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Comparison of New Mexico PED School Grade Scores with CESE Canonical Correlation Scores and Demographics

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Coalition for Excellence in Science and Math Education

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Background

- The Coalition for Excellence in Science and Math Education (CESE), a 501(c)(3) Charitable Organization, has compared the New Mexico's Public Education Department's (PED) numerical school grades to the CESE canonical correlation scores(reading and math) derived from New Mexico Standards Based Assessment (NMSBA) scale scores.
- These comparisons with comments, as appropriate, are presented in the following slides broken into sections of ES (Elementary schools), MS (mid schools), and HS (high schools) – except for two plots.

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Background (Concluded)

1. The PED grade scores are plotted against the CESE canonical correlation combination of the NMSBA scale scores for reading and math.
2. The correlation of PED grade scores with the CESE Demographic Index (canonically combined percentages of minority, FRLP, ELL, disability, and FAY) are shown.
3. The independent canonically combined scale scores (reading and math) versus the demographically predicted scores are plotted. (CESE uses the residual of the linear regression of canonical scores vs. demographic index to determine where to look for outperforming schools to observe best practices to apply to other schools with similar demographics.)
4. The correlation of the CESE canonical scale scores with the demographic index are shown for elementary schools, first.

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Presentation Format

- The plots are as follow:

  - ✓ CESE canonical correlation score (reading and math canonically combined scale scores only) plotted against the PED grade scores, showing cutoffs for PED grades with Correlation and Determination Coefficients and comments, if appropriate.
  - ✓ Short analysis or observations, if appropriate
  - ✓ CESE Demographic Index (% minority, ELL, Disability, FRLP, and FAY) plotted against the PED grade scores.
  - ✓ CESE demographically predicted scores (reading and math combined scale scores only) plotted against actual canonically combined NMSBA reading and math scores.
  - ✓ CESE canonically combined reading and math scale scores from NMSBA tests plotted against the CESE Demographic Index.

- Comments may be added as appropriate.

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Elementary Schools

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PED Grade Scores Vs. CESE Canonically Combined NMSBA Scale Scores (Reading/Math) – ES

PED Grades

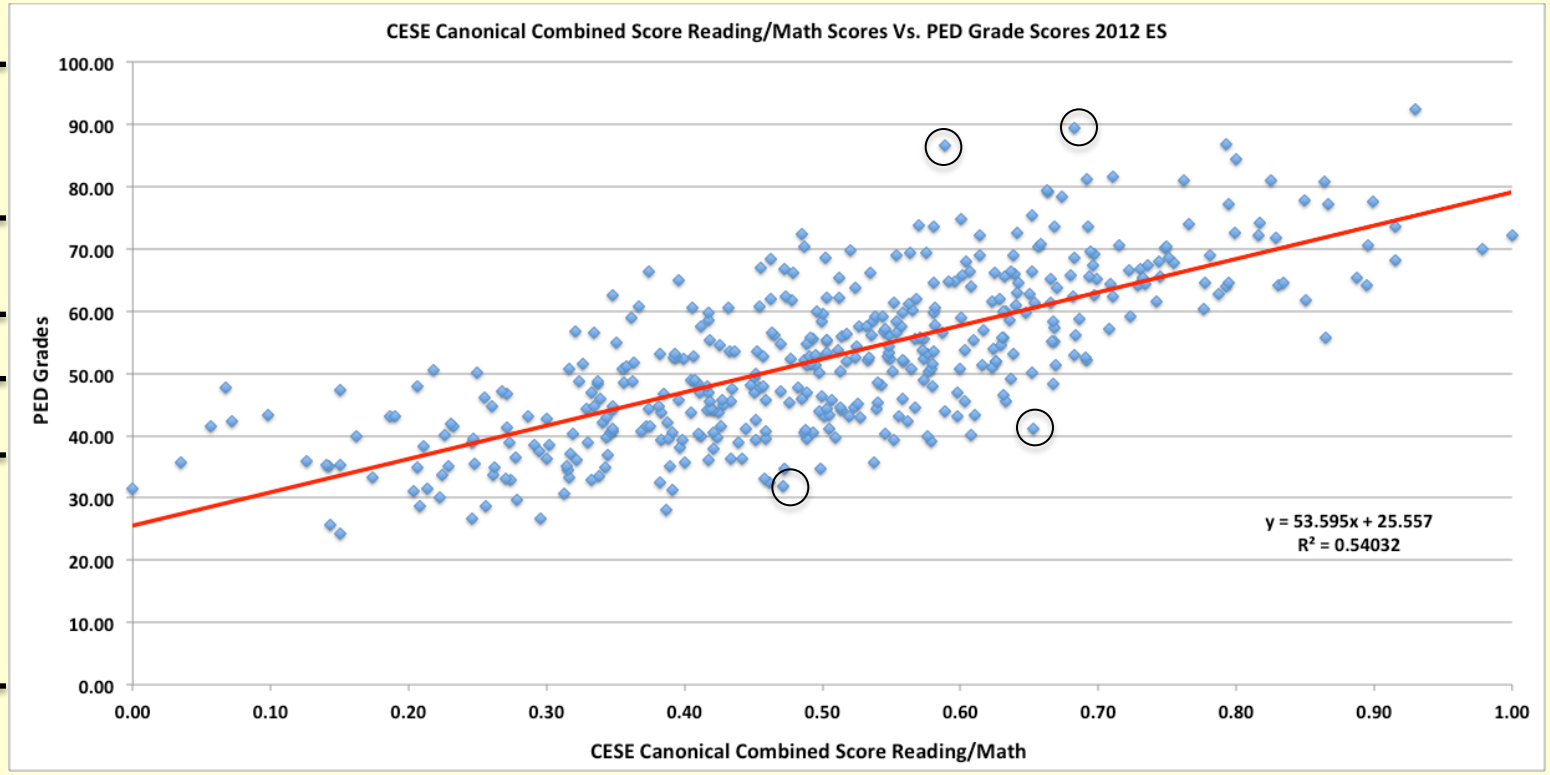
A

B

C

D

F



Correlation Coefficient (R) = 0.7735 (p<<0.001)
Determination Coefficient (R^2) = 0.5403

