

Special Transitional Enrichment Program (STEP): Assessment and Improvement

Neil D. Huefner, Ph.D.

Center for Student Affairs Assessment

Division of Student Affairs

University of California, Davis

Maria T. Frias, Ph.D.

Center for Student Affairs Assessment

Division of Student Affairs

University of California, Davis

Ling Ning, Ph.D.

Center for Student Affairs Assessment

Division of Student Affairs

University of California, Davis

Timoteo Rico, Ed.D.

Center for Student Affairs Assessment

Division of Student Affairs

University of California, Davis

Introduction

The Special Transitional Enrichment Program (STEP) was established in 1976 to assist low-income and minority students in adjusting to the Davis campus and campus life, and to enhance their learning skills and study habits. The STEP program was designed as two separate portions: (1) a transitional four-week summer residential program, during which time participants would be exposed to one-week of orientation and three weeks of instruction prior to the fall quarter and (2) an academic year portion, during which time participants would be able to take advantage of various STEP specific resources (e.g., classes, workshops, tutoring services). Since its inception, the overarching framework of STEP has remained largely unchanged; however, the content and underlying structure has undergone numerous changes over the years. Some of the elements that have experienced changes over the years are the criteria used to select students to participate in STEP, the content of the courses offered, the number of courses that students can take, and the presence of both a critical analysis and an English as Second Language (ESL) course.

In its 40 years of existence, relatively few efforts have been made to assess its impact on the freshmen students it was designed to serve. Three studies, either ongoing or historical, have been identified that address whether participation in STEP is associated with indicators of student academic success (i.e., GPA, units completed, and retention). In this paper, we highlight and summarize many of the key findings of each study. While we draw comparisons across all three studies, it is important to acknowledge that some such comparisons may be misleading due to changes in STEP. Over the course of its existence, the number of courses offered or required from summer participants has varied.

The first of these three studies, conducted by J. Suhr (1980), focused on students that entered STEP either in the Summer or Fall of 1978. The second study, conducted 34 years after

that of Suhr, was carried out by Guzman-Alvarez, Smith, and Molinaro (2014) and focused on students that entered STEP between the years of 2007 and 2012. The final study, an ongoing effort headed by the Center for Student Affairs Assessment (CSAA), focuses on students admitted to STEP in either the Summer or Fall of 2015.

CSAA's most recent assessment effort, led by L. Ning, M. T. Frías, N. D. Huefner, and T. Rico, seeks to advance previous efforts and to address some of the limitations they faced. Three important differences between the Ning et al.'s and prior studies are: (1) the incorporation of an empirically validated theoretical framework of college persistence, including the refinement and inclusion of an existing self-reported measure of college persistence-related dimensions that have been demonstrated to play a moderating role in student success, (2) the use of propensity scores to create control groups that are almost identical to the treatment groups that would be created in a randomized control trial design, and (3) the use of a hierarchical linear model to be more representative in accommodating the existing data structure¹.

Traditionally, when assessing the impact of a given program or practice on academic outcomes, it is common to address the outcomes themselves without investigating the intermediate factors that link the treatment to the outcomes. It has become increasingly apparent that variables that positively influence the persistence of one student may be only weakly related, unrelated, or even negatively related to the persistence of other undergraduates (Davidson, Beck, & Milligan, 2009). In its current analysis of STEP, CSAA seeks to address not only the question of whether participation in STEP is linked to shifts in academic outcomes, but also which are the factors underpinning those shifts as a result of its content. In an effort address the questions more completely, Ning et al. (2015) adapted the Student Persistence Measure (SPM), a tool largely

¹ Points 2 and 3 were included only in the second part of Ning et al.'s study. A written report of this part of the study would be available by June 30th, 2016.

based on the College Persistence Questionnaire and the theoretical framework behind this measure (CPQ; Davidson, Beck, & Milligan, 2009).

