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Reducing the grade disparities between American Indians and Euro-American students in introduction to psychology through small-group, peer-mentored, supplemental instruction

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Supplemental instruction (SI) is a small-group, peer-mentored programme which is compatible with the learning preferences of American Indian students. We tested the hypothesis that SI is a compensatory strategy that reduces the differences in the grades earned in introduction to psychology by Euro-American and American Indian students. The sample consisted of 129 American Indian students and 4588 Euro-American students enrolled in introduction to psychology at a US university. As hypothesised, a multi-level model yielded a significant ($p < .01$) interaction between SI and ethnicity on course grade. Whereas for non-SI users, the gap between Euro-American and American Indian students was .71 grade points, for SI users, it was only .15 grade points. Strategies should be devised for increasing SI visits by students enrolled in introduction to psychology, particularly those who belong to American Indian tribes.

Keywords: American Indians; college students; course grades; supplemental instruction

Compared to other racial and ethnic groups, the college graduation rate among American Indians/Alaskan Natives is lower. More specifically, for the cohort of students who started US colleges in 1999–2000, the six-year graduation rates by racial/ethnic group were 65% (Asian students), 59% (White students), 48% (Hispanic students), 44% Black and 38% (American Indian/Alaskan Native students) (Lee, Donlan, & Brown, 2010–2011). The lack of a college degree may have far-reaching and detrimental consequences for American Indians including lower participation rates in the labour force, lower earnings over the life course, poorer health care coverage and greater health disparities relative to other ethnic groups (Seidman, 2005).

A myriad of economic, social, academic and cultural factors affect student departure from college (Tinto, 1993). Some cultural variables that increase the risk of attrition for American Indian students include external commitments such as financial difficulties and family and community obligations (Lee et al., 2010–2011).

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American Indian students may also experience conflict between tribal culture and the University bureaucracy (Montgomery, Miville, Winterowd, Jeffries, & Baysden, 2000). Guillory (2009) identified poor academic preparation as a risk factor for American Indian students, arguing that many of them enter college lacking academic self-confidence and thus are especially susceptible to leaving college following experiences of academic failure. Cibik and Chambers (1991) found that poor grades are an especially important academic obstacle to degree completion among American Indian students. Research on ethnic differences in GPA indicates that American Indian students often obtain lower grades than their Euro-American or Asian-American peers (Lunneborg & Lunneborg, 1986; Mayo, Murguía, & Padilla, 1995). In a more fine-grained analysis of four introductory courses, Johnson, Okun, Benallie, and Pennak (2010) found that the grade gap between American Indian and Euro-American students was much greater in introduction to psychology as compared to introductory courses in History, Religious Studies and Sociology. At one university, the failure rate for introduction to psychology was three times greater for American Indian students (33%) relative to Euro-American students (11%).

Tinto (2006) proposed that such grade disparities can be partially alleviated by the creation of learning communities. Learning communities may involve mentoring and tutoring a particular group of students or creating environments that feature cooperative learning techniques and group process learning activities (Lenning & Ebbers, 1999). Supplemental instruction (SI) programmes facilitate the creation of learning communities by providing both mentoring and cooperative learning experiences (Bronstein, 2008) for students enrolled in high-risk or barrier courses, i.e. large enrollment courses with high failure and withdrawal rates. Because SI programmes target high-risk courses rather than high-risk students, SI provides a compensatory strategy for a variety of students enrolled in barrier courses, including students with different levels of academic preparation as well as students from diverse ethnic backgrounds. Guillory (2009) has advocated for the implementation of more SI programmes based on the fact that SI appears to be somewhat successful in increasing American Indian retention.

At the University where the present study was conducted, introduction to psychology was identified as a barrier course. To increase student success in this course, a SI programme, following the model developed by the University of Missouri-Kansas City, was implemented in 2006.

SI model

The SI programme which was developed in 1974 in the USA at the University of Missouri-Kansas City, has been designated by the US Department of Education as an Exemplary Education Programme (Arendale, 2001). In the SI programme, a peer leader who has successfully completed the targeted course, guides students in developing and using their own learning resources to help them acquire difficult concepts (Bronstein, 2008). The peer leader (i.e. the SI leader) models problem solving strategies and participating students collaborate on identifying what they do and do not understand (Arendale, 2001). SI is distinguished from other forms of optional academic support by its (a) focus on difficult *courses* rather than high-risk students; and (b) use of SI leaders to keep the students on track, to model appropriate learning strategies and to encourage attendees, as a *group*, to process course material.

