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## The impact of faculty-in-residence programs: A difference-in-differences and cross-sectional approach

Leonard Lira

*San Jose State University, California*, leonard.lira@sjsu.edu

Christine Ma-Kellams

*San Jose State University, California*, christine.ma-kellams@sjsu.edu

Kyle Hambrook

*San Jose State University, California*, kyle.hambrook@sjsu.edu

Ravneet Tiwana

*San Jose State University, California*, ravneet.tiwana@sjsu.edu

Lina Anastasovitou

*San Jose State University, California*, lina.anastasovitou@sjsu.edu

*See next page for additional authors*

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## The impact of faculty-in-residence programs: A difference-in-differences and cross-sectional approach

### Abstract

**Purpose:** Faculty-in-Residence (FIR) programs are implemented based on research that shows positive effects on student success when students interact with faculty outside of the classroom. However, most research is limited by cross-sectional studies of only students and does not look at the Faculty-in-Residence programs from a holistic perspective that investigates the impact on faculty. This study focuses on the impact, not only on students over time but additionally on the perceived impact on faculty who participate in Faculty-in-Residence programs.

**Methods:** We examined the effect of FIR programs at a large, public California university on both student success (i.e., cumulative grade point average, retention, and credits earned per unit attempted) as well as student experience (i.e., based on data from the National Survey of Student Engagement).

**Results:** The quantitative results confirm the literature that faculty-student interactions outside of the classroom are statistically significant but point to differences between the demographics of students and that the mere presence of faculty is not as important as the quantity and quality of interactions.

**Conclusion:** FIR programs can contribute to student success, but the magnitude and direction of this link depend on the level of the interaction between students and faculty as well as the specific outcome of interest.

### Practitioner Notes

1. Educators who engage students outside of the classroom should focus as much on the quality of that engagement as on the number of engagements.
2. Administrators of FIR programs should focus on supporting student-faculty engagement rather than the mere availability of faculty to meet students.
3. Living on campus alone appears to have a weak and slightly negative association with student academic performance. However, this trend can be counteracted by the addition of faculty living in residential communities.
4. To boost retention, consider incorporating faculty into your Living-Learning Communities, or Themed Communities.
5. University administrators should consider the educational effectiveness of student-faculty engagement in on-campus residential environments, in addition to classroom engagement and curriculum advisement.

### Keywords

faculty-student engagement, living-learning communities, faculty-in-residence, student success, student experience, residential learning communities

### Authors

Leonard Lira, Christine Ma-Kellams, Kyle Hambrook, Ravneet Tiwana, Lina Anastasovitou, Luis Arabit, Jennifer Johnston, and Theodore Tsau

## Introduction

The various living, social and co-curricular experiences of students contribute to an institution's goal of educating students. Residential learning communities and themed residential academic communities are examples of the intersection of academic and social engagement opportunities for students. A prime model is the faculty-in-residence (FIR) program, in which faculty contribute directly to college students' educational experience outside of the classroom, specifically in residential settings (Healea et al., 2015). Other titles for the faculty-in-residence role used in higher education institutions worldwide, such as the United Kingdom, Australia, and Canada, include scholar-in-residence, professor-in-residence, faculty mentor-in-residence, and faculty fellows (Muldoon & Macdonald, 2009; Rombough & Johnson, 2015). A growing body of research points to the positive effects on student success from interaction with faculty outside of the classroom (Beckowski et al., 2018; Browne et al., 2010; Garrett & Zabriskie, 2003; Komarraju et al., 2010). Given the contribution of FIR programs to the mission of higher education, it is crucial to examine the links between participation in FIR programs and student outcomes. This study aims to contribute to current literature on the impact of FIR programs by taking a cross-sectional and difference-in-differences quantitative approach to investigate the association between FIR programs and student academic success and experience. This research is part of a larger research project for which the qualitative results are presented in a separate forthcoming article.

There are various types of FIR programs (Beatty et al., 1996; Healea et al., 2015). Some embed faculty in university organisations where they share the educational duties or work with the organisations. Others involve having faculty reside in the residence halls to provide academic support and initiatives to the residents. In programs where the faculty live on campus in the residence halls alongside the students themselves, the faculty has no administrative requirements, only to engage the residents intellectually and educationally where they reside. Alternatively, in the Oxford-Cambridge house style of faculty masters, based on old English styled residential colleges (Duke 1996), the faculty do have more of an administrative role in the day-to-day lives of the residential students. Another variation is the faculty fellow models, in which faculty engage students outside of the classroom in advice or programmatic activities.

In the context of the present research, the focus will be on the first variant of FIR programs. To examine this variant of FIR programs, the unit of analysis is the FIR program at a large public university in northern California. The institution is internationally diverse and situated in a large urban city. Its student population is on average 35,000 students, 12% of which are international students, and of which about 70-80 international students are estimated to have lived in residential communities on campus during the time of this study.

The FIR program was first introduced to University Housing Services (UHS) in the fall of 2016 with a cohort of nine faculty members. The goal for the FIR program has been to enhance student learning by integrating the value of academic life with the residential experience into a seamless living-learning environment. The impetus of this study is to investigate how well this goal has been achieved.