The SPM contemplates eight main college persistence-related variables: degree commitment, institutional commitment, social integration, social support services, academic integration, academic orientation, personality and adjustment, and financial situation. *Degree Commitment* refers to the certainty students have about earning a diploma based on their self-appraised commitment and intentions to finish their degree. *Institutional Commitment* refers to the student's level of confidence in and satisfaction with their selection of a college or university. *Social Integration* involves the level of connection that students perceive between themselves and the campus environment, including the feeling that the institution and its employees care for their academic and personal needs, perception of a welcoming campus life, and development of close relationships with individuals who can become part of one's social network. Students' satisfaction with *Social Support Services* addresses students' assessment of how well the institution meets their in-classroom and out-of-classroom school-related needs. It also extends to students' ratings of the quality of communication of rules, regulations, fairness of policies, the amount of student participation in institutional decision-making, and satisfaction with the living environment, and the extent to which faculty, university staff, family and friends affirm the student's decision to pursue a college degree. *Academic Integration* refers to the extent to which students recognize how the institution's curriculum and instructions contribute to their personal goals by providing venues for academic engagement both inside and outside of the classroom. *Personality and Adjustment* involves the student's most used strategies to cope with stress, their confidence in those strategies, and their ability to satisfactorily meet their academic responsibilities. Finally, a student's *Financial Situation* refers to their perceived ability to cover the costs of tuition with

personal funds and their awareness and understanding of college financial aid programs. Shifts in a student's score across the eight SPM variables over time can provide important insight into the student's experience and the ways in which various programs impact that experience.

A partial report, highlighting the development of the SPM and the impact of the summer portion of the STEP program on the college persistence-related variables, was released to a select audience in October 2015. Final results, including an analysis of the impact that participation in STEP had on students' outcomes during the quarter of Fall 2015 is pending, with an anticipated public release date of June 30, 2016.

Methods

For detailed descriptions of the methods used in each study, the reader is directed to the primary reference material; a brief synopsis of the assessment approaches taken by each study are offered below.

J. Suhr

The study sample used by J. Suhr was comprised of EOP special action admits for Fall 1978. Subjects were excluded from the population if they: (1) did not complete a minimum of nine courses in their first year, (2) were not an entering freshman (i.e., were a transfer student), (3) had withdrawn from the STEP program prior to completion of the Spring quarter, or (4) were missing SAT scores or high school GPA. STEP participants were divided into two groups, those who began the program in August (STEP A), and those who began in October (STEP B). “[Students in STEP A] began with a campus orientation and Summer Advising...[and attended] classes in mathematics, writing, reading, study skills, and, for those who needed and qualified for it, pre-Chemistry. Students in STEP Group B may or may not have attended the Summer Advising and Registration Conference or received a campus orientation in the fall. They could

enroll in STEP English and math classes during the school year as space permitted. Tutoring and workshops were available to all STEP students during the academic year.”

The study assessed the question “Does STEP summer participation relate to improved academic performance in college work?” via analysis of covariance. “A regression model that included participation in [STEP], high school GPA and total CEEB scores” was used to investigate first year cumulative GPA and retention after three and five quarters, while controlling for entry characteristics of high school GPA and total SAT scores.

Guzman-Alvarez et al.

In the study² conducted by Guzman-Alvarez et al., multiple samples were used in order to maximize sample sizes. In each sample, students for whom relevant demographic or outcome variables data was incomplete were excluded. *Sample 1* was used to examine the relationship between participation in STEP and students’ first quarter GPA, first year (freshman) GPA, and credits completed by the end of their freshman year. The sample was comprised of students who entered the university as freshmen between Fall 2007 and Fall 2012. The sample consisted of 25,836 students, 1,078 of whom participated in STEP. *Sample 2* was used to examine the relationship between participation in STEP and students’ second year (sophomore) GPA and total credits completed by the end of their sophomore year. The sample was comprised of

² Note the methodological limitations of the study:

- a. The regression analyses which include only the main effects and not any interaction effects may not capture the treatment effect correctly; theoretically, it is possible that there is disordinal interaction where the effects are of opposite signs in the STEP group and the non-STEP group and cancel each out
- b. The descriptive statistics of the covariates in each group provided in the study indicate that there is significant difference for the covariates between the two groups. The unbalanced distribution of the covariates included or other covariates not included in the study, if not properly adjusted, would lead to biased estimate of the treatment effects as the two groups are initially different.
- c. The assumption behind the study that pooled the freshmen enrolled between 2007 to 2012 together is that the characteristics of STEP program and of the students have remained the same across all the entry cohorts, which, however, may not be the case;
- d. The study did not attempt to adjust for the dependency of students within majors which may result in increased Type I errors, causing analysts to incorrectly conclude that there is significant effect.

students who entered the university as freshmen between Fall 2007 and Fall 2011. The sample consisted of 19,269 students, 757 of whom participated in STEP. *Sample 3* was used to examine the relationship between participation in STEP and student retention through the start of students' sophomore year. The sample was comprised of students who entered the university as freshmen between Fall 2007 and Fall 2012. The sample consisted of 26,812 students, 1,133 students of whom participated in STEP. *Sample 4* was used to examine the relationship between participation in STEP and student retention through the start of junior year. The sample was comprised of students who entered the university as freshmen between Fall 2007 and Fall 2011. The sample consisted of 21,810 students, 967 of whom participated in STEP.