The findings of numerous studies mostly conducted with students enrolled in natural science courses indicate that attending SI is associated with higher course grades and with a greater likelihood of passing the course (Lockie & Van Lanen, 2008). For example, Arendale (2001) reported over a 15-year period that students attending SI sessions had a median advantage of 15% over students who did not attend SI sessions with respect to earning a passing grade in a targeted course.

Bronstein (2008) suggested that the benefits of attending SI sessions were comparable across racial and ethnic groups. Rath, Peterfreund, Xenos, Bayliss, and Carnal (2007), however, found that the relation between SI participation and course grade varied with ethnic group. In their study of an Introductory Biology course, students from underrepresented ethnic minorities (Blacks, Hispanics, and American Indians/Native Alaskans) were analysed in the aggregate and compared with Euro-American students. The difference in mean course grade between students using and not using SI was substantially greater in the ethnic minority group (2.27 vs. 1.55) than in the Euro-American group (2.37 vs. 2.14). Thus, the findings of this study suggest that ethnic minority students may benefit *more* from SI than Euro-American students.

SI as a strategy for success in introduction to psychology

In an essay written to assist his own struggling students, Cabe (2003) delineated four reasons why introduction to psychology is a particularly difficult course: (a) the breadth of the topics covered; (b) the size of the vocabulary that must be mastered; (c) the absence of a preexisting cognitive structure to use as a scaffold for new knowledge; and (d) the lack of effective study strategies for coping with the volume of information presented. In addition to the general course difficulty, students enrolled in this course are often non-majors (Gaultney & Cann, 2001) who may not be interested in mastering the subject but instead use this course as a way to meet general studies requirements. Although difficult for all students, Johnson et al. (2010) reported that the mean difference between course grade in introduction to psychology and overall university GPA was over twice as large for American Indian students ($-.89$) as compared to Euro-American students ($-.40$). The underperformance in introduction to psychology by American Indian students is especially disconcerting because more American Indian psychologists are needed to meet the emotional needs of their own communities (Holliday & Holmes, 2003). Despite the success of interventions designed to improve the recruitment and retention of American Indians students in psychology (Maton, Kohout, Wicherski, Leary, & Vinokurov, 2006), American Indian psychology majors simply cannot go on to more advanced courses without success in introduction to psychology.

Why do many American Indians struggle to achieve academic success in introduction to psychology? Johnson et al. suggested that the lecture mode of teaching, the large class sizes (class sizes typically range from 100 to 450 students at this university) and the focus on memorisation of information appear to be incongruent with the learning preferences of American Indian college students. Further, American Indian students often favour deep processing over shallow processing and memorisation, story-telling over lectures and generating practical knowledge that can be used to help others over and above decontextualised knowledge (Aragao, 2002; Montgomery et al., 2000; Pewewardy, 2002). Finally, collaboration and active learning (learning by observation and participation) are often preferred rather than

competing for individual academic success. Thus, there appears to be a mismatch between preferred learning styles and the way introduction to psychology is taught.

Although, as within any ethnic group, there is substantial variation among individuals, there is further support for this characterisation of the learning preferences of American Indian students at this university. Johnson et al. (2010) had previously assessed preferred modes of learning, strategies for success, sources of course difficulty, getting help and type of testing in an anonymous online survey of introduction to psychology students. American Indian students indicated a greater preference for learning from pictures, models and diagrams and from stories/narratives and less of a preference for learning from lectures compared with Euro-American students. American Indians were also more likely than Euro-American students to indicate that the volume of information, testing issues and class size were all factors that made the course difficult; whereas Euro-American students were more likely than American Indian students to indicate that the lack of motivation made the course difficult. On the one hand, American Indian students viewed tests that focused on memorisation of facts and vocabulary as the most difficult type. On the other hand, Euro-American students viewed tests that focused on theories and practical application as the most difficult type. Whereas, Johnson et al. found that Euro-American students were most likely to mention the textbook and friends as sources of help with the course, American Indian students were more likely than their Euro-American peers to mention SI as a way to get help with this difficult course.

