

STEM Project Internal Evaluation

1. Fall 09 Grades Comparisons Between The Students Who Participated In The SI Program And The Ones Who Did Not
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6. April Meeting Items:
 - Online Tutoring Survey Analysis
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 - April 2nd. 11:00 am – Room AD206
 - May 7th. 11:00 am – Room CI237
 - June 4th. 11:00 am – Room AD206

Summary Page for SI Quantitative Studies

Table 1 Summary of SI Quantitative Study Results (Fall 2009)

	Courses	CRNs	SI/Total (%)	Major Findings	Observations
Astronomy	ASTR115	22254, 22255, 22253, 22256, and 22257	36.4	<ul style="list-style-type: none"> A higher percentage of students passed the ASTR115 course than the students who did not attend any SI sessions. The Chi-square and Logistic Regression results reveal that attending SI sessions is significantly related to the course success rates and the level of grades a student obtained 	
Biology	BIOL105 & BIOL200	20207, 20311, 20307, 20221, 22063, 20238, 20249, 20257, 20245, 20346, 20218, and 20289	46.1	<ul style="list-style-type: none"> A higher percentage of students passed the ASTR115 course than the students who did not attend any SI sessions. The Chi-square and Logistic Regression results reveal that attending SI sessions is significantly related to the course success rates and the level of grades a student obtained 	
Chemistry	CHEM103, 110, 111, & 112	20562, 20558, 20603, 20672, 20360, and 20386	51.8	<ul style="list-style-type: none"> A slight higher percentage of students who attended SI sessions passed the Chemistry courses than the students who did not attend any SI sessions. However, participating in SI program and course success rates is not significantly related. 	<p>The attendance rate for Chemistry classes is highest among all the subjects. The course success rates are high for Chemistry courses range between 70-80%.</p>
Math	MATH130	20640, 20632, 20529, 20648, and 21919	27.1	<ul style="list-style-type: none"> A higher percentage of students who attended SI sessions passed the Math 130 courses than the students who did not attend any SI sessions. However, just participating in the program is not significantly related with course success rates. This study shows that the two are significantly related when students participated SI sessions for 4 or more 	<p>The attendance rate for Math classes is fairly low.</p>

Quantitative Study Results – Supplemental Instruction Program Astronomy 115 – Planetary Astronomy*

Executive Summary:

Attending SI sessions has shown to be beneficial to students in terms of increasing their academic performance in this study. The descriptive data analysis results show a higher percentage of students passed the ASTR115 course than the students who did not attend any SI sessions. The Chi-square and Logistic Regression results reveal that attending SI sessions is significantly related to the course success rates and the level of grades a student obtained. In general, the likelihood of a student passing the course and/or getting a higher grade increased when he or she attended SI sessions.

Key Points:

- The descriptive data analysis result shows that course success rates are higher for students who attended SI sessions than the ones who did not attend any SI sessions (73.8% vs. 53.1%). There are also more students achieving either an A or a C for the course they took when they attended SI sessions in comparison to the ones who did not (e.g. 23.8% vs. 11.6% for As and 31.0% vs. 19.7% for Cs).
- The Chi-Square test result shows that *Attending SI sessions* and *Passing the course* was significantly related ($X^2=8.872$, $df=1$, $p=0.003$). In other words, if a student attended SI sessions, he/she had a higher chance to pass the course.
- The Logistic Regression tests reveal that *Attending SI sessions* and *the frequency of attending SI sessions* significantly affected the level of grades a student obtained.
 - Students who attended SI sessions were likely to achieve higher level of grades than the ones who did not (the probability of getting As and Bs and Cs are 2.04 times greater for students who attended SI sessions than the ones who did not attend the sessions).
 - Also, the higher the frequency of attending SI sessions the higher the likelihood that a student obtained a higher level of grade (the probability of getting As and Bs and Cs is 1.04 times greater for each unit of increase in the frequency of attending SI sessions).

Study Results:

1. Descriptive Data analysis:

- Final Grade Comparisons

	A	B	C	A, B, & C Combined	D	F	FW	W	Total
Not Attended SI	11.6% (17)	21.8% (32)	19.7% (29)	53.1% (78)	8.2% (12)	14.3% (21)	6.1% (9)	18.4% (27)	100% (147)
Attended SI	23.8% (20)	19.0% (16)	31.0% (26)	73.8% (62)	10.7% (9)	7.1% (6)	3.6% (3)	4.8% (4)	100% (84)
Combined	16.0% (37)	20.8% (48)	23.8% (55)	60.0% (140)	9.1% (21)	11.7% (27)	5.2% (12)	13.4% (31)	100% (231)

There are more students achieving either an A or a C for the Astronomy 115 course they took when they attended SI sessions in comparison to the ones who didn't attend any SI sessions. There is also higher percentage of course success rates (the combination of A, B, and C) for the students who attended SI sessions (73.8%) than the students who did not attend the sessions (53.1%).

- Frequency of Attendance

Times of Attendance	0	1	2	3	4	5	6	7	8	9	10	11	13	15	16	17	18	19	20	22	24	26	28	32	34
Frequency	147	22	9	13	4	5	2	2	1	5	2	2	1	3	1	2	1	1	2	1	1	1	1	1	1

Out of the students who were eligible to attend SI sessions, 63.6% of them (147 out of 231) did not attend any SI sessions. At the same time, about 52.4% of the students who attended SI sessions (44 out of 84), they attended the SI sessions one to three times in the semester.

Appendix

2. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Attending SI sessions* and *Passing the course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=8.872$, $df=1$, $p=0.003$), we can conclude that Attending SI sessions and Passing the course was significantly related. In other words, if a student attended SI sessions, he/she had a higher chance to pass the course. The effect size for the relation is rather small ($\phi=0.201$) though.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.872 ^a	1	.003		
Continuity Correction ^b	8.026	1	.005		
Likelihood Ratio	9.179	1	.002		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	8.832	1	.003		
N of Valid Cases	219				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 29.22.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.201	.003
	Cramer's V	.201	.003
N of Valid Cases		219	

3. Logistic Regression Tests:

Next, two logistic regression tests were conducted to find out if *Attending SI sessions* affected the level of the grades that a student received and also if *the frequency of Attending SI sessions* affected the level of the grades that a student received. The level of the grades was coded as: A (level 4), B (level 3), C (level 2), and D, F, W, FW (Level 1).

