

Learning Communities Research and Practice

Volume 8 | Issue 1

Article 2

Increasing Campus Sense of Belonging through LLC Participation: To Gems Camp We Go

Maureen E. Bowers

University of Maryland, College Park, mbowers1@umd.edu

Leah K. Tobin

University of Maryland - College Park, lkreimer@umd.edu

Jessica Lee

University of Maryland, College Park, jlee1021@umd.edu

Kristan C. Skendall

University of Maryland, kskendal@umd.edu

Frank J. Coale

University of Maryland - College Park, fjcoale@umd.edu

Follow this and additional works at: <https://washingtoncenter.evergreen.edu/lcrpjournal>

 Part of the [University Extension Commons](#)

Recommended Citation

Bowers, M. E. , Tobin, L. K. , Lee, J. , Skendall, K. C. , Coale, F. J. (). Increasing Campus Sense of Belonging through LLC Participation: To Gems Camp We Go. *Learning Communities Research and Practice*, 8(1), Article 2.

Available at: <https://washingtoncenter.evergreen.edu/lcrpjournal/vol8/iss1/2>

Authors retain copyright of their material under a [Creative Commons Non-Commercial Attribution 3.0 License](#).

Increasing Campus Sense of Belonging through LLC Participation: To Gems Camp We Go

Abstract

Gemstone seeks to develop students' research and collaboration skills, foster leadership opportunities, and provide a sense of belonging on a large campus utilizing the Best Practices Model (BPM) and a variety of high impact practices (HIPs), like a Gemstone-specific orientation program called Gems Camp. While studies have demonstrated that LLCs increase students' sense of belonging, the goal of this study is to explicitly test via propensity score matching if (a) enrollment in the Gemstone Honors Program increases sense of belonging compared to university students not in Gemstone and (b) attendance at Gems Camp increases sense of belonging in Gemstone students. Gemstone students (N=221) had an increased sense of belonging compared to matched university students (N=221). Moreover, Gemstone students who attended Gems Camp (N=92) had an increased sense of belonging compared to matched Gemstone students who did not attend Gems Camp (N=92). In conclusion, the Gemstone Honors Program is an example of an LLC with scaffolded high impact practices, such as intentional first year programming, undergraduate research, and collaborative projects, that promotes an increase in students' sense of belonging, providing a model for other LLCs to consider in their programming efforts.

Keywords

sense of belonging, living learning community, orientation, honors

The 1990s was a time filled with calls for changes to the delivery of undergraduate education in the United States. From the Boyer Report (1998) to the increased development of living-learning communities (LLCs) on campuses (Gabelnick et al., 1990; Shapiro & Levine, 1999; Whitt & Nuss, 1994), many changes were happening at colleges and universities throughout the United States. The University of Maryland was no exception as the campus experienced widespread adoption of residential LLCs through partnerships between academic and student affairs (Gabelnick et al., 1990; Whitt & Nuss, 1994). Grounded in a relationship between engineering and student affairs, the Gemstone Honors Program began in the mid-nineties. Based on learning principles connecting emerging pedagogy in engineering and residential living (Augustine & Vest, 1994; Blimling, 1993; Blimling, 1997; King & Magolda, 1996; Kuh, 1996; Pascarella et al., 1994; Schroeder & Hurst, 1996; Terenzini et al., 1996), Gemstone first targeted engineering students, evolving over time to include students from all colleges and majors across campus. The original bold mission that was crafted to guide the Gemstone Program continues to motivate achievement toward four overarching goals: (a) develop students' research skills in the context of multidisciplinary team research projects; (b) develop students' ability to work effectively in teams; (c) provide students with leadership opportunities through peer mentoring, teaching and community service; and (d) provide students with a close-knit community that supports them in all of their commitments and activities at the University of Maryland.

Currently, the Gemstone Honors Program includes a four-year sequential curriculum that resides within the Honors College at the University of Maryland as a unique multi and interdisciplinary undergraduate research program for Honors students of all majors. Students apply to the University of Maryland through the regular application process and then are invited to the Honors College. Once invited to the Honors College, students indicate their preferred Honors LLC. This process guides which students are invited to join the Gemstone Honors Program. Practically all of the newly admitted Honors College students who indicate Gemstone as their preference are enrolled in the Gemstone Honors Program. It is rare for an incoming Honors College student who expressed keen interest in participating in the Gemstone Program to be denied admission. Admitted students who wish to live on campus are housed together in Ellicott Hall. Nearly all of the first-year students live together on the residential floors just above the staff offices and seminar rooms. After their first-year, most Gemstone students continue to live together through graduation, both on and off-campus.

Under the guidance of faculty mentors and Gemstone staff, student teams design, direct, and conduct significant research, often exploring the interdependence of science and technology with society. Gemstone students are members of an LLC comprised of fellow students, faculty, staff, and alumni who work together to enrich the undergraduate experience. This community challenges

and supports students in the development of their research, teamwork, communication, and leadership skills. In the fourth year, each team of students presents their research in the form of a thesis to experts, and the students complete the program with a Gemstone Honors Citation, a published thesis, and a tangible sense of accomplishment.

Since its inception, the Gemstone Honors Program has evolved based upon expanding research and scholarship in ways that enhance the undergraduate experience and promote student success and learning. As the pendulum has shifted towards a focus on student learning in student affairs, Gemstone has emerged as an example of a High-Impact Practice (HIP) on a number of levels, mainly as an LLC (Kuh, 2008). Additionally, Gemstone addresses the following intended outcomes of learning communities noted by Brownell and Swaner (2010): direct connections to a peer group making a large campus feel smaller, increased levels of comfort in academic settings encouraging intellectual risks and full engagement with coursework, and enhanced student-faculty interactions both in and out of the classroom. Additionally, as a result of participating in a learning community, such as Gemstone, students engage in active and collaborative learning and seek to connect their coursework and integrate knowledge (Brownell & Swaner, 2010; Swaner & Brownell, 2008). Learning communities are often paired with other HIPs to maximize student learning and development (Chism Schmidt & Graziano, 2016; Inkelas et al., 2018; Kinzie, 2012; Kuh, 2008). Gemstone is uniquely positioned to offer students a number of HIP experiences such as first-year seminars, common intellectual experiences, writing and inquiry intensive courses, collaborative assignments and projects, undergraduate research, and capstone courses and projects. As such, the Gemstone Honors Program is committed to the holistic development of students as scholars, citizens, and leaders, with efforts focused both inside and outside of the classroom. This emphasis placed on leadership development both within the program and beyond is mirrored in the description of leadership as both interdisciplinary and multidisciplinary, which allows for the integration of skills and knowledge in a variety of contexts (Guthrie & Jenkins, 2018). Through fostering intellectual excitement, collaboration, and diversity of thought, Gemstone students achieve transferable skills that will be valuable in all future endeavors.

