Assessing the impact of the Special Transitional Enrichment Program on participants via the 'Student Persistence Measure'. A Preliminary Report.

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October 16, 2015

Abstract

We present a preliminary report of two studies on the ongoing development of the *Student Persistence Measure* (a tool designed to measure factors contributing to undergraduate student persistence), and of its application in assessing the impact that participation in the summer portion of the Special Transitional Enrichment Program (Part A-STEP) has on participants. We demonstrate that Part A-STEP participants exhibit a significant positive shift in four factors known to be important in undergraduate persistence: *Social Integration, Institutional Commitment,* and *Academic Orientation;* a fourth factor, *Personal Adjustment,* appeared to be unaffected among participants. Moreover, Part A-STEP participants exhibited a significant increase in their knowledge/awareness of select college programs and services upon completion of Part A of the program. These effects appear to be independent of both biological sex and ethnicity, with the exception of *Academic Orientation*, where male participants experience a statistically significant, more positive shift than female participants.

Introduction

The Special Transitional Enrichment Program (STEP), which replaced the Summer Enrichment Program in 1976, was designed to assist low-income and minority students 1) to strengthen their learning skills and study habits in areas where improvement was needed, 2) to enhance their readiness to do University work by providing a week of orientation and three weeks of instruction prior to the fall quarter, and 3) to assist them in their adjustment to the Davis campus by providing living/learning experiences in residence halls and general orientation to campus life (Suhr, 1980). Since its inception, the fundamental structure of STEP has remained largely unchanged.

STEP consists of two portions: a four-week summer residential program (Part A) and an academic year component that spans the participants' first two years at UC Davis (Part B). During

Part A, students complete courses in writing, science, math, and general study/productivity skills, are introduced to various campus programs and resources, and experience campus life while being encouraged to develop friendships with other participants. In Part B, students are able to take advantage of special advising, tutoring, and counseling resources, special sections of science and math courses, additional workshops on study/productivity skills, and four quarters of priority registration. Students are selected to participate either in both Part A and Part B of STEP, or in some instances, only Part B.

The following is a preliminary report for an ongoing study aimed at assessing the impact of STEP with regards to student retention, time to degree, and academic success. In this report we discuss the development and implementation of the 'Student Persistence Measure' (SPM), a tool designed to investigate factors contributing to undergraduate student persistence. We present results of the psychometric property analyses of the SPM, and results from our statistical analysis regarding the impact Part A of STEP had on retention related factors among STEP participants. We also present data regarding STEP participants' knowledge/awareness of key campus programs introduced to them during Part A of STEP.

Distribution of 2015 STEP population

Two hundred forty-one students were invited to participate in Part A of STEP 2015. Of those invited, 235 student chose to attend, and 231 successfully completed the full four-week program. The sex distribution of Part A STEP 2015 participants was 67% female (n=158) and 33% male (n=77). The distribution of participants by ethnic group was predominantly Chicano/Latino (60%, n=139), followed by Asian American (16%, n=38), African American (12%, n=27), Pacific Islander (6%, n=14, where 13 of the 14 were Filipino), and white (3%, n=7); other ethnic groups, including American Indians and East Indians, totaled 4% (n=8). Participants also varied by declared major and college; 46% of the total participants were from the College of Letters and

Science (n=108), 20% were from the College of Biological Science (n=47), another 20% were from the College of Agricultural and Environmental Sciences (n=48), and 14% were from the College of Engineering (n=32).

Development of the Student Persistence Measure

The Student Persistence Measure (SPM) was created as a tool to reliably measure persistence-related variables among college students. Based largely on the College Persistence Questionnaire (CPQ) proposed by Davidson, Beck, & Milligan (2009), the SPM includes a series of subscales which can be used as predictors for student retention*: Institutional Commitment, Degree Commitment, Social Integration, Academic Integration, Social Support, Academic Orientation, Personal Adjustment, and Financial Strain*. The SPM is arranged in a questionnaire format that allows ongoing development and refinement; students who score high on the SPM are thought to be more likely to persist in their education at UC Davis, whereas students with lower overall scores are predicted to be at greater risk of dropping out.