### ***Theories of learning related to residential life and learning outside the classroom***

Classic theoretical frameworks for explaining how students best learn in college have long suggested that greater student involvement is linked to better educational outcomes (Astin, 1993). When students are more involved with classroom discussions, outside classroom student activities, and residence hall programs, they exhibit higher rates of learning and achievement. Other theories have similarly argued that student achievement is related to the quality of effort students put forth in investing in their own education, including their use of institutional facilities, and cultivation of meaningful interactions in the personal and social aspects of college life, including interactions with faculty outside of the classroom (Pace, 1982). Subsequent researchers have investigated these theories empirically (Hu & Kuh, 2003; Webber et al., 2013) and ignited innovations such as the development of living-learning centers (LLCs) in residence halls. In fact, investigations from international researchers indicate that student integration into learning communities is an indicator that is highly associated with student success (Krause et al., 2005; Muldoon & Macdonald, 2009; Tinto, 1998).

Nonetheless, most of the literature on student success is primarily focused on activities that occur inside the classroom. Even studies focused on the social interactive aspects of student success are primarily limited to social interaction within classroom spaces (Joyce et al., 1992) or focused on how outside classroom interaction influences curriculum delivery inside the classroom (Ermeling & Yarbo, 2016). Few studies have examined the role of faculty in student success and achievement outside of the classroom and in residential settings. Exceptions to this include Armstrong (1999), Blimling (2015), Healea et al. (2015), and Muldoon and Macdonald (2009).

### ***Research on faculty interaction with students in residence halls***

Although the literature on LLCs—which encompasses FIR programs, but includes other forms of learning communities—has been broad (Garrett & Zabriskie, 2003; Inkelas et al., 2007), research on the specific impact of faculty residing in residence halls is the smallest and most limited sub-area. Multiple studies of faculty-student engagement, in general, demonstrate positive outcomes correlated with faculty-student interaction. However, there is conflicting empirical evidence on which type, and quantity of engagement are beneficial. For example, no empirical research exists comparing the relative impact of assigning FIRs to LLCs versus the general residential population.

Similarly, the literature on LLCs demonstrates conflicting results of student benefits in relation to faculty-student interaction (Healea et al., 2015). To illustrate, the study of the data from the National Study of Living-Learning Programs (NSLLP) reports conflicting results regarding the link between faculty-student interaction in LLCs and student succession in general. Research on faculty involvement in LLCs that focuses on first-generation college students suggests that faculty-student interaction is positively correlated toward better student educational outcomes (Inkelas et al., 2007). However, other research found no such correlation between faculty-student interaction and student outcomes for LLCs in research designs focused on women of color majoring in STEM disciplines (Johnson, 1996). Nonetheless, some international research on residential halls in Hong Kong indicate that faculty have an important association with levels of student involvement (Ting et al., 2016). Taken together, the results from the extant literature suggest that the types, levels, and contextual settings of faculty-student interaction in FIR programs may be important moderators that arbitrate the influence of faculty engagement on student learning outcomes. Further, the literature suggests that interest in the impact of faculty-student engagement in residential college settings on student academic outcomes is not a western academic interest alone, but an international one as well (Ting et al., 2016).

## The present research

While there is a growing literature in the field of faculty-student interaction, few studies have specifically tested the relationship between FIR programs and student success. While extant research suggests positive links to student achievement stemming from student participation in LLCs and faculty-student interaction, there is less investigation into the role that FIRs have in contributing to that success. Additionally, there is no research to our knowledge that has empirically compared the relative efficacy of different types of FIR programs.

### ***Conceptual model***

We aimed to study the effect of FIR programs on (1) student success and (2) quality of student experience. For indicators of student success, we measured three variables: (i) cumulative grade point average (GPA), (ii) year-to-year retention, and (iii) credits earned per unit attempted. For the quality of student experience, we used students' rating of overall quality of educational experience on the National Survey of Student Engagement (NSSE). Other available indicators associated with student success, such as graduation rate, were not included given that it did not apply to all participants in the sample.

### ***Research questions***

Based on the literature review, we developed the following research questions:

**Research question 1 (RQ1):** What was the relationship between the implementation of the FIR program to indicators of first-year student success in LLCs pre and post FIR introduction as compared to first-year students living in the general residential population during both time periods?

**Corresponding hypothesis (H1):** The introduction of an FIR program to LLCs is correlated with a positive average treatment effect on student success outcomes in those communities.

**Research question 2 (RQ2):** Did the presence of FIRs affect the residents' report of the overall quality of residential experience?

**Corresponding hypothesis (H2):** The introduction of the FIR program is correlated with a positive average treatment effect on the reports of the overall residents' college experience in LLCs, as reported in the spring 2014 NSSE compared to the spring 2017 NSSE.

**Research question 3 (RQ3):** Does the level of interaction with FIRs affect student success across resident groups?

**Corresponding hypothesis (H3):** The level of FIR-student interaction positively correlated with the variables of student success in both LLC residents and non-LLC residents who participated in FIR program events, as compared to those who did not.

### **Data collection and description**

To answer the first and second questions, we drew from repeated cross-sectional data of students living in LLCs and general residential students prior to the introduction of FIRs in the LLCs. To answer the third question, we utilized cross-sectional data from one time period where observations of individual student interactions with FIRs were present in LLC and general residential students. Data collection for the indicators of student success and experience came from both aggregated group levels for the first two questions and the individual level for the third.