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Analysis of Outliers

- Sample schools that are clearly visual outliers (greatest distance from the trend line) are circled on the graph, above. They represent those schools that have the greatest difference between CESE and PED scores.
- The state grade scores appear to be primarily driven by Growth (at all divisions – School, Q1 (Quartile 1), and Q2 + Q3 + Q4, (known as Q3 in PED parlance) and Opportunity to Learn.
- The CESE grade scores are a canonically correlated combination of Reading and Math Scale Scores, only. The mathematics decides the weighting factors to maximize the correlation between the combined demographic factors and the combined performance factors, and hence maximizes the ability to remove demographic effects from performance if the goal is to identify over performing schools to be emulated for growth purposes.
- Additional observations provided in the the Middle School slides also apply here, but are left out to avoid repetitiveness and are more deeply analyzed because of fewer schools are involved.

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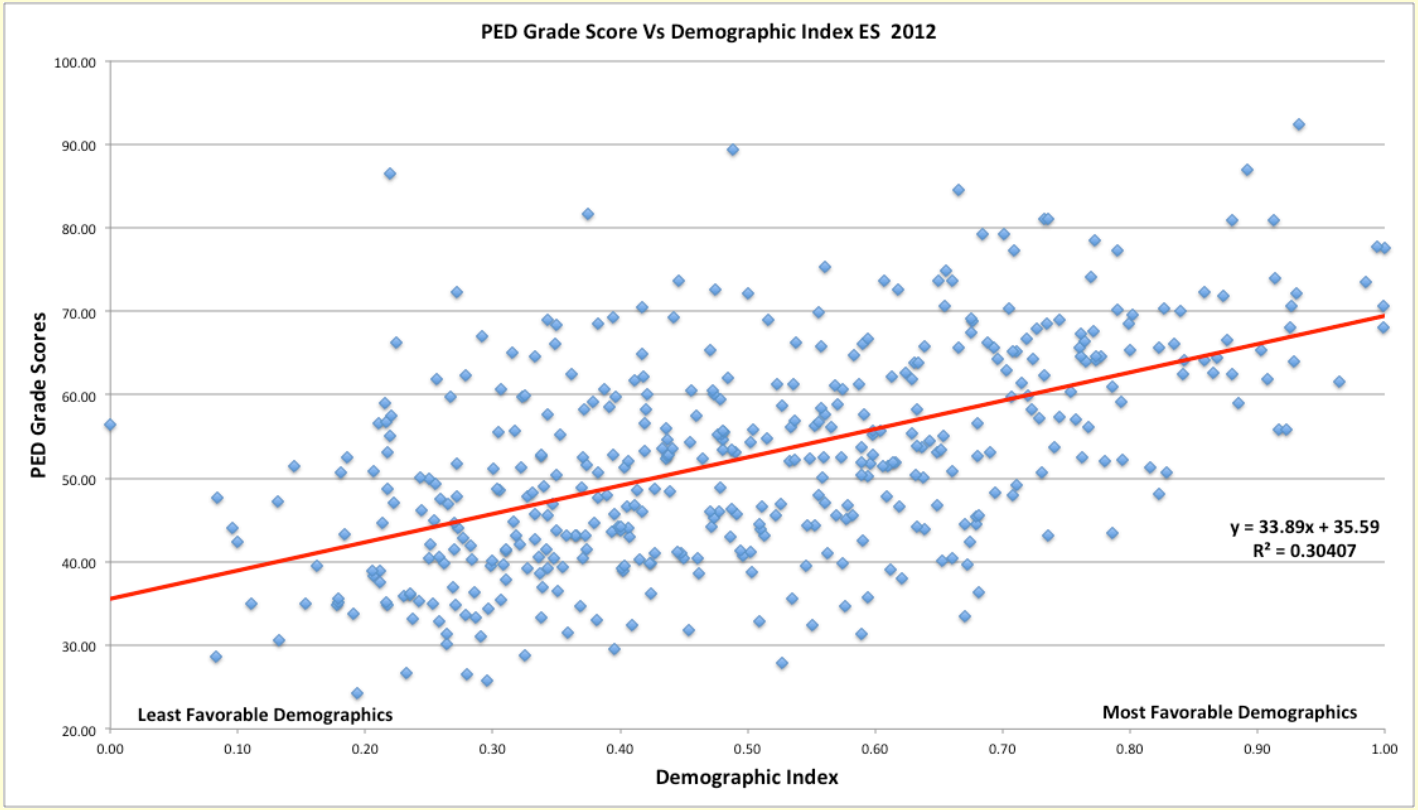
PED Grade Scores Vs. CESE Demographic Index– ES 2012



Determination Coefficient (R^2)= 0.3041 ($p<<0.001$)
Correlation Coefficient (R) = 0 .5514

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Observation

The PED Elementary School grades are correlated with the elementary school demographics (with some noticeable outliers). The correlation is moderate to high, with the p-value << 0.001 (highly significant).

