# General Education Goals & Outcomes

The scientific literacy goals and associated student learning outcomes have been aligned with the following General Education groups:

**Science Outcomes**

|  |  |
| --- | --- |
| **OUTCOMES** | GENERAL EDUCATION GROUPS |
| 1h.1 Use common lab equipment and procedures to collect data. | IVA |
| 1h.2 Use terminology and describe basic principles of science | IVA,IVB |
| 1h.3 Recognize the key elements of scientific investigation such as reliance on evidence, use of inductive reasoning, and control of variables.  | IVA |
| 1h.4 Evaluate and interpret how science relates to contemporary events in everyday life. | IVA, IVB |
| 1h.5 Reflect on and evaluate one’s own health. | V |

The quantitative literacy goals and associated student learning outcomes have been aligned with the following General Education groups:

**Quantitative Outcomes**

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| --- | --- |
| **OUTCOMES** | GENERAL EDUCATION GROUPS |
| 3.1 Collect measurement data in a scientific manner. | IVA |
| 3.2 Accurately analyze and interpret data. | IVA,IVB, IVC, V |
| 3.3 Use quantitative methods to solve problems.  | IVA, IVB, IVC, V |
| 3.4 Evaluate and draw inferences from mathematical models. | IVA, IVB |

# Test Description

The Natural World Test, Version 9 (NW-9) is a 66-item multiple choice test intended to measure learning in scientific and quantitative reasoning for undergraduate college students. The NW-9 can be administered in either paper-and-pencil form or computer based formats. The recommended testing time is 60 minutes.

**Test Blueprint**

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| **NW-9 Objectives** | **Items** | **Objective** |
| Describe the methods of inquiry that lead to mathematical truth and scientific knowledge and be able to distinguish science from pseudo-science. | 2,5,9,14,18,28,38-41,55-57 | Scientific Reasoning |
| Use theories and models as unifying principles to help us understand natural phenomena and make predictions. | 17,20,22,27,64-66 | Scientific Reasoning |
| Recognize the interdependence of applied research, basic research, and technology, and how they affect society. | 1,15,16,43-46 | Scientific Reasoning |
| Illustrate the interdependence between developments in science and social and ethical issues. | 2,19,24-26,29,55-57 | Scientific Reasoning |
| Use graphical, symbolic, and numerical methods to analyze, organize, and interpret natural phenomenon. | 4,7,8,10-13,21,30-33,51-53,58-63 | Scientific Reasoning & Quantitative Reasoning |
| Discriminate between association and causation, and identify the types of evidence and used to establish causation. | 3,34-37,53,60-63, | Scientific Reasoning & Quantitative Reasoning |
| Formulate hypotheses, identify relevant variables, and design experiments to test hypotheses. | 5,6,9-13,18,23,28,41,42,47-50,54,59,60,62,63 | Scientific Reasoning |
| Evaluate the credibility, use, and misuse of scientific and mathematical information in scientific developments and public-policy issues. | 2,14,24-26,29,38-40,60-63 | Scientific Reasoning |

**Methodology**

The spring 2015 Gull Week assessment was open to the entire Salisbury University student population and included students from each school and academic rank at Salisbury. The NW-9 exam is intended to provide information about the effects of curriculum and instruction on students learning and is also intended to measure learning in scientific and quantitative reasoning in undergraduate college students. Test results may be used for instructional improvements. Faculty representatives from the areas being tested were asked to review the questions on the exam to ensure that they were effective in assessing the academic goals being reviewed. The following tables compare the demographics of the students that took the exam to students that did not.

**Non-Test-Takers and GULL Week Test-Takers Comparisons**

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| --- | --- | --- |
| **Table 1** | **Non-Gull Week Test Takers** | **Gull Week Test Takers** |
|  | **N** | **AVG(STD DEV)** | **N** | **AVG(STD DEV)** |
| ***High School GPA\**** | *3481* | *3.30(1.0)* | *456* | *3.46(.96)* |
| ***SAT Verbal*** | *4283* | *529(74.85)* | *600* | *529(76.32)* |
| ***SAT Math\**** | *4284* | *537(76.94)* | *600* | *545(80.28)* |
| ***Cumulative GPA\**** | *6770* | *2.82(1.0)* | *846* | *2.96(.89)* |

Table 1 compares High School GPA, SAT Verbal, SAT Math, and Cumulative GPA in students that took the Gull Week exam and students that did not. The High School GPA’s (3.47 vs 3.31), SAT Math scores (545 vs 537), and Cumulative GPA’s (2.96 vs 2.76) of students who took the Gull Week exam were statistically significantly higher than that of students who did not take the exam.

