THE WASHINGTON ASSESSMENT OF STUDENT LEARNING

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Executive Summary

This paper aims to describe a school district whose students do well on the Washington Assessment of Student Learning (WASL). It highlights more opportunities for districts to come under this description. In addition to the extra efforts already started by schools districts, such as extensive training for teachers and extra tutoring programs for students, this paper will prove that districts can improve their WASL score through the way they administer their schools.

For fourth graders there are three ways that districts can administer their elementary schools to receive improving WASL score. Through the student-to-teacher ratio (-0.0792818), teachers' experience (1.004312), and the percentages of students receiving free or reduced lunch (0.504325), the school district can increase the percentage of students passing the WASL. For seventh graders, the same three variables are significant in affecting the WASL score except at different levels; (-0.267616), (1.029059), and (-0.500744). Ten grader also have teachers' experience (0.872040) and student-to-teacher ratio (-0.861453) as significant variables, but differencing from fourth to seventh graders, the percentages of male attending the school (0.589187) does make an impact on the WASL score.

What is the WASL?

The Washington Assessment of Student Learning (WASL) is a standardized test given at all public schools, not only show the state how each community's school compares to the others, but also to assess the knowledge of each student. The test is based on four different subjects: reading, mathematics, listening, and writing.[1] Students are first given the test at the fourth grade to assess where they currently stand. The test is then retaken in the seventh and tenth grades. If the students do not pass the WASL, they do not graduate from high school. "If nothing changes [from last year's scores], only 27 percent of the class of 2008 would get their diplomas [.]"[2]

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[1] Each subject is graded on a scale from one to four, four being the highest. Students receiving a three or higher pass that particular subject.

[2] Shaw, Linda. "Positives stressed in WASL results" from *Seattle Times*, August 29, 2003

Although some schools are providing extra tutoring and after school programs to prepare their students, there is definitely more that schools can do to help their students pass the WASL. From previous test results data, I regressed the percentages of passing students with the following thirteen variables (as they relate to each school district): drop out rate, ethnic diversity of schools, number of schools in a district, number of students, percentage of male students, percentage of white students, percentage of free or reduced lunch recipients, percentage of students in special education, teachers' educations, teachers' levels of experience, and student-to-teacher ratio.[3] In this paper's calculations, students are considered to have passed the WASL if they have passed three or more of the subject areas.[4] By analyzing the relationships between these variables and test results within individual Washington school districts, we will have more insight with which to help students prepare for the WASL. [Appendix A]

The effects of each variable

Data for the "drop out rate" variable shows that as the percentages of students dropping out of school decreases, test results will improve. The amount of this improvement is 0.066948 % more seventh graders and 0.121196 % more tenth graders passing the WASL with a decrease of one percent in the drop out rate. While the beta for the seventh and tenth graders make sense, the beta for the fourth graders does not. The regression gives a beta of 0.086335, which says the more students drop out in a certain district, the more fourth graders in that district pass the test. While this correlation may be a misleading coincidence, it may also imply that as more high school students drop out, elementary schools invest more in their students (possibly to prevent high drop out rates to continue).

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http://seattletimes.nwsource.com/html/education/2001659112_wasl29m.html Washington State House of Representatives, Office of Program Research
http://www.leg.wa.gov/pub/billinfo/2003-04/House/2100-2124/2124_hba_02282003.txt

[3] Data for variables and test results was collected from http://reportcard.ospi.k12.wa.us/

[4] See note 1

The "ethnic diversity" variable was collected as the difference between the two largest ethnicity groups in the school district. For example, if the percentage of whites in the districts was 85 percent and the percentage of Hispanics was 32 percent. The ethnicity value collected would be 53. The larger the difference between these two groups, the larger this value is; the less diverse the school district is. In choosing this variable, I was hoping to prove that there is a correlation between the diversity of a school and high WASL results. Yet, according to the regression, for fourth and tenth graders, the diversity of schools does not affect the WASL score (–0.005185 and 0.009237). However, for seventh graders, the beta value is slightly higher, having some effects on the WASL score. With a beta of –0.055488, it shows that increasing the diversity of a school by a value of one means increasing the percentage of students passing by .05 percent.