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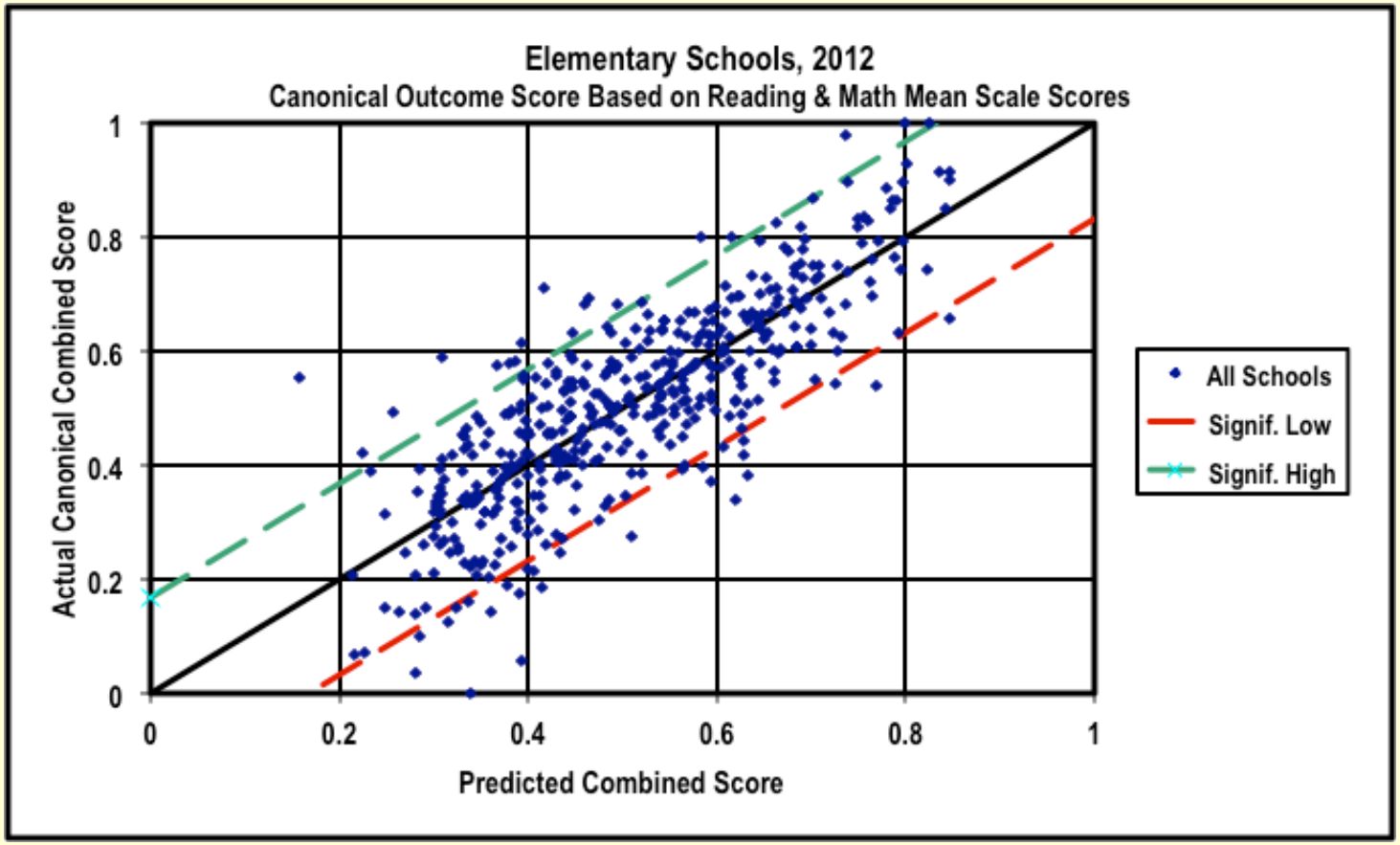
CESE Comparison – Canonical Outcome (Reading/Math) Vs. Regression ES 2012*



$R^2 = 0.66608$

$R = 0.81614$ ($p << 0.001$)

* An Excel file can be made available to identify schools on this plot.

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Analysis (CESE Canonical Comparison) ES 2012

This provides the standard CESE comparison showing elementary schools whose canonically combined reading/ math scale scores exceed a significance value of 0.95. These schools (above the green line) can be used as models for schools below the green line to obtain "best practices" to apply to schools with similar demographics.

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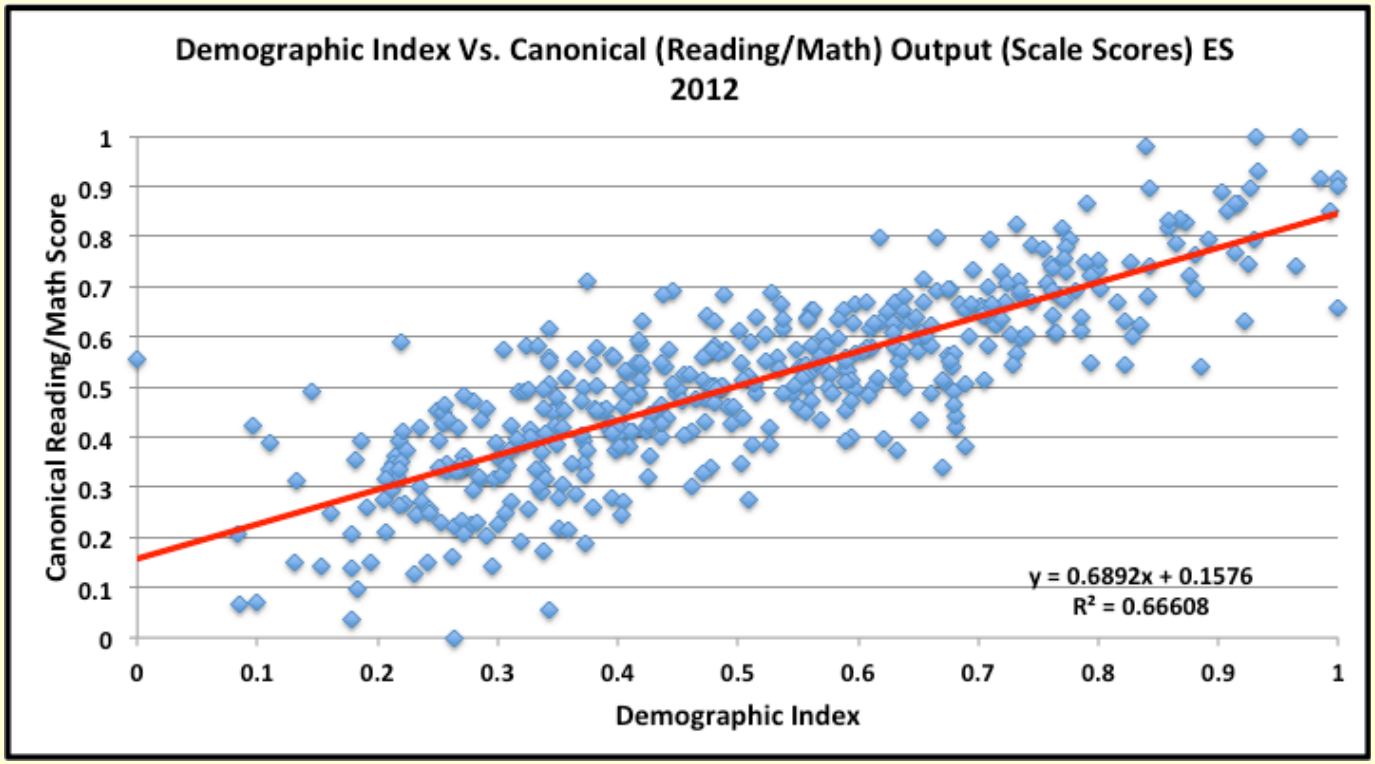
Comparison of Demographic Index to CESE Canonical Combined Scale Scores (Reading/Math) ES 2012



