IMPROVING STATISTICAL LITERACY THROUGH SUPPLEMENTAL INSTRUCTION

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Supplemental Instruction (SI) is an academic support system designed to increase retention of students in typically difficult classes, such as mathematics and statistics. Unlike other programs, SI is open to all students who feel they need help in a particular course. The help is given by a student leader who has taken the course previously and did well. In addition to the students who benefit from the support, the student leaders also benefit, because of the training that helps retain them in the field. In this study, the performance of students in courses with SI support will be compared to those without SI support. This program is currently offered in 1400 US colleges and universities, as well as other countries. It can easily be applied to many educational settings to improve the education of students all over the world.

INTRODUCTION

Supplemental Instruction (SI) is an academic support system designed to increase retention of students in typically difficult classes, such as mathematics and statistics. The program is currently offered in 1400 US colleges and universities, including American University.

Unlike other programs, SI is open to all students who feel they need help in that particular course. The help is given by a student leader who has taken the course previously and did well. The student leaders are not teaching assistants, because they are trained by the SI program to present the material in a way complementary to the method the professor uses. In addition to the students who benefit from the support, the student leaders also benefit from this program: the student leaders are usually majoring in the field they support and their experience provides them with training and also helps retain them in the field.

We believe the Supplemental Instruction method can easily be applied to many educational settings and can be used internationally to improve the education of students all over the world.

OVERVIEW OF PEER COOPERATIVE LEARNING PROGRAMS

In Table 1 below, there is a list of several peer cooperative learning programs. Two of the programs in the list are administered separately from the course (adjunct), whereas three programs in the list are administered as part of the course (embedded). One of the adjunct programs is Supplemental Instruction, which is the program we focus on in this study.

Table 1: Peer Cooperative Learning Programs, Arendale (2012)

Adjunct to the Course	Embedded Within the Course
1. Supplemental Instruction	1. Emerging Scholars Program
2. Structured Learning Assistance	2. Video-based Supplemental Instruction
	3. Peer-Led Team Learning

SUPPLEMENTAL INSTRUCTION (SI) PROGRAM

- Service attached to a specific course (historically difficult courses).
- SI support is provided at the request of the professor (one section may be supported and another one not).
- Service proactive rather than reactive (hence not remedial; no stigma attached).
- SI student leader has taken the course previously and did well.

- SI student leaders attend all classes and hold their own meetings.
- SI student leaders are trained in group facilitation practices.
- Student leaders are supervised by the SI advisor.
- SI student leaders also benefit from this program: usually majoring in the field they support and their experience provides them with training and helps retain them also in the field.
- The program is offered in 1400 US colleges and universities.
- This method is easily applied to many educational settings and is used internationally to improve the education of students all over the world.

The expectations for the SI program are the following:

- Increased retention of students in typically difficult classes, such as mathematics and statistics.
- Student grades in the course will improve.
- Increased retention of the SI leaders in the field (usually majors).

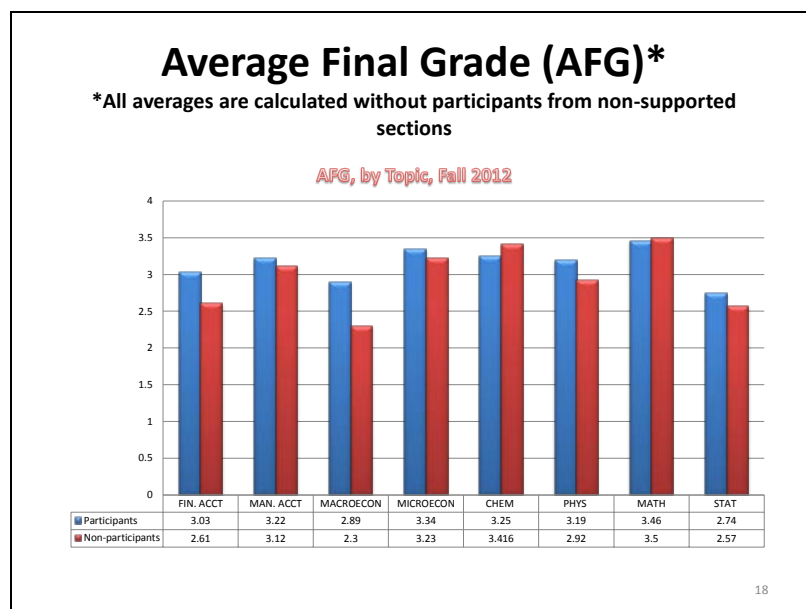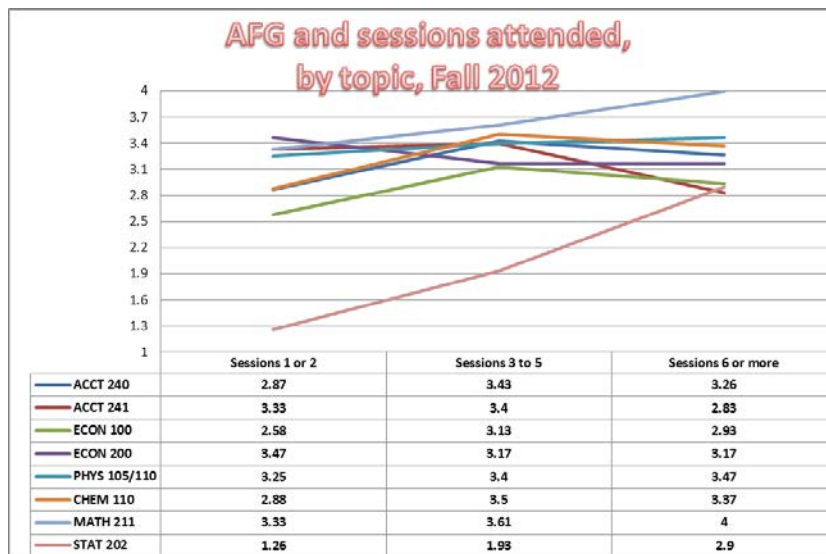SUPPLEMENTAL INSTRUCTION AT AMERICAN UNIVERSITY
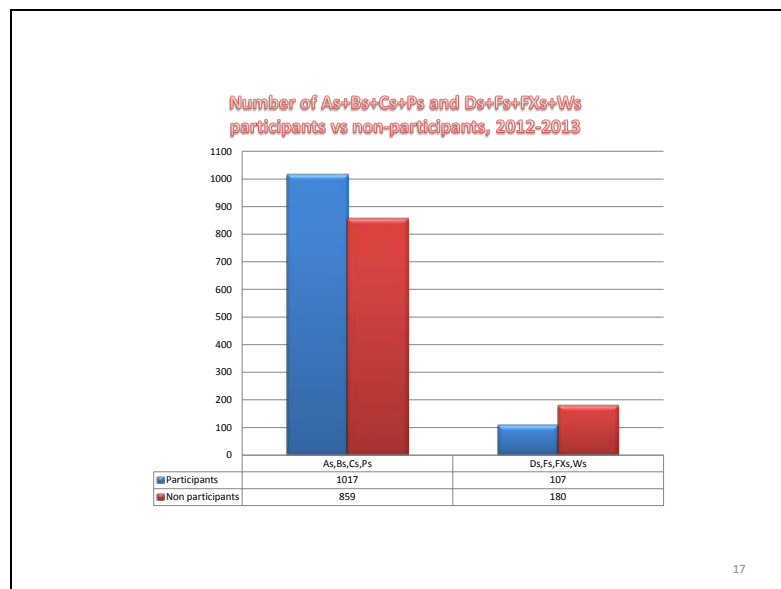
Academic Year 2012/2013 - Overview