One of the least effective variables is "number of schools in a district." There is a positive correlation, which means that a higher number of schools will bring better WASL scores. One reason may be that when parents are committed to their child's learning, they will try to choose the best school in the district for their child. This may motivate that district's many schools to raise their instruction standards so that they will obtain these students from families with high values on learning. The schools will, in effect, be competing with each other for students likely to meet standards like those of the WASL. Simply by adding another school to a district, you can count on having about another .14 to .16 percent passing for fourth and seventh graders. Surprisingly, for tenth graders, adding another school will only increase the percentage of students passing by .0298 percent.

The regression proves that the number of students in a particular school district has no effect on its WASL results. For fourth graders, the beta is -7.68×10^{-5}, for seventh graders the beta is –0.000172, and for tenth graders the beta is 0.000142. This may be because the number of

schools and student-to-teacher ratio is more important. As the amount of students increases, so do the numbers of schools and teachers.

When choosing the variable "percentage of male students" I was anticipating that there would be no correlation to the WASL score. The results were unexpected. The beta for this variable is very different for each age group. For fourth graders, the beta is very small (0.041323). By increasing the male population at a school by one percent it only increases the WASL score by .04 percent. For seventh graders we see a completely opposite effect. With a negative correlation (beta of –0.207951), increasing the male population by one percent will decrease the percentage of students passing the WASL by 0.207951 percent. Standing at the highest correlation for this variable, a one-percent increase in the male population of tenth graders will increase the passing of WASL score by .589187 percent. There could be many explanations for the vast differences in betas. It may be because of how males change throughout grade levels; their growing interests in career fields or desires to impress female students, for example. Whatever the reason may be, by knowing the different betas for each grade will provide for us a better way to structuring schools to increase the WASL score.

I specifically chose to examine the effects the populations of whites have on the WASL score not to say that we need more white students in schools to increase the percentages passing, but rather to test the hypothesis that the WASL score is culturally biased. To prove that the test is culturally unbiased the beta for this variable must be very small, proving that there is not correlation. However, the regression for all three grades shows that there is some correlation between the variable "percentage of white students" and the passing of WASL scores. Although the betas are small, it does show that there is a bit of cultural bias.

One of the least surprising and most highly impacting results is found in the variable "percentage of free or reduced lunch recipients." By reducing the amount of students receiving free or reduce lunch by one percent we could increase the number of students passing the WASL

by 0.5 percent for both fourth and seventh graders. The beta for tenth graders is –0.434404. Since this variable is an indicator of a low-income area, the lower test scores may be caused partially by less school funding in those districts with many free/reduced lunch recipients. Low funding for schools means less "extras" with which to attract highly qualified teachers. Less qualified teachers often bring with them less motivation, a deficiency they are likely to share with their students. Finally, schools with less funding simply have a hard time getting helpful learning tools, such as books, computers, and sometimes just enough paper.

The data collected for the variable "students in special education" shows that, for all three (WASL-tested) grade levels, an increase in the numbers of students attending special education will decrease the percentages of students passing the WASL. This has a reasonable relationship because the standard student in special education does not pass the WASL. It is, however, surprising to see the different beta value for each grade; it starts with its highest value at fourth grade and slowly falls as it moves up to ten grade (from –1.125595, -0.630662 to –0.303597). Although we know the correlation for this variable, it would be unacceptable to turn students away from a particular school simply to increase the percentages of students passing the WASL. It would be wiser to use this knowledge in making other adjustments, either to the WASL system or Washington's school districts.

The data for the variable "teachers' educations" was collected in terms of the percentage of teachers in a district with a master's degree or higher. The regressions show that there is a positive correlation between "teachers' educations" and the WASL scores. However, the amount of impact varies for each grade. For fourth graders, we can have 0.174758 percent more students passing the WASL by increasing the percentage of teachers with a masters or higher by one percent. For seventh graders, the impact is 0.100489 percent. The highest impact is found the in the tenth graders with a beta of 0.244147.

While we could see that the amount of educations by teachers does impact the WASL score, the regression shows that "teachers' levels of experience" is more effective. The data for this variable is taken as the average amount of teachers' experience in years. This variable has the strongest correlation to the WASL score. For both fourth and seventh graders, an increase of "teachers' levels of experience" by one percent will increase the percentage of students passing the WASL by one percent. For tenth graders, the impact is not as strong (0.872040). Taking both "teachers' educations" and "teachers' levels of experience" into account, it may be better for tenth graders to hire high school teachers with superior education and average experience.