$R^2 = 0.66608$

$R = 0.81614$ ($p << 0.001$)

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Observations

- The R^2 and R values for the canonical combination vs. regression is exactly the same as is the canonical combination vs. demographic index.

- The correlation of canonically combined grade scores and CESE Demographic index is high and significant, and is equal to the correlation of canonically predicted scores with canonically combined grade scores, as would be expected from the math. The above slide demonstrates this fact.

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Middle Schools

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PED Grade Scores Vs. CESE Canonically Combined NMSBA Scale Scores (Reading/Math) – MS

PED Grades

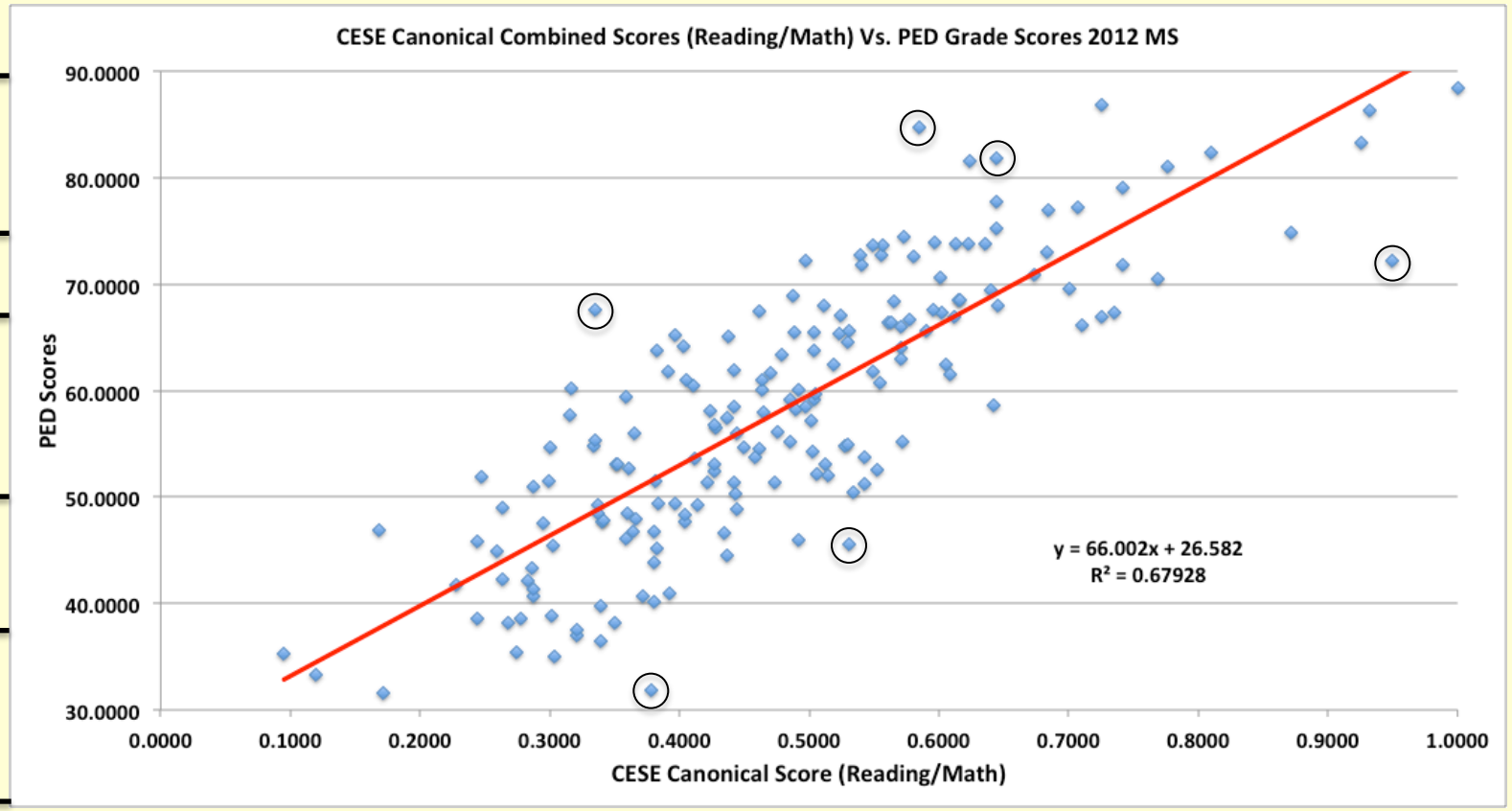
A

B

C

D

F



R^2 = 0.67928

R = 0.8242 (p<<0.001)

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Samples of Apparent Disparities with PED Grading

- The apparent primary drivers for the sample outlying circled schools are Growth (generally chaotic in the short term) and Opportunity to Learn.
- For several of the circled schools, the PED grades were up to two grades different than CESE would have assigned if using the same scale.
- For at least one high ranked school, overall growth was graded as a C, while Growth of the top three quartiles was an A, and growth of the bottom quartile was a B. This is undoubtedly confusing to the district personnel in charge, and is also confusing to us.
- For at least one low ranked school, the overall score was an F, but the Opportunity to Learn was a B. Similarly, another school scored an overall F but had an Opportunity to Learn of an A. This appears potentially contradictory and confusing.
- Opportunity to Learn appears to be a questionable measure. Current Performance does not appear to correspond with canonical performance, even closely, with the schools scoring significantly less than the trend line.
- Growth appears to simply not correspond with the significantly high or low scored schools, and sometimes drives the overall grade when Current Performance does not. Growth is chaotic for New Mexico schools, and this is an expected outcome when it's PED weighting is set as high as it is.