Administration of and validity/reliability check of SPM

The SPM was administered twice to students participating in Part A of STEP 2015: once immediately upon arrival (pre-survey), and again at the conclusion of the four-week 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. While several items exhibited a slightly negative skew (indicating a natural tendency to score positively on our indicators of college persistence), all but one item's skewness and kurtosis fell within acceptable ranges (between -2 and +2 for both skewness and kurtosis). The item "*If I were to quit school, people who mean the most to me (i.e., friends and family) would be disappointed*" showed a kurtosis value of 4.02 and was therefore excluded from subsequent analyses.

Upon completion of the descriptive analyses, all items of the SPM were correlated against each other. Given that most correlation coefficients were low (below 0.5), and none was greater than 0.52, all items were retained for the factorial analysis. We then performed a principal components factorial analysis with orthogonal rotation. Based on the resultant scree plot and our theoretical framework of college persistence, we determined that five factors could be extracted from the combined pre- and post-survey SPM dataset: *Social Integration*, *Institutional Commitment*, *Personal Adjustment*, *Academic Orientation*, and *Financial Strain and Social Support Services*. A list of the five extracted factors, along with their associated items, is shown in Table 1. While the first four factors extracted from the factorial analyses fit well with our conceptual framework of college persistence, the fifth element, *financial strain and social support services,* represented a complex amalgamation of two of the original subscales targeted, and was therefore excluded from our persistence-likelihood analysis.

Table 1. SPM subscales identified via factor analysis, their composition, and their reliability (Cronbach's alpha – **α**) for the pre- and post-survey datasets.

Social Integration *pre α = 0.872/ post α = 0.870*
Students of all sexual orientations are respected on this campus.
Students of all socio-economic statuses are respected on this campus.
Students of all genders are respected on this campus.
I am able to appreciate cultural and global diversity.
I am able to appreciate racial and ethnic diversity.
A respectful environment exists on campus for the expression of all religious beliefs.
Students of all races and ethnicities are respected on campus.
A respectful environment exists on campus for the expression of all political beliefs.
Institutional commitment *pre α = 0.815/ post α = 0.821*
I feel confident that UC Davis is the right university for me.
I am excited about attending UC Davis.
My overall impression of students at UC Davis is favorable.
I feel a strong sense of loyalty to UC Davis.
I feel a sense of connection with others on campus (e.g., faculty, students, staff).
I have much in common with other students at UC Davis.
For me personally, the advantages of attending UC Davis (versus other institutions I have considered) outweigh the disadvantages.
At this moment in life, I feel strongly committed to earning a college degree at UC Davis
My interactions with other students at UC Davis have (or will have) a significant positive impact on my intellectual growth.
Personal adjustment (organization and coping skills) *pre α = 0.781/post α = 0.734*
I set aside time for planning and scheduling.
I often forget academic responsibilities (reversed coded).
I find myself completing tasks at the last minute (reverse coded).
I accurately estimate how long an academic task will take to complete.
I prioritize new assignments I am given according to their importance.
When I consider the techniques I use to study, I feel like my study skills are effective.
I feel enthusiastic about the academic tasks I perform.
When I feel pressure, I am able to find healthy ways to relax.
I am stressed about deadlines and commitments (reverse coded).
Academic orientation (academic skills) *α pre = 0.795 /post α = 0.814*
Please rate … your writing skills.
Please rate … your reading and comprehension skills as related to academic materials.
Please rate … your analytical and critical thinking skills.
Please rate … your ability to prepare and make a formal presentation.
Please rate … your proficiency at concepts specific to your particular field of study (i.e., your major).
Please rate … your interpersonal (social) skills.
Please rate … your library research skills (e.g., finding books and articles, identifying and evaluating reliable sources of information).
Overall, I am confident in my ability to earn the grades I want in my coursework.
Financial strain and social support services *α pre = 0.716 /post α = 0.841*
The costs of courses at the university is NOT likely to delay my graduation plans.
Overall, the University of California-Davis administrators, staff, and faculty care about me as an individual.
I see a positive, meaningful connection between what I am learning (or will be learning) at the University of California-Davis and my future career possibilities.
Overall, the University of California-Davis does well at fostering healthy social life for its students (e.g., friendships, college, organizations, extracurricular activities, support networks).
Purchasing the essential resources I need for courses (e.g., books and supplies) does NOT pose a significant financial strain for me.
Trying to meet the financial demands of college will NOT pose a significant challenge to me and my family.
I am aware of those programs that exists to help mitigate the costs of receiving a college degree.

