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A Longitudinal Analysis of Institution of Higher Education Faculty Engagement

in a Math and Science Partnership Project

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Research for Better Schools

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Introduction

In recent years, in response to increasing national concern about student achievement and teacher quality in the American K–12 education system, institutions of higher education (IHE) were urged by the federal and state government to shoulder shared responsibility for improving the mathematics and science education in their neighborhood districts (The National Science Board, 1999). The most noteworthy of such development efforts is the Math and Science Partnership (MSP) Program sponsored by the National Science Foundation (NSF). MSP projects provide opportunities for science, technology, engineering, and mathematics (STEM) disciplinary faculty from IHEs to contribute to K–12 education reform efforts through engagement in educational activities with K–12 pre-service and in-service teachers[1] and in research activities related to teacher content knowledge and content-specific teaching skills. As a result, more and more STEM faculty members at four-year and two-year IHEs are becoming involved in applied research that directly relate to K–12 teaching and learning (Zhang, McInerney, & Frechtling, 2010). The extension of faculty work to include partnership with local community stakeholders outside academe calls for an innovative approach to assessing faculty productivity and scholarship that goes beyond the traditional roles of teaching and research.

Since the early 1990's, increasing economic and political pressures have focused state legislative interest on faculty productivity and scholarship in IHEs (Presley & Engelbride, 1998). The availability of nationally representative data collected by NCES and NSF, such as the

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[1] Pre-service teacher is defined as "One who has declared an education major but has not yet completed training to be a teacher;" in-service teacher education is defined as "additional professional development, usually through formal course work and practical application, of persons currently employed as classroom teachers." (Source: education.com)

National Study of Postsecondary Study (NSOPF), Integrated Postsecondary Education Data (IPEDS), and Survey of Earned Doctorates (SED) has also generated tremendous research opportunities on such topics as job satisfaction (e.g., Rosser, 2005); equity issues in earnings, tenure and promotion (e.g., Perna, 2001; Perna, 2002); and departure (e.g., Rosser & Townsend, 2006) of IHE faculty. Despite the continuing growth of literature on the relationships between faculty research and teaching or work and life, conspicuously absent from the research to date is an informed discussion of the extent and nature of service-oriented scholarship and its impact on faculty's own research and teaching practice. One of the key barriers to engaging faculty in community/university partnerships, especially for early-career faculty members, is the prevailing institutional reward structure that undervalues service and teaching relative to research (Braxton, Luckey, & Helland, 2002). How do institutional and community leaders engage faculty within a system that undervalues service in the tenure and promotion process? This study aims to provide a longitudinal analysis of individual and institutional factors that explain differences of 119 STEM faculty members with respect to their breadth, intensity, and persistence of engagement in NSF-funded Math and Science Partnership Greater Philadelphia project (MSPGP), using four years of survey data (2003–2007). Specifically, the study will shed light on the conditions within departments and institutions that might entice or motivate more faculty to become involved in activities that aim to improve learning and teaching in K–12 classrooms. In this paper, we address the following research questions:

1. What kinds of activities tend to attract higher levels of involvement by IHE faculty? Does extent of engagement in each activity vary by type of institution, academic discipline, gender, race/ethnicity, or tenure status?

2. What demographic, career status, and institutional factors are significantly associated with the breadth and intensity of one's overall engagement in MSPGP? And do these

associations vary by type of activity, i.e., preservice, in-service and management

activities?

3. In what ways do faculty members who persist in the MSPGP (stayers) differ from those

who leave the program early (leavers)?

Due to the longitudinal and hierarchical nature of the data, this study will explore multilevel

sources of variance that predict breadth and intensity of engagement among college faculty in the

MSPGP during 2003–2007. Building upon national descriptive studies of faculty engagement

(Zhang et al., 2008; 2007), a three-level hierarchical linear model (HLM) is used to explain the

proportion of variance attributable to temporal, individual, and institutional level variables,

respectively. Suggestions for future research about effective engagement of college faculty in

similar efforts to reform secondary mathematics and science education are explored.