Program Structure

Today, the Gemstone Honors Program student body is composed of approximately 500 Honors College students spanning from first through senior years. Each incoming class cohort of approximately 150 students spends the entire first year developing and focusing their research interest and forming multi and interdisciplinary teams of 8 to 14 students through a series of three sequential courses they take together with several small discussion sessions for each course. These research teams subsequently design, direct, and conduct significant original

research through a series of six project seminars over the course of three years. Typically, 12 teams are formed per class cohort, for a typical total of 36 teams actively conducting research over the sophomore, junior and senior years. Each Gemstone research team is guided and supported by a dedicated faculty mentor with expertise in the team's selected field of research. A comprehensive description of the Gemstone Honors Program has been published by Coale et al. (2016).

The Gems Camp Experience

At the beginning of the Gemstone Program, newly admitted first-year students arrive to campus prior to the arrival of other incoming students to participate in Gems Camp, an overnight orientation program designed to introduce new students to the Program, create connections with their peers, and provide a forum for focused guidance and advice from upperclass students serving as peer mentors referred to as "Camp Leaders." Gems Camp participants are taken off-campus to become familiar with the University of Maryland and Gemstone Honors Program curriculum, while also learning about the various leadership opportunities and campus resources in the context of a fun and purposeful camp theme. Camp content includes components such as participating in intentional icebreakers to help build relationships among their peers, engaging in team building activities, and introducing students to Gemstone team dynamics and the four-year Gemstone research timeline. Campers are divided into small groups for the duration of camp, and each group is typically paired with two Camp Leaders. The goals of Gems Camp are to foster confidence about the upcoming Gemstone experience, establish a sense of comfort with being a member of the University community, and energize the students about embarking on their four-year Gemstone research journey. These goals align with Inkelas et al.'s (2018) LLC Best Practices Model (BPM), specifically in regard to the socially supportive climate within the academic environment. The Gemstone Honors Program is built upon a strong infrastructure, which is enhanced by an intentional collaboration between academic and student affairs with elements grounded by clear goals, objectives, and outcomes. The Gemstone Honors Program creates a supportive environment in which students can thrive socially and academically. The enhancement of students' social integration can lead to successful college transition, commitment to civic engagement, and more (Inkelas et al., 2018). Specifically, effective LLCs can help foster students' sense of belonging and can serve as an "icebreaker" to a deeper relationship with peers and their community (Inkelas et al., 2018; Wawrzynski et al., 2009, p. 151). These critical components are intentionally integrated throughout Gems Camp and the entire Gemstone student experience, designed and enhanced based upon annual assessment and evaluation.

Sense of Belonging

Hagerty et al. (1992) define sense of belonging “as the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or environment” (p. 173). Positive measures of sense of belonging have often been cited as a mechanism for improving student persistence (Braxton, 2000; Hagedorn & Castro, 1999; Hausmann et al., 2007; Tinto, 1993), influencing academic motivation (Goodenow & Grady, 1993), serving as a fundamental human motivator (Baumeister & Leary, 1995; Hurtado et al., 2015; McClelland, 1987; Ribera et al., 2017), and functioning centrally to student learning and development, particularly for a diverse student population (Hurtado & Carter, 1997; Johnson et al., 2007; Strayhorn, 2019). When Hoffman et al. (2002) examined measures of sense of belonging for first-year students engaged in a first-year seminar and LLC at the University of Rhode Island (URI), LLC students reported more engaged friendships and greater peer academic support. The study demonstrated that LLC students scored statistically significantly higher on all measures of sense of belonging. Hoffman et al. (2002) noted:

Learning community students reported higher levels of perceived peer support, perceived faculty support/comfort, perceived classroom comfort in the classroom environment, and empathetic faculty understanding. These same learning community students also reported lower levels of perceived isolation than students in a stand-alone freshman seminar course. (p. 249)

These studies demonstrate the ways in which LLCs examine sense of belonging as a key outcome associated with program assessment and evaluation, the mortar of many programs (Inkelas et al., 2018). Given the important connection between LLCs and sense of belonging, the purpose of our study is to explore sense of belonging in the context of the Gemstone Honors Program. Specifically, our guiding research questions are as follows:

1. Is there a difference in measures of sense of belonging between students who participate in the Gemstone Honors Program and a matched sample from the University of Maryland, College Park (UMCP)?
2. Is there a difference in measures of sense of belonging for Gemstone Honors Program students who participate in Gems Camp and a matched sample of Gemstone students who do not participate in the experience?

Methods

To examine how the Gemstone Honors Program and Gems Camp affect the sense of belonging in students, over the course of three years the Gemstone staff collected survey data focused on a variety of learning outcomes, including sense of belonging. To examine differences in sense of belonging between Gemstone Honors Program students and university students not in the program, we utilized

propensity score matching with a sample of university undergraduates from the University of Maryland 2015 Multi-Institutional Study of Leadership (MSL) dataset. The MSL is an international research study focused on examining college student leadership outcomes, which aligns with Gemstone's broad leadership, academic, and co-curricular outcomes (The Multi-Institutional Study of Leadership, 2019; Guthrie & Jenkins, 2018). With permission of the MSL principal investigator, Dr. John Dugan, Gemstone used four outcomes (sense of belonging, collaboration, resilience, and cognitive complexity) from the MSL in a specific Gemstone focused study. The goal of this study is to compare sense of belonging between Gemstone students and university students at-large. Students were matched based on covariates describing demographics, parent characteristics, college experience, and extracurricular activities. This procedure was then repeated to assess how Gems Camp attendance influences sense of belonging within Gemstone students by matching Gemstone students who attended Gems Camp with Gemstone students who did not attend Gems Camp.