Administration of and validity/reliability check of 'Knowledge' items

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 participants as a part of the pre- and post-surveys discussed above. As with the SPM, reliability tests were carried out on these knowledge/awareness items (independently from the SPM subscales and their corresponding items). Items from *Knowledge about UC Davis programs*, along with their computed reliability coefficient (for both the pre- and post-survey), are reported in Table 2.

Table 2. Items from *Knowledge about UC Davis programs* and their reliability (Cronbach's alpha – **α**) across pre- and post-survey datasets.

Knowledge about different UC Davis programs *pre α = 0.817 /post α = 0.841*
I understand how to register for classes at the university.
I understand the purpose of the Mentorship for Undergraduate Research Participants in the Physical and Mathematical Sciences (MURPS) program.
I understand the purpose of the Career Discovery Groups program.
I understand the purpose of the Biology Undergraduate Scholars (BUPS) program.
I understand the purpose of the Leadership in Engineering Advancement Diversity and Retention (LEADR) program.
I feel confident in my ability to navigate the requirements of my major.
I understand how to apply for financial aid.
I am aware of those programs that exist to help mitigate the costs of receiving a college degree.
I understand the purpose of the University Honors program.
I understand the purpose of the Guardian Scholars program.
I understand the purpose of the TRiO Scholars program.
I understand the purpose of the Educational Opportunity program.

Comparative analyses (pre versus post) of the four SPM subscales and *Knowledge of Campus Programs*

The items in pre- and post-survey were measured using a 5-point Likert-type scale ranging from 1 (e.g. "Strongly Disagree", "Very Rarely", "Very Poor") to 5 (e.g. "Strongly Agree", "Very Often", "Very Good"). As noted in Table 1, this point scale was reversed for a small subset of items, whose wording was designed to elicit an inverse response with regards to likelihood of persistence. Participants' scores across items within each of the four SPM subscales mentioned

above, as well as across *Knowledge of Campus Programs*, were summed for further analyses; the pre- and post-survey distributions of sum score across these five groupings are presented in Table 3.

Table 3. Sum score distribution of SPM subscales and *Knowledge of Campus Programs* for pre-survey and post-survey responses.

Subscale / pre-survey (**post-survey)**	N	Mean	Std. Dev.	Min.	Max.
Social Integration	235 (**228**)	33.94 (**36.08**)	6.41 (**4.06**)	8 (**19**)	40 (**40**)
Institutional Commitment	235 (**228**)	37.05 (**40.7**)	4.77 (**3.8**)	21 (**29**)	45 (**45**)
Personal Adjustment	235 (**228**)	32.39 (**32.73**)	4.14 (**4.24**)	5 (**20**)	40 (**43**)
Academic Orientation	235 (**228**)	30.36 (**31.56**)	4.05 (**4.14**)	15 (**21**)	40 (**40**)
Knowledge of Programs on Campus	235 (**228**)	36.54 (**43.54**)	7.52 (**8.84**)	17 (**19**)	60 (**60**)

The sum scores of the four subscales and of the 12 items measuring participants' knowledge of campus programs and services did not follow a normal distribution. Of particular note, the sum score distribution of the *Social Integration* subscale was severely, negatively skewed in both the pre- and post-survey. The Friedman test (a nonparametric two-way ANOVA test that accounts for violations of the normality assumption common in statistical analyses) was used to determine whether there was a statistically significant difference in the pre- versus post-survey responses for the five variables tested. At the 0.05 significance level, the Friedman test indicated a significant difference in participants' responses across three of the four subscales and in *Knowledge of Campus Programs*: *Social Integration* (χ^2 (1) = 22.79, p<**0.0001**), *Institutional Commitment* (χ^2 (1) = 86.32, p<**0.0001**), *Academic Orientation* (χ^2 (1) = 11.64, p=**0.0006**), *Knowledge of Campus Programs* (χ^2 (1) = 116.24, p<**0.0001**); no statistically significant difference was detected for the *Personal Adjustment* subscale (χ^2 (1) = 0.71, p=0.40).