- In the first Logistic Regression, the overall model is significant ($p=0.004$). *Attending SI sessions* has significantly affected the level of the grades a student achieved. For students who attended SI sessions, we would expect a 0.715 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs and Cs are 2.04 times ($\text{expb}=2.04$) greater for students who attended SI sessions than the ones who did not attend the sessions.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	41.608			
Final	33.271	8.337	1	.004

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1.00]	-.174	.161	1.179	1	.278	-.489	.140
	[Grade_Level = 2.00]	.820	.170	23.387	1	.000	.488	1.153
	[Grade_Level = 3.00]	1.953	.212	84.988	1	.000	1.538	2.368
Location	SI	.715	.250	8.167	1	.004	.225	1.205

Link function: Logit.

- In the second Logistic Regression, the overall model is significant ($p=0.001$). *The frequency of attending SI sessions* has significantly affected the level of the grades a student achieved. For each unit of increase in the frequency of attendance (i.e., going from 0 to 1 time), we would expect a 0.097 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs and Cs are 1.07 times ($\exp=1.07$) greater for each unit of increase in the frequency of attending SI sessions.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	143.719			
Final	133.002	10.717	1	.001

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1.00]	-.267	.143	3.489	1	.062	-.548	.013
	[Grade_Level = 2.00]	.737	.150	24.144	1	.000	.443	1.031
	[Grade_Level = 3.00]	1.879	.198	90.365	1	.000	1.492	2.267
Location	SI_Attendance	.065	.021	9.505	1	.002	.024	.107

Link function: Logit.

Note:

* The CRNs of participating SI sessions are: 22254, 22255, 22253, 22256, and 22257.

Quantitative Study Results – Supplemental Instruction Program BIOLOGY 105 & 200*

Executive Summary:

Attending SI sessions has shown to be beneficial to students in terms of increasing their academic performance in this study. The descriptive data analysis results show a higher percentage of students passed the Biology courses than the students who did not attend any SI sessions. The Chi-square and Logistic Regression results reveal that attending SI sessions is significantly related to the course success rates and the level of grades a student obtained. In general, the likelihood of a student passing the course and/or getting a higher grade increased when he or she attended SI sessions.

Key Points:

- The descriptive data analysis result shows that course success rates are higher for students who attended SI sessions than the ones who did not attend any SI sessions (76.5% vs. 59.9%). There are also more students achieving an A, a B, or a C for the course they took when they attended SI sessions in comparison to the ones who did not.
- The Chi-Square test result shows that *Attending SI sessions* and *Passing the course* was significantly related ($X^2=19.624$, $df=1$, $p=0.000$). In other words, if a student attended SI sessions, he/she had a higher chance to pass the course.
- The Logistic Regression tests reveal that *Attending SI sessions* and *the frequency of attending SI sessions* significantly affected the level of grades a student obtained.
 - Students who attended SI sessions were likely to achieve higher level of grades than the ones who did not (the probability of getting As and Bs and Cs are 1.95 times greater for students who attended SI sessions than the ones who did not attend the sessions).
 - Also, the higher the frequency of attending SI sessions the higher the likelihood that a student obtained a higher level of grade (the probability of getting As and Bs and Cs is 1.06 times greater for each unit of increase in the frequency of attending SI sessions).

Appendix

2. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Attending SI sessions* and *Passing the course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=19.624$, $df=1$, $p=0.000$), we can conclude that *Attending SI sessions* and *Passing the course* was significantly related. In other words, if a student attended SI sessions, he/she had a higher chance to pass the course. The effect size for the relation is rather small ($\phi=0.176$) though.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.624 ^a	1	.000		
Continuity Correction ^b	18.878	1	.000		
Likelihood Ratio	19.930	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	19.593	1	.000		
N of Valid Cases	635				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 95.05.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.176	.000
	Cramer's V	.176	.000
N of Valid Cases		635	

3. Logistic Regression Tests:

Next, two logistic regression tests were conducted to find out if *Attending SI sessions* affected the level of the grades that a student received and also if *the frequency of Attending SI sessions* affected the level of the grades that a student received. The level of the grades was coded as: A (level 4), B (level 3), C (level 2), and D, F, W, FW (Level 1).

- In the first Logistic Regression, the overall model is significant (p=0.000). *Attending SI sessions* has significantly affected the level of the grades a student achieved. For students who attended SI sessions, we would expect a 0.668 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs and Cs are 1.95 times (expb=1.95) greater for students who attended SI sessions than the ones who did not attend the sessions.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	56.523			
Final	35.223	21.299	1	.000

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1.00]	-.440	.105	17.422	1	.000	-.647	-.233
	[Grade_Level = 2.00]	.938	.111	71.437	1	.000	.720	1.155
	[Grade_Level = 3.00]	1.991	.134	220.863	1	.000	1.728	2.254
Location	SI_1	.668	.146	21.005	1	.000	.382	.953

Link function: Logit.

- In the second Logistic Regression, the overall model is significant (p=0.000). *The frequency of attending SI sessions* has significantly affected the level of the grades a student achieved. For each unit of increase in the frequency of attendance (i.e., going from 0 to 1 time), we would expect a 0.060 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs and Cs are 1.06 times (expb=1.06) greater for each unit of increase in the frequency of attending SI sessions.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	314.717			
Final	269.952	44.766	1	.000

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1.00]	-.518	.091	32.424	1	.000	-.696	-.340
	[Grade_Level = 2.00]	.893	.095	88.068	1	.000	.707	1.080
	[Grade_Level = 3.00]	1.985	.124	255.697	1	.000	1.742	2.228
Location	SI	.060	.009	40.166	1	.000	.041	.079

Link function: Logit.

Note:

* The CRNs of participating SI sessions are: 20207, 20311, 20307, 20221, 22063, 20238, 20249, 20257, 20245, 20346, 20218, and 20289.