Background & Conceptual Framework

The National Science Foundation (NSF) created the MSP Program to address national

concern about the educational performance of U.S. students in mathematics and science. The

mission of the program is to ensure today's students learn the disciplinary content knowledge

and skills required by the global marketplace. To achieve this goal, MSPs provide opportunities

for science, technology, engineering, and mathematics (STEM) disciplinary faculty from

institutions of higher education (IHE) to contribute to reform efforts through engagement in

educational activities with preservice and in-service K–12 teachers, and research activities

related to development and improvement of teacher pedagogical content knowledge.

Descriptive studies have explored types of activities in which STEM faculty have engaged

(e.g., Zhang et al., 2008; 2007), and these have led to a better understanding of the complexities

of engaging disciplinary faculty in MSP work. This study builds upon existing research and uses

a three-level HLM analysis to estimate the amount of variance in faculty engagement that can be

explained by (1) repeated measures through the use of an annual survey, (2) faculty characteristics, and/or (3) institutional characteristics.

The conceptual framework undergirding this study reflects the perspective that engagement in organized and structured activities can be measured in two separable dimensions of engagement: breadth (number of different types of activities one is involved in) and intensity (average involvement frequency) (Rose-Krasnor et al., 2006). Limited evidence is available about how breadth and intensity may be related and how each may be uniquely related to positive improvement of a community. Fletcher and Shaw (2000) interpreted intensity of involvement in a small number of activities as reflecting specific interest or talent, while involvement in a large number of community activities was considered an indication of community integration. Jacobs et al. (2005), on the other hand, used several measures reflecting breadth of involvement to assess links between the activities and individual perceptions of competence and values. Few researchers have examined breadth and intensity of engagement simultaneously and explored the extent to which the two are interrelated. This study examines multilevel factors associated with faculty breadth and intensity of engagement and assesses the relationship between these two variables within a context of university-school collaboration. Results have important implications for conceptualization and measurement of faculty engagement in K–12 educational reform efforts.

Data Source and Descriptive Statistics

The primary data that this study relies on are 119 MSPGP faculty participants' responses to the *Annual IHE Participant Survey for Comprehensive and Targeted MSPs*, conducted by Westsat during 2003–04, 2004–05, 2005–06, and 2006–07. These 119 participants come from thirteen colleges and universities in the greater Philadelphia area, including three community

colleges. More than half of the participants (55.5%) work within a science or engineering discipline such as biology, chemistry, geology, physics, or chemical engineering; about 24.4 percent work at a mathematics or/and computer science department; and about 16.8 percent come from education and humanities backgrounds (see Table 3 and Figure 1). About 46 percent of the participants are female and 52 percent have obtained tenure (i.e., professor or associate professor title). The racial/ethnic breakdown is as follows: 86.6 percent white, 2.5 percent black, 5.0 percent Hispanic, 4.2 percent Asian, and 1.7 percent other. Although most partner IHEs are predominantly white liberal arts colleges (the cohort includes one historically black university), this cohort is demographically similar to national samples of IHE faculty (80.3% white, 5.5% black, 8.7% Hispanic, 3.5% Asian, and 2.1% other: National Center for Education Statistics, 2005). The number of faculty who participated in the MSP for one, two, three, and four years are 43, 31, 16, and 29, respectively.

In general, from year 2003 to 2007, the MSPGP project involved 119 faculty members from 13 colleges for an average time of 99.85 hours per person per year in 22 different activities with an average engagement in about 4 activities per person peryear. The average length of engagement is about 2.26 years per person (however this number is underestimated because the data include 24 first-time participants engaged during the 2006-07 year who may continue their engagement in 2007-08). The total hours of engagement are about 26,860 hours (99.85 hrs x119 persons x 2.26 years). For tables and figures that display the distribution of the 119 faculty participants, please see the Appendix.

Methods

The three key dependent variables in this study are defined as follows:

1. Breadth of engagement: represented by the sum of types of MSP preservice activities, in-service (K–12) activities, and management and other activities engaged in during a year.

2. Intensity of engagement: calculated as number of hours involved in the MSP per year divided by number of activities engaged in during the same year. Intensity represents the average hours one is engaged in each activity per year.