As shown in Table 4, STEP participants scored significantly higher in the post-survey than in the pre-survey in the continuums of *Social Integration, Institutional Commitment, and Academic Orientation,* implying that Part A of STEP had a statistically significant, positive impact on

participants' perception in those subscales. Table 4 also reveals that the workshops presented during Part A significantly enhanced the students' knowledge about campus programs and services deemed (by the administrators of STEP) to be of greatest value to that population.

Table 4. Distribution of SPM subscales and the *Knowledge of Campus Programs* group

	Subscales									
	Social Integration		Institutional Commitment		Personal Adjustment		Academic Orientation		Knowledge of Campus Programs	
Quartiles	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Median	35	38	38	42	33	33	31	31	37	45
1st Quartile	32	33	35	38	30	30	28	29	31	39
3rd Quartile	39	40	41	44	35	36	33	33	42	50

Comparative analysis (pre versus post) of the SPM subscales and *Knowledge of Campus Programs* by biological sex

To better understand the impact of Part A on participants, we investigated differences in the pre- and post- survey responses for the 4 subscales and Knowledge of Campus Programs by biological sex and by ethnic group. To account for the non-Normal distribution of the data, we used the Mann-Whitney Wilcoxon test, a two-sample non-parametric t-test. In comparing female and male participants, no significant difference was found for the subscales of *Social Integration* (U=0.001, p=0.99), *Institutional Commitment* (U=0.46, p=0.50), *Personality Adjustment* (U=1.00, p=0.32), or *Knowledge of Campus Programs* (U=0.01, p=0.91); however, a significant difference was detected between females and males in the *Academic Orientation* subscale (U=7.48, p=**0.006**). As can be seen in Table 5, the distribution of the change-in-response shifts further to the right (more positive) among men than it does among women in the *Academic Orientation* subscale; this suggests that while Part A of STEP did not appear to have a significant impact on female students' perception of the academically-related, collegiate environment, it did have a significant positive change on male participants in this regard.

Table 5. Distribution by biological sex of change-in-response (post-survey minus pre-survey) for SPM subscales and *Knowledge of Campus Programs*.

	Subscales									
	Social Integration		Institutional Commitment		Personal Adjustment		Academic Orientation		Knowledge of Campus Programs	
Quartiles	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Median	1.0	1.0	3.0	0.0	0.0	0.5	0.0	2.0	7.0	7.0
1st Quartile	-1.0	-1.0	1.0	3.0	-3.0	-2.0	-2.0	0.0	2.0	3.5
3rd Quartile	4.0	5.0	6.0	6.5	3.0	3.0	3.0	4.0	12.0	11.5

Comparative analysis of the SPM subscales (pre versus post) and *Knowledge of Campus Programs* by ethnic group

To investigate changes in pre- versus post-survey responses by ethnic group, a non-parametric, one-way ANOVA, Kruskal-Wallis test was used to account for the dataset's non-Normal distribution. The results of the test indicated that, among the ethnic groups observed, there was no significant difference for the subscales of *Social Integration* (H (5) =2.54, p=0.77), *Institutional Commitment* (H (5) =2.74, p=0.74), *Personality Adjustment*, (H (5) =8.85, p=0.11), and *Knowledge of Campus Programs* (H (5) =6.56, p=0.26); however, a significant difference was detected for the *Academic Orientation* subscale (H (5)=10.87, p=**0.05**). While post-hoc analyses using Dunn's multiple comparison procedure (Elliott & Hynan, 2011) did not reveal any statistically significant differences between ethnic groups, the result for *Academic Orientation* bordered on significance (α=0.05); we therefore felt it would be worthwhile to look at the distribution of differences by ethnicity in greater detail for this subscale. As shown in Table 6, our data indicates that participation in Part A of STEP led to a noticeable (though not statistically significant) positive shift in students' perception of the academically-related, collegiate environment among Asian Americans, African Americans, Whites, and Pacific Islanders (i.e. Filipinos), but not among Chicanos/Latinos or other ethnic groups (i.e. American Indians and East Indians).