Quantitative Study Results – Supplemental Instruction Program CHEMISTRY 103, 110, 111, & 112*

Executive Summary:

The descriptive data analysis results show a slight higher percentage of students who attended SI sessions passed the Chemistry courses than the students who did not attend any SI sessions. However, participating in SI program and course success rates are not significantly related.

Key Points:

- The descriptive data analysis result shows that course success rates are a slightly higher for students who attended SI sessions than the ones who did not attend any SI sessions (81.9% vs. 79.6%). There are also more students achieving either an A or a B for the course they took when they attended SI sessions in comparison to the ones who did not (e.g. 17.2% vs. 14.8% for As and 31.9% vs. 28.7% for Bs). Then the students were further divided into three groups: the ones who did not attend any SI sessions, the ones who attended the sessions between 1 and 3 times, and the ones who attended 4 or more sessions. It is clear that the ones who attended the sessions 4 or more times had the highest course success rates (86.7%) in comparison to the other two groups.
- However, neither of the two Chi-Square tests shows significant results. *Attending SI Sessions* and *Passing the Course* are not significantly related ($X^2=0.185$, $df=1$, $p=0.667$). At the same time, the *Three Attendance Patterns* and *Passing the Course* are not significantly related either ($X^2=2.008$, $df=2$, $p=0.366$).

Study Results:

1. Descriptive Data analysis:

- Final Grade Comparisons

	A	B	C	A, B, & C Combined	D	F	W	Total
Not Attended SI	14.8% (16)	28.7% (31)	36.1% (39)	79.6% (86)	7.4% (8)	6.5% (7)	6.5% (7)	100% (108)
Attended SI	17.2% (20)	31.9% (37)	32.8% (38)	81.9% (95)	9.5% (11)	6.0% (7)	2.6% (3)	100% (116)
Combined	16.1% (36)	30.4% (68)	34.4% (77)	80.8% (181)	8.5% (19)	6.3% (14)	4.5% (10)	100% (224)

There are more students achieving either an A or a B for the Chemistry course they took when they attended SI sessions in comparison to the ones who didn't attend any SI sessions. The percentage of course success rates (the combination of A, B, and C) for the students who attended SI sessions (81.9%) is slightly higher than the students who did not attend the sessions (79.6%).

- Frequency of Attendance

Times of Attendance	0	1	2	3	4	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	24	26	28	33	37
Frequency	108	22	15	19	8	8	4	1	3	5	1	3	2	1	5	2	1	2	3	2	2	1	2	1	1	1	1

Out of the students who were eligible to attend SI sessions, 51.8% of them (116 out of 224) attended any SI sessions. Therefore, a little over half of the eligible students participated in the SI program. However, about 48.3% of the students who attended SI sessions (56 out of 116), they only attended the SI sessions one to three times in the semester.

Appendix

2. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Attending SI sessions* and *Passing the course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=0.185$, $df=1$, $p=0.667$), we can conclude that *Attending SI Sessions* and *Passing the Course* are not significantly related.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.185 ^a	1	.667		
Continuity Correction ^b	.068	1	.794		
Likelihood Ratio	.185	1	.667		
Fisher's Exact Test				.735	.397
Linear-by-Linear Association	.184	1	.668		
N of Valid Cases	224				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 20.73.

b. Computed only for a 2x2 table

3. Final Grade Comparisons – Divided Into 3 Groups:

The students are further divided into three groups: the ones who did not attend any SI sessions, the ones who attended the sessions between 1 and 3 times, and the ones who attended 4 or more sessions. It is clear that the ones who attended the sessions 4 or more times had the highest course success rates (86.7%) in comparison to the other two groups.

	A	B	C	A, B, & C Combined	D	F	W	Total
Not Attended SI	14.8% (16)	28.7% (31)	36.1% (39)	79.6% (86)	7.4% (8)	6.5% (7)	6.5% (7)	100% (108)
Attended SI 1 to 3 Times	16.1% (9)	26.8% (15)	33.9% (19)	76.8% (43)	8.9% (5)	8.9% (5)	5.4% (3)	100% (56)
Attended SI 4 or More Times	18.3% (11)	36.7% (22)	31.7% (19)	86.7% (52)	10.0% (6)	3.3% (2)	0.0% (0)	100% (60)
Combined	16.1% (36)	30.4% (68)	34.4% (77)	80.8% (181)	8.5% (19)	6.3% (14)	4.5% (10)	100% (224)

4. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Three Attendance Patterns* and *Passing the Course* (the combination of A, B, and Cs). However, based on the Chi-square test results ($X^2=2.008$, $df=2$, $p=0.366$), we can conclude that the *Three Attendance Patterns* and *Passing the Course* are not significantly related either.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.008 ^a	2	.366
Likelihood Ratio	2.103	2	.349
Linear-by-Linear Association	.932	1	.334
N of Valid Cases	224		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.75.

Note:

* The CRNs of participating SI sessions are: 20562, 20558, 20603, 20672, 20360, and 20386.

Quantitative Study Results – Supplemental Instruction Program Math 130 – Elementary Algebra

Executive Summary:

The descriptive data analysis results show a higher percentage of students who attended SI sessions passed the Math 130 courses than the students who did not attend any SI sessions. However, just participating in the program is not significantly related with course success rates. This study shows that the two are significantly related when students participated SI sessions for 4 or more times.

Key Points:

- The descriptive data analysis result shows that course success rates are a higher for students who attended SI sessions than the ones who did not attend any SI sessions (61.7% vs. 55.3%). There are also more students achieving either an A or a B for the course they took when they attended SI sessions in comparison to the ones who did not (e.g. 18.3% vs. 14.9% for As and 25.0% vs. 19.9% for Bs). Then the students were further divided into three groups: the ones who did not attend any SI sessions, the ones who attended the sessions between 1 and 3 times, and the ones who attended 4 or more sessions. It is clear that the ones who attended the sessions 4 or more times had the highest course success rates (82.8%) in comparison to the other two groups.
- According to the first Chi-Square test, *Attending SI Sessions* and *Passing the Course* are not significantly related ($X^2=0.728$, $df=1$, $p=0.394$). However, the *Three Attendance Patterns* and *Passing the Course* are significantly related ($X^2=10.916$, $df=2$, $p=0.004$). It shows that if a student attended SI sessions for 4 or more times, he/she had a higher chance to pass the courses than the students who either did not attend any SI sessions or only attended 1 to 3 times.