3. Persistence of engagement: a dichotomous variable that indicates whether one stays in the program or not throughout 2003≠07. Therefore, any analysis related to persistence of engagement is based on a subsample of 46 participants who began their involvement in MSPGP in 2003.

To address the first research question, a series of frequency tables and cross-tabulations that display the joint distribution of each individual and institutional attribute variable versus breadth of engagement in preservice, in-service, and management activities were created. Next, multivariate analysis of variance (MANOVA) was applied to breadth of engagement in three categories of MSP activities with the first factor with two levels (minority, non-minority) representing race/ethnicity group, the second factor with two levels (female, male) corresponding to gender, the third factor with three levels (mathematics, science & engineering, and education & humanities) representing academic discipline, and the fourth factor with two levels (tenure, non-tenure) representing tenure status, and the fifth factor with two levels (2-year, 4-year) representing institutional type. The MANOVA was used to examine whether changes in the independent variables have a significant effect on breadth of engagement in preservice, in-service, and management activities, respectively. Due to the limitation of the IHE survey data, breadth (number of different activities) is the only outcome variable that can be examined across categories of activities.

Since the survey data involve repeated measures (annual surveys) of participation in MSP nested within teachers nested within IHEs, faculty members' breadth and intensity of engagement can be specified using a three-level hierarchical linear model (HLM). The HLM takes into account variance explained by temporal (e.g., year, tenure status), individual (e.g., gender, race/ethnicity, discipline), and organizational level (e.g., average hours of participation of peer faculty at the same institution, institution type) variables allowing intercepts and slope coefficients for selected variables to vary across individuals and colleges (Raudenbush & Bryk, 2002). Multi-level models separate unexplained error into repeated measures (level 1), person (level 2), and college (level 3) components, thereby removing correlations among error terms resulting from the nested data structure.

At level 1, the outcome is represented at temporal order t with individual i and college j as:

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}a_{1tij} + ... + \pi_{Pij}a_{Ptij} + e_{tij},$$

where $e_{tij} \sim N(0, \sigma^2)$. In this study, time-varying predictors (e.g., tenure status, temporal sequence) were entered into this model.

At level 2, each of the π_{pij} coefficients in the level-1 model becomes an outcome variable:

$$\pi_{pij} = \beta_{p0j} + \beta_{p1j}X_{1ij} + ... + \beta_{pQj}X_{Qij} + r_{Pij}$$

where $[r_{0ij}, r_{1ij}, ..., r_{Pij}] \sim N(0, T_\pi)$. In this study, person-level predictors such as racial/ethnic affiliation, gender, and academic discipline were entered here.

At level 3, each of the β_{pqj} coefficients in the level-2 model becomes an outcome variable: $\beta_{pqj} = \gamma_{pq0} + \gamma_{pq1}W_{1j} + ... + \gamma_{pqS}W_{sj} + u_{Pqj}$, wth $\vec{u} \sim N(0, T_\beta)$

In our example, the college-level predictors such as average number of hours peer faculty are involved in the MSP and institution type (2- or 4-year college) were entered here.

Unconditional means models partition the overall variance of intensity and breadth of MSP engagement into three components: (1) proportion of variance within person: $\dfrac{\sigma^2}{\sigma^2 + \tau_\pi + \tau_\beta}$;

(2) proportion of variance among faculty members within colleges: $\dfrac{\tau_{\pi}}{\sigma^2 + \tau_{\pi} + \tau_{\beta}}$;

(3) proportion of variance among colleges: $\dfrac{\tau_{\beta}}{\sigma^2 + \tau_{\pi} + \tau_{\beta}}$.

To address the engagement persistence or retention question, the demographic, career status and institutional characteristics of stayers and leavers were compared, and a multivariate logistic regression was applied with retention as the outcome variable. This comparison was based on a subsample of faculty members who first participated in the program in 2003–04.

Results

Frequency Tables of Engagement Breadth by Category of Activities

In general, in-service activities tend to attract most faculty participants in this study, as shown by the average breadth at 1.68 activities per person per year. The participants have engaged in far fewer types of activities related to management and other tasks, with an average of fewer than one activity per person per year. If we look at the engagement across gender, male faculty members tend to have higher level of participation in all three categories of activities, especially for management and other activities (male average breadth = 1.04; female average breadth =.68). These findings are illustrated in Tables 1 and 2. Due to the limitation of the survey data, it is impossible to examine whether the distribution of engagement hours also share similar patterns.

