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Project Graduation: The Digital Advantage Resiliency Skills and Tier Data Analysis (Desert View HS)

Prepared for Sunnyside Unified School District

Using a cohort of 375 ninth-graders at Desert View High School in the Sunnyside Unified School District (SUSD), this report describes the characteristics of students within five SUSD-defined Tiers. We also examine relationships between these Tiers and various academic and attendance data. A significant relationship between Tiers and average resiliency score, as measured by the *Success Highways Revving Up* survey, is also described. Finally, we show that resiliency scores predict the Tiers into which students will fall.

Key Findings

- Thirty-six percent of ninth-graders in this cohort belonged to Tier 1, the target group, to whom laptops are given through the Digital Advantage program.
- Tier 1 students attained the highest average G.P.A (3.30), followed by Tier 2 (3.08), Tier 4 (1.80), Tier 3 (1.73) and Tier 5 (0.79).
- Students in Tier 5 recorded the highest average of failing grades (3.12) while those in Tier 1 recorded the fewest number (0.02).
- Students in Tier 5 recorded an average of 42.63 unexcused absent periods, the highest of all Tiers, while those in Tier 1 recorded the lowest average (3.45).
- At the significance level of $\alpha = 0.05$, there is enough evidence to suggest that there is a difference among the average resiliency scores based on Tier number.
- Average resiliency scores may be useful as predictors of future Tier number for SUSD students.
- At the significance level of $\alpha = 0.05$, there is enough evidence to suggest that the individual resiliency score Well-being is a useful as predictors of future Tier number for SUSD students.

Background

Digital Advantage

In an effort to improve graduation rates, Sunnyside Unified School District (SUSD) has launched Project Graduation, a comprehensive effort which has received the Arizona Commission for Postsecondary Education's 2009 Pathways to Higher Education Award.

Digital Advantage is an initiative within Project Graduation and is a multifaceted, comprehensive and research-based approach. Through Digital Advantage, SUSD awards a laptop to every ninth-grader who maintains the following Four A's:

1. Attendance (a 95% or better attendance rate - no more than four absences, no unexcused absences and attendance on the first day of school)
2. Achievement (2.5 or higher grade point average)
3. extracurricular Activity (participation in at least one extracurricular activity)
4. Attitude (no out-of-school suspensions).[1]

Description of the data

Hanover Research was provided with data for Desert View High School ninth-graders from the first semester of the 2009-10 school year. This data may be divided into three categories as is demonstrated in the table below

Table 1: Description of Data

	Category	Subcategories
1.	Academic	G.P.A.
		Number of Failing Grades
2.	Attendance	All Periods Absent
		Excused Absent Periods
		Unexcused Absent Periods
3.	Resiliency	Education
		Confidence
		Connections
		Stress
		Well-being
		Motivation

Below is a brief description of these variables. We explain what they measure and how they are used in this report:

[1] "The Digital Advantage." Sunnyside Unified School District. Project Graduation. http://www.susd12.org/node/1274

- G.P.A: this variable measures the average grade earned by a student during a given period. Sunnyside's 4-point scale for categorizing grades is used in this report and is detailed in the table below.[2]

Table 2: Grade Average and Corresponding Grade Level

Grade Average	GPA Level
A average	4.00
B average	3.00 - 3.99
C average	2.00 - 2.99
D average	1.00 - 1.99

- Failing grades measures the student's total number of failed grades for the semester.
- All Periods Absent" is the sum of both "Excused Absent Periods" and "Unexcused Absent Periods." In this report we will focus on "Unexcused Absent Periods."

An additional, important data point was also included: Tier number.

Ninth-grade students in the Sunnyside Unified School District (SUSD) are currently classified into one of five Tiers based on their academic performance and attendance record. It is the students who are in Tier 1 who are eligible to earn a laptop through the Digital Advantage program described above. The criteria for each of the SUSD's five Tiers are described in the table below.