Study Results:

1. Descriptive Data analysis:

- Final Grade Comparisons

	A	B	C	A, B, & C Combined	D	F	FW	W	Total
Not Attended SI	14.9% (24)	19.9% (32)	20.5% (33)	55.3% (89)	10.6% (17)	14.3% (23)	7.5% (12)	12.4% (20)	100% (161)
Attended SI	18.3% (11)	25.0% (15)	18.3% (11)	61.7% (37)	10.0% (6)	18.3% (11)	3.3% (2)	6.7% (4)	100% (60)
Combined	15.8% (35)	21.3% (47)	19.9% (44)	57.0% (126)	10.4% (23)	15.4% (34)	6.3% (14)	10.9% (24)	100% (221)

There are more students achieving either an A or a B for the Math 130 course they took when they attended SI sessions in comparison to the ones who didn't attend any SI sessions. There is also higher percentage of course success rates (the combination of A, B, and C) for the students who attended SI sessions (61.7%) than the students who did not attend the sessions (55.3%).

- Frequency of Attendance

Times of Attendance	0	1	2	3	4	5	6	8	9	10	11	12	14	15	16	17	18	20	21	22	23	24	36
Frequency	161	15	9	7	2	1	1	1	1	1	4	2	3	1	3	1	1	1	1	2	1	1	1

Out of the students who were eligible to attend SI sessions, 72.9% of them (161 out of 221) did not attend any SI sessions. At the same time, about 51.7% of the students who attended SI sessions (31 out of 60), they attended the SI sessions one to three times in the semester.

Appendix

2. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Attending SI sessions* and *Passing the course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=0.728$, $df=1$, $p=0.394$), we can conclude that Attending SI sessions and Passing the course are not significantly related.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.728 ^a	1	.394		
Continuity Correction ^b	.490	1	.484		
Likelihood Ratio	.733	1	.392		
Fisher's Exact Test				.446	.243
Linear-by-Linear Association	.724	1	.395		
N of Valid Cases	221				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.79.

b. Computed only for a 2x2 table

3. Final Grade Comparisons – Divided Into 3 Groups:

The students are further divided into three groups: the ones who did not attend any SI sessions, the ones who attended the sessions between 1 and 3 times, and the ones who attended 4 or more sessions. It is clear that the ones who attended the sessions 4 or more times had the highest course success rates (82.8%) in comparison to the other two groups.

	A	B	C	A, B, & C Combined	D	F	FW	W	Total
Not Attended SI	14.9% (24)	19.9% (32)	20.5% (33)	55.3% (89)	10.6% (17)	14.3% (23)	7.5% (12)	12.4% (20)	100% (161)
Attended SI 1 to 3 Times	19.4% (6)	12.9% (4)	9.7% (3)	41.9% (13)	12.9% (4)	29.0% (9)	6.5% (2)	9.7% (3)	100% (31)
Attended SI 4 or More Times	17.2% (5)	37.9% (11)	27.6% (8)	82.8% (24)	6.9% (2)	6.9% (2)	0.0% (0)	3.4% (1)	100% (29)
Combined	15.8% (35)	21.3% (47)	19.9% (44)	57.0% (126)	10.4% (23)	15.4% (34)	6.3% (14)	10.9% (24)	100% (221)

4. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Three Attendance Patterns* and *Passing the Course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=10.916$, $df=2$, $p=0.004$), we can conclude that the *Three Attendance Patterns* and *Passing the Course* are significantly related. Combined with the Chi-Square test above, this test shows that students who attended SI 4 or more times are likely to be significantly different from the other two groups. In other words, if a student attended SI sessions for 4 or more times, he/she had a higher chance to pass the courses than the students who either did not attend any SI sessions or only attended 1 to 3 times.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.916 ^a	2	.004
Likelihood Ratio	11.786	2	.003
Linear-by-Linear Association	3.845	1	.050
N of Valid Cases	221		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.47.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.222	.004
	Cramer's V	.222	.004
N of Valid Cases		221	

Note:

* The CRNs of participating SI sessions are: 20640, 20632, 20529, 20648, and 21919.

28

29 Another indicator of a successful SI leader is their ability to stimulate students' passion toward the subject so that the students
30 themselves become mini-SI leader or student-helpers.

31

32 *"I had other people tell me that another classmate became mini-SI leader when I am not available. They get together in study*
33 *sessions and there is somebody who organizes them. There is somebody shows me the handout they made as well like fill out the blank*
34 *questions. Somebody else who focuses on their studies and drawing things on the white-board just like what I'll do. And different things like*
35 *that. And they made me feel good because they taking things from SI and applying their studies outside, and also it is an environment for*
36 *them to meet with other students and become friends"* (Emma)

37

38 *"If you have students who easily Aings the course, they tend to be leaders. They would do is to help students who are struggling*
39 *and the students who are struggling they know that not only am I there as their resources and they also know that I can fellowship and*
40 *associate with these students. And a lot of times, they find opportunity that they can exchange information and once the SI session is done and*
41 *I am going home, they are keeping contact each other and they help each other out. I mean it seems to be beyond the SI. The whole process is*
42 *like cloning"* (Jonathan)

43

44 1. Enjoying helping others

45 A good SI leader is the one who enjoys helping others. They care for their students and have the desire to do it well.
46 Because of their motivation to help others, they are dedicated and committed.

47

48 *"I enjoy sharing my knowledge if there is someone needed it and I enjoy helping people in general especially in a form of*
49 *teaching"* (James)

50

51 *"...having the desire to want to do it is probably really big thing because if you could go in there and you could do it (you know)*
52 *just put no effort into it and it really shows in your students. But if you have the desire to want to make people's lives easier and better –*
53 *see them succeed, it helps"* (Brianna)

54

55 2. Knowledge

56 SI leaders usually got As or Bs in their classes and were recommended to be a SI leader by their faculty members.
57 Therefore, they have knowledge in the subject matter. They are model students and they want to set up a model for the
58 students as well.