**Cumulative GPA Comparison by Academic Rank**

|  |  |  |
| --- | --- | --- |
| **Table 2** | **Non-Gull Week Test Takers** | **Gull Week Test Takers** |
|  | **N** | **AVG(STD DEV)** | **N** | **AVG(STD DEV)** |
| *Freshmen\** | *980* | *2.30(1.3)* | *173* | *2.76(1.1)* |
| *Sophomores\** | *1433* | *2.66(1.0)* | *210* | *2.96(.93)* |
| *Juniors* | *1812* | *2.85(.87)* | *243* | *2.94(.82)* |
| *Seniors\** | *2235* | *3.10(.52)* | *209* | *3.21(.48)* |

Table 2 compares Cumulative GPA by academic rank in students that took the Gull Week exam and students that did not. The Cumulative GPA’s of Freshmen (2.76 vs 2.30), Sophomores (2.96 vs 2.66), and Seniors (3.21 vs 3.10) that took the Gull Week exam were statistically significantly higher than that of students with the same academic rank that did not take the exam.

**Non-Test-Takers and GULL Week Test-Takers Gender Comparison**

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| **Table 3** | **Non-Gull Week Test Takers** | **Gull Week Test Takers** |
|  | **N** | **N(%of test-takers)** |
| **Male(1)** | *3028(45%)* | *255(30%)* |
| **Female(2)** | *3738(55%)* | *589(70%)* |
| **Total** | ***6766(100%)*** | ***844(100%)*** |

Table 3 compares the number of students that took the Gull Week exam to those that did not by gender. Out of all the students that took the Gull Week exam, 70% were female. This is significantly (though not statistically) higher than the percentage of female students (55%) that did not take the test.

**First Time vs Transfer Student Comparison**

|  |  |  |  |
| --- | --- | --- | --- |
| **Classification** | **Non-Gull Week Test Taker** | **Gull Week Test Taker** | **Total** |
| **Unknown** | *224**(3.3%)* | *8**(0.9%)* | *232**(3.0%)* |
| **First time Student** | *3961**(58.5%)* | *613**(72.5%)* | *4574**(60.1%)* |
| **Transfer**  | *2585)**(38.2%)* | *224**(26.6%)* | *2809**(36.9%)* |
| **Total** | *6770**(100.0%)* | *845**(100.0%)* | *7615**(100.0%)* |

Table 11 compares the number of Gull Week test takers to non-test takers based on their first-time or transfer student status upon entry to SU. 72.5% of NW-9 test takers were first time students, 26.6% were transfer students.

**Academic Rank Comparison**

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 5** | **Non-Gull Week Test Taker** | **Gull Week Test Taker** | **Total** |
| **Freshmen** | *980**(14.5%)* | *173**(20.5%)* | *1153**(15.1%)* |
| **Sophomores** | *1433**(21.2%)* | *210**(24.9%)* | *1643**(21.6%)* |
| **Juniors** | *1812**(26.8%)* | *243**(28.8%)* | *2055**(27.0%)* |
| **Seniors** | *2235**(33.0%)* | *209**(24.7%)* | *2444* *(32.1%)* |
| **Non-Degree** | *310**(4.5%)* | *10**(1.1%)* | *320**(4.2%)* |
| **Total** | *6770(100%)* | *845(100%)* | *7615(100%)* |

Table 5 compares the number of students that took the Gull Week exam to those that did not by academic rank. Juniors had the highest turnout for the exam (28.8% of test takers) and Freshmen had the lowest turnout (20.5% of test takers) next to Non-Degree seeking students (1.2%).

**Race/Ethnicity Comparison**

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| --- | --- | --- | --- |
| **Table 6** | **Non-Gull Week Test Taker** | **Gull Week Test Taker** | **Total** |
| **African-American** | *848**(12.5%)* | *116**(13.7%)* | *964**(12.7%)* |
| **American Ind/Alaska Native** | *31**(0.5%)* | *1**(0.1%)* | *32**(0.4%)* |
| **Asian** | *171**(2.5%)* | *28**(3.3%)* | *199**(2.6%)* |
| **Hispanic** | *273**(4.0%)* | *33**(3.9%)* | *306**(4.0%)* |
| **Native Hawaiian/Pacific Island** | *10**(0.1%)* | *1**(0.1%)* | *11**(0.1%)* |
| **NRA** | *153**(2.3%)* | *23**(2.7%)* | *176**(2.3%)* |
| **Two or more races** | *263**(3.9%)* | *29**(3.4%)* | *292**(3.8%)* |
| **White** | *4790**(70.8%)* | *585**(69.2%)* | *5375**(70.6%)* |
| **Unknown/Not specified** | *231**(3.4%)* | *29**(3.4%)* | *260**(3.4%)* |
| **Total** | *6770**(100.0%)* | *845**(100.0%)* | *7615**(100.0%)* |

Table 6 compares the number of students that took the Gull Week exam to those that did not by race/ethnicity. The percentage of students that took the exam closely resembled the percentage of students that did not take the exam when looked at by race. When looked at holistically, African-American and Asian students represented a bigger percentage of Gull-Week test takers population (13.7% and 3.3% respectively) than they did as a part of the Salisbury University population (12.7% and 2.6% respectively).