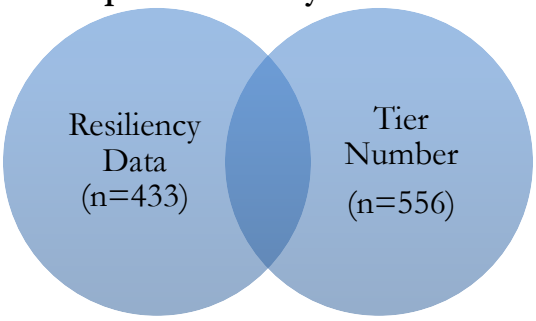
Table 3: Tier Criteria

Tier	G.P.A		Attendance		Failing a Class	
	2.5 or higher	2.5 or lower	95% Attendance and above	Less than 95% Attendance	0-1 classes failed	2+ classes failed
1	**X**		**X**			
2	**X**			**X**		
3		**X**	**X**			
4		**X**		**X**	**X**	
5				**X**		**X**

An examination of the data revealed a critical overlap between students for whom we had both Tier and resiliency information.

[2] "Graduation Requirements." Sunnyside Unified School District. http://www.sunnysideud.k12.az.us/content/graduation-requirements

Chart 1: Overlap of Resiliency Data and Tier number



Indeed, there were 375 ninth-graders with both resiliency data and a Tier number; these 375 students will be the focus of the remainder of this report.

Success Highways Revving Up Survey

Student resiliency scores are generated from the *Success Highways Revving Up* survey administered by ScholarCentric. According to the company website, "Students with these skills have been shown to perform better in school than similarly situated students who struggle in these areas."[3] *Success Highways Revving Up* is specifically designed to measure the following six key academic resiliency skills:

1. Importance of Education (Education)
2. Academic Confidence (Confidence)
3. Connections to Educators and Positive Role Models (Connections)
4. Ability to Handle Academic Anxiety (Stress)
5. Sense of Well-being (Well-being)
6. Intrinsic Motivation (Motivation)

This data is available, not as raw scores, but as difference from the national norm. The following table describes five rating scores associated with.

Table 4: Resiliency Score Rating Criteria

Rating	Number of standard deviations away from the National Mean
1	1 Below
2	1/2 Below
3	Within
4	1/2 Above
5	1 Above

The standard deviation of a population is the square root of its variance. Standard deviation is widely used and is a measure of variability.

[3] "Frequent Questions." Success Highways: Proven Dropout Solutions. http://scholarcentric.com/faq.html

Research Questions

After a close examination of the data available to us, we have formulated the following questions which we will in turn address in the subsequent "Analysis" section of this report.

Question #1: What are the characteristics of each Tier?

Question #2: How do Tiers compare with respect to academic and attendance data? Is there a significant relationship between Tier number and academic and/or attendance data?

Question #3: Is there a significant relationship between Tier number and resiliency status? Do resiliency scores predict the Tiers into which students will fall?

Analysis

Question 1: What are the characteristics of each Tier?

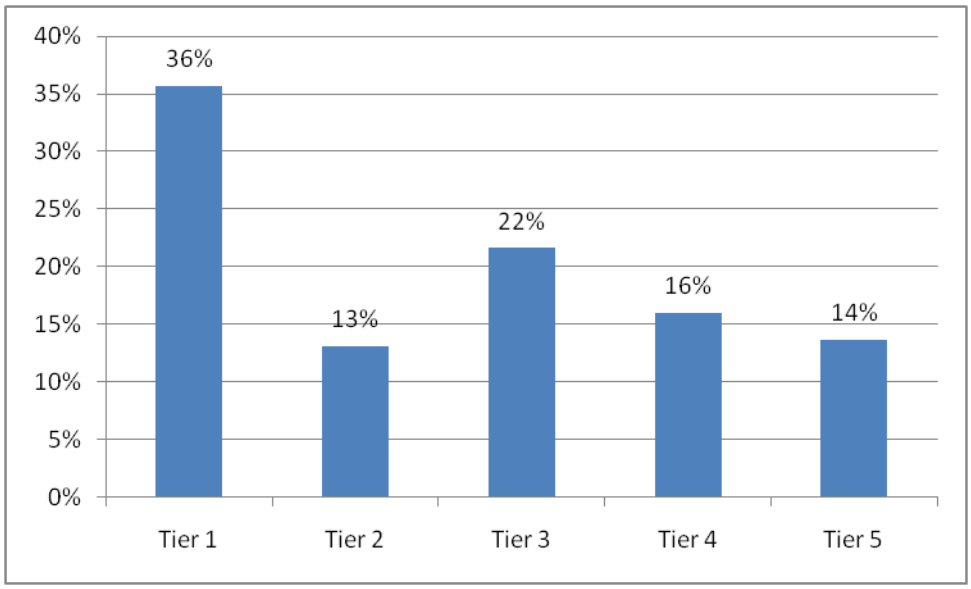
Recall that SUSD aims to have the greatest number of students possible in the targeted Tier number 1. In fact, Tier 1 did contain the greatest number of students in this sample (n=134, 36%), followed by Tier 3 (n=81, 22%) and Tier 4 (n=60, 16%), see the Table below.