59
60 *“...you have to be the ideal student first – you have to sit in the class, take notes, although there are lecture slides, I still take lots*
61 *of notes. And a lot of students have benefited from that one. We do note reviews of the class because something happened they can look*
62 *at my notes and they can catch up so in that perspective they told me I needed to be an ideal student once in class and I have done that”*
63 (Emma)

64
65 *“...the best students. If you got As or Bs. Those are the ones working the hardest and tend to know the materials the most”*
66 (Jonathan)

67
68 However, SI leaders are students as well or they call themselves “second-time students”, so they don’t have to know
69 everything in the class. They usually acknowledge that and students usually do not expect them to know everything either.

70
71 *“...And it is ok if you were asked a question that you don’t know. It’s Ok to say, I am not sure I have to look up. Because At the*
72 *beginning, I don’t know if I have to remember everything ... In the first of class, I did let them know I was a student as well, and*
73 *previously I have taken the class if I don’t know we can find the answer together or we can work together to figure out what it is”* (Emily)

74
75 *“I don’t ever claim to know everything. I let them know up front I got an A in this class but it wasn’t easy. I worked hard and I*
76 *went to SI. It helped me, so...If I don’t know something you can ask the professor, make sure we bring it in class or I’ll ask the professor*
77 *and bring it to the next session and say “hey, I got this and I answered this question and this is how it was supposed to be”. I am their*
78 *peer and they don’t expect me to know everything”* (Sarah)

79
80 3. Communication skills

81 Communication skills go hand in hand with subject knowledge and sometimes was even promoted higher by the SI
82 leaders and students. In general, SI leaders need to communicate well with the students so that they can bond with them.

83
84 *“...they need to be sociable, friendly because it doesn’t matter how good a SI leader you are, you can know the material inside out*

85 *and people think you should teach it, but that doesn't help if students don't like you and students don't feel comfortable around you and*
86 *that's one big success that I've been have. I told myself when I go into this that I need to very friendly and I need to be very open if I want*
87 *students to feel comfortable around me. And there are some students who are very timid and very quiet, and they are helpful but it is very*
88 *hard for one shy student works with one shy SI leader and to feel comfortable to ask questions. You have to pull it out of them" (Emma)|*
89

90 *"They feel comfortable with me. They're not afraid to ask me questions. They're not afraid to tell me they really need to work on*
91 *something like "could I focus on that?" We really have an open relationship so communication is a big deal. If you shut yourself off from*
92 *the students you're not going to get very far. They're not going to put the effort to come see you if you don't put the effort. They know you*
93 *are here for them" (Sarah)*
94

95 Bonding with students well is especially important when students are intimidated to ask instructor questions directly.
96

97 *"A little concerned just because ah.. I think he is just a very busy guy and always other students talking with him and I just like*
98 *the one on one better than having other five students hear my questions and annoying my business that type of thing because I don't want*
99 *anybody has to hear what I have to say to the teacher so I found it easier to go to her than to the actual teacher" (Ava)*
100

101 102 4. Patient

103 SI leaders are patient and try to accommodate many types of personalities and learning styles of their students.
104

105 *"I think you have to be able to relate to other students and know what they're going through, I guess. Be like a leader and a*
106 *mentor that they can look up to and ask questions. I think you just need to have patience because sometimes it's frustrating when you can*
107 *tell they don't get it and you've explained it for a while and they still don't understand it. It takes a lot of patience" (Hannah)*
108

109 5. Organized

110 Being organized and keeping students constantly informed of the SI sessions is the key to success.
111

112 *"I would definitely give the advice to be really organized and make sure that they are really organized. I think organization is*
113 *really big key for the success ... Like keeping track of everything they do, like all the information they covered, make sure they go through*
114 *everything they can in order to maximize their time. So they are not like in the SI session, they try to find the problem or something to do*

115 *or waste time in the SI session. They know what they are doing and they know what they are doing, like going to point 1 to point 3*
116 *whatever during SI session. Like a concept map kind of where you have an idea. That kind of organization is really good” (Thomas)*
117

118 *“You need to be consistently updated about what your sessions going to be about. Because if they were “iffy” about coming*
119 *and you tell them I’m working on photosynthesis and they are really struggling with that they might just come because they need that*
120 *extra help. But if they have no idea of what you are going to be like doing, they would be like they may wonder if this is going to be*
121 *beneficial to me, so they may not go. If they know I am doing for a special class, they will make the effort to show up” (Sarah)*
122

123 6. Creative

124 A creative SI leader puts in special twist in their study materials. As a result, their students become so interested in their
125 sessions that they keep coming to the sessions and wanting for more.
126

127 *“But the moon face, it is just so hard for them to understand so we went outside and I said my head is the sun and the globe is the*
128 *moon and I rotated the globe around and I showed them how the shadow moves because they just move the same way and I had him stand*
129 *up and do it and he got and he’s like you know doing the physical thing really helped” (James)*
130

131 *“To be an SI leader you need to be kind of creative. It’s boring for the students to just listen to you repeat the lecture. I think they*
132 *want different stuff to help them learn better” (Hannah)*
133

134 7. Confident

135 Hosting a SI session can be nerve-striking when standing in front of students. Therefore, a good SI leader needs to be
136 confident and not afraid of speaking publicly.
137

138 *“I was nervous. You know, talking in front of all these strangers. They don’t have much faith in the program because it’s brand*
139 *new to them because they’ve never heard of it before. They are like this is not really going to help me. You are just a student and what*
140 *you know. I think I said something really dumb the first day. I said something like we eat other people and that broke the ice immediately”*
141 *(Sarah)*
142

143 *“SI leaders have to have lots of confidence as well. Be in front of people and talk in front of people and that’s the best way to*

144 *get more people to come to your sessions and feel comfortable around you. And trust themselves to be incorrect around you” (Emma)*
145

146 8. Encouraging and supportive

147 Science is not easy to learn. Being a SI leader, they have to be encouraging and supportive. In some occasions, they are
148 students’ cheer-leaders. They cheer students up and encourage them move forward.