Purpose of the study

The purpose of the current study was to assess whether SI provides a viable compensatory strategy for American Indian students enrolled in introduction to psychology. Rath et al. (2007, p. 203) described SI as creating,

... cooperative learning environments where students participate in learning activities that complement the course material, focusing on student misconceptions and difficulties, construction of a scaffolded knowledge base, applications involving problem solving and articulation of constructs with peers.

In light of the high degree of correspondence between the learning preferences of American Indians and the learning environment created in SI sessions, we expected that the gap in the mean course grade earned in introduction to psychology between Euro-American and American Indian students to be smaller among students who attend at least one SI session relative to students who do not. We selected Euro-American students as the comparison group because they represent the dominant cultural group, had the highest average course grade and were the clear statistical majority group at the university where the data were collected.

Method

University and course

The current study was conducted using data from students attending a large, urban, multi-campus, research-oriented university located in the USA. We chose to focus on introduction to psychology because this three-credit course has a large enrollment, is very difficult and has been the primary course targeted by the University for SI.

SI programme in the study

SI for introduction to psychology during the time frame for the current study consisted of regularly scheduled, peer-led, collaborative study and review sessions. Student participation in SI sessions was voluntary and not credit-bearing. The programme operated within the University Academic Success Programmes (UASP), an academic support unit which is housed under the university provost. UASP's SI Coordinator, who was trained at the University of Missouri-Kansas City, developed the SI programme based on the UMKC model (University of Missouri-Kansas City, 2013).

To begin with introduction to psychology faculty members were recruited to make SI available as a resource for their classes. Then, the SI leaders were hired and trained by the SI Coordinator. The selection process was competitive and required students to meet the following criteria in order to submit an application: (1) sophomore status or above, (2) an 'A' in introduction to psychology, (3) a minimum 3.0 cumulative grade point average, and (4) a recommendation from an introduction to psychology faculty instructor. Once selected, the SI leaders engaged in rigorous, on-going training in such topics as learning theory, learning strategies and group dynamics. SI leaders were mentored by the SI Coordinator in bi-weekly staff meetings where they shared challenges faced in their sessions and worked collaboratively to solve problems and design learning-based activities.

SI leaders were expected to attend all lectures in their assigned section, take notes in class and complete all homework assignments. Each SI leader facilitated two SI sessions per week between 50 and 75 min in length, throughout a semester. Typically, SI leaders worked 8–10 h per week including prep time and staff meetings. During the time frame of this study, SI leaders were compensated for their time at the approximate rate of \$9.50 per hour. Across the 31 introduction to psychology sections in the study, we estimate that (a) there were 25 different SI leaders and (b) 50% of the SI leaders served for more than one semester.

SI leaders were assigned to introduction to psychology sections based on their academic schedules. Although faculty contact with the SI leaders varied, it was standard practice for faculty to provide a copy of the textbook and syllabus to their SI leaders and to meet with them to review course objectives. SI leaders planned the content covered in each session based on material from the most recent lecture or reading assignment. In accordance with the SI model, SI leaders did not teach course material rather, they engaged students in collaborative learning activities that integrated study strategies with course content (how-to-learn with what-to-learn). In a typical session, SI participants would learn how to apply tools such as note-taking, graphic organisation, questioning techniques, vocabulary acquisition and problem-solving to improve their comprehension of course concepts.

Students learned about SI sessions for introduction to psychology in multiple ways. Faculty included information about SI and how to contact the SI leader in both the course syllabus and Blackboard, an online course management system. Students could search for information about SI sessions by date, time, location and instructor name on the UASP website (Arizona State University, 2013).

SI leaders also maintained active contact with students enrolled in introduction to psychology sections. In addition to attending class and making announcements, they reached out to students using Blackboard and social media such as Facebook.

Data-set

Prior to constructing the data-set, the study protocol was approved by the University's IRB. The data-set was constructed in multiple steps. First, the UASP provided the Office of Institutional Analysis with a list of all sections of introduction to psychology that offered SI during the specified time frame and student attendance information at each SI session. Data on student visits to SI were recorded and tracked using the web-based application, *TutorTrac*. Second, the Office of Institutional Analysis generated data for all students enrolled in these sections of introduction to psychology including their university-assigned student identification number. These two data-sets were merged using the student identification number as the matching variable. Students who did not use SI were assigned a score of zero visits. Finally, prior to releasing the data-set to the research team, the Office of Institutional Analysis replaced student identification numbers with 4-digit participant identification numbers to guarantee student anonymity.