The first set of data consisted of first-year students who self-selected to reside on campus in general residence halls or LLCs and was collected at six different yearly time periods starting with academic year (AY) 2013-2014 and ending in AY 2018-2019. The mean average of the variables of interest was calculated for the period prior to the inclusion of the FIR program (from AY 2013-2014 to AY 2015-2016) and after the inclusion of the FIR program (from AY 2016-2017 to AY 2018-2019). These data constituted aggregated group-level observations from two periods of time (i.e., repeated cross-sections). The second set of data was collected from first-year LLCs and non-LLC students who responded to the Spring 2014 and 2017 NSSE survey questions about their overall educational satisfaction (i.e., another repeated cross-sections) and constituted aggregated group level observations. The third set of data was collected from one period, AY 2018-2019, and contained observation of individual students about where they resided (i.e., non-LLC residents, LLC residents, and non-residents) and their participation in FIR-led programs as identified by their registration using the SAMMY app, an official university engagement app, to verify attendance at engagement events. Participation in FIR programs were optional/voluntary. Individual students in each of these data sets were identified by their student identification numbers. That data was provided to the university's Institutional Research office, which in turn provided a de-identified data set of the students with their student success and NSSE data to the researchers. The data for the first and second questions were aggregated at the group level for analysis, while individual-level data were used for the third question.

The dependent variables in the first and third questions were student success variables as indicated by grade point average (GPA), retention, and credit achievement/unit attempted. The dependent variable for the second question was student experience as indicated by student responses on the spring 2014 & 2017 NSSE reporting overall satisfaction with their educational experience. For the first question, the independent variables consisted of binary indicators of residential status, and residential status conditioned by occurring prior to or post-FIR implementation. For the third question, GPA, retention, and unit/credit achievement data were compared across cohorts and as a function of student participation in FIR program events to identify if FIR-student interaction had a positive impact on those variables of student success, and whether such impact depended on their residency, in an LLC or not. Control variables of gender and race were used for each data set.

### **Summary statistics**

Below are the descriptive statistics of the entire sample population and the dependent variables used to conduct the quantitative analysis.

Table 1

*Summary Statistics for Variables of Interest*

Variable	Sample size	Mean	Std. Dev.	Min	Max
Total Number of Students	33,795	9045.21	5406.65	1	18,891*
Combined Semester GPA	23,141	2.88	.717	0	4.0
Credit Earned/Unit Attempted	23,143	.90	.17	0%	100%
Retention	33,795	.79	.407	0%	100%
2014 and 2017 Quality of Educational Experience	1,076	3.03	.658	1	4

Note: The GPA is the fall and spring GPA combined. The credit earned/unit attempted (CE/UA) is a percentage of the number of credits earned compared to the number of units attempted averaged between both the fall and spring semesters. Retention indicates if the percentage of students retained from one semester to the next.

\*Total number of unique students

The student demographics of the population observed are listed in Table 2 below.

**Methods of analysis**

The method of analysis used for the first question was a repeated cross-sectional academic model. The analysis used for the second question was a repeated cross-sectional experience model, and the analysis used for the third question was a single cross-sectional academic model.

For RQ1, the first repeated cross-sectional academic model, we first employed an independent t-test to examine the mean average differences of the student success variables in LLC students after the introduction of the FIR program. This was compared to the non-LLC student success variables. Then, we utilized a two-by-two difference-in-differences (DID) analysis to calculate both the differences of the effect of the FIR implementation between both groups and the average effect of the implementation on the LLC group. The DID method has been a reputable method to estimate the effect of a treatment on treated groups in quasi-experimental research (Abadie & Cattaneo, 2018; Angrist & Pischke, 2009; Ashenfelter & Card, 1985; Blundell & Dias, 2009; Imbens &

Wooldridge, 2009; Pischke, 2007; Wing et al., 2018). It was specifically useful for analyzing aggregate data to evaluate an average programmatic impact on groups of different individuals in pre and post settings (Angrist & Pischke, 2009; McEwan, 2010) where analysis does not rely on tracking individuals over time (Imbens & Wooldridge, 2009). An example was the study of the impact of a policy intervention on two different cohorts of secondary students separated by a decade (Pischke, 2007). Since the individuals observed were viewed from a two-period and two-group perspective, meaning that the individuals in the pre-FIR group were not present in the post-FIR group, our 2 x 2 DID model does not include group and time effects. By conducting a DID regression, we can calculate the average treatment effect on the treated group, the LCC group, and estimate the differences between mean averages of the variables of interest with and without the implementation of the FIR program. All analyses were done using Stata.

Table 2

*Student Demographics*

AY	Ethnicity					Gender			Other				
	*AI	Asian	Black	Hispanic	**HNPI	White	2 <sup>≥</sup> Race s	Unk	F	M	Unk	Pell	1 <sup>st</sup> Gen
2013-2014	11	1,114	290	985	13	861	244	259	1,792	1,884	101	1,436	889
2014-2015	7	1,105	290	1,098	21	866	244	306	1,879	1,920	138	1,547	992
2015-2016	8	1,078	298	1,143	14	778	248	416	1,902	1,874	207	1,442	933
2016-2017	11	1,663	398	1,692	27	1,082	335	3,584	2,752	2,752	3,288	2,038	1,308
2017-2018	3	766	150	866	13	373	147	1,814	1,249	1,149	1,734	1,037	674
2018-2019	7	1,945	420	1,905	38	996	391	3,472	3,149	2,809	3,216	2,223	1,385
Total s	47	7,671	1,846	7,589	126	4,957	1,689	9,859	12,723	12,388	8,684	9,722	6,181

Note. This table displays student demographics by Academic Year.