149
150 *“I knew how students would feel so I just trying to help them and comfort them and say “hey, it’s ok. don’t give up”. Because*
151 *you know it’s something that you want to give up, so I know a lot of them. They don’t know why they still coming and they still don’t*
152 *know if they might do well. So I’ll go and just come to SI sessions more often. You know just study groups, we can go over things and just*
153 *don’t give up. You know you accumulate points in class. If you did bad in one class, you can still get an A because I did bad on my first*
154 *test, you know, so I am the living proof that ... you can still get an A” (Samantha)*

155
156 9. Collaborative

157 Collaborating with the course instructors and the SI supervisor to the key to success for many SI leaders.

158
159 *“I really enjoy working with the instructor ... who has helpful and very inceptive to the program, he lets me to come to his office*
160 *to discuss the materials with him and he reviews things that I am not sure about and tells me how to refine the materials that I’m going to*
161 *review in the SI session, to focus on more key important concepts that he’d like them to work on” (Emma)*

162
163 *“Communicating with Eleanor is important. Communication with the supervisor is really important. If there is anything comes up*
164 *or anything happened, he/she needs to always communicate with Eleanor and let the supervisor know what’s going on” (Thomas)*

165
166 10. Flexible and Adaptive

167 Being flexible in terms of session times and adaptive to different personalities and different learning styles contributes to
168 SI leaders’ success.

169
170 *“I have 4 sessions. I started with 3 and they started to get really low attendance so I started talking to students more and changed*
171 *the times around quite a few times. Then I added another session because they wanted another day” (Sarah)*

172
173 *“The ability to adapt to different people’s personalities (ah...) because people have different styles of learning. So to*

174 incorporate (ah...) different things in your SI sessions, like review worksheet, question and answer, pairing people up, like to mix up to
175 see what works best for everyone” (Emily)

176 **Issues and Concerns:**

177 1. Space

178 Space is the main concern for almost all of the SI leaders. That is the biggest issue brought up again and again in the
179 interviews. When several SI sessions held together in the STEM Center especially with different subjects, it was hard for
180 students to concentrate.

181
182 “...we actually used the STEM Center, which is sometimes not very practical because there are other sessions that sometimes at
183 the same time. There are chemistry sessions or BIOL 105 sessions, so with 2 large session sessions and three small ones, it’s really
184 loud there. I had to hop three different tables to. It used to be mentally-draining...” (Emma)

185
186 “I do wish I had my own classroom. Not because I want to sit up there and teach the whole time but because I don’t want to
187 disturb the other sessions. With a large group it’s really hard for me to be very quiet. I feel like I’m disrupting other students’ SI
188 sessions and I feel really bad about it. But there is no other place for me to be unless I go outside or something. Location is kind of
189 small. I think they need like a whole floor for SI because it’s a growing program. Probably next semester that small little room isn’t
190 going to house all of the students that need to use it. I think it’s ok to just have the computers in the one place but I think they need to
191 have another room with tables and stuff so we, as SI leaders, don’t have to be so cramped. I have students who come in late and have
192 to sit across the room because there’s nowhere for them to sit. That takes away from the experience, so they need to be more centered
193 together so space has to be something they have to fix. Because as a SI leader we are getting better, the students will start to
194 attending” (Sarah)

195
196 2. SI Preparation Hours

197 Several SI leaders felt they were not given enough hours to be counted for their preparation time. As a consequence,
198 they had to put in many of their own hours into the program. Thus, they hope more allowance can be allocated to their
199 preparation time.

200
201 “...if somehow they could give SI leaders another 3 to 5 hours a week of allowance just to really spend time to reread the

202 *text and spend the time to restudying as a student or studying. Because we only given so much time to prepare, so a lot of it... We*
203 *are not rated on the course, so we are not going to spend 5 hours reading the book. But if we did, that will make us more competent*
204 *and more useful I think. Other than that, I mean, for me, I have always put in more time and effort to prepare for the sessions even if*
205 *I don't write them down... So if I am only given an hour, I'll claim the hour, but I still take an extra couple of hours at the time*
206 *because I want to know the information better. Say we have one hour a week to prepare make it three weeks to prepare. I mean if*
207 *they put in a little bit money and a little bit resources for the SI leaders, it will be huge difference for us to keep up with the study that*
208 *they want to do” (Jonathan)*

209
210 *“I prepare a lot actually. All of the stuff I don't remember I have to go over that, the lecture notes, part of the book ...*
211 *Then it gets easier to prepare as you go on. I still put a lot of time in. They only want us to prepare for 1 hour a week which I don't*
212 *feel is enough. I have 5 sessions a week cause I'm doing 2 classes and to only prepare for an hour is not like a lot of time. They only*
213 *want us to put 1 hour on our timecard” (Hannah)*

214
215 **3. Soliciting Instructors' Help**

216 There is a wide range of patterns in terms of soliciting instructors' help. There are SI leaders who have met with
217 their instructors on a weekly basis. There are SI leaders who did not feel the need to meet with faculty as much, thus they
218 have not collaborated with their instructors to that extend. At the same time, there are also other SI leaders hoping to
219 collaborate more with their instructors. From instructors' perspective, some instructors could not provide clear guidance
220 for the SI leaders.

221
222 *“The instructor I had she was not very clear on what she want to emphasize. So it's hard to say.. Yeah, I would ask that*
223 *this is what I am planning and ask her if it is good and she would say that this is good, so I am like ok. So just more specific I guess*
224 *it would be nice” (Emily)*

225
226 From SI leaders' perspective, some thought they should not “bother” the instructors too much although they wanted
227 more collaborations.

228
229 *“I felt I was a guest in her class and I worked with her like passing out the handouts and asking her permission to do*
230 *certain things like “would it be alright if I walk around the classroom.” But I did feel if I asked her too much, it would bother and I*
231 *want her to have a positive outlook and it wasn't actually until this end and she's like “if you need help with the review, give me an*

232 *email” I don’t think I have take advantage of her as much as I should because that’s something I learnt for the....”*
233 (James)

234
235 In general, collaboration with instructors enhances SI leaders’ performance. Three things that an instructor can do to
236 foster such collaborations are: **promoting SI, providing SI leaders with course structure**, and **letting SI leaders know**
237 **their expectations of the students**. With that said, it is easier for SI leaders to work with the instructors who taught them
238 previously because they will have known the course structure and expectations already.