Procedures

All students were older than 18 years old and provided consent. The Institutional Review Board at the University of Maryland, College Park (UMCP) approved all procedures and questionnaires. Both the MSL and Gemstone-specific surveys were distributed electronically. Students completed questions about basic demographics including race, gender, and parental education. They also answered questions about involvement in extracurricular and professional activities in high school, on campus, and outside of campus. Central to our second research question, Gemstone students were also asked if they had or had not attended Gems Camp at the start of their first-year at UMCP.

Participants

Our study utilized two samples of undergraduate students at UMCP. First, data were collected from the first sample of undergraduates at UMCP. In 2015, a random sample of 3,998 undergraduates at UMCP were sent the MSL questionnaire online, and those who completed them did so voluntarily. A total of 1247 (525 female) undergraduates completed some or all of the MSL questionnaire. Only a select number of questions and scales from the MSL, described in the below sections (Measuring Sense of Belonging and Covariates used to Match Students), were used in this analysis. The second sample was derived from a Gemstone-specific survey that included a total of 1544 undergraduates who were enrolled in the Gemstone Honors Program at UMCP. They completed variations of the same questionnaires used in the MSL with three response windows, once in 2014, once in 2015, and once in 2016. In this three-year period, 438 (180 female) Gemstone students completed some or all of these questionnaires. Of the 438 respondents, 292

did attend Gems Camp, and 146 did not attend Gems Camp. It is important to note two limitations to this dataset. First, there may be Gemstone students who responded to the University-wide questionnaire; consequently, those students may have responses in both datasets. Second, because the Gemstone data were collected over a three-year timeframe, there may be repeat respondents in the Gemstone dataset. However, due to confidentiality concerns, students' names and/or university ID numbers were not collected, so repeat respondents could not be identified and removed.

Measuring Sense of Belonging

Specifically, the MSL examines sense of belonging as a way to describe a student's feelings of affiliation with the campus community. The instrument measures a student's sense of belonging by asking three questions that are measured on a scale of 1 (strongly disagree) to 5 (strongly agree). The three items are: (a) *I feel valued as a person at this school*, (b) *I feel accepted as a part of this campus community*, and (c) *I feel I belong on this campus*. Sense of belonging is then calculated as an average of the three responses (Dugan & Komives, 2007). The MSL PI gave permission for the use of the sense of belonging scale on the Gemstone survey.

Covariates used to Match Students

In total, 14 independent variables were used as covariates in the propensity score matching. The same covariates were used for both research questions: (a) when matching Gemstone students with other UMCP students, and (b) when matching Gems Camp attendees with non-attendees. First, we matched the students on demographic information. *Age* of the student was included as a continuous measure. *Gender* was converted to a dichotomous variable designating either man or woman. The Gemstone response set had only one respondent and the MSL response set had only five total individuals who identified in the trans and gender non-binary category, and while these are important members of the community, the small sample size did not allow for statistical analysis, so trans and gender non-binary respondents were removed from the analysis. Four dichotomous variables designed as a proxy for racial identity were included: (a) *White* or not, (b) *Asian* or not, (c) *African American* or not, (d) *Multi-racial* or not. Pacific Islander and Native American respondents were not included because no Gemstone students reported these identities and the Maryland students had very low frequencies of these identities. Additionally, variables describing students' financial background were included. First, highest level of *parent education* was coded as categorical including less than high school, high school/GED, some college, associate's degree, bachelor's degree, graduate/professional degree, or other. Second, an estimate of *parent income* was incorporated. Due to differences in the survey options for

Gemstone and Maryland students, income levels were collapsed into four categories common to both surveys: <75k, 75k–100k, 100k–150k, and >150k. Parent education and income were included as covariates because they are both strong predictors of collegiate academic success (Astin, 1993; Pascarella & Terenzini, 2005; Walpole, 2003). Additionally, we included one dichotomous variable reflecting whether the student is a *full-time student* or less than full-time student. *Class standing* was also used as a categorical variable with four levels: freshman, sophomore, junior, and senior. *Current GPA* was included with four levels: 4.0–3.5, 3.5–3.0, 3.0–2.5, and 2.5–2.0. Six university students with a GPA below 2.0 were removed because zero Gemstone students had a GPA below 2.0. Finally, we wished to match the students based on their college experiences and extracurricular involvement, which both could influence their sense of belonging (Astin, 1993; Hoffman et al., 2002). One dichotomous measure indexed whether the student has held an *internship* or not during college. Two categorical measures of previous *high school campus involvement* and current *college campus involvement* were also used. To create these variables, we utilized the list of activities each in which a respondent was involved and coded them as either no participation in extracurriculars, participation in one activity, or participation in two or more activities.

Propensity Score Matching

Propensity score matching generates the probability of being in the treatment group for every participant. Then participants in each group are matched based on those probabilities and unmatched participants are dropped. Using the matched sample, a linear regression can test how the outcome of interest differs based on group membership within the matched sample. Propensity score matching generates the average treatment effect for the treated (ATT), which reveals the treatment effect on those in the treatment group rather than the treatment effect on all individuals in the population. Propensity score matching procedures were completed using the “Matchit” plugin (Ho et al., 2011) in R-Studio Version 1.1.442. Respondents were only included if they had complete data on all covariates used to predict propensity scores and on the variable of interest, sense of belonging.

For our first research question, which probes whether students in the Gemstone Honors Program have a different sense of belonging than other university students, 800 UMCP students (417 female) and 319 Gemstone students (132 female) had complete data and were included in analyses. The first step of propensity score matching is to use a logistic regression to estimate the probability (i.e. propensity score) that a student would be in the treatment group (i.e. Gemstone Honors Program). Students in Gemstone were coded as “1,” and students not in the Gemstone Honors Program were coded as “0.” The demographic and background covariates listed above were used as predictors of inclusion in the Gemstone Honors Program in a logistic regression.