\*AI= American Indian; \*\*HNPI = Hawaiian Native Pacific Islander; Unk = unknown; Pell = Pell Grant recipient

For RQ2, the repeated cross-sectional experiential model, the team conducted an independent t-test to examine cohort response differences to the spring NSSE 2014 and 2017 question, *How*



*would you evaluate your entire educational experience at this institution?* This question was measured on a 4-point Likert scale from 1 being poor to 4 being excellent. We also conducted a DID analysis similar to the analysis for RQ1 to identify the average treatment effect on the LLC group for how they responded to this survey question. All analyses were done using SPSS.

For RQ3, the single cross-sectional academic model, we used Pearson's correlations and MANOVA to compare indices of student success (GPA, units earned, and retention) across all students from 2018-2019 as a function of participation in FIR events and included those who lived both off and on-campus and in both in LLC communities and not. The MANOVA model used residency status (on-campus resident vs. off-campus), LLC status (in a live-in learning community vs. not), and FIR interaction (attended at least one FIR event vs. not) as factors to test for differences in student outcomes (GPA, the ratio of credits earned to units attempted, and retention). Results revealed a similar, albeit more nuanced, pattern to the correlation results which will be discussed in the results below. The impact was determined first based on the correlational differences between residents who did have interactions with FIR versus those who did not. A follow-up analysis compared the impact of FIR participation and residency status simultaneously on student outcomes. All analyses were conducted using SPSS.

Based on our analytical models above and the research questions, the first and second methods of analysis address the relation between FIR presence in a community to student success and student quality of experience. The third method of analysis investigated the relationship between levels of student engagement with FIRs and variables of student success. An advantage of using these different models with separate cohorts of residential students from each of the data sets was that, in addition to assessing the relationship of the presence of FIR in a residential community to student outcomes, the type, and level of interaction effect can also be investigated. Furthermore, comparing aggregate group data both prior to and after program implementation provides a control group that, in effect, constituted a quasi-experimental design.

## Results

The first set of results reported below is the descriptive statistics. The results from the independent t-test and DID analysis, and cross-sectional analysis follow.

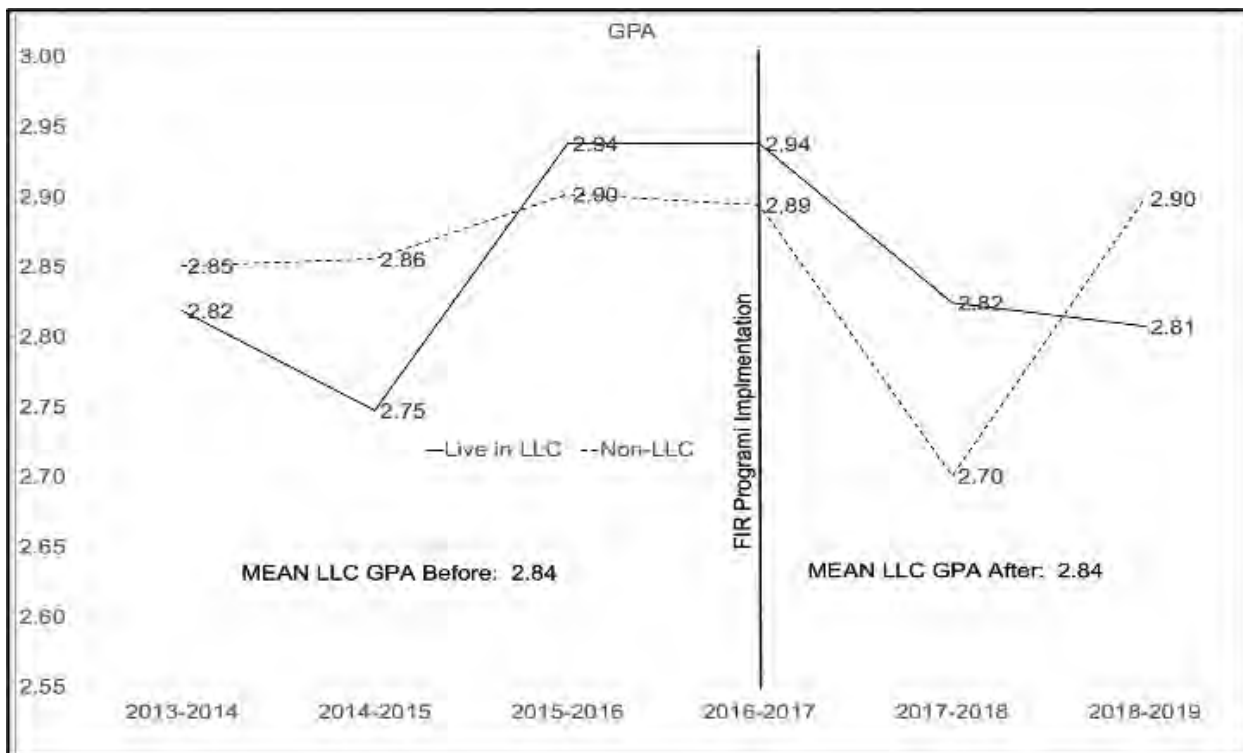
### ***Repeated cross-sectional academic impact model results***

For RQ1, the mean for the GPA appears to show no change for all students in the LLC group after the introduction of FIRs to the LLCs, as depicted in Figure 1.