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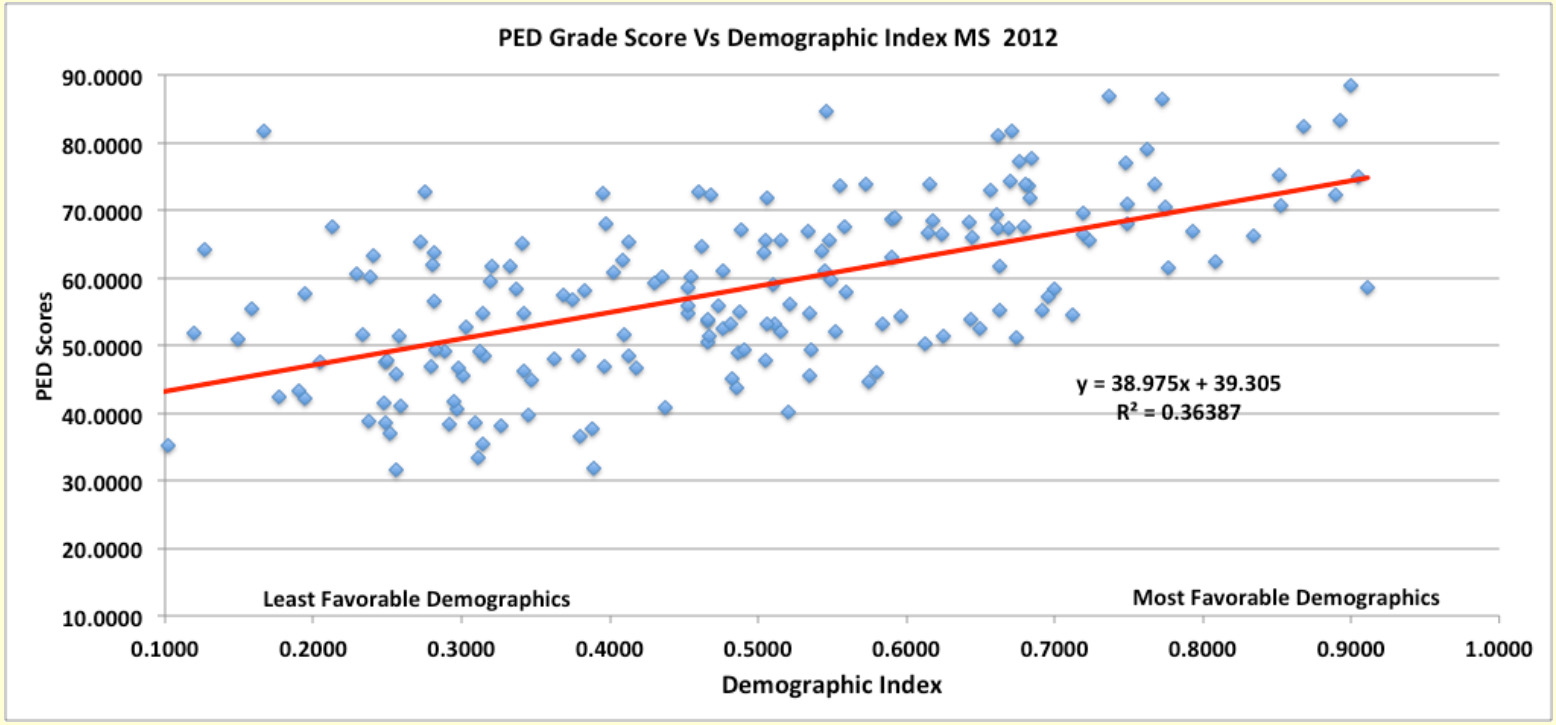
Comparison of Demographic Index to PED Grade Scores (Reading/Math) MS 2012



$R^2 = 0.36387$

$R = 0.6032$ ($p << 0.001$)

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Observation

- The PED Middle School grades are well correlated with the middle school demographics. The correlation is moderate to high, with the p-value << 0.001 (highly significant).

- Sometimes, other PED performance variables significantly impact the overall scores which can cause a lower correlation than may otherwise be expected.