For our second research question, whether Gemstone students who attended Gems Camp have a different sense of belonging than the students who did not attend Gems Camp, the final dataset included 216 students who attended Gems Camp (90 female) and 103 students who did not (42 female). Again, our first step of propensity score matching was to use a logistic regression to estimate the probability (i.e. propensity score) that a student would be in the treatment group (i.e. Gems Camp Attendee). Students who had attended Gems Camp were coded as “1,” and students who had not attended Gems Camp were coded as “0.” The demographic and background covariates listed above were used as predictors of attendance at Gems Camp in a logistic regression. In step 2 of propensity score matching, we used the matched sample to conduct a regression predicting sense of belonging scores from student attendance at Gems Camp (yes or no).

Results

Sense of Belonging in University Students compared to Gemstone Students

Matching results

The propensity score matching resulted in 221 UMCP students matched with 221 Gemstone students. Therefore, there were 579 unmatched UMCP students and 98 unmatched Gemstone students. Figure 1 displays the overlap of the propensity scores between the Gemstone and UMCP students and the propensity scores of the unmatched students.

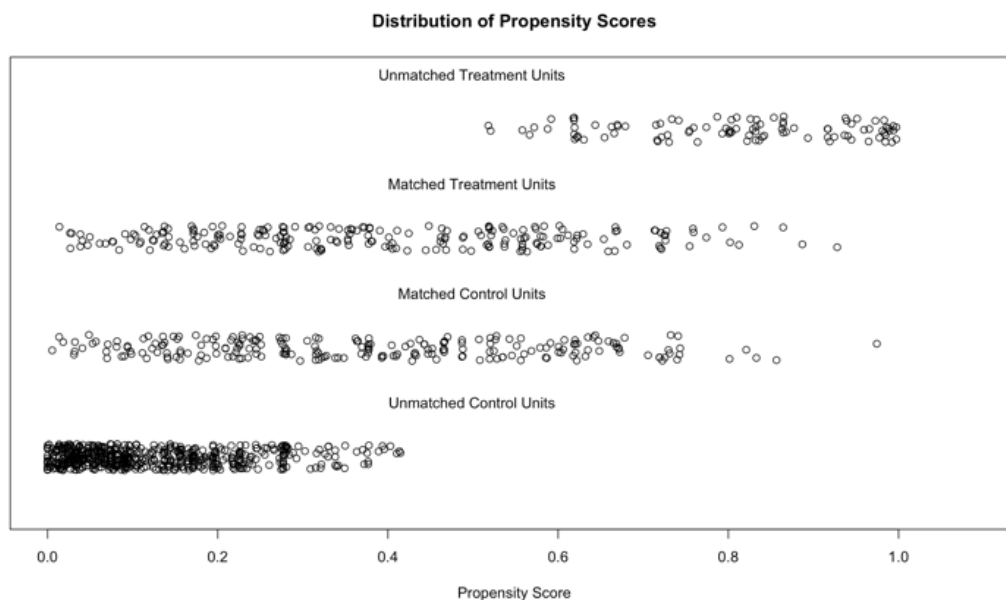


Figure 1. Distribution of propensity scores for the matched and unmatched students. Here, the treatment units refer to the Gemstone students, and the control units refer to the UMCP students.

To assess whether the propensity score matching adequately balanced the samples on the covariates of interest, we examined the adjusted standardized mean difference in the unmatched and the matched sample (Table 1). A standardized mean difference of less than 0.25 after matching was used to determine that we had acceptable balance (Stuart, 2010). Using the cobalt package in R (Greifer, 2019), a standardized mean difference was computed for our continuous variable, age. All categorical variables were converted to new binary variables for each level of the categorical variable. The balance statistic for the binary variables is the raw difference in proportion. All covariates were below the 0.25 criterion.

Table 1**Matching Results for UMCP Students and Gemstone Students**

Covariate	Before Matching		After Matching		Std Mean Diff (Adj)
	Gemstone N = 319	UMCP N = 800	Gemstone N = 221	UMCP N = 221	
Age	19.8 (1.3)	19.5 (2.3)	20.0 (1.3)	20.2 (2.7)	- 0.170
Gender (Female)	132 (41.3%)	417 (52.1%)	94 (42.5%)	102 (46.2%)	0.036
Race					
White	187 (58.6%)	547 (68.4%)	144 (62.5%)	138 (62.4%)	0.027
African American	10 (3.1%)	82 (10.3%)	9 (4.1%)	11 (4.9%)	- 0.009
Asian/Asian American	112 (35.1%)	152 (19.0%)	61 (27.6%)	54 (24.4%)	0.032
MultiRacial	8 (2.5%)	33 (4.1%)	7 (3.2%)	6 (2.7%)	0.005
Parent Education					
Less than HS/GED	0 (0.0%)	14 (1.8%)	0 (0.0%)	0 (0.0%)	0.000
High School/GED	5 (1.6%)	61 (7.6%)	5 (2.3%)	5 (2.3%)	- 0.018
Some college	27 (8.5%)	67 (8.4%)	20 (9.0%)	24 (10.9%)	0.014
Associate's Degree	11 (3.4%)	39 (4.9%)	10 (4.5%)	7 (3.2%)	0.009
Bachelor's Degree	87 (27.3%)	235 (29.4%)	66 (29.8%)	64 (28.9%)	- 0.005
Graduate/Professional Degree	189 (59.2%)	384 (48.0%)	120 (54.3%)	121 (54.8%)	
Parent Income					
<75k	49 (15.4%)	202 (25.3%)	36 (16.3%)	42 (19.0%)	- 0.027
75k – 100k	36 (11.3%)	97 (12.1%)	27 (12.2%)	24 (10.8%)	0.014
100k – 150k	122 (38.2%)	214 (26.7%)	79 (35.7%)	83 (37.6%)	- 0.018
>150k	112 (35.1%)	287 (35.8%)	79 (35.7%)	72 (32.6%)	0.032
Full-Time Student (Yes)	315 (98.7%)	794 (99.2%)	218 (98.6%)	216 (97.7%)	0.081