There appears to be a slight decrease in the mean retention percentage, from 87% prior to the inclusion of FIRs to the LLCs, to 86% after their inclusion, as shown in Figure 2.

Figure 1

Descriptive Graphic of GPA pre- and post- FIR Program Implementation



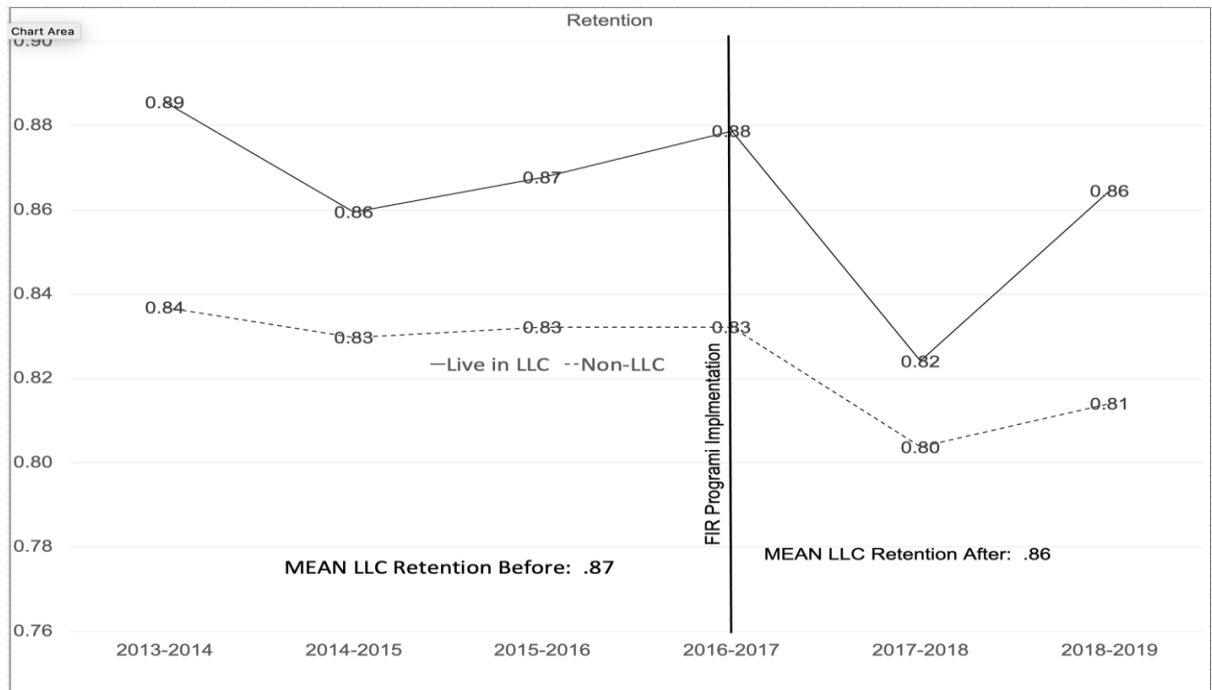
Results of the independent t-test to confirm if mean differences between LLC and non-LLC are statistically significant, the difference between the differences of pre-post LLC and non-LLC, and the average treatment effect on LLCs are reported in Table 3.

There appears to be a slight increase in the ratio of credits earned to units attempted by students in the years following the introduction of FIR to LLCs (84% prior as compared to 91% post-FIR introduction to LLCs), as shown in Figure 3.

The descriptive charts in Figures 3, 4, and 5 initially appear to show no discernible significant change in the expected outcomes after the implementation of the FIR program. The independent t-test confirms that the difference between the LLC and non-LLC groups in either period for GPA is not statistically significant. However, the independent t-test reveals that the difference in means between the LLC group and non-LLC group is statistically significant in pre- and post-settings for credit earned/unit attempted and retention.