239
240 One remedy has been proven effective when the collaboration between an instructor and a SI leader was weak is to
241 communicate with the SI supervisor and let her/him know the situation.

242
243 *“I had a specific occurrence with my teacher where he was not really supportive so ... I contacted with Eleanor, so that’s*
244 *ultimately why they moved me to another class because no one is showing up and my teacher was not supportive of the program. So*
245 *they moved me to another class that happened because I was in communication with Eleanor the whole time. To make sure the SI*
246 *leaders understand that the communication is really important with what’s going on” (Thomas)*

247
248 4. Others

249
250 The SI leader training has proven to be effective and the majority of the SI leaders thought it has provided them enough
251 skills and strategies to get started. Two more topics, however, can be addressed to make the trainings even better. They
252 are teaching skills and handling different learning styles. Some students also hoped they could check out videos and bring
253 them home to study and some SI leaders hoped they had the access to the website provided by the textbook.

254
255 **Commonly Used SI Strategies:**

256
257 Redirecting questions, note reviews, review worksheet, mock exam, pairing up, handouts, group activities, divide &
258 conquer, matching vocabulary, true/false, and concept relations.

259

260 **The Reasons Why Some Students Not Going To SI:**

261

262

263

264

Time conflicts, personal preference (e.g. rather study on their own), don't think they need it (e.g. understand the materials so well that they don't think they need it), don't care (e.g. just want to get by with a passing grade), and others (e.g. reasons that students did not disclose)

Quantitative Study Results – Math Success Center (MSC) Fall 2009

Executive Summary:

Using Math Success Center has shown to be beneficial to students in terms of increasing their academic performance in this study. The descriptive data analysis results show a higher percentage of students both passed the courses and also obtained more As or Cs than the students who did not use the Center. The Chi-square and Logistic Regression results reveal that using Math Success Center is significantly related to the course success rates and the level of grades a student obtained. In general, the likelihood of a student passing the course and/or getting a higher grade increased when he or she used Math Success Center.

Key Points:

- The descriptive data analysis result shows that course success rates are higher for students who used Math Success Center than the ones who did not use the Center (64.3% vs. 58.2%). There are also more students achieving As or Cs for the course(s) they took when they used the Center in comparison to the ones who did not (e.g. 18.4% vs. 16.5% and 25.5% vs. 20.8%).
- The Chi-Square test result shows that *Using Math Success Center* and *Passing the course* was significantly related ($X^2=9.815$, $df=1$, $p=0.002$). In other words, if a student used the Center, he/she had a higher chance to pass the course.
- The Logistic Regression tests reveal that *Using Math Success Center* and *the length of using Math Success Center* significantly affected the level of grades a student obtained.
 - Students who used Math Success Center were likely to achieve higher level of grades than the ones who did not (the probability of passing the courses (the combination of A, B, C, and CR/Ps) versus not-passing the courses are 1.18 times greater for students who used Math Success Center than the ones who did not use the Center).
 - Also, the longer the lengths of using the Math Success Center the higher the likelihood that a student obtained a higher level of grade (the probability of passing the courses is 1.02 times greater for each additional hour in the usage of Math Success Center).

Study Results:

4. Descriptive Data analysis:

- Final Grade Comparisons

	A	B	C	CR/P	PASS	D	F	FW	I	W	Total
Not Used MSC	16.5% (613)	20.7% (769)	20.8% (772)	0.1% (5)	58.2% (2159)	11.3% (420)	16.0% (593)	3.4% (125)	0.0% (0)	11.1% (412)	100% (3,709)
Used MSC	18.4% (136)	20.1% (149)	25.5% (189)	0.2% (2)	64.3% (476)	10.1% (75)	14.2% (105)	2.0% (15)	0.1% (1)	9.2% (68)	100% (740)
Combined	16.8% (749)	20.6% (918)	21.6% (961)	0.1% (7)	59.2% (2635)	11.1% (495)	15.7% (698)	3.1% (140)	0.02% (1)	10.8% (480)	100% (4,449)

There is a higher percentage of course success rates (the combination of A, B, C, and CR/P) for the students who used the Math Success Center (64.3%) than the students who did not use the Center (58.2%). There are also more students achieving As or Cs for the Math course(s) they took when they used the Math Success Center in comparison to the ones who didn't use the Center.

- Aggregated Usage Breakouts for Math Success Center in Fall 09 Semester

	0	< 1 hour	1 to 3 hrs	3 to 6 hrs	6 to 10 hrs	10 to 20 hrs	20 to 40 hrs	40 to 80 hrs	80+ hrs
Fall 09	3,709 (83.4%)	156 (21.1%)	199 (26.9%)	125 (16.9%)	88 (11.9%)	104 (14.1%)	42 (5.7%)	23 (3.1%)	3 (0.4%)

Out of the students who took any Math course in the Fall09 semester, 83.4% of them (3,709 out of 4,449) did not use the Math Success Center. At the same time, about 48.0% of the students who used the Center used it for less than 3 hours in the semester.

Appendix

5. Chi-Square Test:

Next, a Chi-Square test was conducted to see if there is a significant relationship between *Using Math Success Center* and *Passing the course* (the combination of A, B, C, and CR/Ps). Based on the Chi-square test results ($X^2=9.815$, $df=1$, $p=0.002$), we can conclude that *Using Math Success Center* and *Passing the course* was significantly related. In other words, if a student used the Math Success Center, he/she had a higher chance to pass the course(s). The effect size for the relation is rather small ($\phi=0.047$) though. One student who got an “I” was taken out of the analysis.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.815 ^a	1	.002		
Continuity Correction ^b	9.560	1	.002		
Likelihood Ratio	9.937	1	.002		
Fisher's Exact Test				.002	.001
Linear-by-Linear Association	9.813	1	.002		
N of Valid Cases	4448				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 301.22.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.047	.002
	Cramer's V	.047	.002
N of Valid Cases		4448	

6. Logistic Regression Tests:

Next, two logistic regression tests were conducted to find out if *Using Math Success Center* affected the level of the grades that a student received and also if *the length of Using Math Success Center* affected the level of the grades that a student received. The level of the grades was coded as: A (level 4), B (level 3), C (level 2), and D, F, W, FW (Level 1). Because it is hard to categorize CR/P and I into the levels and also a small number of students actually got them, those students were taken out of the analysis.