Initial sample

The sample was defined initially as all American Indian and Euro-American students enrolled in SI-supported sections of introduction to psychology at the University's main campus over six consecutive fall and spring semesters beginning with the fall 2007 semester and ending with the spring 2010 semester. To avoid dependencies in the data, for those students who enrolled in introduction to psychology more than once during these six semesters, we used the data from their earliest enrollment in the course. After eliminating these records, we had a total of 6320 records from different students nested within 31 sections.

Characteristics of students

American Indians comprised 3.0% of the initial sample which mirrored their percentage in the population of American Indian and Euro-American undergraduates (3.4%). The initial sample was divided evenly between males (50.9%) and females (49.1%). The majority of the students were first-year students (69.0%), followed by sophomores (22.2%), juniors (6.3%), seniors (2.1%) and non-degree (0.5%) students.

We decided to exclude non-degree students because there were only 29 of them in the sample. We also eliminated the students who were taught by the instructor who offered only one section of introduction to psychology between the fall 2007 semester and the spring 2010 semester ($n = 153$), which reduced our sample size to 6138. Next, because they did not earn a letter grade that translated into a numerical value, we eliminated students who received an incomplete or who withdrew from the course. After dropping the 644 students who received incompletes or who withdrew from the course, our sample size was 5494. Finally, missing data existed on (a) SAT/ACT scores only ($N = 256$), (b) high school GPA only ($N = 474$) or (c) both ($N = 47$). Consequently, an additional 777 students were dropped from the study on the basis of missing academic records. Thus, our final sample size, based on students with complete data who had finished the course, was 4717.

Table 1. Descriptive statistics for the study variables for the total sample and by ethnicity.

	Total			Euro-American			American Indian		
	%	M	SD	%	M	SD	%	M	SD
<i>Ethnicity</i>									
American Indian	2.7			0.0			100.0		
Euro-American	97.3			100.0			0.0		
<i>SI visit</i>									
No	75.2			75.2			72.9		
Yes	24.8			24.8			27.1		
<i>Academic standing</i>									
First-year	68.8			68.7			72.1		
Sophomore	23.0			23.2			18.6		
Junior	6.1			6.1			7.0		
Senior	2.0			2.0			2.3		
<i>Residence</i>									
Off campus	43.4			43.0			58.1		
On campus	56.6			57.0			41.9		
<i>Sex</i>									
Male	49.7			50.1			34.9		
Female	50.3			49.9			65.1		
<i>Teacher</i>									
Teacher 1	55.2			54.9			66.7		
Teacher 2	15.5			15.6			8.5		
Teacher 3	29.3			29.4			24.8		
<i>Semester</i>									
Fall 2007	21.1			21.1			17.8		
Spring 2008	9.7			9.5			17.1		
Fall 2008	19.4			19.6			14.7		
Spring 2009	14.9			14.8			18.6		
Fall 2009	22.4			22.6			14.0		
Spring 2010	12.5			12.3			17.8		
Class size		319.50	105.44		319.35	105.68		325.09	96.58
SAT equivalent		1089.69	162.22		1085.51	150.42		945.97	154.06
High school GPA		3.34	0.48		3.34	0.48		3.25	0.48
Credits attempted		13.88	2.41		13.90	2.41		13.01	2.20
Course grade		2.61	1.23		2.64	1.22		1.62	1.37

Notes: The descriptive statistics above do not take clustering by classroom into account.

Final sample characteristics

Table 1 provides a description of the total sample and is broken down by ethnicity. Of the 4717 students in the final sample, 2.7% were American Indian and 50.3% were women. The majority of the sample was first-year students (69.7%). The SI-supported sections of introduction to psychology were taught by three instructors. These instructors taught 7, 11 and 13 sections, and 15.5, 29.3 and 55.2% of the students, respectively.

Measures

Course grade

The course grade earned by students in introduction to psychology ranged from E (coded 0.0) to A+(coded 4.33). The other letter grades (with numerical values in parentheses) included D (1.00), C (2.00), C+(2.33), B−(2.66), B (3.00), B+(3.33),

A–(3.66) and A (4.00). Approximately, 28% of the students earned a grade of A– or higher and another 32% of the students earned a grade between B– and B+. Twenty-two per cent of the students earned a grade of C or C+. Nine per cent of the students earned a Grade of D and 9% of the students earned a grade of E.