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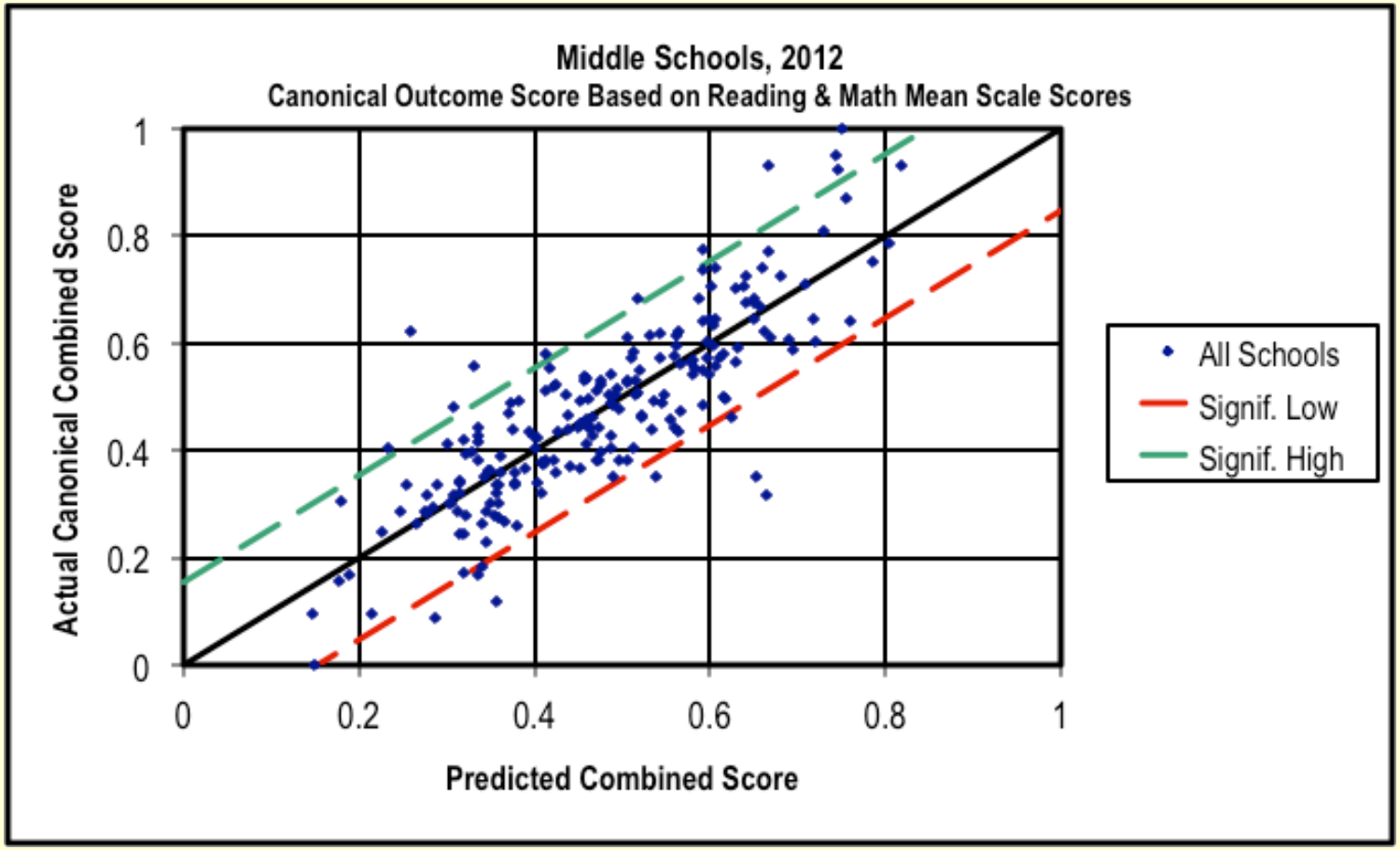
CESE Comparison – Canonical Outcome (Reading/Math) to Regression MS 2012



$R^2 = 0.69533$

$R = 0.8339$ ($p << 0.01$)

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Analysis (CESE Canonical Comparison) MS 2012

- This provides the standard CESE comparison showing middle schools whose canonically combined reading/ math scale scores exceed the significance value (0.95). These schools (above the green line) can be used as models for schools below the green line to obtain "best practices" to apply to schools with similar demographics.

- The correlation to PED grades is high and significant, but has some significant outliers that may not be scored appropriately.

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High Schools

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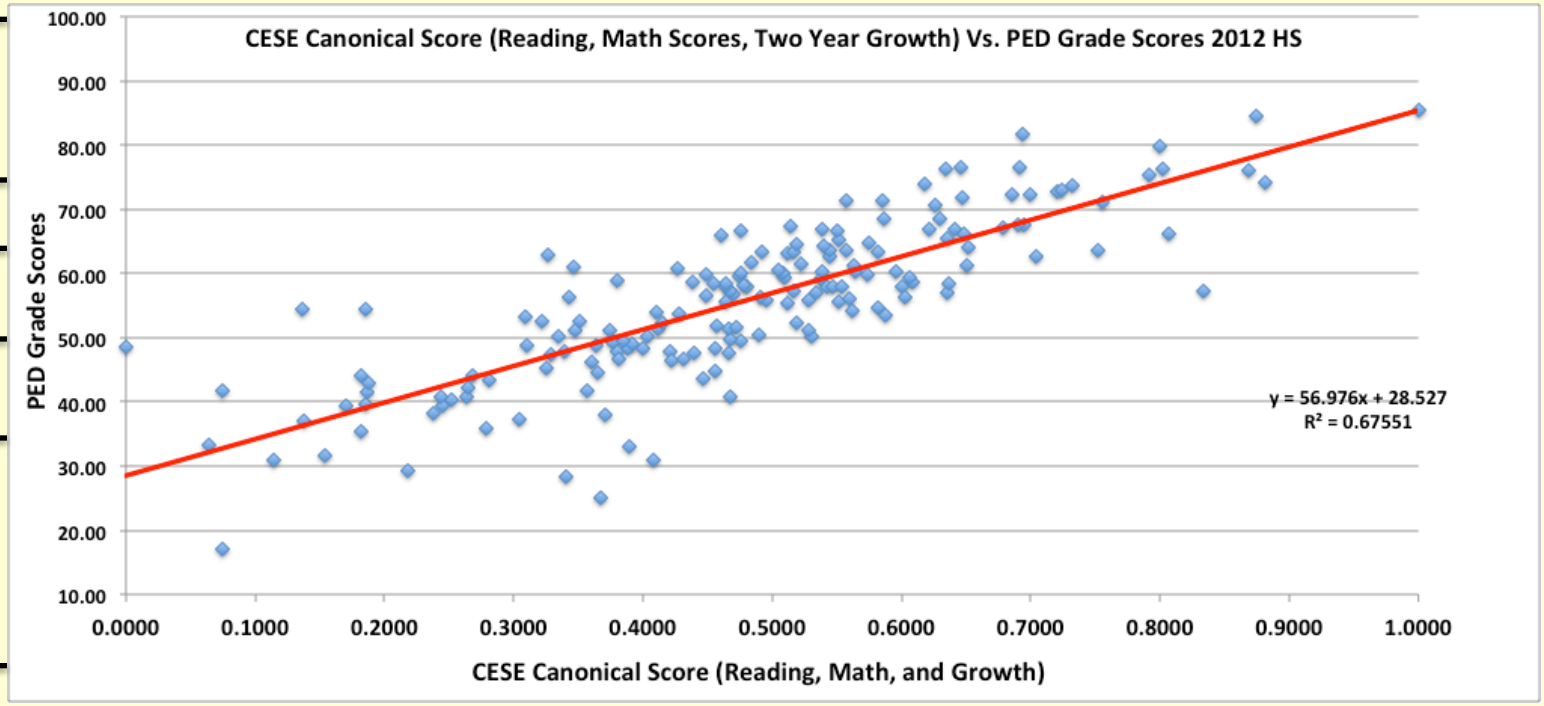
PED Grade Scores Vs. CESE Canonically Combined NMSBA Scale Scores (Reading/Math) – HS