Table 1: Overall Breadth of Engagement

Breadth	N	Mean	Std Dev	Minimum	Maximum
Pre-service	269	1.58	2.21	0	11
In-service	269	1.68	2.52	0	13
Management	269	0.89	1.42	0	8

Table 2: Breadth of Engagement by Gender

Sex	N	Breadth	N	Mean	Std Dev	Minimum	Maximum
Male	155	Pre-service	155	1.65	2.29	0	11
		In-service	155	1.72	2.44	0	11
		Management	155	1.04	1.56	0	7
Female	114	Pre-service	114	1.49	2.1	0	9
		In-service	114	1.62	2.64	0	13
		Management	114	0.68	1.18	0	8

Across disciplines, mathematics faculty had the highest level of engagement breadth in management and other activities, and education and humanities faculty had the highest level of engagement breadth in preservice and in-service activities. These findings are illustrated in Tables 3 through 5.

Table 3: Breadth of Engagement—Education Faculty

Breadth	N	Mean	Std Dev	Minimum	Maximum
Pre-service	51	2.71	2.83	0	11
In-service	51	2.00	2.85	0	11
Management	51	1.1	1.53	0	8

Table 4: Breadth of Engagement Science and Engineering Faculty

Breadth	N	Mean	Std Dev	Minimum	Maximum
Pre-service	142	1.35	2.03	0	8
In-service	142	1.42	2.46	0	13
Management	142	0.51	0.88	0	4

Table 5: Breadth of Engagement Mathematics and Computer Science Faculty

Breadth	N	Mean	Std Dev	Minimum	Maximum
Pre-service	76	1.25	1.81	0	6
In-service	76	1.95	2.39	0	8
Management	76	1.46	1.89	0	7

Across type of institution, faculty at two-year institutions[2] (i.e., community colleges) tend to be engaged to in more number of in-service activities than their four-year institution counterparts

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[2] In this paper, two-year colleges and community colleges are interchangeable.

(by an average of .55 activities per person/year); and faculty at four-year institutions have been

engaged in more preservice activities than community college faculty (by an average of .57

activities per person/year). The engagement breadth in management-related activities doesn't

vary significantly across institution type, as shown in Table 6.

Table 6: Breadth of Engagement by Type of Institution

Institution	N	Breadth	Mean	Std Dev	Minimum	Maximum
4-year	223	bread_pre	1.68	2.32	0	11
		bread_in	1.58	2.41	0	11
		bread_man	0.89	1.42	0	8
2-year	46	bread_pre	1.11	1.49	0	6
		bread_in	2.13	3.01	0	13
		bread_man	0.89	1.43	0	5

MANOVA Results

The MANOVA results show that the main effects were found for academic discipline and

tenure status. The main effect for discipline is significant with $F(6, 512) = 6.99$, $p < .001$. The

main effect of tenure status was also found with $F(3, 256) = 7.42$, $p < .0001$. In addition, the

interaction effect between gender and academic discipline was also significant with $F(6, 512) =$

2.67, $p < .05$, as was the interaction effect between academic discipline and tenure status with

$F(6, 512) = 2.14$, $p < .05$. The other two-way interaction effects were previously tested to be

found non-significant and therefore are only included in the MANOVA model. Post-hoc analysis

(a least-squares mean comparison using Tukey test) for academic discipline further indicated

that, on average, education faculty were engaged in significantly more preservice activities than

were mathematics faculty (L-S mean 2.67 as opposed to 1.07, $p < .01$) and science faculty (2.67

as opposed to 1.20, $p < .01$); there are no statistical differences of engagement breadth for in-

service activities across discipline; and mathematics faculty were engaged in almost three times

more management activities than were science faculty (L-S mean .92 as opposed to .31, $p < .05$).