Guzman-Alvarez et al. (2014) stated "Multiple regression analyses were used to examine the association between participation in the STEP program and students' GPA and units completed. Logistic regression analyses were used to analyze the effect of the program on student retention. These analyses [allowed the authors] to control for student demographic characteristics (i.e., gender, first generation, underrepresented minority, major, international, etc.), student SAT scores, and their participation in other programs (i.e., EOP, BUSP, TRIO, GSP, LFA)."

Center for Student Affairs Assessment

The study sample for the current assessment efforts consists of 231 students accepted into the STEP program in the summer of 2015 (STEP A) and 40 students accepted into the STEP program in the fall of 2015 (STEP B). A control group comprised of 1000 students was randomly sampled out of a total of 8523 undergraduate students admitted in Fall 2015. To adjust for selection bias, propensity score matching was used to conduct pairwise matching among students participating in STEP A, those participating in STEP B, and those in the control group.

Propensity scores were derived based on 30 covariates captured at the time of admission, including, but not limited to, the same criteria used in selecting students for participation in STEP (e.g., first generation status, primary language of household, foster youth status, single versus two-parent household, high school API, performance on SAT). Conditional on the propensity score, the distributions of the observed covariates between the participants and non-participants will be independent of the group membership assignment, thereby correcting for the fact that students are not randomly assigned to STEP. To accommodate the underlying data structure, a hierarchical linear model with students nested by majors was used for outcome analysis while controlling for factors such as gender, ethnicity, income status, first generation status, high school GPA, SAT total score, and advanced placement credit.

The SPM was administered to STEP A participants immediately upon arrival (pre-survey) and again at the conclusion of the four-week summer program (post-survey). To ensure the validity and reliability of the measure, a series of parallel analyses were run on the pre- and post-survey data, and the psychometric property results were evaluated. Descriptive analyses (frequency, skewness, and kurtosis) were performed across all items. Only one item's skewness value fell outside acceptable ranges, and was therefore excluded from subsequent analysis. Based on the results of a principal component factorial analysis and the theoretical framework of college persistence, four factors could be successfully extracted from the combined pre- and post-survey SPM dataset: *institutional commitment*, *social integration*, *academic orientation*, and *personality and adjustment*, a fifth factor was extracted, but excluded from the persistence-likelihood analysis as it represented a complex amalgamation of two of the original subscales targeted, *financial situation* and *social support services*. In addition to the items comprising the SPM, a series of questions designed to investigate the level of students' knowledge or awareness

of University programs was also administered to STEP A participants as a part of both the pre- and post-surveys. As with the SPM, reliability tests were carried out on these *Knowledge of Campus Programs* items (independently from the SPM subscales and their corresponding items).

Results

GPA

Ning et al., Guzman-Alvarez et al., and Suhr each addressed the question of whether or not participation in STEP is associated with a significant change in college GPA. Suhr found no statistically significant difference in academic performance in first-year, college cumulative GPA among freshman undergraduate students in the Fall 1978 cohort who participated in STEP A or B. Suhr (1978) concluded that "Summer STEP participation does not have a statistically significant effect on first-year college GPA after correcting for the influences of students' academic background and academic workload." When Guzman-Alvarez et al. examined the 2007 through 2012 cohorts, they obtained the same result; that is, participation in STEP was not found to have a statistically significant effect on first-year cumulative GPA ($\beta = 0.00, p < 0.05$).

However, when they analyzed the effect of STEP by discipline, Guzman-Alvarez et al. found that participation in STEP was correlated with a statistically significant increase in first-year cumulative GPA among students in the Math and Physical Sciences (MTHPS) discipline ($\beta = 0.18, p < 0.01$); no effect on the first-year GPA was observed for students in other disciplines.

When Guzman-Alvarez et al. examined the impact of STEP participation on first-quarter freshman GPA, they found that among MTHPS students, participation in STEP was associated with an average increase of 0.30 points ($\beta = 0.30, p < 0.001$); no statistically significant change in first-quarter GPA was observed among students from other disciplines. By the end of students' second year, STEP was no longer associated with an impact on GPA regardless of discipline.