Table 5: Percentage of Desert View HS Ninth-graders in Each of Five Tiers

Tier	Count	Percentage
1	134	36%
2	49	13%
3	81	22%
4	60	16%
5	51	14%
Total	375	100%

The percentage of students in each of the five Tiers is also presented graphically in the chart below.

Chart 2: Percentage of Desert View HS Ninth-graders in Each of Five Tiers



Next we turn our attention to describing each Tier individually. As the Tiers were created based on academic and attendance data, we expect to document appropriate patterns and relationships between the Tiers.

Tier 1

Although there was valid data in most categories for 134 students, attendance data was only provided for 122 students. The average G.P.A for Tier 1 was 3.30 (Range: 2.50-4.25). The maximum number of grades failed was 1, with an average of 0.02 grades. The number of total periods absent ranged from 0 to 28 with a mean of 11.86 periods. Please see the Table below.

Table 6: Tier 1 and Academic, Attendance and Resiliency Data

	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Academic	G.P.A.	134	2.50	4.25	3.30	0.51
	Failing Grades	134	0	1	0.02	0.15
Attendance	All Periods Absent	122	1	28	11.86	7.99
	Excused Absent Periods	122	0	28	8.41	7.68
	Unexcused Absent Periods	122	0	22	3.45	4.51
Resiliency	Education	134	0	4	3.13	0.92
	Confidence	133	1	5	2.80	1.28
	Connections	134	1	5	2.77	1.29
	Stress	134	1	5	2.74	1.27
	Well-being	134	1	6	3.29	1.16
	Motivation	134	1	5	3.19	1.33
	Average Resiliency Score	134	1.33	4.83	2.99	0.82

The average resiliency score from the *Revving Up* survey for Tier 1 is 2.99 which means that students scored approximately within one-half standard deviation from the National Mean. The lowest average score achieved for this Tier in a sub-resiliency category was 2.74 for Stress and the highest was 3.29 for Well-being. Please see the Table above.

Tier 2

There was valid data in all categories for 49 students. The average G.P.A for Tier 2 was 3.08 (Range: 2.50-4.00). The maximum number of grades failed was 1, with an average of 0.04 grades. The number of total periods absent ranged from 29-168 with a mean of 52.49 periods. Please see the table below.

Table 7: Tier 2 and Academic, Attendance and Resiliency Data

	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Academic	G.P.A.	49	2.50	4.00	3.08	0.38
	Failing Grades	49	0	1	0.04	0.20
Attendance	All Periods Absent	49	29	168	52.49	24.45
	Excused Absent Periods	49	0	116	35.78	22.15
	Unexcused Absent Periods	49	0	72	16.71	17.36
Resiliency	Education	49	1	4	3.20	0.82
	Confidence	49	1	5	2.94	1.23
	Connections	49	1	5	2.78	1.16
	Stress	49	1	5	2.94	1.22
	Well-being	49	1	5	2.96	1.26
	Motivation	49	1	5	3.14	1.17
	Average Resiliency Score	49	1.67	4.67	2.99	0.78

The average resiliency score from the *Success Highways Revving Up* survey for Tier 2 is 2.99 which means that students scored approximately within one-half standard deviation of National Mean. The lowest average score achieved for this Tier on a sub-resiliency category was 2.78 for Connections and the highest was 3.20 for Education.

Tier 3

Although there was valid data in most categories for 81 students, attendance data was only provided for 79 students. The average G.P.A for Tier 3 was 2.42 (Range: 0.00-2.42). The maximum number of grades failed was 5, with an average of 1.02 grades. The number of total periods absent ranged from 1 to 28 with a mean of 16.32 periods. Please see the table below.