Class Standing					
Freshman	58	344	52	55	- 0.014
Sophomore	(18.2%)	(43.0%)	(23.5%)	(24.9%)	0.009
Junior	76	277	65	63	0.005
Senior	(23.8%)	(34.6%)	(29.4%)	(28.5%)	0.000
	83	90	46	45	
	(26.0%)	(11.3%)	(20.8%)	(20.4%)	
	102	89	58	58	
	(32.0%)	(40.3%)	(26.2%)	(26.2%)	
Current GPA					
4.0 – 3.5	236	370	151	150	0.005
3.5 – 3.0	(74.0%)	(46.3%)	(68.3%)	(67.9%)	0.014
3.0 – 2.5	65	285	54	51	- 0.009
2.5 – 2.0	(29.4%)	(35.6%)	(24.4%)	(23.1%)	- 0.054
	15	123	14	16	
	(4.7%)	(15.4%)	(6.3%)	(7.2%)	
	3	22	2	4	
	(0.9%)	(2.8%)	(0.9%)	(1.8%)	
Internship (Yes)	166	268	114	126	- 0.109
	(52.1%)	(33.5%)	(51.6%)	(57.0%)	
High School Involvement					
None	25	1	1	1	0.000
One Activity	(7.8%)	(0.1%)	(0.5%)	(0.5%)	0.009
Two or More	40	30	19	17	- 0.009
Activities	(12.5%)	(3.8%)	(8.6%)	(7.7%)	
	254	769	201	203	
	(79.6%)	(96.1%)	(90.9%)	(91.9%)	
Campus Involvement					
None	12	65	10	11	- 0.005
One Activity	(3.8%)	(8.1%)	(4.5%)	(4.9%)	0.005
Two or More	40	50	16	15	0.000
Activities	(12.5%)	(6.3%)	(7.2%)	(6.8%)	
	267	685	195	195	
	(83.7%)	(85.6%)	(88.2%)	(88.2%)	

Note. Mean (SD) or Frequency (%) presented.

Sense of Belonging

Within the sample of matched Gemstone and UMCP students, students in the Gemstone Honors Program scored 0.37 points higher on sense of belonging compared to UMCP students, $t(440) = 5.48, p < .001$. Gemstone enrollment explained 3.77% of variation in sense of belonging scores, $F(1, 440) = 30.01, p < .001$.

Sense of Belonging in Gems Camp Attendees compared to Gems Camp Non-Attendees

Matching results

The propensity score matching resulted in 92 Gems Camp attendees matched with 92 non-attendees. Therefore, there were 124 unmatched attendees and 11 unmatched non-attendees. Figure 2 displays the overlap of the propensity scores

between the Gems Camp attendees and non-attendees and the propensity scores of the unmatched students.

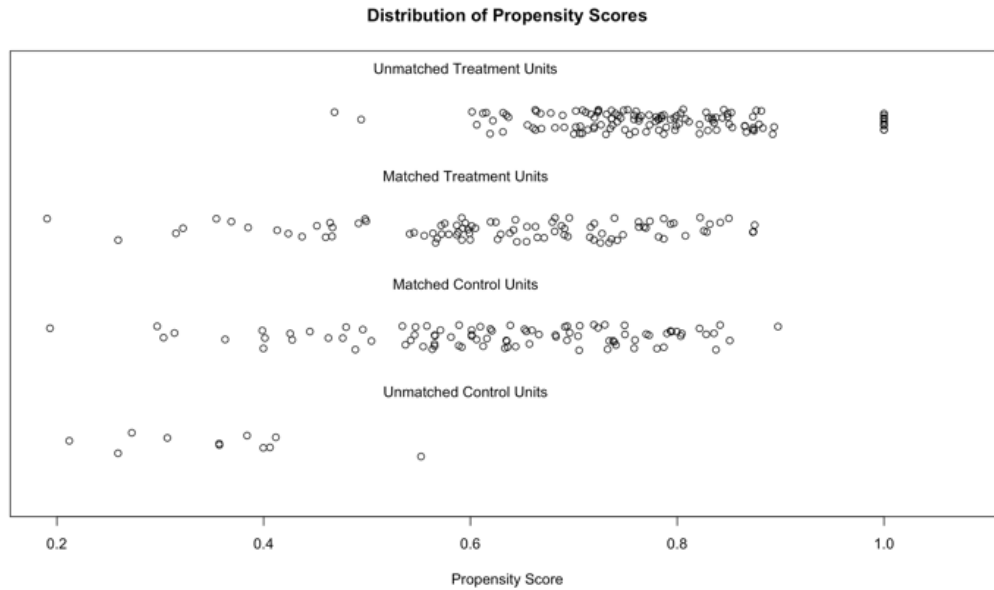


Figure 2. Distribution of propensity scores for the matched and unmatched students. Here, the treatment units refer to the Gems Camp attendees, and the control units refer to those who did not attend Gems Camp.

Again, we used a standardized mean difference of less than 0.25 to ensure the balance on the covariates of interest (Stuart, 2010). Table 2 details the means and frequencies of each covariate before and after matching. Moreover, it shows that all covariates indeed had a standardized mean difference or raw difference in proportion of less than 0.25 after matching.

Table 2

Matching Results for Gems Camp Attendees and Non-Gems Camp Attendees

Covariate	Before Matching		After Matching		Std Mean Diff (Adj)
	GC N = 216	No GC N = 103	GC N = 92	No GC N = 92	
Age	19.8 (1.2)	19.9 (1.3)	19.9 (1.2)	19.9 (1.2)	- 0.044
Gender (Female)	90 (41.7%)	42 (40.7%)	41 (44.5%)	37 (40.2%)	- 0.044
Race					
White	135 (62.5%)	52 (50.5%)	54 (58.7%)	47 (51.1%)	0.076
African American	8 (3.7%)	2 (1.9%)	2 (2.2%)	2 (2.2%)	0.000
Asian/Asian American	66 (30.5%)	46 (44.6%)	33 (35.9%)	40 (43.5%)	- 0.076
MultiRacial	5 (2.3%)	3 (2.9%)	3 (3.2%)	3 (3.2%)	0.000