Ning et al. found that among students of the Fall 2015 freshman cohort, participation in STEP was associated with a roughly significant negative impact on first-quarter freshman GPA ($\beta = -0.92, t = -1.72, p = 0.09$). A similar result was found for participation in STEP B ($\beta = -0.64, t = -1.74, p = 0.08$). Also among students of the Fall 2015 freshman cohort, there was no significant association between participation in STEP and first-quarter GPA, after controlling for demographic variables (i.e., first generation status, gender, low income status, and ethnicity).

Unit Completion

While all three studies investigated the impact of STEP participation on unit completion, limitations of data availability and differences in methodological approaches prevent a direct comparison of results. While Suhr identified a statistically significant ($p < 0.05$) difference in the average total units recorded on transcripts for the first three quarters of college of STEP A versus STEP B participants (30 and 34 respectively), this result should be taken with caution since there was no control group in this study. Furthermore, Guzman-Alvarez et al. found that, after controlling for student demographic characteristics, SAT score and participation in other select programs, participation in STEP was associated with a statistically significant decrease in the number of credits completed by students by the end of both their freshman ($\beta = -2.61, p < 0.001$) and sophomore ($\beta = -3.79, p < 0.001$) years.

In the continuation of the Ning et al.'s study that is currently being conducted, unit completion data is limited to the students' first quarter. Because Ning et al. are more concerned with whether or not students are taking enough units to make satisfactory progress towards a four-year graduation than it is with the actual number of units completed by students per quarter, a binary variable satisfactory rate of unit completion was created in which 'TRUE' is defined as the completion of (on average) of at least 45 units per year. Students who were freshman during

Fall 2015 and successfully completed 15 or more units during the Fall quarter were assigned a value of 'TRUE' for this outcome variable. Compared to non-participants, the likelihood of male STEP A participants to have a satisfactory rate of unit completion was roughly significantly lower than that of female participants ($d = -0.35$, $t = -1.85$, $p = 0.06$). The likelihood of students who are East Indians or American Indians in STEP A to have a satisfactory rate of unit completion is significantly higher than that of White students ($d = 2.35$, $t = 2.02$, $p = 0.04$).

Retention

A positive association between participation in STEP and retention was identified in each of the three studies described. In the assessment carried out in 1978, Suhr observed a statistically significant effect on retention as measured by number of quarters enrolled after correcting for the influence of students' academic background through a covariance analysis ($F = 4.775$, $p < 0.05$). The relationship between retention and summer STEP participation was found to be particularly strong for those students with the poorest academic entry characteristics (i.e., high school GPA and A-F subject omissions). This positive relationship between STEP participation and retention was again observed and documented in much greater detail by Guzman-Alvarez et al., who found no statistically significant increase in the odds of being retained through the first year was observed in STEP participants relative to the control participants ($\beta = 0.02$, $p > 0.05$). However, the authors did find that, among students in the Social Sciences discipline (SOCSC), participation in STEP was associated with an 85% increase in the odds of being retained by the end of their first year ($\beta = 0.62$, $p < 0.05$). The impact of the STEP program on second-year retention was even more pronounced, with participation in STEP being associated with a statistically significant increase in two-year retention ($\beta = 0.35$, $p < 0.001$). After controlling for demographic characteristics, SAT score, participation in other programs, and discipline,

participation in STEP among students from all disciplines other than SOCSOC was associated with a 66% increase in the odds of being retained through the second year. This effect was even more pronounced for students in SOCSOC who, with participation in STEP, saw a 175% increase in the odds of being retained by the end of their second year ($\beta = 0.51, p < 0.05$). Both within the SOCSOC discipline and outside of it, the positive increases in 2-year retention rates associated with participation in STEP appeared to be more pronounced among students from underrepresented minorities and among male students.

Although retention outcomes in the study that is being currently conducted by Ning et al. are limited to retention through the first quarter, important trends can already be observed. As in the study by Guzman-Alvarez et al., the results from the 2015 cohort suggest that the effects of STEP A on retention differs depending on participants' ethnicity. Difference between control and treatments were significant between Chicano/Latino, Pacific Islanders, East Indians and American Indian groups but not among Whites. The likelihood for Chicano/Latino students in STEP A to be retained through their first quarter is significantly higher than the likelihood of White students in STEP A to be retained ($d = 8.58, t = 6.33, p < 0.0001$). This same trend is observed for both Pacific Islanders ($d = 4.33, t = 2.55, p = 0.02$) and for the students in the combined East Indian/American Indian group ($d = 4.44, t = 2.38, p = 0.03$). Though not significant at the 0.05 significance level, the fact that White students of low income in STEP A appear to be retained at a higher rate than those of low income in the control group ($d = 2.24, t = 1.84, p = 0.07$) suggests that the impact STEP has on student retention may also differ depending on one's low income category.