# NW-9 Sample

For the 2015 NW-9 assessment, data from 153 Gull Week test takers were collected. Demographic, SAT, and cumulative grade comparisons were made to examine the similarities between the sampled students and all undergraduate students that did not take the NW-9 exam. In addition, data were compared based on students’ academic rank, and first-time student status (SU native vs. transfer).

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| **Table 7** | **NW-9 Test Taker** | **Non-NW9 -Test Taker** |
|  | **N** | **Avg (SD)** | **N** | **Avg (SD)** |
| **High School GPA** | *78* | *3.44(.90)* | *3859* | *3.32(1.0)* |
| **SAT Verbal** | *111* | *534(85)* | *4772* | *529(75)* |
| **SAT Math** | *111* | *543(78)* | *4772* | *538(77)* |
| **Cumulative GPA** | *153* | *2.97(.97)* | *7462* | *2.78(.98)* |

Table 7 compares High School GPA, SAT Verbal, SAT Math, and Cumulative GPA in students that took the NW-9 exam and students that did not. The High School GPA’s (3.44 vs 3.32), SAT Verbal scores (534 vs 529), SAT Math scores (543 vs 538), and Cumulative GPA’s (2.97 vs 2.78) of students who took the NW-9 exam were higher than that of students who did not take the NW-9 exam.

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| **Table 8** | **NW-9 Test Taker** | **Non-NW9-Test Taker** | **Total** |
|  |  |  |  |
| **African American** | 24*(15.7%)* | 940*(12.6%)* | 964*(12.7%)* |
| **American Ind/Alaska Native** | 1*(0.7%)* | 31*(0.4%)* | 32*(0.4%)* |
| **Asian** | 3*(2.0%)* | 196*(2.6%)* | 199*(2.6%)* |
| **Hispanic** | 6*(3.9%)* | 300*(4.0%)* | 306*(4.0%)* |
| **Native Hawaiian/Pacific IslandHH** | 0*(0.0%)* | 11*(0.1%)* | 11*(0.1%)* |
| **NRA** | 4*(2.6%)* | 172*(2.3%)* | 176*(2.3%)* |
| **Two or more races** | 5*(3.3%)* | 287*(3.8%)* | 292*(3.8%)* |
| **White** | 103*(67.3%)* | 5272*(70.7%)* | 5375*(70.6%)* |
| **Unknown/Not specified** | 7*(4.6%)* | 253*(3.4%)* | 260*(3.4%)* |
| **Total** | 153*(100.0%)* | 7462*(100.0%)* | 7615*(100.0%)* |

Table 8 compares the number of students that took the NW-9 exam to those that did not by race/ethnicity. The percentage of African-American and American Indian/Alaska Native students that took the exam (15.7% and 0.7% respectively) accounted for a higher percentage of the NW-9 test-taker population then they did the Salisbury population (12.7% and 0.4% respectively). The percentage of students that did not take the NW-9 when looked at by race almost exactly matches the percentage by race of students in the Salisbury University population. This makes sense because out of the 7615 students in the SU population, only 153 took the NW-9 test.

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| **Table 9** | **NW-9 Test Taker** | **Non-NW9-Test Taker** | **Total** |
| **Freshmen** | *39**(25.5%)* | *1149**(14.9%)* | *1153**(15.1%)* |
| **Sophomores** | *43**(28.1%)* | *1600**(21.4%)* | *1643**(21.6%)* |
| **Juniors** | *24**(15.7%)* | *2031**(27.2%)* | *2055**(27.0%)* |
| **Seniors** | *44**(28.8%)* | *2400**(32.2%)* | *2444* *(32.1%)* |
| **Non-Degree** | *3**(2.0%)* | *317**(4.2%)* | *320**(4.2%)* |
| **Total** | *153**(100.0%)* | *7462**(100.0%)* | *7615**(100.0%)* |

Table 9 compares the number of students that took the NW-9 exam to those that did not by academic rank. More seniors took the exam than any other academic rank (28.8% of test takers) and Juniors had the fewest students take the NW-9 (15.7% of test takers) next to Non-Degree seeking students (2.0%).