Table 6. Distribution by ethnic group of change-in-response (post-survey minus pre-survey) for SPM subscales and *Knowledge of Campus Programs*.

Quartiles	Chicano/Latino	Asian American	African American	Pacific Islander	White	Other*
Median	0.0	2.0	2.0	2.0	3.5	0.0
1st Quartile	-2.0	0.0	0.0	0.0	1.0	-4.0
3rd Quartile	3.0	4.0	4.0	5.0	5.0	2.0

**includes American Indian and East Indian ethnic groups.*

Validity and reliability analysis for the post STEP survey

As discussed above, using the data gathered from the pre-survey we were able to reliably measure four of the eight subsection considered within our framework of college persistence; however, we were also interested in using the data we collected to further strengthen the power and reliability of the SPM, both in those four subsections and in the four remaining subsections. Seventy items were considered for the validity analysis. We first performed the same set of preliminary analyses as described for the pre- and post-cohorts when analyzed together (i.e., frequency, descriptive, skewness, kurtosis, and correlations). All seventy items were retained for the factorial analysis. We performed a principal components factor analysis with orthogonal rotation. Considering the results of the scree plot and our conceptual framework together, we were able generate a new iteration of the survey that should allow us to reliably measure six factors: academic integration, academic orientation (planning and organization), academic orientation (skills), financial strain, degree commitment, and one last factor 'Other' combining three items related to different subscales (Table 3). The first five factors fit well with our conceptual framework of college persistence and represent an improvement over the pre-survey administered to Part A STEP participants in our ability to measure college persistence. Given the low number of items and the lack of conceptual consistency among the sixth factor, these items, as they currently stand, will not be considered in future analyses. The continual refinement of the SPM will be important as we utilize it in the ongoing assessment of STEP and other campus programs.

Table 3. SPM subscales identified via factor analysis, their composition, and their reliability (Cronbach's alpha – **α**) post-survey datasets.

Social integration *α = 0.913*
Students of all genders are respected on this campus.
Students of all races and ethnicities are respected on this campus.
Students of all sexual orientations are respected on this campus.
A respectful environment exists on campus for the expression of all religious beliefs.
Students of all socio-economic statuses are respected on this campus.
My overall impression of students at UC Davis is favorable.
A respectful environment exists on campus for the expression of all political beliefs.
Overall, UC Davis does well at fostering a healthy social life for its students. (e.g. friendships, college organizations, extracurricular activities, support networks)
I see a positive, meaningful connection between what I am learning (or will be learning) at UC Davis, and my future career possibilities.
The faculty at UC Davis cares about my academic success.
Overall, University of California-Davis administrators, staff, and faculty care about me as an individual.
I am able to appreciate cultural and global diversity.
My interactions with other students at UC Davis have (or will have) a significant, positive impact on my intellectual growth.
I feel confident that UC Davis is the right university for me.
The academic tutoring services provided at UC Davis.
The quality of the instruction offered at UC Davis is good.
My input (on matters such as course offerings, rules and regulations, and registration procedures) plays (or will play) an important role in the decision-making process at UC Davis.
I have much in common with other students at UC Davis.
Academic orientation (planning and organization) *α = 0.782*
I accurately estimate how long an academic task will take to complete.
I set aside time for planning and scheduling.
I prioritize new assignments I am given according to their importance.
When I feel pressure, I am able to find healthy ways to relax.
I feel enthusiastic about the academic tasks I perform.
I become interested in the content of the school courses I take.
I 'go the extra mile' in my school courses – researching and exploring the course content beyond what is expected or required of me.
When I consider the techniques I use to study, I feel like my study skills are effective.
Academic orientation (skills) *α = 0.793*
Please rate … your writing skills.
Please rate … your reading and comprehension skills as related to academic materials.
Please rate … your analytical and critical thinking skills.
Please rate … your ability to prepare and make a formal presentation.
Please rate … your library research skills. (e.g. finding books and articles, identifying and evaluating reliable sources of information)
Your proficiency at concepts specific to your particular field of study. (i.e. your college major)
Financial strain *α = 0.844*
Money will NOT be a problem for me in earning a college degree.
Trying to meet the financial demands of college will NOT pose a significant challenge to me and my family.
Purchasing the essential resources I need for courses (e.g. books and supplies) does NOT pose a significant financial strain for me.
I know how I will cover the costs of tuition as a student at UC Davis.
The cost of courses at the university is NOT likely to delay my graduation plans.
Degree commitment *α = 0.679*
I am committed to earning a college degree.
I believe adult life is significantly better when you have a college degree.