A
B
C
D
F
0.0



R^2 = 0.67551
R = 0.8219 (p<<0.01)

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Analysis of Outliers

- High schools present differently than elementary and middle schools on the PED grading variables. Current Standing, Growth of Highest ¾, Growth of the lowest ¼ , and Opportunity to learn are all still used. Added are Graduation Rate and College and Career Readiness.
- As one can see from the plot (prior page), the correlation between the PED grade scores and the CESE canonical correlation output are very high. Outliers are still very close to the best fit line (none were circled), providing little room for differentiation between high/low outliers and average performance.
- There are a few schools for which the canonical correlation would indicate either a higher or lower grade should be assigned. These schools have a Current Standing that is different from Growth, Opportunity to Learn (OTL), and/or Graduation rate. E.g., several schools are scored a letter grade below or above their performance level because of higher/lower scores in OTL, Growth rates, and/or Graduation rates. But there is less impact for high schools than for the other grades.

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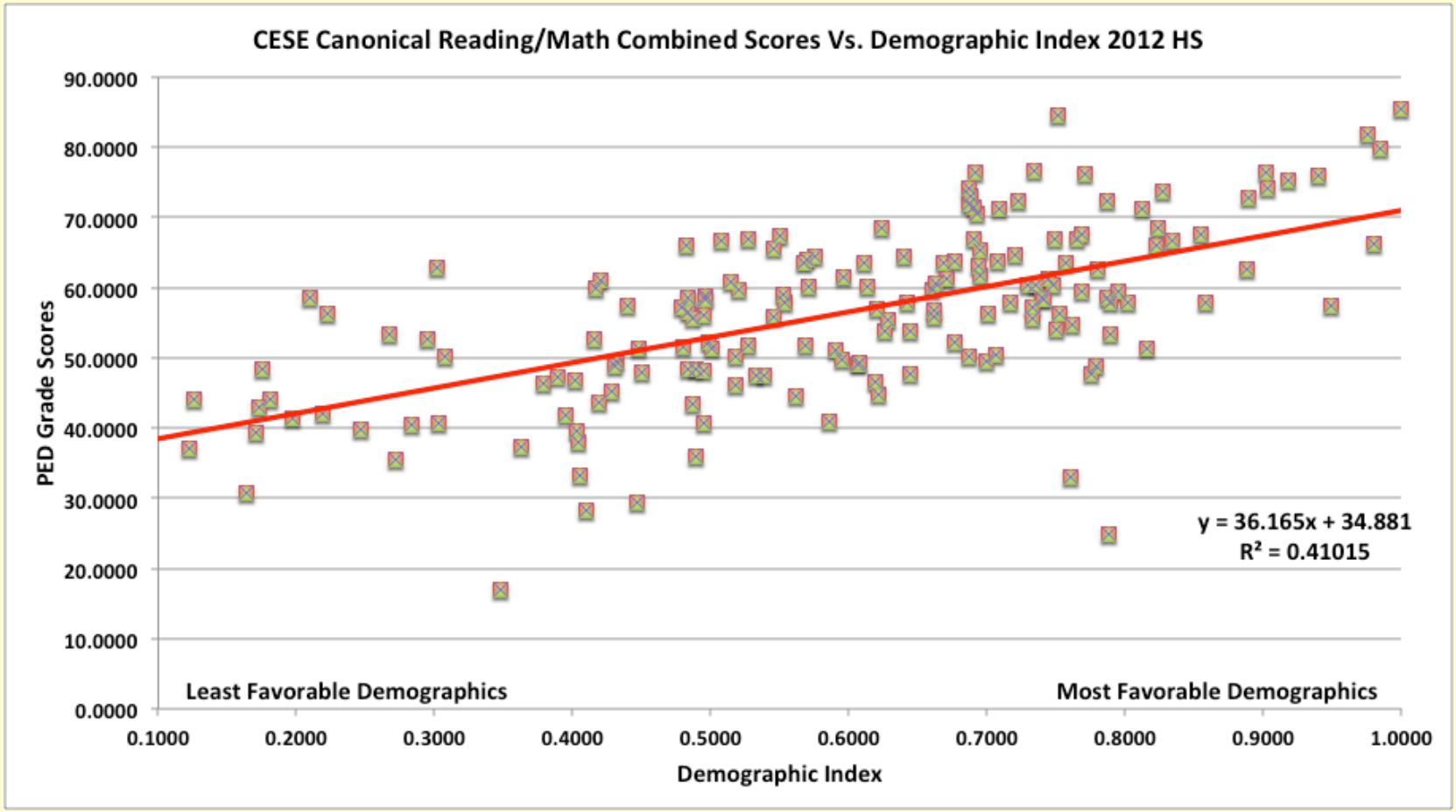
Comparison of Demographic Index to PED Grade Scores (Reading/Math) HS 2012



R^2 = 0.4101

R = 0.6405 (p<<0.001)

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Observation

The PED High School grade scores are moderate to highly correlated with the middle school demographics. The p-value << 0.001 is (highly significant).