Parent Education					
Less than HS/GED	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.000
High School/GED	3 (1.4%)	2 (1.9%)	1 (1.1%)	2 (2.2%)	- 0.011
Some college	14 (6.5%)	13 (12.6%)	11 (12.0%)	11 (12.0%)	0.000
Associate's Degree	6 (2.8%)	5 (4.9%)	5 (5.4%)	4 (4.3%)	0.011
Bachelor's Degree	53 (24.5%)	34 (33.0%)	28 (30.4%)	27 (29.3%)	0.011
Graduate/Professional Degree	140 (64.8%)	49 (47.6%)	47 (51.1%)	48 (52.3%)	0.011
Parent Income					
<75k	29 (13.4%)	20 (19.4%)	14 (15.2%)	16 (17.4%)	- 0.022
75k – 100k	23 (10.6%)	13 (12.6%)	9 (9.7%)	10 (10.8%)	- 0.011
100k – 150k	82 (37.9%)	40 (38.8%)	43 (46.7%)	39 (42.4%)	0.044
>150k	82 (37.9%)	30 (29.1%)	26 (28.2%)	27 (29.3%)	- 0.011
Full-Time Student (Yes)	212 (98.1%)	103 (100%)	92 (100%)	92 (100%)	0.000
Class Standing					
Freshman	41 (18.9%)	17 (16.5%)	14 (15.2%)	15 (16.3%)	- 0.011
Sophomore	51 (23.6%)	25 (24.3%)	21 (22.8%)	24 (26.1%)	- 0.033
Junior	51 (23.6%)	32 (31.1%)	31 (33.7%)	28 (30.4%)	0.033
Senior	73 (33.8%)	29 (28.2%)	26 (28.2%)	25 (27.2%)	0.011
Current GPA					
4.0 – 3.5	165 (76.3%)	71 (68.9%)	69 (75.0%)	66 (71.7%)	0.033
3.49 – 3.0	40 (18.5%)	25 (11.6%)	18 (19.6%)	23 (25.0%)	- 0.054
2.99 – 2.5	8 (3.7%)	7 (3.2%)	5 (5.4%)	3 (3.3%)	0.022
2.49 – 2.0	3 (1.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.000
Internship (Yes)	110 (50.9%)	56 (54.4%)	47 (51.1%)	50 (54.3%)	- 0.033
High School Involvement					
None	18 (8.3%)	7 (6.8%)	4 (4.3%)	7 (7.6%)	- 0.033
One Activity	29 (13.4%)	11 (10.6%)	13 (14.1%)	11 (11.9%)	0.022
Two or More Activities	169 (78.2%)	85 (82.5%)	75 (81.5%)	74 (80.4%)	0.011
Campus Involvement					
None	4 (1.8%)	8 (3.7%)	4 (4.3%)	4 (4.3%)	0.000
One Activity	27 (12.5%)	13 (12.6%)	11 (11.9%)	13 (14.1%)	- 0.022
Two or More Activities	185 (85.6%)	82 (79.6%)	77 (83.7%)	75 (81.5%)	- 0.022

Note: Mean (SD) and Frequency (%) are presented.

Sense of Belonging

In the sample of matched Gems Camp attendees and Gems Camp non-attendees, students who participated in Gems Camp scored 0.20 points higher on sense of belonging compared to those who did not attend Gems Camp, $t(182) = 2.24$, $p = .026$. Gems Camp attendance explained 2.69% of variation in sense of belonging scores, $F(1, 182) = 5.03$, $p = .026$.

Discussion

The goal of this study was to examine differences in sense of belonging, first, between students in the Gemstone Honors Program at the University of Maryland compared to non-Gemstone students at the University of Maryland and second, between Gemstone students who attended Gems Camp compared to Gemstone students who did not. To answer our first research question, propensity score matching was utilized to match 221 university students with 221 Gemstone students based on demographics and student engagement. In this matched sample, Gemstone students had greater scores on sense of belonging compared to non-Gemstone students. Next, 92 Gemstone students who attended Gems Camp were matched using propensity score matching with 92 Gemstone students who did not attend Gems Camp. Indeed, students who attended Gems Camp reported increased sense of belonging compared to students who did not attend Gems Camp in this matched sample of Gemstone students.

The first-year college experience not only sets the tone for the rest of their college career, but it also serves as a critical point towards their success (Ribera et al., 2017). According to Hagedorn and Castro (1999) and Hausmann et al. (2007), students entering college who feel that they do not belong may drop out of higher education or transfer to a different institution at a higher rate than those with a higher sense of belonging. In current higher education literature, sense of belonging is commonly understood as the “psychological dimension of student integration” leading to attachment to the college community (Hurtado et al., 2015, p. 62; Ribera et al., 2017). Strayhorn (2019) states that, given the various contexts in which students engage in and out of the classroom, one’s sense of belonging is situational. In other words, depending on the environment, students may feel either validated or isolated (Ribera et al., 2017). In the first phase of our analysis, compared to students at the University of Maryland, Gemstone students in the matched sample had a statistically significant higher level of sense of belonging, which situates students’ sense of belonging in the broader context of a living-learning community (LLC).

The second propensity score matched sample revealed that students who participated in Gems Camp had a statistically significant higher sense of belonging as compared to their peers who did not attend Gems Camp. Gems Camp creates an environment that situates students increased sense of belonging through the small group setting in which students receive individual attention from their Camp Leaders (Strayhorn, 2019). This experience likely results in students feeling integrated in and valued by the Gemstone Honors Program from the moment they arrive on campus. The Gems Camp curriculum has evolved through the years and is designed to maximize outcomes such as increased sense of belonging. Although seemingly trite, activities such as icebreakers and team-building games seek to help students literally break-the-ice, resulting in deeper relationships from the very

beginning of their Gemstone experience (Wawrzynski et al., 2009). These findings align with past research exploring the outcomes of intentional first-year programming in the context of LLCs (Hoffman et al., 2002).

Additionally, the Gems Camp experience provides students an opportunity for intentional peer mentoring from upper class Gemstone students who serve as Camp Leaders. The Camp Leader role is the first peer mentoring relationship that Gemstone students are exposed to in the college context, demonstrating the commitment to developing a socially supportive climate. The informal mentoring relationship established at Gems Camp may contribute to positive outcomes that assist students in their transition to college, their confidence in their own ability to succeed, and their decision to remain at the university in the Gemstone Honors Program (Collier, 2015; Inkelas et al., 2018).