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| **Table 10** | **NW-9 Test Taker** | **Non-NW9-Test Taker** |
|  | **N(%of test-takers)** | **N** |
| **Male(1)** | *57(37.3%)* | *3226(43.3%)* |
| **Female(2)** | *96(62.7%)* | *4231(56.7%)* |
| **Total** | ***153(100.0%)*** | ***7457(100%)*** |

Table 10 compares the number of students that took the NW-9 exam to those that did not by gender. Out of all the students that took the NW-9 exam, 62.7% were female. This is significantly higher than the percentage of female students (56.7%) that did not take the test.

|  |  |  |  |
| --- | --- | --- | --- |
| **Classification** | **NW-9 Test Taker** | **Non-NW9-Test Taker** | **Total** |
| **Unknown** | *2**(1.3%)* | *230**(3.1%)* | *232**(3.0%)* |
| **First time Student** | *110**(71.9%)* | *4464**(59.8%)* | *4574**(60.1%)* |
| **Transfer**  | *41**(26.1%)* | *2768**(37.1%)* | *2809**(357%)* |
| **Total** | *153* *(100.0%)* | *7462**(100.0%)* | *7615**(100.0%)* |

Table 11 compares the number of Gull Week test takers to non-test takers based on their first-time or transfer student status upon entry to SU. Table 11 compares the number of Gull Week test takers to non-test takers based on their first-time or transfer student status upon entry to SU. 71.9% of NW-9 test takers were first time students, 26.1% were transfer students.

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| **Table 12** | **NW-9 Test Taker** | **Non-NW9-Test Taker** |
|  | **N** | **AVG(STD DEV)** | **N** | **AVG(STD DEV)** |
| ***Freshmen\**** | *39* | *3.10(.93)* | *1114* | *2.35(1.3)* |
| ***Sophomores\**** | *43* | *2.87(1.1)* | *1600* | *2.69(1.0)* |
| ***Juniors*** | *24* | *2.76(1.1)* | *2031* | *2.86(.86)* |
| ***Seniors\**** | *44* | *3.17(.58)* | *2400* | *3.10(.51)* |

Table 12 compares Cumulative GPA by academic rank in students that took the NW-9 exam and students that did not. The Cumulative GPA’s of Freshmen (3.10 vs 2.35), Sophomores (2.87 vs 2.69), and Seniors (3.17 vs 3.10) that took the Gull Week exam were statistically significantly higher than that of students with the same academic rank that did not take the exam.

# Results

## Reliability

The Crohnbachs Alpha, which tells how consistently we are measuring a skill.

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| **Reliability Statistics** |
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .836 | .891 | 2 |

NW-ScienceMath-----Reliability between Math and Science subsections

## Performance

In this section we will breakdown scoring on NW-9 exam as a whole, as well as by section (Science and Math). In addition, we will breakdown scoring on these sections by school (Fulton, Henson, Perdue, and Seidel). The data were collected from the 153 students that chose to take the Gull Week exam and were randomly assigned the NW-9 exam.

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| **Table 13** | **N** | **NW-9 Percent Average Score(Std dev)** | **Avg Score/Max Possible** |
| **Total Average Score** | 153 | 61.9(14.5) | 62/95 |
| **NW-9 Math** | 153 | 64.1(16.9) | 17/26 |
| **NW-9 Science** | 153 | 60.9(14.5) | 30/47 |

Table 13 shows the percent average score on the whole NW-9 exam as well as the NW-9 Math, and NW-9 Science sections. Students scored higher (64.1%) on the NW-9 Math section than they did on the exam overall (61.9%) and the NW-9 Science section (60.9%).

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| --- | --- | --- |
| **School** | **N** | **NW-9 Percent Average Score(Std dev)** |
| **Fulton** | *51* | *64.2(16.2)* |
| **Henson\*** | *36* | *65.5(13.9)* |
| **Perdue\*** | *23* | *55.0(14.6)* |
| **Seidel** | *35* | *58.3(10.7)* |
| **Undeclared** | *8* | *66.6(12.1)* |
| **Total** | **153** | **61.9(14.5)** |

*\*P value lower than .05*

Table 14 shows the percent average score on the NW-9 exam by school. Henson (65.5%) students scored significantly higher than Perdue (55%). All other school comparison were not statistically significant. Undeclared students (66.6%) scored higher than all of the other schools, though this could be explained by their relatively small sample size of 8.