Table 8: Tier 3 and Academic, Attendance and Resiliency Data

	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Academic	G.P.A.	81	0.00	2.42	1.73	0.55
	Failing Grades	81	0	5	1.02	1.11
Attendance	All Periods Absent	79	1	28	16.32	8.27
	Excused Absent Periods	79	0	26	7.71	7.21
	Unexcused Absent Periods	79	0	26	8.61	7.51
Resiliency	Education	81	1	4	2.73	1.04
	Confidence	81	1	5	2.60	1.26
	Connections	81	1	5	2.53	1.17
	Stress	81	1	5	2.52	1.23
	Well-being	81	1	5	3.30	1.16
	Motivation	81	1	5	2.75	1.21
	Average Resiliency Score	81	1	4.83	2.74	0.74

The average resiliency score from the *Success Highways Revving Up* survey for Tier 3 is 2.74 which means that students scored one-half standard deviation away from the National Mean. The lowest average score achieved for this Tier on a sub-resiliency category was 2.52 for Stress and the highest was 3.30 for Well-being.

Tier 4

There was valid data in all categories for all 60 students. The average G.P.A for Tier 4 was 1.80 (Range: 1.16-2.41). The maximum number of grades failed was 1, with an average of 0.55. The number of total periods absent ranged from 31 to 186 with a mean of 61.37 periods. Please see the Table below.

Table 9: Tier 4 and Academic, Attendance and Resiliency Data

	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Academic	G.P.A.	60	1.16	2.41	1.80	0.36
	Failing Grades	60	0	1	0.55	0.50
Attendance	All Periods Absent	60	31	186	61.37	32.33
	Excused Absent Periods	60	0	173	36.93	32.87
	Unexcused Absent Periods	60	0	103	24.43	21.14
Resiliency	Education	60	1	4	3.05	1.03
	Confidence	60	1	5	2.82	1.35
	Connections	60	1	5	2.62	1.25
	Stress	60	1	5	2.37	1.29
	Well-being	60	1	5	2.63	1.35
	Motivation	60	1	5	3.37	1.22
	Average Resiliency Score	60	1.33	4.67	2.81	0.82

The average resiliency score from the *Revving Up* survey for Tier 4 is 2.81 which means that students scored one-half standard deviation away from the National Mean. The lowest average score achieved for this Tier on a sub-resiliency category was 2.37 for both Stress and the highest was 3.37 for Motivation.

Tier 5

There was valid data in all categories for 51 students. The average G.P.A for Tier 5 was 0.79 (Range: 0.00-1.50). The maximum number of grades failed was 6, with an average of 3.12 grades. The number of total periods absent ranged from 32 to 190 with a mean of 77.69 periods. Please see the Table below.

Table 10: Tier 5 and Academic, Attendance and Resiliency Data

	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Academic	G.P.A.	51	0.00	1.50	0.79	0.36
	Failing Grades	51	2	6	3.12	0.89
Attendance	All Periods Absent	51	32	190	77.69	38.39
	Excused Absent Periods	51	0	108	35.06	27.00
	Unexcused Absent Periods	51	1	138	42.63	30.05
Resiliency	Education	51	1	4	2.63	1.18
	Confidence	51	1	5	2.63	1.28
	Connections	51	1	5	2.43	1.14
	Stress	51	1	5	2.10	1.15
	Well Being	51	1	5	3.00	1.33
	Motivation	51	1	5	2.78	1.29
	Average Resiliency Score	51	1	4	2.59	0.82

The average resiliency score from the *Revving Up* survey for Tier 5 is 2.59 which means that students scored one-half standard deviation away from the National Mean. The lowest average score achieved for this Tier on a sub-resiliency category was 2.43 for Connections and the highest was 3.00 for Well-being.

Question #2: How do Tiers compare with respect to academic and attendance data? Is there a significant relationship between Tier number and academic and/or attendance data?

In order to examine answers to Question #2, we will first consider the following Table which compares four average student data points across each of the five Tiers. As the Tiers were created based on academic and attendance data, we expect to document these respective patterns and relationships between the Tiers.

