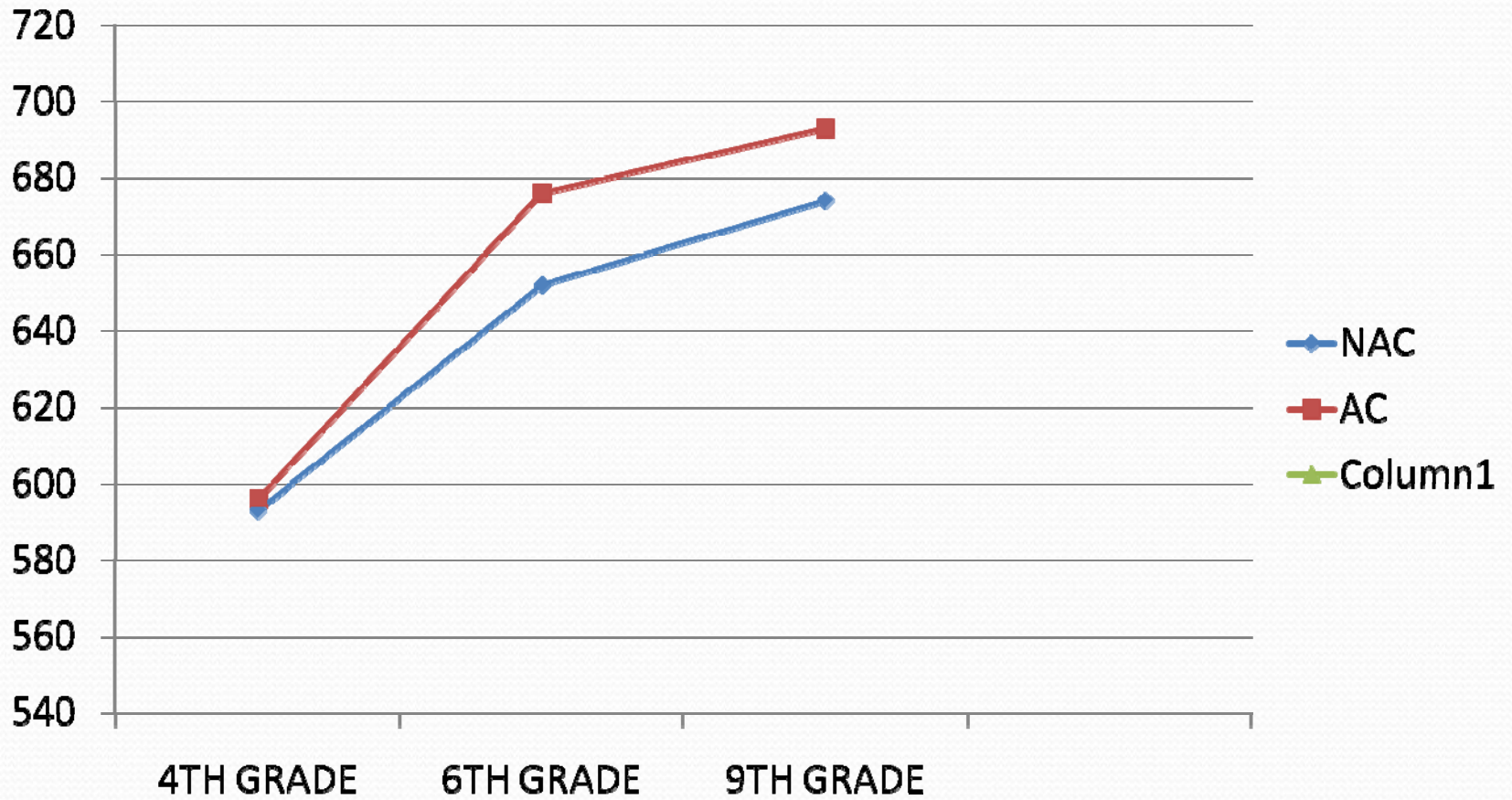
TOTAL MATH



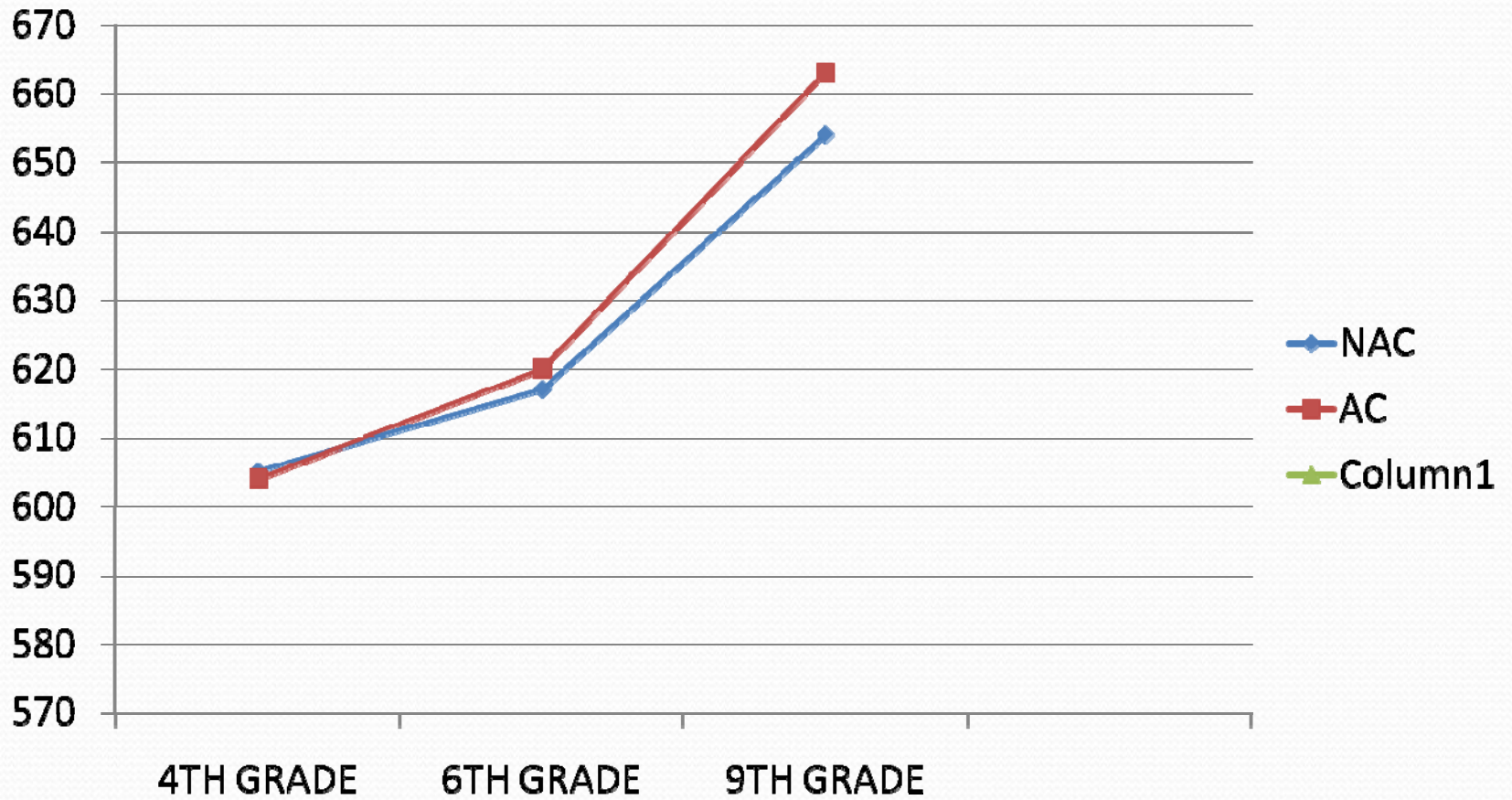
PROBLEM SOLVING



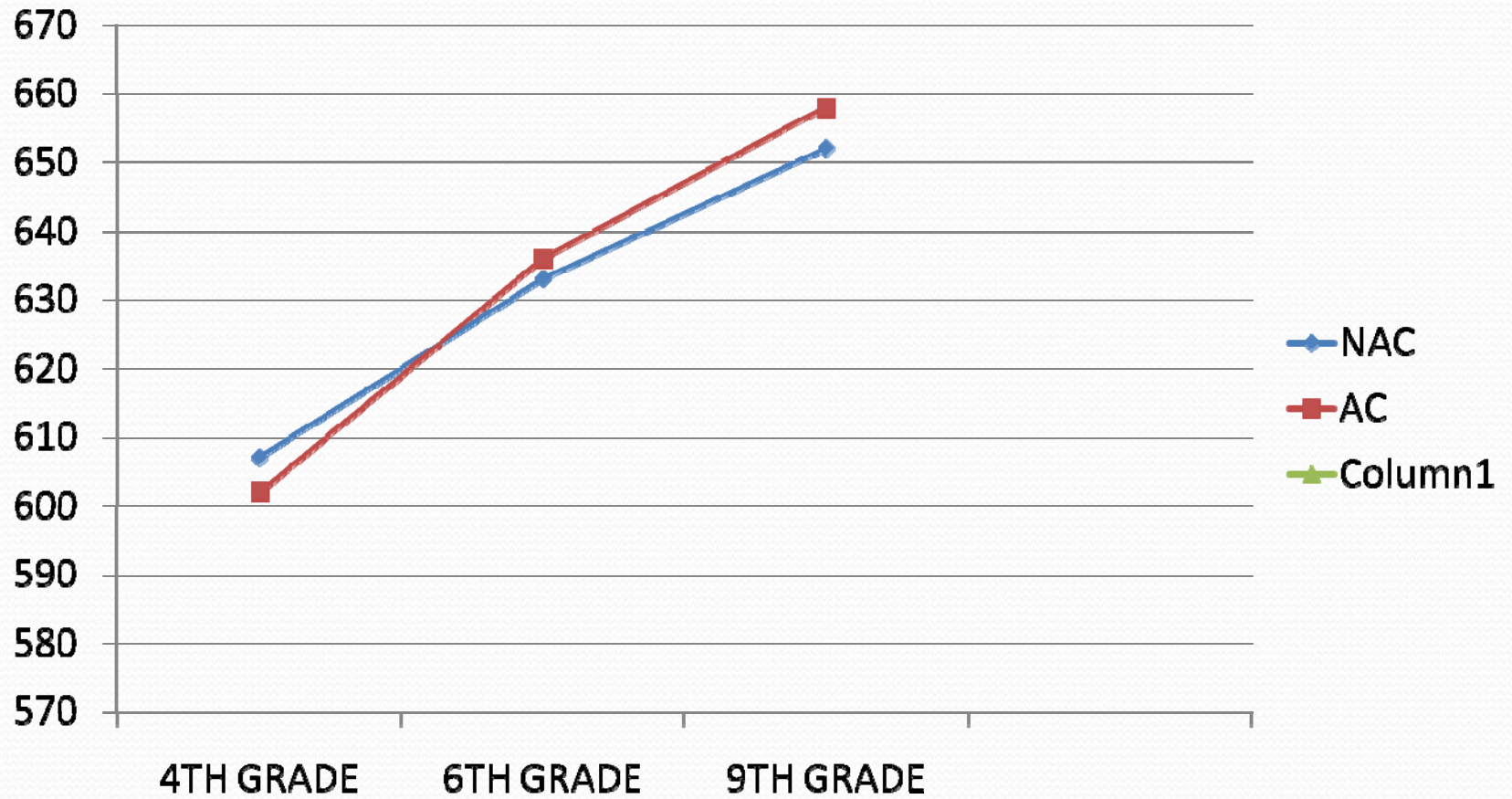
MATH PROCEDURES



PRE-WRITING



EDITING



AC LONGEVITY & STUDENT ACHIEVEMENT

- Statistical Analysis resulted in a Significant Difference in Scores in Sub-tests of Total Mathematics and Mathematics Procedures.
- Indicating AC did make a Significant Difference between the Two Scores.
- There were Important Trends Indicating a Difference in Scores between AC and NAC School Buildings.

LIMITATIONS

- Not able to Measure Quality of AC in Classrooms. No IAQ Test Made. Funding Problem.
- Was not able to Measure Degree Temperature Days in All School Divisions.
- Small Schools have Particular Characteristics that help Students.

AC LONGEVITY & STUDENT ACHIEVEMENT

- What can be Concluded?
 - AC does have a Positive Affect upon Students?
 - The Longer a Student is Exposed to AC the Better the Student Performance.
 - Conversely, Longer Students do not have AC the Less They will Score on Achievement Tests.
 - This Study Supported Previous Research.