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| --- | --- | --- |
| **School** | **N** | **NW-9 Math % Average Score(Std dev)** |
| **Fulton** | *51* | *66.6(19.0)* |
| **Henson** | *36* | *67.6(14.1)* |
| **Perdue** | *23* | *56.9(16.9)* |
| **Seidel** | *35* | *60.0(14.0)* |
| **Undeclared** | *8* | *73.1(18.2)* |
| **Total** | **153** | **64.1(16.9)** |

Table 15 shows the percent average score on the NW-9 Math exam by school. Henson (67.6%) students scored higher than all other schools. Perdue students (56.9%) scored the lowest on the NW-9 Math exam. School comparisons were not statistically significant. Undeclared students scored (73.1%) highest in the sample.

|  |  |  |
| --- | --- | --- |
| **School** | **N** | **NW-9 Science % Average Score(STD DEV)** |
| **Fulton** | *51* | *63.0(16.5)* |
| **Henson** | *36* | *64.3(14.5)* |
| **Perdue** | *23* | *54.0(14.5)* |
| **Seidel** | *35* | *58.1(10.4)* |
| **Undeclared** | *8* | *64.5(10.5)* |
| **Total** | **153** | **60.9(14.5)** |

Table 16 shows the percent average score on the NW-9 Science exam by school. Henson (64.3%) students scored higher than all other schools. Perdue students (54.0%) scored the lowest on the NW-9 Science exam. School comparisons were not statistically significant. Undeclared students (64.5%) scored highest in the sample. As noted before, the NW-9 science had the lowest average scores when compared to the NW-9 overall and NW-9 math.

Dependent Variable: NW9MathPercent

Tukey HSD

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **School** **Table 18** | **School**  | **Mean Difference**  | **Std. Error** | **Sig.** | **95% Confidence Interval** |
| **Lower Bound** |
| **Fulton** | **Henson** | **-.0104** | **.03590** | **.998** | **-.1095** |
|  | **Perdue** | **.0974** | **.04142** | **.135** | **-.0170** |
|  | **Seidel** | **.0703** | **.03619** | **.300** | **-.0296** |
|  | **Undeclared** | **-.0649** | **.06271** | **.839** | **-.2380** |
| *Henson* | *Fulton* | *.0104* | *.03590* | *.998* | *-.0888* |
|  | *Perdue* | *.1077* | *.04402* | *.109* | *-.0138* |
|  | *Seidel* | *.0807* | *.03914* | *.243* | *-.0274* |
|  | *Undeclared* | *-.0545* | *.06445* | *.916* | *-.2325* |
| **Perdue** | **Fulton** | **-.0974** | **.04142** | **.135** | **-.2117** |
|  | **Henson** | **-.1077** | **.04402** | **.109** | **-.2293** |
|  | **Seidel** | **-.0270** | **.04426** | **.973** | **-.1493** |
|  | **Undeclared** | **-.1622** | **.06768** | **.122** | **-.3491** |
| *Seidel* | *Fulton* | *-.0703* | *.03619* | *.300* | *-.1703* |
|  | *Henson* | *-.0807* | *.03914* | *.243* | *-.1888* |
|  | *Perdue* | *.0270* | *.04426* | *.973* | *-.0952* |
|  | *Undeclared* | *-.1352* | *.06462* | *.229* | *-.3136* |
| **Undeclared** | **Fulton** | ***.0649*** | ***.06271*** | ***.839*** | ***-.1083*** |
|  | **Henson** | ***.0545*** | ***.06445*** | ***.916*** | ***-.1235*** |
|  | **Perdue** | ***.1622*** | ***.06768*** | ***.122*** | ***-.0247*** |
|  | **Seidel** | ***.1352*** | ***.06462*** | ***.229*** | ***-.0433*** |

Table 18 shows the Tukey’s HSD test for statistical significance between paired comparisons for the different pairings of the independent variable (school). Approximately **7.7%** of the variability in NW-9 Math can be attributed to the School in which a student majors. In terms of practical significance, this would be considered a medium effect size. Although there appears to be no statistically significant correlation between schools and test scores, the overall ANOVA test (*for the relationship between the independent variable (school) and the dependent variable (NW9-Math scores*)) gave a statistically significant value of **.018**. Reasons this could be happening are because the two tests test for different things and/or because ANOVA is more sensitive to finding statistically significant difference than pairwise comparisons using Tukey’s HSD. Tukey’s HSD more stringently controls for Type I error, thus it requires a larger difference to indicate that results are statistically significantly different.