While all three studies document a positive relationship between participation in STEP and student retention, Ning et al. are also currently undertaking an effort to elucidate the manner

in which that positive shift occurs. By comparing students' responses to the SPM items before and after participation in the summer portion of STEP, researchers were able to test for shifts in factors associated with student persistence. STEP participants exhibited statistically significant shifts on the knowledge of campus programs dimension and the four student persistence subscales tested: institutional commitment ($\chi^2(1) = 86.32, p < 0.0001$), social integration ($\chi^2(1) = 22.79, p < 0.0001$), academic orientation ($\chi^2(1) = 11.64, p = 0.0006$), and knowledge of campus programs ($\chi^2(1) = 116.24, p < 0.0001$). No statistically significant difference was detected for the personality and adjustment subscale ($\chi^2(1) = 0.71, p = 0.40$). These results imply that participation in the summer portion of STEP had a statistically significant, positive impact of participants' perception in those persistence subscales; it also reveals that the workshops presented as a part of STEP significantly enhanced the students' knowledge about campus programs and services deemed by the administrators of STEP to be of greatest value to that population. Among the knowledge of campus programs and four persistence subscales, only the academic orientation subscale exhibited a statistically significant difference in the shift observed in male versus female participants ($U = 7.48, p = 0.006$). The fact that this shift in the academic orientation subscale was greater among men than women, with the difference being roughly statistically significant, suggests that the summer portion of STEP tends to benefit men more on academic orientation. Moreover, an investigation of the changes in pre- versus post-survey responses by ethnic group indicated that with the possible exception of academic integration ($H(5) = 10.87, p = 0.05$), among the ethnic groups observed, there was no significant difference in the shifts produced. A closer look at the shifts in the academic integration subscale, broken down by ethnicity, indicates that participation in the summer portion of STEP led to a noticeable positive shift in students' perception of how well the institution's curriculum and instructions

contribute to their personal goals among Asian Americans, African Americans, and Filipinos, but not among Chicanos/Latinos, American Indians, East Indians, or Pacific Islanders.

Conclusions

Among the three studies conducted so far on the efficacy of STEP, only Guzman-Alvarez et al. (2014) found a significant effect of STEP participation on cumulative first-year GPA among the Math and Physics discipline students, but not among students of other disciplines. It is worth mentioning, however, the fact that the control group for the Guzman-Alvarez et al.'s study was generated without taking into account the demographic characteristics of the treatment group, which alters the statistical significance of the effects of participation in STEP on cumulative first-year GPA. This is a limitation that Ning et al. are addressing by generating a control group based on propensity scoring matching techniques.

Moreover, the changing nature of the structure of STEP with regards to elements such as the criteria used to select participants, the content of courses delivered, and the number of courses students take, represents a limitation for both the Guzman-Alvarez et al. and Ning et al. current studies. These changes keep researchers from conducting meta-analyses studies of different cohorts and leave them with cross-sectional studies with unique limitations to replicate and generalize findings to other applicable cohorts.

The results of the three referenced studies highlight the need to restructure the STEP program to positively impact student outcomes across a diverse set of socioeconomic backgrounds, ethnicities, and disciplines. Impacts are now meticulously analyzed on a regular basis, so that further improvements directly benefit the student participants, with the current changes allowing us to capitalize on weekends and increase the program's focus on the academic

curriculum. The number of students served annually through the program has expanded.

International students are not – and have never been – eligible to participate, as the focus remains on first-generation and low-income domestic students during their transition to a more rigorous college environment³.

While the efforts that have been made so far to understand the factors that affect student success variables (e.g., GPA, units completed, and retention) represent a highly valuable start, a large gap in knowledge remains to be addressed by the higher education profession, including what are the mediators associated with student success among the specially marginalized groups such as African-American, Chicano/Latino, Native-American, the LGBTQIA and undocumented communities. Ning et al. and future studies conducted at CSAA will contribute to the understanding of these mediators.

³ In 2013, the campus explored expanding STEP to include international students, but instead established the UC Davis Summer Start Program as a separate summer residential and academic preparatory program for incoming international students.

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