Figure 2

*Descriptive Graphic of Retention pre- and post- FIR Program Implementation*

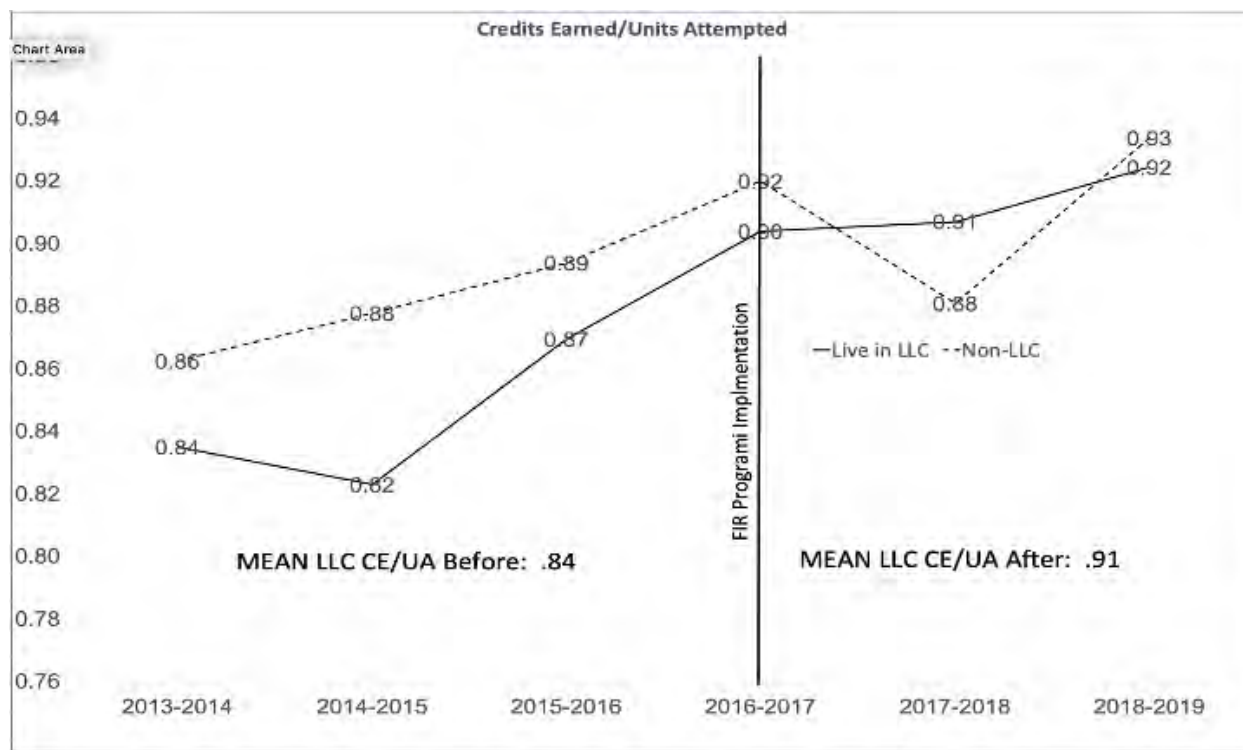


To ascertain if the presence of FIR influences post-LLC versus pre-LLC, as compared to pre-post non-LLC for all three variables of interest, the critical result of interest then is the average treatment effect on the treated groups (ATET). The ATET is the average treatment effect of the FIR program on the treated group (i.e., LLC) and can be interpreted as the difference-in-differences of what the mean outcome of the treated group would be, if not for the treatment.

According to Table 3, the difference between the differences of the post and pre-effect of FIR presence between LLC and non-LLC (i.e., the change in LLC minus the change in non-LLC after the introduction of FIRs to the LLC) is .04 for GPA, 3.56 for CE/UA, and -.28 for retention. However, when we run the DID regression analysis of those difference-in-differences to identify the average treatment effect on the treated group, we discover that the ATET for the LLC group is .006 for GPA, .029 (or 2.9%) for CE/UA, and .001 (or .10%) for retention. All three results were statistically significant at the 0.000 level. While on face value it appears that the implementation of the FIR program had no effect on GPA, a modest effect on CE/UA, and a negative effect on retention, according to further statistical analysis using the DID method, the mean GPA would have actually been 2.83, instead of staying even at 2.84, the CE/UA would have been 88.3% instead of 91.2%, and retention would have been a tenth of a percent lower (i.e. 85.48% instead of 85.58%). Thus, the results demonstrate a positive and statistically significant average treatment effect on the student success variables of interest for students residing in the LLC due to the implementation of the FIR program.

Figure 3

*Descriptive Graphic of Credit Earned/Units Attempted pre- and post- FIR Program Implementation*



### **Repeated cross-sectional experiential model results**

In response to the question: *How would you evaluate your entire educational experience at this institution?* a total of 308 non-LLC residents and 40 LLC residents responded in 2014 and 647 non-LLC residents and 81 LLC residents responded in 2017. Their mean response to the questions, from a Likert scale of 1 to 5, the difference-in-differences, and the average treatment effect on the response from LLC residents in 2017 with FIR present are reported in Table 4.

The results indicate that there was no statistically significant difference in mean ratings of educational experience between students who participated in the spring 2014 and 2017 administrations of NSSE. However, the mean response to the question about the overall educational experience for LLC residents rose from 2.9 in spring 2014, before FIR presence, to 3.11 in spring 2017, after FIR presence. Furthermore, the results of the DID regression analysis of responses from LLC students and non-LLC students, prior to and after the implementation of the FIR program, reveal that the difference-in-differences is .20 and the average treatment effect on the LLC group (ATET) by accounting for FIR presence is .215 and is statistically significant at the .001 level. According to these results, the mean response of the 2017 LLC group would have been .215 less (i.e., 2.90 not 3.11) without the presence of the FIR. These results confirm other research