SI participation

Students recorded their student identification number each time they attended an SI session for introduction to psychology. Only 25% of the students attended an SI session. Given that 35 of the 129 American Indian students made one or more SI visits, we treated SI participation as a binary variable (0 = none; 1 = one or more SI visits). This was done so that the plots of the relation between SI use and course grade within each ethnic group would be based on an adequate number of observations.

SAT equivalent

The sum of the Verbal and Quantitative SAT score was extracted from each student's permanent academic record. When SAT scores were unavailable, ACT scores were converted to an SAT equivalent score according to the University's standard conversion formula. The mean and standard deviation for SAT equivalent scores were 1081.69 and 152.22, respectively.

High school GPA

All high school GPA scores were converted into a standard scale ranging from 0.0 (all Es) to 4.0 (all As). The mean high school GPA was 3.34 (SD = 0.48).

Academic standing

Academic standing was determined by the number of credit hours completed prior to the semester that the student enrolled in introduction to psychology. Students' academic standing was categorised into four distinct groups: freshman, sophomore, junior or senior according to the university-defined criteria.

Credits attempted

Credits attempted refer to the number of credit hours students were enrolled for during the semester they took introduction to psychology. The mean number of credits attempted was 13.88 (SD = 2.41).

Residence

During the semester that students were enrolled in introduction to psychology, they indicated whether they resided on-campus (43.4%) or off campus (56.6%).

Ethnicity and sex

Students who self-reported their ethnicity as American Indian or Caucasian were included in the present study. Student sex was indicated as male or female.

Classroom-level variables

Class size, teacher and semester were measured as classroom-level variables. Students were clustered into classroom sections which ranged in size from 90 to 415. The mean and standard deviation for class size (number of students enrolled in a section) were 319.50 and 105.44, respectively. To assess shifts over historical time, semesters were coded 0, 1, 2, 3, 4 or 5 with fall 2007 semester assigned a value of 0 and spring 2010 semester assigned a value of 5.

Results

Analysis strategy

Because of its voluntary nature, it is reasonable to expect that students who participate in SI sessions differ in meaningful ways from those who do not (Bowles & Jones, 2003–2004). Therefore, we incorporated several covariates into our statistical models of course grade. Because students are nested within sections (classrooms), the failure to remove classroom-level differences could lead to biased estimates of the effects of student-level variables such as SI visit on course grades. To overcome this problem, we analysed our data using multi-level modelling (Raudenbush & Bryk, 2002). With this approach, we can separate the variability due to the classroom from that due to the students, and obtain unbiased estimates for both classroom predictors (such as teacher and class size) and student-level predictors (such as high school GPA).

Our analyses were done using PASW Statistics Software Version 18.0.3 (SPSS Inc, 2010). The level 1, or student-level, variance estimate is a measure of the extent to which students within a single classroom differ from one another. The level-two, or classroom-level, variance estimate is a measure of the extent to which classrooms differ from one another (between classroom variance). Predictors which are specific to students were assessed as level-one predictors and include SAT scores, high school GPA, academic standing, credit hours attempted, residence, sex, ethnicity and SI visit. Predictors which apply to the entire classroom were assessed as level-two predictors; these include teacher, class size and the semester in which the course was offered. All models included only fixed effects which yields estimates that are conceptually similar to regression coefficients and indicate the average relationship between each predictor and course grade.

The general approach was to begin with a null model, add the covariates in the second model, ethnicity and SI visit in the third model and to add the ethnicity by SI visit interaction effect in the final model. Tests of nested models were conducted to assess the degree of improvement from model to model and were accompanied by proportion reduction in variance statistics.

Racial/ethnic group, visit to SI, academic standing and teacher were dummy coded with Euro-American first-year students who did not attend SI and who were taught by Teacher 1 as the reference group. These correspond to the largest groups within each variable. Semester was treated as a continuous variable and remained coded as zero (fall 2007) through five (spring 2010). The remaining binary (sex and residence) and continuous (SAT equivalent, high school GPA, credits attempted and class size) variables were centred at the grand mean. Due to uneven numbers in the groups, the grand mean centering of sex resulted in males being coded $-.504$ and

females being coded .496. For residence, students living off-campus were coded $-.559$ and students living on-campus were coded .441. This centering and dummy-coding convention was used in all relevant multilevel models.