Gems Camp, as a shared first year program, emerges as an example of a successful practice incorporated within the Best Practices Model (BPM), specifically in regards to the creation of a socially supportive climate with broad implications for student satisfaction and retention (Inkelas et al., 2018; Tinto, 1993). These outcomes are reflected in the Gemstone one-year retention rate, which from fall 2010 to fall 2017 ranged from 97% to over 99%, compared to the overall UMCP one-year average retention rate of 95.2% in the same time period (UMD Undergrad Retention & Completions, 2019). Similarly, Gemstone's four-year graduation rate from fall 2010 to fall 2014 ranged from 80% to 83% compared to UMCP's average graduation rate for the same period of 69.2% (UMD Undergrad Retention & Completions, 2019). While the Gemstone students are expected to retain and graduate at a higher rate given their preparation, these statistics may also reflect the intentionality of the Gemstone Honors Program in fostering a sense of belonging through the inclusion of HIPs and the alignment with the BPM (Inkelas et al., 2018; Kuh, 2008).

Limitations and Implications

There are some limitations of this study. Students were matched based on a variety of variables that could have impacted sense of belonging on campus (e.g., class standing and campus involvement). However, this list is not exhaustive, and other factors could influence sense of belonging not explored here. Additionally, there could be repeat respondents in both datasets that are not able to be removed since there is no identifiable information in the dataset.

Implications for Future Research

As a unique, honors, team-based, undergraduate research-focused LLC, the Gemstone Honors Program has additional analyses to conduct on the outcomes associated with the program. Sense of belonging is one way to understand the student experience; however, Gemstone can also explore additional outcomes such

as collaboration, cognitive complexity, and resilience. Additionally, the respondents in this study were current students. Future research could be conducted to analyze perceptions of sense of belonging of Gemstone Honors Program alumni to determine if they feel a different or changed connection with the Program after some time away from the campus. The sense of belonging among Gemstone Honors Program alumni may connect to alumni philanthropy in the future.

An additional area of important future research is to more deeply understand what about both the Gemstone and Gems Camp experiences contributes to an increased measure of sense of belonging. A more in depth understanding of the nature of the Gemstone and Gems Camp experience (e.g., faculty mentoring or peer relationships) would provide insight into specific parts of the programs that are contributing to this phenomenon. These analyses could be explored quantitatively through a similar analysis and also would benefit from qualitative exploration to better understand the depth of the experiences.

Gemstone is comprised of three distinct, but important, program characteristics: the living-learning community, undergraduate research, and long-term team experiences. Current analyses do not disaggregate these components, and more research on the impact of each area individually, and collectively, would enhance understanding.

Implications for Practice

The findings of this study serve as a reminder to practitioners that despite the dearth of research surrounding the influence of orientation on college students, there can be positive, developmental outcomes that occur as a result of participation (Mayhew et al., 2011). Further, the documented outcomes associated with increased sense of belonging, such as retention, student persistence, and academic motivation reinforce the notion that, even in the context of an academic LLC, programmatic efforts should be made prior to the beginning of the academic experience to create orientation-like experiences for students (Braxton, 2000; Goodenow & Grady, 1993; Hagedorn & Castro, 1999; Hausmann et al., 2007; Tinto, 1993). These experiences can enhance the students' transition not only into the LLC environment, but also to the overall campus environment, positioning students for success as they begin their collegiate experience.

Conclusion

The Gemstone Honors Program and Gems Camp highlight the value of the LLC experience, particularly as mechanisms that reflect elements of the BPM (Inkelas et al., 2018). An increased rate of sense of belonging through participation in these experiences highlights the added value of LLCs and intentional programming for students. Further research on other outcomes of participation in the Gemstone Honors Program, such as collaboration and critical thinking skills,

would highlight the value of other aspects of the program, particularly the team research and honors experiences.

References

- The Multi-Institutional Study of Leadership (MSL). (2019). *About MSL*. Retrieved from <https://www.leadershipstudy.net/about>
- Astin, A. W. (1993). *What matters in college? Four critical years revisited*. Jossey-Bass.
- Augustine, N. & Vest, C. (1994, October). Engineering education for a changing world. *American Society of Engineering Education*. <https://www.asee.org/papers-and-publications/publications/The-Green-Report.pdf>
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497-529.
- Blimling, G.S. (1993). The influence of college residence halls on students. In J. Smart (Ed.), *Higher education: Handbook of theory and research*. Agathon Press.
- Blimling, G. (1997). The benefits and limitations of residential colleges: A meta-analysis of the research. In F.K. Alexander & D.E. Robertson (Eds.), *Residential colleges: Reforming American higher education* (pp. 39-76). Oxford International Roundtable.
- Boyer Commission on Educating Undergraduates in the Research University. (1998). *Reinventing undergraduate education: A blueprint for America's research universities*. State University of New York at Stony Brook.
- Braxton, J.M. (Ed.). (2000). *Reworking the student departure puzzle*. Vanderbilt University Press.
- Brownell, J.E., & Swaner, L.E. (2010). *Five high-impact practices: Research on learning outcomes, completion and quality*. Association of American Colleges and Universities.
- Coale, F. J., Skendall, K., Tobin, L. K., & Hill, V. (2016). The Gemstone Honors Program: Maximizing learning through team-based interdisciplinary research. In M. Peterson & Y. Rubinstein (Eds.), *Directions for Mathematics Research Experiences for Undergraduates* (pp. 167-180). World Scientific.
- Chism Schmidt, L., & Graziano, J. (Eds.). (2016). *Building synergy for high-impact educational initiatives: First-year seminars and learning communities*. University of South Carolina, National Resource Center for The First-Year Experience & Students in Transition.
- Collier, P. J. (2015). *Developing effective student peer mentoring programs*. Stylus.
- Dugan, J. P., & Komives, S. R. (2007). *Developing leadership capacity in college students: Findings from a national study*. A Report from the Multi-Institutional Study of Leadership. National Clearinghouse for Leadership Programs.