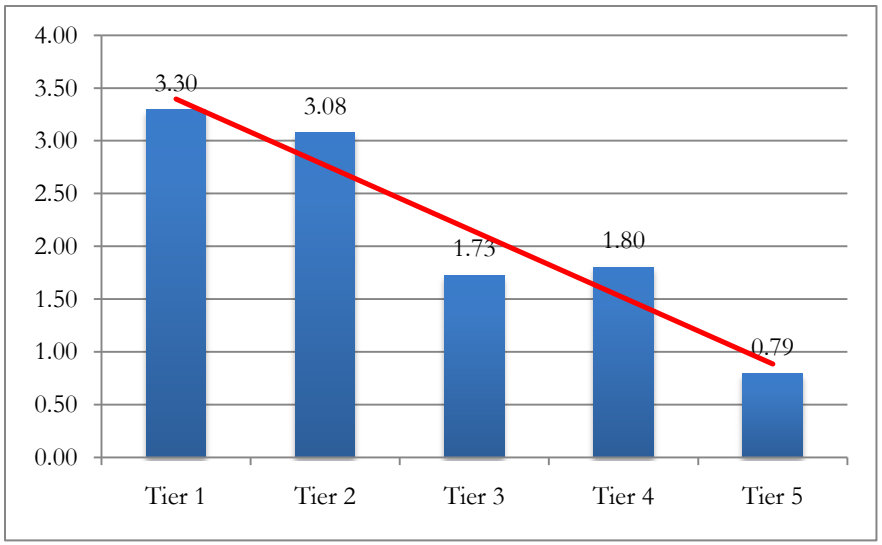
Table 11: Tiers and Academic and Attendance Data

Tier	Statistic	Academic Performance		Unexcused Absent Periods
		G.P.A	# Failing Grades	
Tier 1	Mean	3.30	0.02	3.45
	N	134	134	122
Tier 2	Mean	3.08	0.04	16.71
	N	49	49	49
Tier 3	Mean	1.73	1.02	8.61
	N	81	81	79
Tier 4	Mean	1.80	0.55	24.43
	N	60	60	60
Tier 5	Mean	0.79	3.12	42.63
	N	51	51	51
Total	Mean	2.35	0.75	15.40
	N	375	375	361

Tiers and G.P.A

From the table above and the chart below, we demonstrate that average G.P.A of Sunnyside students across different Tiers reflects the design of the Tier system, as G.P.As can generally be seen to be decreasing with each Tier. The exception to the trend is Tier 3, which has a lower average G.P.A than Tier 4. Students in higher Tiers are clearly performing better in school.

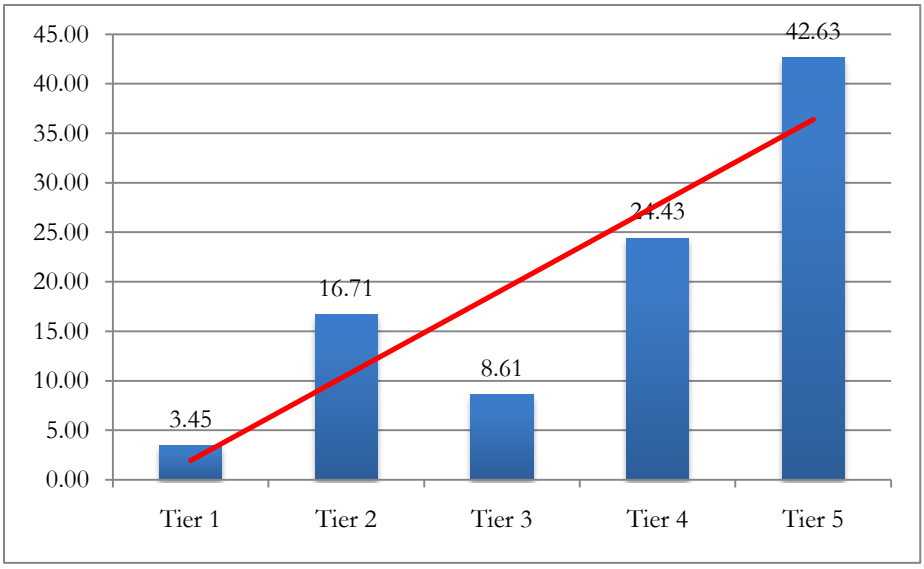
Chart 3: Tiers and G.P.A



Tiers and Attendance

The average number of unexcused absences for each Tier, which are described in Table 11 above and the Chart below, show that students in higher Tiers generally have more unexcused absences. Tier 3 offers a notable exception, as students in this group have fewer unexcused absences than Tier 2.