Sensitivity analysis

To determine whether missing data had any effect on substantive results, we analysed the data (a) with all possible cases but without HS GPA, or SAT equivalent scores as predictors and (b) using the same set of predictors but including only those cases with no missing data. No substantive differences in the results were found for the remaining predictors and consequently the main analyses are reported only on the 4717 students for whom complete data were available.

Multi-level modelling (MLM) of course grades

Partitioning of variance

Model 1 (Table 2) is a null model that contains no predictors, and estimates the breakdown of variance that exists at level-one (1.460) and level-two (0.061). The standard deviation at level-one was 1.208, indicating that within a classroom, the average distance from the mean classroom grade was about one and a quarter whole letter grades. The standard deviation at level-two was .247, indicating that the average classroom mean course grade fell only about one quarter of a whole letter grade away from the grand mean of course grades. The intraclass correlation coefficient (ICC) for this model was $\rho = .040$. As a general rule of thumb, ICC scores of .05 or above are considered high enough to warrant multilevel modelling in order to ensure unbiased estimates. Although the between-classroom variance is low enough to ignore it, we chose to partition student- and classroom-level variance to eliminate the possibility that classroom level variance would lead to biased estimates of the student-level variables of interest.

Covariate model

Model 2 (Table 2) includes a set of control variables expected to be associated with course grades. A proportion reduction in variance test comparing models one and two indicated that the set of predictors included in model two accounted for a 31.99% reduction in the level-one variance in course grade.

Ethnicity and SI visit main effects

Model 3 added the main effects of ethnicity and SI visit to Model 2. Together, they reduced the level-one variance in course grades by an additional 6.74%.

Ethnicity by SI visit interaction effect

In a final model, we added the interaction between ethnicity and SI visit. A proportion reduction in variance test comparing the level-one variance in Models 3 and 4 indicated that the ethnicity by SI visit interaction effect accounted for an additional 0.22% reduction of the variance in course grade.

Table 2. Fixed effects estimates and variance-covariance estimates for the models of predictors of course grade.

	Model 1	Model 2	Model 3	Model 4
Intercept	2.654*** (0.048)	2.355*** (0.07)	2.074*** (0.06)	2.081*** (0.06)
Level 1				
(student-specific)				
SAT equivalent		0.002*** (0.00)	0.002*** (0.00)	0.002*** (0.00)
High school GPA		0.743*** (0.03)	0.695*** (0.03)	0.695*** (0.03)
Academic standing				
Sophomore		0.174*** (0.04)	0.178*** (0.04)	0.176*** (0.04)
Junior		0.382*** (0.06)	0.352*** (0.06)	0.346*** (0.06)
Senior		0.324*** (0.11)	0.353*** (0.10)	0.355*** (0.10)
Credits attempted		0.098*** (0.01)	0.090*** (0.01)	0.090*** (0.01)
Residence		0.086** (0.03)	−0.001 (0.03)	−0.002 (0.03)
Sex		0.153*** (0.03)	0.128*** (0.03)	0.129*** (0.03)
Ethnicity			0.556*** (0.09)	−0.710*** (0.10)
SI visit			0.623*** (0.04)	0.606*** (0.04)
Ethnicity x SI visit				0.563** (0.19)
Level 2 (classroom)				
Teacher				
Teacher 2		0.399*** (0.10)	0.479*** (0.09)	0.477*** (0.09)
Teacher 3		0.203* (0.08)	0.341*** (0.07)	0.339*** (0.07)
Class size		0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
Semester		0.066** (0.02)	0.054** (0.02)	0.054** (0.02)
−2 log likelihood	15,261.373	13,423.224	13,085.915	13,077.460
Level 1 variance (SE)	1.460 (0.03)	0.993 (0.02)	0.926 (0.02)	0.924 (0.02)
Level 2 variance (SE)	0.061 (0.02)	0.022 (0.01)	0.015 (0.01)	0.015 (0.01)

Notes: The reference group for Model 2 consisted of first-year students who were taught by Teacher 1. In Models 3 and 4, the reference group was further restricted to Euro-American students who made zero visits to SI. SAT equivalent, High School GPA, Sex (males negative, females positive), Credits attempted, Residence (off-campus negative, on-campus positive), and class size were all centred at the grand mean.
* $p < .05$. ** $p < .01$. *** $p < .001$.