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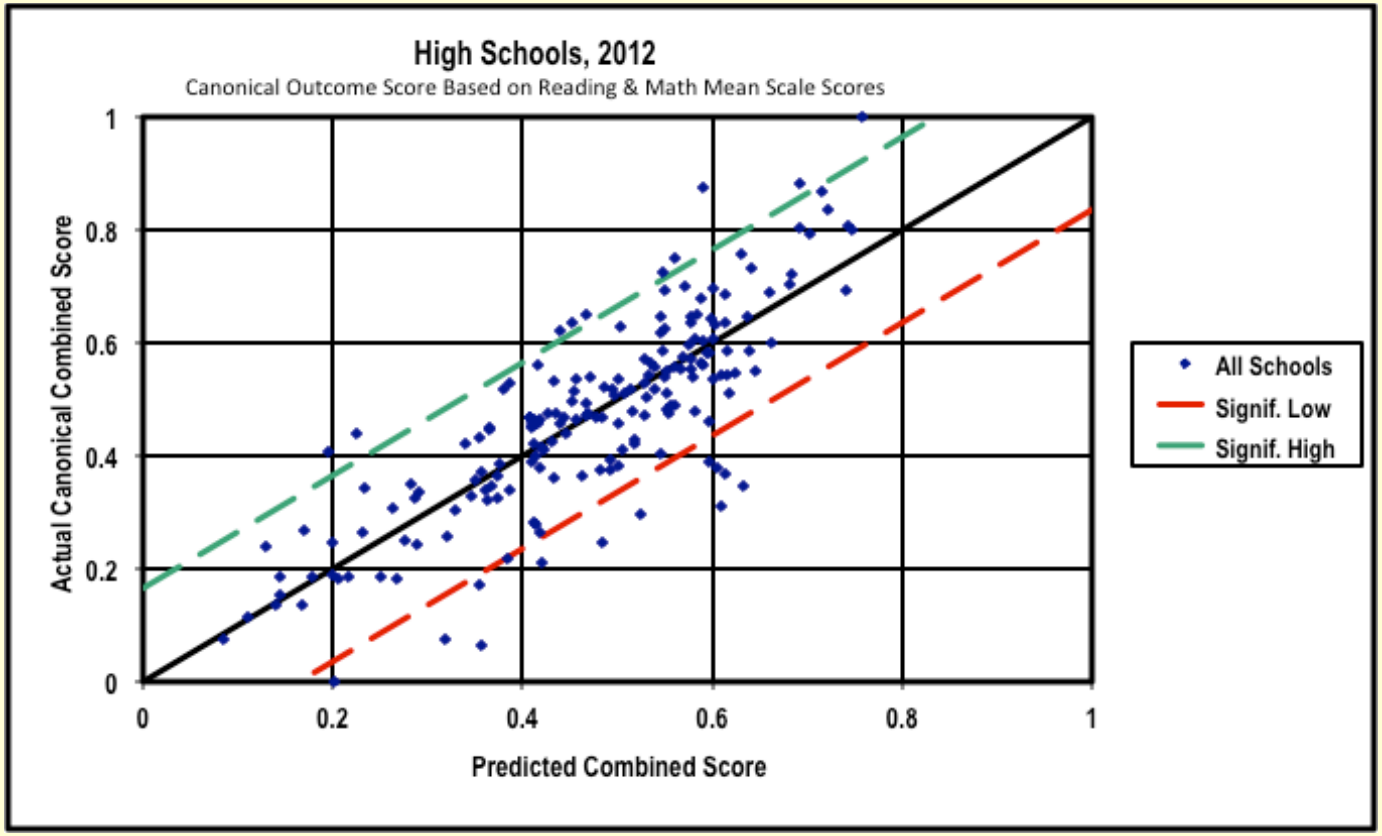
CESE Comparison – Canonical Outcome (Reading/Math) to Regression HS 2012



$R^2 = 0.67413$

$R = 0.82105$ ($p << 0.001$)

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Analysis (CESE Canonical Comparison) HS 2012

- This provides the standard CESE comparison showing high schools whose canonically combined reading and math scale scores exceed the significance value of 0.95. These schools (above the green line) can be used as models for schools below the green line to obtain "best practices" to apply to schools with similar demographics.

- The correlation to PED grade scores is high and highly significant.

- Comparison of the CESE canonical combined scores to the demographic index will provide identical correlation for all grade levels, as seen in the Elementary School plots (slides 10 and 12) and addressed in slide 13.

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Overall Conclusions

- The PED grade scores and the CESE canonically combined Reading and Math scores correlate very well – with the exception of some noticeable outliers.
- The "outliers" appear to be the result of:
  - ✓ PED variables of Growth (generally chaotic in actual New Mexico data) and appears to impact a number of the PED scores.
  - ✓ Opportunity to Learn (OTL) often does not come close to Current Standing (which appears as if the metrics for OTL might be inappropriate). This impacts a number of the overall scores.
  - ✓ For high schools, Growth, Graduation, and College and Career Readiness are similar to OTL and Growth used for elementary and middle schools. They are often *"out of sync"* with the Current Standing, which appears to impact PED overall grade scores, sometimes in an apparently disproportionate manner.

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Recommendations

- CESE recommends that the PED consider the weightings currently used and the metrics chosen for those input variables that are scored to derive New Mexico school grades, such that they are more consistent with the actual scores being recorded AND the results of unbiased canonical correlation modeling.
- For the current grading system that the PED is using, schools that one may identify as "outliers" using the CESE canonical correlation approach (or other method) should be given a special review to determine whether the current variables being used have resulted in an erroneous assignment of grade level, and a re-adjustment to that grade level made as appropriate.
- CESE recommends that as many subjects be tested and used for evaluations as is possible, rather than simply relying on Reading and Math which may not represent the broader range of learning for New Mexico students. This could all be done and stay within New Mexico statute requirements and Federal Department of Education statutory and regulation requirements. They should also not be overly burdensome to the students and teachers.