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| Dependent Variable: NW9SciencePercent  |
| **Table 19**  |
| **(I) School Numeric** | **(J) School Numeric** | **Mean Difference (I-J)** | **Std. Error** | **Sig.** | **95% Confidence Interval** |
| **Lower Bound** |
| **Fulton** | **Henson** | ***-.0126*** | ***.03098*** | ***.994*** | ***-.0982*** |
|  | **Perdue** | ***.0908*** | ***.03574*** | ***.088*** | ***-.0079*** |
|  | **Seidel** | ***.0495*** | ***.03124*** | ***.510*** | ***-.0368*** |
|  | **Undeclared** | ***-.0152*** | ***.05412*** | ***.999*** | ***-.1646*** |
| *Henson* | *Fulton* | *.0126* | *.03098* | *.994* | *-.0729* |
|  | *Perdue* | *.1034* | *.03799* | *.056* | *-.0015* |
|  | *Seidel* | *.0621* | *.03378* | *.356* | *-.0312* |
|  | *Undeclared* | *-.0026* | *.05562* | *1.000* | *-.1562* |
| **Perdue** | **Fulton** | ***-.0908*** | ***.03574*** | ***.088*** | ***-.1895*** |
|  | **Henson** | ***-.1034*** | ***.03799*** | ***.056*** | ***-.2083*** |
|  | **Seidel** | ***-.0413*** | ***.03820*** | ***.816*** | ***-.1468*** |
|  | **Undeclared** | ***-.1059*** | ***.05841*** | ***.370*** | ***-.2672*** |
| *Seidel* | *Fulton* | *-.0495* | *.03124* | *.510* | *-.1358* |
|  | *Henson* | *-.0621* | *.03378* | *.356* | *-.1554* |
|  | *Perdue* | *.0413* | *.03820* | *.816* | *-.0642* |
|  | *Undeclared* | *-.0647* | *.05577* | *.774* | *-.2187* |
| **Undeclared** | **Fulton** | ***.0152*** | ***.05412*** | ***.999*** | ***-.1343*** |
|  | **Henson** | ***.0026*** | ***.05562*** | ***1.000*** | ***-.1511*** |
|  | **Perdue** | ***.1059*** | ***.05841*** | ***.370*** | ***-.0554*** |
|  | **Seidel** | ***.0647*** | ***.05577*** | ***.774*** | ***-.0894*** |

Table 19 shows the Tukey’s HSD test for statistical significance between paired comparisons for the different pairings of the independent variable (school). Approximately **6.7%** of the variability in NW-9 Science can be attributed to the School in which a student majors. In terms of practical significance, this would be considered a medium effect size. Although there appears to be no statistically significant correlation between schools and test scores, the overall ANOVA test (*for the relationship between the independent variable (school) and the dependent variable (NW9-Science scores*)) gave a statistically significant value of **.036**. Reasons this could be happening are because the two tests test for different things and/or because ANOVA is more sensitive to finding statistically significant difference than pairwise comparisons using Tukey’s HSD. Tukey’s HSD more stringently controls for Type I error, thus it requires a larger difference to indicate that results are statistically significantly different.

|  |
| --- |
| **Multiple Comparisons** |
| Dependent Variable: TEST SCORE  |
| Tukey HSD  |
| (I) School Numeric | (J) School Numeric | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval |
| Lower Bound |
| **Fulton** | **Henson** | **-1.31** | **3.073** | **.993** | **-9.80** |
|  | **Perdue** | **9.25** | **3.546** | **.074** | **-.55** |
|  | **Seidel** | **5.90** | **3.099** | **.319** | **-2.65** |
|  | **Undeclared** | **-2.40** | **5.369** | **.992** | **-17.23** |
| *Henson* | *Fulton* | *1.31* | *3.073* | *.993* | *-7.17* |
|  | *Perdue* | *10.56\** | *3.769* | *.045* | *.15* |
|  | *Seidel* | *7.22* | *3.351* | *.203* | *-2.04* |
|  | *Undeclared* | *-1.09* | *5.518* | *1.000* | *-16.33* |
| **Perdue** | **Fulton** | **-9.25** | **3.546** | **.074** | **-19.04** |
|  | **Henson** | **-10.56\*** | **3.769** | **.045** | **-20.97** |
|  | **Seidel** | **-3.34** | **3.790** | **.903** | **-13.81** |
|  | **Undeclared** | **-11.65** | **5.795** | **.266** | **-27.66** |
| *Seidel* | *Fulton* | *-5.90* | *3.099* | *.319* | *-14.46* |
|  | *Henson* | *-7.22* | *3.351* | *.203* | *-16.47* |
|  | *Perdue* | *3.34* | *3.790* | *.903* | *-7.12* |
|  | *Undeclared* | *-8.31* | *5.533* | *.563* | *-23.59* |
| **Undeclared** | **Fulton** | **2.40** | **5.369** | **.992** | **-12.42** |
|  | **Henson** | **1.09** | **5.518** | **1.000** | **-14.15** |
|  | **Perdue** | **11.65** | **5.795** | **.266** | **-4.35** |
|  | **Seidel** | **8.31** | **5.533** | **.563** | **-6.97** |

Table 20 shows the Tukey’s HSD test for statistical significance between paired comparisons for the different pairings of the independent variable (school). Approximately **7.8%** of the variability in NW-9 exam can be attributed to the School in which a student majors. In terms of practical significance, this would be considered a medium effect size. Although there appears to be no statistically significant correlation between schools and test scores, the overall ANOVA test (*for the relationship between the independent variable (school) and the dependent variable (NW-9 scores*)) gave a statistically significant P value of **.017**. Reasons this could be happening are because the two tests test for different things and/or because ANOVA is more sensitive to finding statistically significant difference than pairwise comparisons using Tukey’s HSD. Tukey’s HSD more stringently controls for Type I error, thus it requires a larger difference to indicate that results are statistically significantly different.