- In the first Logistic Regression, the overall model is significant (p=0.022). *Using Math Success Center* has significantly affected the level of the grades a student achieved. For students who used Math Success Center, we would expect a 0.166 increase in the expected level of grades in the log odds scale. In other words, the odds of passing the courses versus not-passing them are 1.18 times ($\exp b=1.18$) greater for students who used the Math Success Center than the ones who did not use the center.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	57.556			
Final	52.313	5.243	1	.022

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1]	-.343	.033	109.596	1	.000	-.408	-.279
	[Grade_Level = 2]	.538	.033	259.460	1	.000	.472	.603
	[Grade_Level = 3]	1.624	.042	1487.502	1	.000	1.542	1.707
Location	MSC	.166	.073	5.159	1	.023	.023	.309

Link function: Logit.

- In the second Logistic Regression, the overall model is significant ($p=0.000$). *The length of Using Math Success Center* has significantly affected the level of the grades a student achieved. For each hour of increase in the length of attendance (i.e., going from 0 to 1 hour), we would expect a 0.019 increase in the expected level of grades in the log odds scale. In other words, the odds of passing the courses versus not-passing them are 1.02 times ($\exp b=1.02$) greater for each additional hour in the usage of the Math Success Center.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1649.010			
Final	1631.865	17.146	1	.000

Link function: Logit.

Parameter Estimates

	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Threshold [Grade_Level = 1]	-.347	.031	125.225	1	.000	-.408	-.287
[Grade_Level = 2]	.536	.032	286.554	1	.000	.474	.598
[Grade_Level = 3]	1.624	.041	1584.780	1	.000	1.544	1.704
Location Length	.019	.005	16.409	1	.000	.010	.028

Link function: Logit.

Calculus Workshop Program Data Analysis Results

1. Descriptive Data analysis

- Final Grade Comparisons

The course success rates (the combination of A, B, and C) are higher for Calculus Workshop participants (87.1%) than non-participants (61.5%). A higher percentage of participants achieved A or B than non-participants as well.

	A	B	C	A, B, & C Combined	D	F	W	Total
Non-Participants	30.8% (28)	14.3% (13)	16.5% (15)	61.5% (56)	17.6% (16)	16.5% (15)	4.4% (4)	100% (91)
Participants	45.9% (39)	29.4% (25)	11.8% (10)	87.1% (74)	3.5% (3)	9.4% (8)	0.0% (0)	100% (85)
Combined	38.1% (67)	21.6% (38)	14.2% (25)	73.9% (130)	10.8% (19)	13.1% (23)	2.3% (4)	100% (176)

2. Chi-square:

A Chi-square test was conducted to see if there is a significant relationship between *Participating in the Calculus Workshop Program* and *Passing the Course* (the combination of A, B, and Cs). Based on the Chi-square test results ($X^2=14.827$, $df=1$, $p=0.000$), we can conclude that *Participating in Calculus Workshop program* and *Passing the Course* are significantly related. The effect size for the relationship is small ($\phi=0.29$).

if participated CW * Pass or not Crosstabulation

			Pass or not		Total
			No	Yes	
if attended CW	No	Count	35	56	91
		% within Pass or not	76.1%	43.1%	51.7%
	Yes	Count	11	74	85
		% within Pass or not	23.9%	56.9%	48.3%
Total		Count	46	130	176
		% within Pass or not	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.827 ^a	1	.000		
Continuity Correction ^b	13.534	1	.000		
Likelihood Ratio	15.458	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.742	1	.000		
N of Valid Cases	176				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.22.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.827 ^a	1	.000		
Continuity Correction ^b	13.534	1	.000		
Likelihood Ratio	15.458	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.742	1	.000		
N of Valid Cases	176				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.22.

b. Computed only for a 2x2 table

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.290	.000
Cramer's V	.290	.000
N of Valid Cases	176	

3. Logistic Regression Tests:

Next, two logistic regression tests were conducted to find out if *Participating in the Calculus Workshop Program* affected the level of the grades that a student received and also if *the frequency of Participating in the Calculus Workshop Program* affected

the level of the grades that a student received. The level of the grades was coded as: A (level 4), B (level 3), C (level 2), and D, F, W, FW (Level 1).

- In the first Logistic Regression, the overall model is significant ($p=0.000$). *Participating in the Calculus Workshop Program* has significantly affected the level of the grades a student achieved. For students who participated in the program, we would expect a 1.019 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs are 2.77 times ($\text{expb}=2.77$) greater for students who participated in the Calculus Workshop program than the ones who did not participate in the program.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	45.525			
Final	32.136	13.389	1	.000

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1]	-.587	.207	8.011	1	.005	-.993	-.180
	[Grade_Level = 2]	.114	.201	.323	1	.570	-.280	.508
	[Grade_Level = 3]	1.045	.217	23.224	1	.000	.620	1.470
Location	CW	1.019	.282	13.071	1	.000	.467	1.572

Link function: Logit.

- In the second Logistic Regression, the overall model is significant ($p=0.010$). *The frequency of participating in the Calculus Workshop program* has significantly affected the level of the grades a student achieved. For each unit of increase in the frequency of participation (i.e., going from 0 to 1 time), we would expect a 0.038 increase in the expected level of grades in the log odds scale. In other words, the odds of getting As and Bs are 1.039 times ($\exp b=1.039$) greater for each unit of increase in the frequency of participating in the program.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	157.805			
Final	151.155	6.650	1	.010

Link function: Logit.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Grade_Level = 1]	-.813	.190	18.366	1	.000	-1.185	-.441
	[Grade_Level = 2]	-.141	.178	.630	1	.428	-.489	.207
	[Grade_Level = 3]	.759	.187	16.501	1	.000	.393	1.125
Location	CW_Attendance	.038	.015	6.042	1	.014	.008	.068

Link function: Logit.