The beta for "student-to-teacher ratio" proves that it is connected to WASL scores. Despite what grade the student is in, there is a strong negative relationship between the two. For fourth graders, we could increase the percentage of students passing the test by 0.792818, if we could simply reduce the average student-to-teacher ratio by one student. For tenth graders, the impact is only slightly higher with a beta of –0.861453. Surprisingly, the ratio does not have a very strong impact on seventh graders. The beta is only –0.267616. A deduction in the ratio by one student will only increase the WASL score by 0.267616. Although the betas for the grade levels are different, the correlations between the student-to-teacher and the WASL score are always significantly negative.

Weaknesses and strengths to the regression

Overall I am pleased with the results, but am disappointed with the R-squared value. My variables only account for 47-55 percent of the effects on students' scores. I know that the school districts' budgets is a significant variable I have not included, but obtaining the data is nearly impossible (sheer volume of phone calls). Identifying this and other variables that affect students' scores would strengthen this model as it would raise the R-squared value.

In addition a stronger t-statistics would reinforce the betas for each variable. When analyzing the regressions for each grade, it should be brought to attention that not all of the

variables have significant t-statistics. Unfortunately, only two variables are significant at the 95% confidence interval for all three grades. However this proves that the betas for "free and reduced lunch" and "teachers' experience" are very significant. In addition, for tenth graders the variables "student-to-teacher ratio" and "teachers' education" are also significant. For this reason I strongly urge that school districts, when making decisions affecting their high schools, take these four variables into account because three of the four variables are completely controlled by them. This is an absolute advantage for the districts. In addition to these four variables, for fourth graders "special education" is also significant at the 95 % confidence interval. Although, public elementary schools do not have the ability to choose the type of students attending their schools, the beta for this variable can be use as an explanation for lower WASL results. Since the same four significant variables affect elementary schools as they do high schools, school districts should make the same considerations when addressing their elementary schools.

Conclusion

When looking at fourth graders solely, there are four variables that the school districts can focus on to increase the percentage of students passing the WASL. The strongest is the "teachers' levels of experience." With a beta of 1.0041312 the school district can raise the percentage of students passing one percent simply by increasing its average teacher's level of experience by one year. The school district can increase an additional .792818 of a percent by simply decreasing the student-to-teacher ratio by one student. An additional .504 of a percent can be added by decreasing the amount of students needing free or reduced lunch by one percent, distributing concentrated financial need to the care of more school districts. The last of the four major ways school districts can help increase their fourth graders' scores is through their

teachers' education. By simply ensuring one percent more teachers have at least a master's degree, another .174758 of a percent will pass the WASL.

The four ways that school districts can help their seventh graders are very similar to those for the fourth graders except at one point. School districts should still place careful attention to "teachers' levels of experience" (1.029059), "student-to-teacher ratio" (-0.267616), and "percentage of free or reduced lunch recipients" (-0.500744). However with seventh graders, it is also important for a school district to consider if the amount of middle schools/junior highs it has is sufficient for the district's number of students. By building one more school, it can increase the percentage of students passing by 0.159124.

While the fourth and seventh grades have a lot in common, the tenth graders are different. With the beta for student-to-teacher ratio at –0.861453 it shows that in a tenth grade classroom there should be fewer students to a teacher. Simply by dropping the average student-to-teacher ratio by one student, the percentage of student passing the WASL will increase by 0.861453. The teachers' experience (0.872040) is also important although it is not as strong as it is with the fourth and seventh graders. For the tenth graders it may be wiser to hire teachers with experience but also expect for them to have higher education since the beta for teacher's education (0.244147) is higher than for the other grades. This probably reflects the growth in knowledge tenth graders have attained throughout all their years of education and how teachers need to still be superior in this area, to challenge and motivate their students.

All in all, this paper is structured to allow school districts know which variables (or characteristics) in their schools affect how their students will do on the WASL. My intention is for school districts to see the strengths of some correlations and use this information to run the schools better, so that more students can pass the WASL. By having the schools do their best to help the students prepare for the WASL, it will give their students the optimum opportunity to succeed.