## Validity

Correlations-NW9 Science and Math Subsections----Validity

|  |  |  |
| --- | --- | --- |
|  | NW9Math | NW9Science |
| NW9Math | Pearson Correlation | 1 | .803\*\* |
| Sig. (2-tailed) |  | .000 |
| N | 153 | 153 |
| NW9Science | Pearson Correlation | .803\*\* | 1 |
| Sig. (2-tailed) | .000 |  |
| N | 153 | 153 |

## Item Analysis

The following table shows the average percent score for each question on the NW-9 exam.

|  |
| --- |
| **NW-9 Item Statistics** |
|  | **Mean** | **Std. Dev** | **N** |
| **NW.1** | *.61* |  *.49* | 153 |
| **NW.2** | *.24* | *.43* | 153 |
| **NW.3** | *.59* | *.49* | 153 |
| **NW.4** | *.52* | *.50* | 153 |
| **NW.5** | *.95* | *.21* | 153 |
| **NW.6** | *.39* | *.49* | 153 |
| **NW.7** | *.46* | *.50* | 153 |
| **NW.8** | *.67* | *.47* | 153 |
| **NW.9** | *.59* | *.49* | 153 |
| **NW.10** | *.95* | *.22* | 153 |
| **NW.11** | *.43* | *.50* | 153 |
| **NW.12** | *.64* | *.48* | 153 |
| **NW.13** | *.81* | *.39* | 153 |
| **NW.14** | *.58* | *.50* | 153 |
| **NW.15** | *.56* | *.50* | 153 |
| **NW.16** | *.69* | *.47* | 153 |
| **NW.17** | *.61* | *.49* | 153 |
| **NW.18** | *.88* | *.32* | 153 |
| **NW.19** | *.88* | *.33* | 153 |
| **NW.20** | *.61* | *.49* | 153 |
| **NW.21** | *.57* | *.50* | 153 |
| **NW.22** | *.63* | *.49* | 153 |
| **NW.23** | *.75* | *.44* | 153 |
| **NW.24** | *.77* | *.42* | 153 |
| **NW.25** | *.81* | *.40* | 153 |
| **NW.26** | *.59* | *.50* | 153 |
| **NW.27** | *.71* | *.45* | 153 |
| **NW.28** | *.65* | *.48* | 153 |
| **NW.29** | *.52* | *.50* | 153 |
| **NW.30** | *.56* | *.50* | 153 |
| **NW.31** | *.71* | *.45* | 153 |
| **NW.32** | *.63* | *.49* | 153 |
| **NW.33** | *.55* | *.50* | 153 |
| **NW.34** | *.84* | *.37* | 153 |
| **NW.35** | *.78* | *.41* | 153 |
| **NW.36** | *.82* | *.38* | 153 |
| **NW.37** | *.82* | *.38* | 153 |
| **NW.38** | *.70* | *.46* | 153 |
| **NW.39** | *.84* | *.37* | 153 |
| **NW.40** | *.80* | *.40* | 153 |
| **NW.41** | *.89* | *.32* | 153 |
| **NW.42** | *.80* | *.40* | 153 |
| **NW.43** | *.21* | *.41* | 153 |
| **NW.44** | *.24* | *.43* | 153 |
| **NW.45** | *.73* | *.45* | 153 |
| **NW.46** | *.35* | *.48* | 153 |
| **NW.47** | *.63* | *.49* | 153 |
| **NW.48** | *.47* | *.50* | 153 |
| **NW.49** | *.42* | *.50* | 153 |
| **NW.50** | *.60* | *.50* | 153 |
| **NW.51** | *.63* | *.49* | 153 |
| **NW.52** | *.68* | *.47* | 153 |
| **NW.53** | *.61* | *.49* | 153 |
| **NW.54** | *.55* | *.50* | 153 |
| **NW.55** | *.61* | *.49* | 153 |
| **NW.56** | *.56* | *.50* | 153 |
| **NW.57** | *.39* | *.49* | 153 |
| **NW.58** | *.59* | *.49* | 153 |
| **NW.59** | *.46* | *.50* | 153 |
| **NW.60** | *.59* | *.49* | 153 |
| **NW.61** | *.56* | *.50* | 153 |
| **NW.62** | *.67* | *.47* | 153 |
| **NW.63** | *.51* | *.50* | 153 |
| **NW.64** | *.56* | *.50* | 153 |
| **NW.65** | *.24* | *.43* | 153 |
| **NW.66** | *.64* | *.48* | 153 |