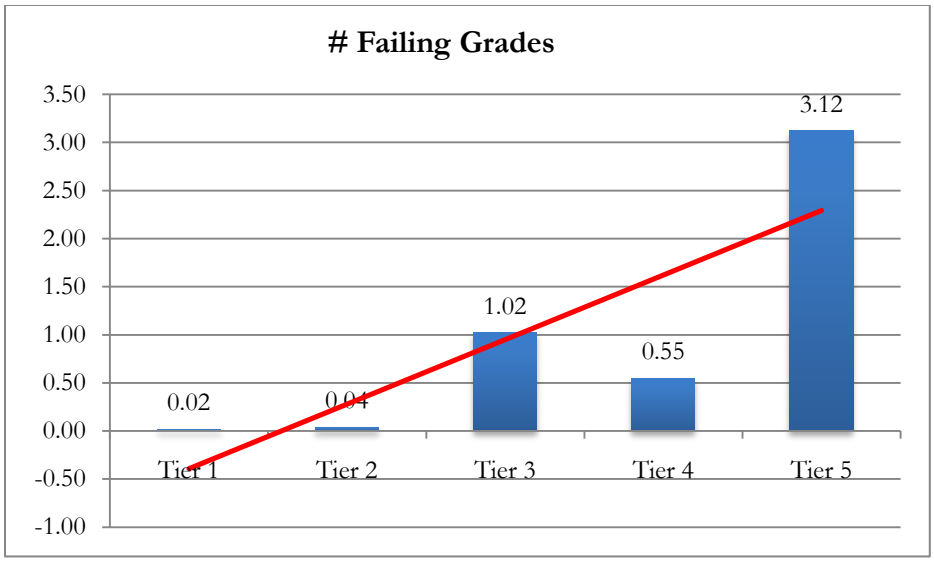
Chart 4: Tiers and Unexcused Absences



Tiers and Number of Failing Grades

Tiers 1 and 2 have a very low average number of failing grades and both of these figures are far below those of other Tier groups. Note that the higher the Tier, the greater number of failing grades.

Chart 5: Tiers and Number of Failing Grades



Significance

Using the Kruskal-Wallis test, at the significance level of $\alpha = 0.001$, there is enough evidence to suggest that there is a difference among G.P.A, number of failing grades and unexcused absent periods, based on Tier number. Because the Tiers are defined in terms of G.P.A, number of failing grades and attendance, it is not surprising that these relationships are statistically significant. The trend-lines in the three charts above are given as a visual reference to these significant relationships.

Question #3: Is there a significant relationship between Tier number and resiliency status? Do resiliency scores predict the Tiers into which students will fall?

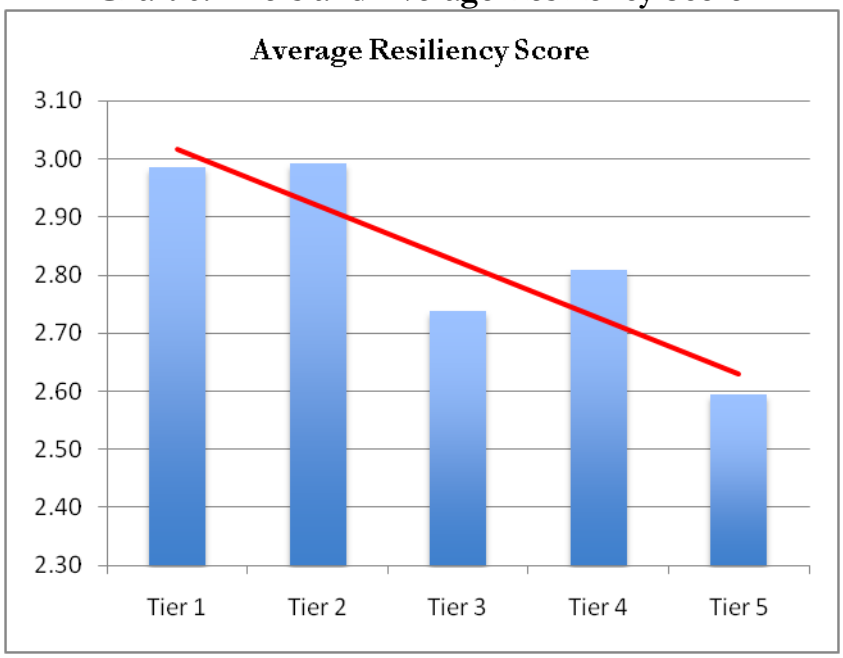
As an introduction to addressing this third question, we first examine the relationship between Tier number and average resiliency score. The Table below shows the average resiliency score according to Tier number

Table 12: Tiers and Average Resiliency Scores

Tier	Average Resiliency Score
1	2.99
2	2.99
3	2.74
4	2.81
5	2.59

The Chart below demonstrates a visual negative relationship between average resiliency score and Tier number. Using the Kruskal-Wallis test, at the significance level of $\alpha = 0.05$, there is evidence to suggest that there is a difference among the average resiliency scores based on Tier number. The red trend line in the chart below gives a visual reference to this significant relationship.