APENDIX A

Dependent Variable: P_4THPASS
Method: Least Squares
Date: 12/04/03 Time: 19:31
Sample(adjusted): 1 243
Included observations: 227
Excluded observations: 16 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	68.71757	22.00818	3.122366	0.0020
DROP_RATE	0.086335	0.142520	0.605779	0.5453
ETHNICITY	-0.005185	0.048638	-0.106613	0.9152
N_SCHOOLS	0.141207	0.223320	0.632307	0.5279
N_STUDENTS	-7.68E-05	0.000447	-0.171781	0.8638
P_MALE	0.041323	0.342200	0.120758	0.9040
P_WHITES	0.041752	0.061493	0.678973	0.4979
REDUCEMEAL	-0.504325	0.065681	-7.678429	0.0000
SPECIALED	-1.125595	0.381879	-2.947516	0.0036
T_EDUCATION	0.174758	0.081127	2.154135	0.0323
T_EXPERIENCE	1.004312	0.423459	2.371688	0.0186
TS_RATIO	-0.792818	0.321877	-2.463109	0.0146

R-squared	0.525501	Mean dependent var	50.96740
Adjusted R-squared	0.501224	S.D. dependent var	15.50381
S.E. of regression	10.94942	Akaike info criterion	7.675866
Sum squared resid	25776.32	Schwarz criterion	7.856920
Log likelihood	-859.2107	F-statistic	21.64629
Durbin-Watson stat	1.827116	Prob(F-statistic)	0.000000

Dependent Variable: P_7THPASS
Method: Least Squares
Date: 12/04/03 Time: 19:31
Sample(adjusted): 1 243
Included observations: 229
Excluded observations: 14 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	66.12268	17.64040	3.748366	0.0002
DROP_RATE	-0.066948	0.122138	-0.548133	0.5842
ETHNICITY	-0.055488	0.041912	-1.323910	0.1869
N_SCHOOLS	0.159124	0.192074	0.828450	0.4083
N_STUDENTS	-0.000172	0.000385	-0.448157	0.6545
P_MALE	-0.207951	0.280886	-0.740341	0.4599
P_WHITES	0.040457	0.052888	0.764950	0.4451
REDUCEMEAL	-0.500744	0.056589	-8.848791	0.0000
SPECIALED	-0.630662	0.328284	-1.921088	0.0560
T_EDUCATION	0.100489	0.069668	1.442391	0.1506
T_EXPERIENCE	1.029059	0.354538	2.902536	0.0041
TS_RATIO	-0.267616	0.263112	-1.017120	0.3102

R-squared	0.558657	Mean dependent var	41.63755
Adjusted R-squared	0.536285	S.D. dependent var	13.85586
S.E. of regression	9.435378	Akaike info criterion	7.377788
Sum squared resid	19318.72	Schwarz criterion	7.557721
Log likelihood	-832.7568	F-statistic	24.97101
Durbin-Watson stat	2.216422	Prob(F-statistic)	0.000000

Dependent Variable: P_10THPASS
Method: Least Squares
Date: 12/04/03 Time: 19:31
Sample(adjusted): 1 243
Included observations: 222
Excluded observations: 21 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.28698	22.25442	1.316007	0.1896
DROP_RATE	-0.121196	0.137192	-0.883407	0.3780
ETHNICITY	-0.009237	0.047987	-0.192484	0.8475
N_SCHOOLS	0.029836	0.214541	0.139069	0.8895
N_STUDENTS	0.000142	0.000430	0.329505	0.7421
P_MALE	0.589187	0.365755	1.610879	0.1087
P_WHITES	0.025651	0.060597	0.423308	0.6725
REDUCEMEAL	-0.434404	0.064001	-6.787509	0.0000
SPECIALED	-0.303597	0.384460	-0.789671	0.4306
T_EDUCATION	0.244147	0.079305	3.078602	0.0024
T_EXPERIENCE	0.872040	0.418188	2.085281	0.0383
TS_RATIO	-0.861453	0.322199	-2.673666	0.0081

R-squared	0.473872	Mean dependent var	50.90180
Adjusted R-squared	0.446313	S.D. dependent var	14.10801
S.E. of regression	10.49779	Akaike info criterion	7.592745
Sum squared resid	23142.76	Schwarz criterion	7.776674
Log likelihood	-830.7947	F-statistic	17.19476
Durbin-Watson stat	2.011482	Prob(F-statistic)	0.000000