For me personally, the advantages of attending UC Davis (versus other institutions I have considered) _____ outweigh the disadvantages.
Overall, my academic performance _____ the expectations of my parents (or others who are important to me).
During the course of their studies, it is common for students to experience periods of doubt regarding whether or not they will successfully complete their degree. Please indicate, at this particular moment, how strongly you agree or disagree with the following statement: I am certain I will earn a college degree.
I am certain I will earn a college degree.
If I were to quit school, the people who mean the most to me (i.e. friends and family) would be disappointed.
It is an expectation of my family that I earn a college degree.
If I have trouble understanding the content of a school course I am taking, I make an extra effort to master that content.
Other $\alpha = 0.464$
The counseling services (those offered to help students cope with life/personal struggles) provided at UC Davis.
I do my best to learn and understand the content of the school courses I take.
My family encourages me in my pursuit of a college degree.

Summary and Conclusions

This report presents preliminary results of an ongoing study aimed at assessing the impact of STEP with regards to student retention, time to degree, and academic success. The four primary points of focus for the report are: 1) a discussion of the development and implementation of the *Student Persistence Measure* (SPM), 2) a presentation of the psychometric property analyses of the SPM tool, 3) a discussion of the results of our statistical analyses regarding the impact Part A of STEP had on persistence-related factors among participants, and 4) a discussion of the impact Part A of STEP had on participants' level of knowledge/awareness of key campus programs.

The reliability and validity analyses of the SPM tool revealed that four theoretically consistent factors, or subscales, could be derived from our pre- and post-survey SPM datasets. Across both survey datasets, each subscale was found to be statistically reliable, with values of α ranging from 0.73 to 0.87. Our analysis of the items assessing STEP participants' knowledge/awareness of campus programs also revealed a high reliability for both the pre- and post-survey (0.82 and 0.84 respectively). Because the SPM is under an ongoing process of refinement, certain items were added, removed, or modified on the post-survey in order to better assess college-persistence-related factors beyond the four factors successfully captured by the pre-

survey. The factor analysis performed on the refined post version alone revealed five factors that fit well with the theoretical framework of college persistence. In addition to expanding the number of distinct factors tested by the SPM, the refined post survey also showed an increase in the reliability of the subscales identified, with α ranging from 0.7 to 0.9, though the statistical significance of said increase is uncertain.

Based on the results of our psychometric analysis of the pre-and post-survey data, we performed comparative analyses to detect changes in participants' scores in each of the four subscales. We went on to examine whether significant differences between pre- and post-survey responses were detected between participants of different biological sex or ethnic background in each of the subscales. For the whole sample, significant positive changes were detected in the factors of *Social Integration, Institutional Commitment,* and *Academic Orientation*, and in the items assessing STEP participants' level of knowledge/awareness of campus programs. Females and males significantly differed in their changes in *Academic Orientation* as a result of their participation in Part A of STEP*,* with male participants experiencing a greater increase than females. No significant differences were detected in any of the five scales as a function of ethnicity; however, while only bordering on significance, a noticeable difference was detected among ethnic groups in the impact Part A had on their *Academic Orientation*, with Asian Americans, African Americans, Whites, and Pacific Islanders showing greater increases in this subscale than participants of other ethnic groups.

The results of this report should be considered in light of its limitations regarding sample size and distribution, and should not be generalized to student populations or contexts that differ significantly from those considered herein (eligible participants in Part A of STEP). The ongoing

improvement and refinement of the SPM will allow us to better tap a more comprehensive set of college-persistence-related factors.

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