To depict the form of the significant ethnicity by visit ($p < .01$) interaction effect, in Figure 1 we plotted the predicted course grade as a function of ethnicity and SI visit. These estimates were derived from the final model, and all other variables in the model were graphed at the intercept (or the grand mean for continuous or select binary variables) or at the reference group.

Among Euro-American first-year students, the expected grade for students who made zero SI visits was 2.081 (slightly above a C grade) whereas the expected grade for students who attended one or more SI session was 2.687 (a B grade). Among American Indian first-year students, the expected grade for students who made zero SI visits was 1.371 (a D grade) whereas the expected grade for students who attended one or more SI session was 2.540 (a C+ grade). Among students who made no visits to SI, American Indians obtained final course grades on average .710 grade points below Euro-Americans ($p < .001$). In contrast, among students who visited SI, the effect of ethnicity was non-significant (the estimated difference was −.149 letter grades, $SE = .165$, $p = .367$).

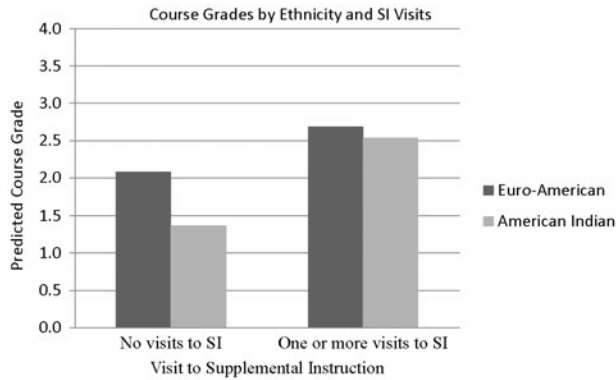


Figure 1. Predicted course grade as a function of ethnicity and SI visit.

Level-two effects in the final model

There were significant (p 's < .01) level-two (classroom effects) for teacher and semester. Relative to sections taught by the instructor serving as the reference group, sections taught by the other two instructors, on average, had significantly (p 's < .001) higher mean grades. Course grades were lower for the teacher who taught the majority of the sections ($M = 2.08$) as compared to the teachers who taught approximately 30% ($M = 2.42$) of the sections and 15% of the sections ($M = 2.56$) when holding all other variables constant (i.e. for Euro-American, first-year students in the fall of 2007 who did not attend and were average on all other predictors). Over the period from fall 2007 to spring 2010, there was a linear trend for mean classroom grades to increase. Class size was not a significant predictor of course grades.

Discussion

The low six-year college graduation rate for American Indian students coupled with their under-representation in psychology have been a growing cause for concern (Lee et al., 2010–2011; Maton et al., 2006). Consequently, there has been an increased focus in psychology on the recruitment and retention of American Indian college students (Rabasca, 2000). Despite the success of such programmes, we were concerned about the grade gap between Euro-American students and American Indian students in one specific course – introduction to psychology (Johnson et al., 2010). Introduction to Psychology is a high-enrollment barrier course at the University where the current study was conducted. Failure to do well in this and other introductory courses may be a critical pathway leading to attrition among college students in general (Tinto, 1993) and especially among American Indian students (Cibik & Chambers, 1991).

In the present study, we examined whether the grade gap in introduction to psychology between Euro-American and American Indian students is reduced by attending SI. As expected, we found main effects for SI attendance and ethnicity on grades in introduction to psychology. Consistent with previous research on the effectiveness of SI (Arendale, 2001), we found that, on average, students in the present study who attended at least one SI session earned grades in introduction to psychology that were approximately three-quarters of a standard deviation higher than those

who did not attend. Replicating a previous study (Johnson et al., 2010), we found that, on average American Indian students earned grades in introduction to psychology that were approximately two-thirds of a standard deviation lower than Euro-American students.

Ethnicity by SI interaction effect

In support of our hypothesis, we found that the gap in course grades in introduction to psychology earned by Euro-American students and American Indian students was much lower among students who attended at least one SI session relative to those who did not. In the current study, use of SI exerted a larger impact on the predicted course grade of American Indian students than Euro-American students.

Why do American Indian students benefit so much more from SI visits than Euro-American peers? One statistical explanation is that at zero SI visits, American Indian students have a much lower average course grade than Euro-American students and thus have more room for improvement than their Euro-American counterparts (see Rath et al., 2007). However, we do not believe that this is a compelling explanation for the differential effect of SI visits on course grades for American Indian and Euro-American students because there was no evidence of a ceiling effect among Euro-American students who made one or more SI visits.