- Gabelnick, F., MacGregor, J., Matthews, R. S., & Smith, B. L. (1990). *Learning communities: Creating connections among students, faculty, and disciplines. New Directions for Teaching and Learning*, 41. Jossey-Bass.
- Goodenow, D., & Grady, K.E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education*, 62(1), 60-71.
- Greifer, N. (2019). cobalt: Covariate balance tables and plots. R package version 3.7.0.
- Guthrie, K., & Jenkins, D. (2018). *The role of leadership educators: Transforming learning*. Information Age Publishing.
- Hagedorn, L. S., & Castro, C. R. (1999). Paradoxes: California's experience with reverse transfer students. In B. K. Townsend (Ed.), *Understanding the Impact of Reverse Transfer Students on Community Colleges* (pp. 15-26). Jossey-Bass.
- Hagerty, B. M. K., Lynch-Sauer, J., Patusky, K., Bouwsema, M., & Collier, P. (1992). Sense of belonging: A vital mental health concept. *Archives of Psychiatric Nursing*, 6, 172-177.
- Hausmann, L. R., Schofield, J. W., & Woods, R. L. (2007). Sense of belonging as a predictor of intentions to persist among African American and White first-year college students. *Research in Higher Education*, 48, 803-839.
- Ho, D., Imai, K., King, G., & Stuart, E. (2011). MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, 42(8), 1-28. doi:<http://dx.doi.org/10.18637/jss.v042.i08>
- Hoffman, M., Richmond, J., Morrow, J., & Salomone, K. (2002). Investigating “sense of belonging” in first-year college students. *Journal of College Student Retention*, 4, 227-256.
- Hurtado, S., Alvarado, A. R., & Guillermo-Wann, C. (2015). Creating inclusive environments: The mediating effect of faculty and staff validation on the relationship of discrimination/bias to students’ sense of belonging. *Journal Committed to Social Change on Race and Ethnicity*, 1(1), 60-81.
- Hurtado, S., & Carter, D. F. (1997). Effects of college transition and perceptions of the campus racial climate on Latino college student’s sense of belonging. *Sociology of Education*, 70, 324-435.
- Inkelas, K.K., Jessup-Anger, J.E., Benjamin, M., & Wawrzynski, M.R. (2018). *Living-learning communities that work: A research-based model for design, delivery, and assessment*. Stylus.
- Johnson, D.R., Soldner, M., Leonard, J.B., Alvarez, P., Inkelas, K.K., Rowan-Kenyon, H.T. & Longerbeam, S.D. (2007). Examining sense of belonging among first-year undergraduates from different racial/ethnic groups. *Journal of College Student Development*, 48, 525-547. <https://doi.org/10.1353/csd.2007.0054>

- King, P.M., & Magolda, M. (1996). A developmental perspective on learning. *Journal of College Student Development, 37*, 163-173.
- Kinzie, J. (2012). Optimizing high impact practices in the senior year. In M. S. Hunter, J. R. Keup, J. Kinzie, & H. Maietta (Eds.), *The senior year: Culminating experiences and transitions*. University of South Carolina, National Resource Center for the First-Year Experience and Students in Transition.
- Kuh, G.D. (1996). Guiding principles for creating seamless learning environments for undergraduates. *Journal of College Student Development, 37*, 135-148.
- Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Association of American Colleges and Universities.
- Mayhew, M. J., Stipeck, C. J., & Dorow, A. J. (2011). The effects of orientation programming on learning outcomes related to academic and social adjustment with implications for transfers and students of color. *Journal of the First-Year Experience & Students in Transition, 23*(2), 53-75.
- McClelland, D. C. (1987). *Human motivation*. Cambridge University Press.
- Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research*. Jossey-Bass.
- Pascarella, E.T., Terenzini, P.T., and Blimling, G.S. (1994). The impact of residential life on students. In C. C. Schroeder, P. Mable, & Associates, *Realizing the educational potential of residence halls* (pp. 22-52). Jossey-Bass.
- Ribera, A.K., Miller, A. L., & Dumford, A. D. (2017). Sense of belonging and institutional acceptance in the first year: The role of high-impact practices. *Journal of College Student Development, 58*(4), 545-563. doi:10.1353/csd.2017.0042
- Schroeder, C.C., & Hurst, J.C. (1996). Designing learning environments that integrate curricular and cocurricular experiences. *Journal of College Student Development, 37*, 174-181.
- Shapiro, N. S., & Levine, J. H. (1999). *Creating learning communities: A practical guide to winning support, organizing for change, and implementing programs*. Jossey-Bass.
- Strayhorn, T.L. (2019). *College students' sense of belonging: A key to educational success for all students* (2nd ed.). New York, NY: Routledge.
- Stuart E.A. (2010). Matching methods for causal inference: A review and look forward. *Statistical Science, 25*(1), 1-21. doi: 10.1214/09-STS313
- Swaner, L. E., & J. E. Brownell. (2008). *Outcomes of high impact practices for underserved students: A review of the literature*. Association of American Colleges and Universities.

- Terenzini, P.T., Pascarella, E.T., & Blimling, G.S. (1996). Students out-of-class experiences and their influence on learning and cognitive development: A literature review. *Journal of College Student Development*, 37, 149-162.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition research* (2nd ed.). University of Chicago Press.
- UMD undergrad retention & completions. (2019). https://www.irpa.umd.edu/CampusCounts/Retention/ug_retcomp.pdf
- Walpole, M. (2003). Socioeconomic status and college: How SES affects college experiences and outcomes. *The Review of Higher Education*, 27, 45-73.
- Wawrzynski, M. R., Jessup-Anger, J., Stolz, K., Helman, C., & Beaulieu, J. (2009). Exploring students' perceptions of academically based living-learning communities. *College Student Affairs Journal*, 28(1), 138-158.
- Whitt, E.J., & Nuss, E.M. (1994). Connecting residence halls to the curriculum. In C.C. Schroeder, P. Mable, & Associates, *Realizing the educational potential of residence halls* (pp. 133-164). Jossey-Bass.