The following table shows the average percent score for each math question on the NW-9 exam.

|  |
| --- |
| **NW-9 Math Item Statistics** |
| **Question #** | **Mean** | **Std. Dev** | **N** |
| **NW.3** | *.59* | *.49* | 153 |
| **NW.4** | *.52* | *.50* | 153 |
| **NW.7** | *.46* | *.50* | 153 |
| **NW.8** | *.67* | *.47* | 153 |
| **NW.10** | *.95* | *.22* | 153 |
| **NW.11** | *.43* | *.50* | 153 |
| **NW.12** | *.64* | *.48* | 153 |
| **NW.13** | *.81* | *.39* | 153 |
| **NW.21** | *.57* | *.50* | 153 |
| **NW.30** | *.56* | *.50* | 153 |
| **NW.31** | *.71* | *.45* | 153 |
| **NW.32** | *.63* | *.49* | 153 |
| **NW.33** | *.55* | *.50* | 153 |
| **NW.34** | *.84* | *.37* | 153 |
| **NW.35** | *.78* | *.41* | 153 |
| **NW.36** | *.82* | *.38* | 153 |
| **NW.37** | *.82* | *.38* | 153 |
| **NW.51** | *.63* | *.49* | 153 |
| **NW.52** | *.68* | *.47* | 153 |
| **NW.53** | *.61* | *.49* | 153 |
| **NW.58** | *.59* | *.49* | 153 |
| **NW.59** | *.46* | *.50* | 153 |
| **NW.60** | *.59* | *.49* | 153 |
| **NW.61** | *.56* | *.50* | 153 |
| **NW.62** | *.67* | *.47* | 153 |
| **NW.63** | *.51* | *.50* | 153 |

The following table shows the average percent score for each science question on the NW-9 exam.

|  |
| --- |
| **NW-9 Science Item Statistics** |
|  | **Mean** | **Std. Dev** | **N** |
| **NW.1** | *.61* |  *.49* | 153 |
| **NW.2** | *.24* | *.43* | 153 |
| **NW.5** | *.95* | *.21* | 153 |
| **NW.6** | *.39* | *.49* | 153 |
| **NW.9** | *.59* | *.49* | 153 |
| **NW.10** | *.95* | *.22* | 153 |
| **NW.11** | *.43* | *.50* | 153 |
| **NW.12** | *.64* | *.48* | 153 |
| **NW.13** | *.81* | *.39* | 153 |
| **NW.14** | *.58* | *.50* | 153 |
| **NW.15** | *.56* | *.50* | 153 |
| **NW.16** | *.69* | *.47* | 153 |
| **NW.17** | *.61* | *.49* | 153 |
| **NW.18** | *.88* | *.32* | 153 |
| **NW.19** | *.88* | *.33* | 153 |
| **NW.20** | *.61* | *.49* | 153 |
| **NW.22** | *.63* | *.49* | 153 |
| **NW.23** | *.75* | *.44* | 153 |
| **NW.24** | *.77* | *.42* | 153 |
| **NW.25** | *.81* | *.40* | 153 |
| **NW.26** | *.59* | *.50* | 153 |
| **NW.27** | *.71* | *.45* | 153 |
| **NW.28** | *.65* | *.48* | 153 |
| **NW.29** | *.52* | *.50* | 153 |
| **NW.38** | *.70* | *.46* | 153 |
| **NW.39** | *.84* | *.37* | 153 |
| **NW.40** | *.80* | *.40* | 153 |
| **NW.41** | *.89* | *.32* | 153 |
| **NW.42** | *.80* | *.40* | 153 |
| **NW.43** | *.21* | *.41* | 153 |
| **NW.44** | *.24* | *.43* | 153 |
| **NW.45** | *.73* | *.45* | 153 |
| **NW.46** | *.35* | *.48* | 153 |
| **NW.47** | *.63* | *.49* | 153 |
| **NW.48** | *.47* | *.50* | 153 |
| **NW.49** | *.42* | *.50* | 153 |
| **NW.50** | *.60* | *.50* | 153 |
| **NW.54** | *.55* | *.50* | 153 |
| **NW.55** | *.61* | *.49* | 153 |
| **NW.56** | *.56* | *.50* | 153 |
| **NW.57** | *.39* | *.49* | 153 |
| **NW.59** | *.46* | *.50* | 153 |
| **NW.60** | *.59* | *.49* | 153 |
| **NW.61** | *.56* | *.50* | 153 |
| **NW.62** | *.67* | *.47* | 153 |
| **NW.63** | *.51* | *.50* | 153 |
| **NW.64** | *.56* | *.50* | 153 |
| **NW.65** | *.24* | *.43* | 153 |
| **NW.66** | *.64* | *.48* | 153 |

# Summary