Attendance by topic is calculated with students from non-supported sections or courses; general attendance is calculated without students from non-supported sections or courses:

Students enrolled: 2,116
Participants: 1,116
Participants from non-supported sections or courses: 16
Number of sessions held: 692
Number of sessions attended: 562
Number of sessions with no attendance: 130
Average number of students per session: 5.29
Total number of contact hours: 5,008.25
Final Grade Average, Participants: 3.0
Final Grade Average, non-participants: 2.7
Percent of participants getting a C or higher: 90.5%
Percent of non-participant getting a C or higher: 83%

The graphs below show the average final grade (AFG) of participants by number of sessions attended and topic; and average final grade (AFG) of participants versus non-participants

by topic. We see that the AFG of students increases with the number of SI sessions attended by the students and that it is consistently higher for participants than non-participants.

AFG and sessions attended, by topic, Fall 2012

	Sessions 1 or 2	Sessions 3 to 5	Sessions 6 or more
ACCT 240	2.87	3.43	3.26
ACCT 241	3.33	3.4	2.83
ECON 100	2.58	3.13	2.93
ECON 200	3.47	3.17	3.17
PHYS 105/110	3.25	3.4	3.47
CHEM 110	2.88	3.5	3.37
MATH 211	3.33	3.61	4
STAT 202	1.26	1.93	2.9

Average Final Grade (AFG)*
*All averages are calculated without participants from non-supported sections

AFG, by Topic, Fall 2012

	FIN. ACCT	MAN. ACCT	MACROECON	MICROECON	CHEM	PHYS	MATH	STAT
Participants	3.03	3.22	2.89	3.34	3.25	3.19	3.46	2.74
Non-participants	2.61	3.12	2.3	3.23	3.416	2.92	3.5	2.57

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Now we are planning to study the effect of the SI program with a comparative experiment, as follows: the performance of students in course sections where SI support is available will be compared to the performance of students in course sections where SI support is not available. In this study, we are also planning to include a variation of the SI program. In the variation, students are given extra credit for attending the SI sessions. We expect that the extra credit will encourage more students to participate. SI has been shown to improve student grades and improve retention of students in their major field. However, most of the studies done so far have been observational. We would like to do an actual experiment where course sections are randomly assigned to one of the treatments.

The courses we are planning to use in this study are, initially, Introductory Statistics (Stat 202), and later introductory mathematics courses (such as Math 211). The data we have so far, on the positive effect of SI on the student performance, seem very promising. In a sense, the SI program seems opposite to the trend towards on-line courses. However, on-line courses are particularly vulnerable to becoming impersonal, whereas SI is anything but impersonal. SI offers personal help to students who need it.

CONCLUSION

The SI peer support program is very effective in improving student performance and increasing student retention in traditionally difficult courses. It is also very effective in increasing retention of SI student leaders in the major fields they support. We have observed similar results in introductory statistics and introductory mathematics courses. However, these results are based mostly on observational studies. We would like to measure the SI effect on student grades by performing a comparative experiment.

FUTURE WORK

- Design a comparative experiment to measure the effect of Supplemental Instruction (SI) in learning statistics and mathematics.
- Analyze the experiment using the scores in the Math Placement Test as a covariate.
- On-line courses are particularly vulnerable to becoming impersonal. Can on-line SI solve this problem?

ACKNOWLEDGEMENTS

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REFERENCES

Arendale, D. R. (compiler/ed.) (2012). *Postsecondary Peer Cooperative Learning Programs: Annotated Bibliography 2012*. Updated versions of this document available at *http://z.umn.edu/peerbib*