Table 3

*Difference of Mean pre and post, Independent t-Test comparison, DID and ATET*

DV	Pre-Post and Diff. (post-pre)	LLC			Non-LLC			T-test comparison		
		n	M	SD	n	M	SD	Mean Diff (LLC-Non)	P-Value	95% CI
GPA	Pre	1065	2.84	0.71302	8104	2.87	0.68694	-0.03	0.1587	-.0123851 .0757872
	Post	1521	2.84	0.73619	10105	2.83	0.73594	0.01	0.1986	-.0136552 .0656985
	Diff. (post-pre)		0			-.04	DID=	.04	ATET =	.0056794***
CE/UA	Pre	1065	84.28%	0.00606	8104	87.83%	0.18161	-3.55	0.0000	.0224681 .0459214
	Post	589	91.20%	0.00823	4015	91.19%	0.18971	0.01	0.0202	.0030562 .0361038
	Diff. (post-pre)		6.92			3.36	DID =	3.56	ATET =	.0293131***
Retention	Pre	1122	87.1%	0.33757	9023	83.29%	0.37301	3.81	0.0021	-.058915 -.0130882
	Post	2303	85.58%	0.34415	16697	82.05%	0.37936	3.53	0.0000	-.0534211 -.0207199
	Diff. (post-pre)		-1.52			-1.24	DID=	-2.8	ATET =	.0010689***

Note. This table displays the difference between the mean effect of the post and pre-effect of FIR presence between LLC and non-LLC, the independent t-test comparison between those two groups, the difference between the differences in the post and pre-effect of FIR presence between LLC and non-LLC, and the average treatment effect on the groups with FIR presence.

\*\*\*Significant at  $p < .001$

that shows similar correlations between faculty-student engagement and measures of overall satisfaction with college experience (Li et al., 2005; Ting et al., 2016).

Table 4

Mean Responses, Independent t-Test, DID and ATET for LLC compared to non-LLC

NSSE question	Pre-post LLC			Non-LLC			T-test comparison				
		n	M	SD	n	M	SD	Diff (LLC-non-LLC)	P-value	95% CI	
How would you evaluate your entire educational experience at this institution?	Spring 2014	40	2.9	.7089	308	3.02	.65049	-0.12	0.280	-0.098104 3	.333651
	Spring 2017	81	3.11	.5924	647	3.03	.66715	0.08	0.30240	-.2332838 32	.072400
Diff (2017-2014) =			.21			0.01		DID (LLC-non-LLC) = .20	ATET =	.215***	

Note. \*\*\*Significant at  $p < .001$

**Single cross-sectional academic impact model results**

To address the question: *How are FIR event attendance and residential status associated with student outcomes?*, results from Pearson’s correlations revealed that attendance in FIR events, coded dichotomously for attended or not, then summed across all events for the academic year 2018-2019, was associated with an increased ratio of credits earned to units attempted ( $r = 0.039$ ,  $p < 0.001$ ) as well as higher combined semester GPA ( $r = 0.018$ ,  $p = 0.008$ ). Moreover, FIR event participation was also linked to both retention ( $r = 0.012$ ,  $p = 0.043$ ) as well as time to graduation, with greater attendance correlating with fewer semesters needed to graduate ( $r = -0.039$ ,  $p < 0.001$ ). Interestingly, residential status and enrollment in LLCs by themselves were inversely correlated with these student outcomes. Residents of LLCs and on-campus residents exhibited lower ratios of credits earned to units attempted ( $r = -0.038$ ,  $p < 0.001$  and  $r = -0.021$ ,  $p = 0.002$ , respectively) as well as performed worse, in terms of combined semester GPA ( $r = -0.023$ ,  $p = 0.001$  and  $r = -0.021$ ,  $p = 0.002$ , respectively). Additionally, LLC status was positively related to

retention ( $r = 0.026, p < 0.001$ ); no relationship emerged between residency and retention,  $r = -0.002, p = 0.76$ ). Table 5 depicts a summary of the full correlation matrix.

Table 5

*Correlations of FIR events attended, participation in a learning community (LLC), residential status (on-campus vs. not), and student outcomes (ratio of credits earned to units attempted; GPA; and retention)*

Predictor	Ratio (credits)	GPA	Retention
FIR events	.039***	.018**	.012*
LLC	-.038***	-.023**	.026***
Residential	-.021**	-.021**	-.002

Note. \*\*\*Significant at  $p < .001$ , \*\* Significant at  $p < .01$ , \* Significant at  $p < .05$

To address the question: *Are there differences in student outcome across residential groups as a function of participation in FIR events?* two sets of MANOVAs were computed. As an initial test of this hypothesis, residents were compared to non-residents: a MANOVA with residency status, on campus vs. off, and FIR interaction, attended at least one FIR event or not, as factors to test for differences in student outcomes (GPA, ratio of credits earned to units attempted, retention) revealed no significant main effects or interactions (all  $p$ 's  $> .12$ ). A subsequent MANOVA examined the effect of FIR interaction among residents living on campus using LLC status and FIR interaction to predict the same student outcome variables of interest. This revealed a marginal effect of LLC status on ratio of credits ( $F(1, 20805) = 2.75, p = .098$ ), as well as a significant effect of FIR interaction on all three outcome variables: GPA ( $F(1, 20805) = 11.54, p = .001$ ), ratio of credits ( $F(1, 20805) = 36.38, p < .001$ ), and retention ( $F(1, 20805) = 5.93, p = .015$ ). Non-LLC residents had marginally higher ratios ( $M = .93, SE = .004$ ) compared to LLC residents ( $M = .91, SE = .008$ ). Those who attended FIR events exhibited better outcomes across the board: higher GPA ( $M = 3.00, SE = .038$  vs.  $M = 2.87, SE = .008$ ), higher ratio ( $M = .95, SE = .009$  vs.  $M = .89, SE = .002$ ) and better retention ( $M = .94, SE = .016$  vs.  $M = .90, SE = .003$ ). No other main effects or interactions were significant (all  $p$ 's  $> .16$ ).