Chart 6: Tiers and Average Resiliency Score



Because resiliency scores were gathered in October of 2009 and Tier number was calculated at the end of the semester an important question emerges:

Could Average Resiliency Scores be used to predict into which Tiers a student will fall?

In order to examine this question using statistical methods, we chose Multinomial Logistic Regression, a regression model that generalizes logistic regression and allows more than two discrete outcomes. Using the Multinomial Logistic Regression, at the significance level of $\alpha = 0.05$, there exists enough evidence to conclude that the average resiliency score is useful as a predictor of future Tier number for SUSD students.

There are potential applications for this finding. For example, if a student achieves a low average resiliency score on the *Revving Up* survey in October, then it may be likely that he/she will place in a low Tier at the end of the semester. Possessing this knowledge in advance may help SUSD identify at risk students.

Individual Resiliency Scores

Because there is a significant relationship between Tier number and average resiliency score, we now turn our attention to examining potential significance of individual resiliency scores in predicting Tier number.

Could individual resiliency scores be used to predict into which Tiers a student will fall?

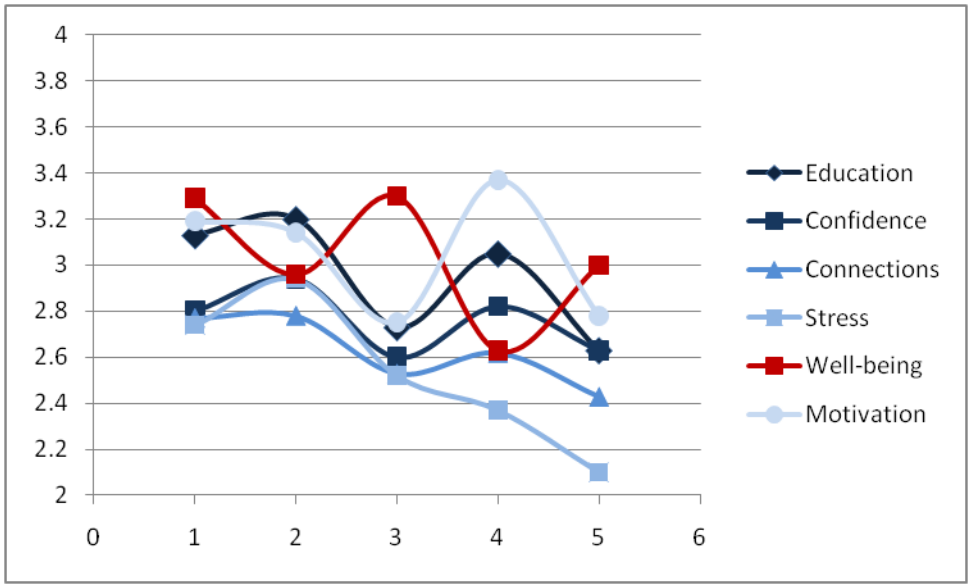
The Table below plots average individual resiliency scores according to each Tier.

Table 13: Individual Resiliency Scores and Tier Number

Tier	Education	Confidence	Connections	Stress	Well-being	Motivation
Tier 1	3.13	2.80	2.77	2.74	3.29	3.19
Tier 2	3.20	2.94	2.78	2.94	2.96	3.14
Tier 3	2.73	2.60	2.53	2.52	3.30	2.75
Tier 4	3.05	2.82	2.62	2.37	2.63	3.37
Tier 5	2.63	2.63	2.43	2.10	3.00	2.78
Total	2.97	2.75	2.65	2.57	3.10	3.06

In order to examine this question using statistical methods, we again chose – multinomial logistic regression. Using the multinomial logistic regression, at the significance level of $\alpha = 0.05$, there exists enough evidence to conclude that Well-being (marked in burgundy in the Chart below) is a useful as a predictor of future Tier number for SUSD students.

Chart 7: Individual Resiliency Scores and Tier Number



There are potential applications for this finding. Possessing this knowledge in advance may help SUSD put interventions in place for students who achieve low scores in Confidence and Stress.

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