Sternberg, Grigorenko and Zhang (2008) have marshalled evidence that students with different learning preferences are differentially affected by the type of instruction and mode of assessment. Previously, we have argued that the learning preferences of American Indian students are incompatible with the type of instruction and testing used in introduction to psychology at the university where the current study took place (Johnson et al., 2010). When the rural background, poverty levels and lack of academic preparation of many American Indian students are taken into account, in conjunction with their strong commitment to family and community (Demmert, Grissmer, & Towner, 2006; Lee et al., 2010–2011), it is not surprising that, as compared to Euro-American students, their academic performance in introduction to psychology should be boosted more by attending SI sessions. The components of SI that may make it particularly efficacious for American Indian students include (a) opportunities to learn ‘how to learn,’ (b) active learning – observing how others master a task, (c) a cooperative, peer-oriented learning environment and (d) a peer facilitator who may provide an important mentoring role.

Given that the majority of students who participated in SI attended only one session, the question arises as to how SI impacts grades in introduction to psychology. One possibility is that American Indian students acquire effective learning and study strategies in a single SI session and use these strategies for the duration of the course. A second possibility is that American Indian students acquire study buddies during the SI session and then interact with them outside of the contexts of the classroom and SI. A third possibility is that use of SI is a proxy for academic motivation (Alivernini & Lucidi, 2011). According to this explanation, which we cannot rule out in the current study, the gap in grades earned in introduction to psychology by Euro-American and American Indian students is eliminated when both groups of students are high in academic motivation. This explanation could be tested in future studies by measuring academic motivation, and controlling for it in models that test the ethnicity by SI visits interaction on course grades.

Effects of covariates

Consistent with previous research, SAT equivalent scores (Martin, Montgomery, & Saphian, 2006) and high school GPA (Fuller, Wilson, & Tobin, 2011) were positively related to course grade. Reflecting greater investment in academic pursuits (Szafran, 2001), students attempting more credit hours had higher course grades than students attempting fewer credit hours. Replicating earlier studies (Stage, Okun, Stock, & George, 1984), first-year students had lower course grades than sophomores, juniors and seniors. In accord with the findings of Ruban and McCoach (2005), female students had higher course grades than male students. Finally, living on campus was a positive predictor of course grade (Upcraft & Pilato, 1982) until ethnicity and SI visit were entered into the model. Students who live on campus are more likely than students living off campus to attend a SI session, which in turn, enhances their academic performance. From the fall of 2007 to the spring of 2010, we observed a rise in classroom grades. This trend could reflect several factors including grade inflation, changes in the academic preparation of the students, or improvement over time in instructors' teaching and assessment strategies.

Several caveats regarding the current study should be noted. First, we were unable to disentangle SI leader effects from classroom effects; SI leader and section were highly confounded in the design. SI leaders can make a difference in the benefits that students derive from SI visits (Lockie & Van Lanen, 2008). However, in the present study, despite the inclusion of 25 or so SI leaders, we found that only 4% of the variance in final course grades was at the classroom level. Consequently, it is likely that the effect of SI leaders on course grades was small. Second, in the current study, the majority of the American Indian students were Diné (Navajo nation). However, American Indians are a very heterogeneous group (Whitbeck, Hoyt, Stubben, & LaFromboise, 2001) and we might expect there to be differences in the effects of SI among the many tribal nations. Third, with respect to external validity, we drew a sample from a single US institution of higher education with a predominantly Euro-American faculty and student body. Fourth, the percentage of American Indian students in our final sample was very low (2.7%), although it should be noted that for every 1000 Euro-American students enrolled at the University, there are only 35 American Indian students.

Conclusion

In the current study, we showed that participation in SI sessions appears to have been so successful that unfavourable course grade disparities between American Indian and Euro-American students in Introductory Psychology remained only for those who did not attend any SI sessions. Given that only 27% of the American Indian students attended at least one SI session, targeted outreach efforts to help connect American Indians to SI are likely to increase their grades. Such efforts will require university administration, academic success programme and learning centres, student services for American Indian students and instructors teaching introduction to psychology to work together. Furthermore, American Indian student may derive even greater benefits from participation in SI if other American Indian students are recruited and trained to serve as SI leaders (Brown & Robinson Kurpius, 1997; Shotton, Oosahwe, & Cintron, 2007).

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