## Discussion

Taken together, all three analytical models contribute to the suggestion that the implementation of the FIR program was positively correlated with student learning outcomes. However, the differences between the repeated cross-sectional analysis of the academic impact and experience models and the single cross-sectional academic impact model demonstrate that the mere presence of faculty in the residence halls is not enough to elicit dramatically positive effects of student success. Rather, a higher frequency of FIR-student interactions is correlated with higher amounts of student success. Specifically, findings indicate that FIR event participation correlates with all indices of student success, including credits earned, GPA, and retention, which was particularly notable, given that both living on campus in general and in an LLC, in particular, were negatively

correlated with a number of these outcomes. Said differently, living on campus by itself appears to be a double-edged sword that is associated with better retention but worse student performance; in this context, implementation of FIR programming becomes even more important. Cross-sectional findings comparing the impact of FIR interaction across different groups of students (i.e., those living on campus versus off, in an LLC versus not) revealed that having FIR interaction was linked to better outcomes (i.e., GPA, credits earned, retention).

In thinking about broader international implications, research on residence hall satisfaction demonstrates that domestic students are more satisfied with their resident halls than international students (Li et al., 2005). Assuming this is true, the results of this study would seem pertinent to understanding the importance of faculty interaction with students, not just outside of the classroom, but specifically in residential hall settings, in making students, especially international students, feel welcomed on campus and given a sense of belonging. Given the diversity of ethnic demography at the university this research investigated, which is an Asian and Hispanic serving institution, it would seem that the patterns observed in the findings of this study could apply to other international academic settings where international students must overcome the initial cultural shock.

Overall, this research extends the current knowledge of the interaction effects of faculty and students by demonstrating a novel quasi-experimental method to study faculty-student interactions and their effect on student success measurements. As such, it contributes to the theory building by empirically demonstrating not only that that interaction is important, but the quality of that interaction matters as well.

### **Limitations and future research**

The results of this research suggest that, overall, the FIR program had a positive impact on student success. However, there are some caveats and limitations. The results observed from the DID analysis relied on a major assumption that all the students within the LLC post-FIR implementation had some level of interaction with the faculty. That data does not exist, just the fact that the FIR program was in effect or not. Therefore, the team employed an additional cross-sectional analysis for the year that FIR-student interaction data existed. Further, assumptions of a parallel trend between the treatment group, the LLC, and control group, the non-LLC, could not be confirmed due to the lack of group and time effects in the model and the potential for several theoretical reasons that account for differences between groups, such as economic shock or varying levels of participation in each group, as in this current study. Nonetheless, recent advancements in DID analysis suggest that such DID analysis can still be carried out despite violations of the parallel trends assumptions (Rambachan & Roth, 2019; McKenzie, 2020). Therefore, to not overly rely on data that only captures the presence of FIR, further investigation of interaction over time is necessary (i.e., panel data that is balanced over time periods). Additionally, the aggregate nature of the group data did not differentiate between individual demographics such as gender or race. Thus, while our results seem to replicate results of current research showing that overall student interaction with faculty increases student success (Cuseo, 2018; Komarraju et al. 2010), our study did not confirm other studies that parse results by student demographics, such as Inkelas et al. (2007) and Sax et al. (2005). Future studies should ideally use a *multi-lab* approach to examine the relationship between FIR programming/engagement and student outcomes across institutions that vary demographically to test the moderating role of race/ethnicity, class, and other social group memberships more stringently.



## Conclusion

Student success in higher education should be the goal of all administrators, staff, and faculty. Given the fact that faculty are so critical to the conveyance of education and the contribution of student learning success, university administrators and residential life professionals should fully support and facilitate programs like faculty-in-residence programs. This research project indicates that while FIR programs overall appear to contribute to student success, the magnitude and direction of this link hinges on the level of that interaction between students and faculty. Understanding those nuanced relationships creates greater opportunities for student engagement, student sense of belonging, and student success.

This study contributes to the understanding of the impact of employing an FIR program in higher education, both in Western settings and other international settings. It supports the theoretical assumptions that faculty engagement with students outside of the classroom leads significantly toward student learning success. Further empirical research into the correlational effects of faculty-student interaction based on race, gender, nationality, and time in residential educational programs is necessary to further isolate the beneficial aspects of this phenomenon. Therefore, more research and data development are needed to confirm not only the effect from frequency of interactions between faculty and students in residential settings, but also the quality of that interaction on overall student learning success. The answers to the research questions presented by this investigation provide a starting point for similar research on the impact of FIR programs. Future researchers should further explore the potential of faculty-in-residence programs to better contribute to the accomplishment of the overall university mission.

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