In particular, male education faculty were engaged in the highest number of preservice activities

(L-S mean = 3.09), while female science faculty were engaged in the lowest number of preservice activities (L-S mean = .95; the difference is significant with $p < .05$). Male education faculty were engaged in the highest number of in-service activities (L-S mean = 3.25) while male science faculty were engaged in the lowest number of in-service activities (L-S mean = 1.04; the difference is significant with $p < .05$); male mathematics faculty were engaged in the highest number of management activities (L-S mean = 1.35) while female science faculty were engaged in the lowest number of management activities (L-S mean = .24; the difference is significant with $p < .0001$.

Post-hoc analysis for tenure status further indicated that tenured faculty were engaged in more MSP activities than non-tenured faculty or staff in preservice (2.03 as opposed to 1.27, $p < .05$), in-service (2.09 as opposed to 1.28, $p < .05$), and management and other tasks (.98 as opposed to .28, $p < .001$). In particular, tenured education faculty were engaged in the highest number of preservice activities (L-S mean = 3.08) and non-tenured mathematics faculty were engaged in the lowest number of preservice activities (L-S mean = .48; the difference is significant with $p < .001$); tenured education faculty also were engaged in the highest number of in-service activities (L-S mean = 2.67) while non-tenured mathematics faculty were engaged in the lowest number of in-service activities (L-S mean = .61; the difference is significant with $p < .05$); however, tenured mathematics faculty were engaged in the highest number of management activities (L-S mean = 1.48) while non-tenured education faculty were engaged in the lowest number of management activities (L-S mean = .23; the difference is significant with $p < .05$).

HLM Analysis Results

As indicated in the summary of Level-1 (within teacher) variables (Table 7), average hours of engagement per person per year totaled 99.85 hours, average intensity of engagement was 33.13 hours per activity, and 59 percent of respondents were tenured faculty. Preliminary

analysis shows that annual levels of individual faculty breadth of engagement range from 1 to 22

activities (*M* = 4.14, *SD* = 4.20). Faculty spent an average of 33.13 hours on a particular activity

during a given year, with a range of 3.33 to 240 hours per activity (*M* = 33.13, *SD* = 35.54).

*Table 7: HLM Results—Level 1—Within Teacher (*N = 269

Variable Name	Mean	S.D.	Minimum	Maximum
Participate in PreService	0.52	0.50	0.0	1.0
Participate in In-Service	0.52	0.50	0.0	1.0
Participate in Management	0.41	0.49	0.0	1.0
Breadth in Pre-Service	1.58	2.21	0.0	11.0
Breadth in In-Service	1.68	2.52	0.0	13.0
Breadth in Management	0.89	1.42	0.0	8.0
Breadth in Total	4.14	4.20	1.0	22.0
Hours	99.85	81.28	10.0	240.0
Intensity	33.13	35.54	3.3	240.0
Tenure	0.59	0.49	0.0	1.0

Table 8 summarizes level-2 variables and shows that 45 percent of participants were female,

13 percent were members of a minority group, and 53 percent are science faculty and are

compared with faculty of mathematics and mathematics education (the reference category).

*Table 8: HLM Results—Level 2—Between Teachers (*N = 119)

Variable Name	N	Mean	S.D.	Minimum	Maximum
Female	119	0.45	0.50	0.0	1.0
Minority	119	0.13	0.34	0.0	1.0
Science Dept.	119	0.55	0.50	0.0	1.0
Education Dept.	119	0.17	0.38	0.0	1.0

Table 9 shows that mean faculty engagement at the college level is 107.16 hours, mean

intensity per activity is 38.22 hours, and average breadth of engagement is 4.17 activities.

Twenty-three percent of IHEs are community colleges. Mean levels of engagement in

preservice, in-service, and management activities are 1.71, 1.65, and .82 activities, respectively.

*Table 9: HLM Results—Level 3—Between Schools (*N =13*)*

Variable Name	N	Mean	S.D.	Minimum	Maximum
Tenure %	13	0.52	0.28	0.0	0.9
Mean Hours	13	107.16	43.99	48.1	225.0
Mean Intensity	13	38.22	23.37	18.6	111.3
Mean Breadth	13	4.17	1.05	2.4	6.0
Minority %	13	0.13	0.25	0.0	0.9
Community College	13	0.23	0.44	0.0	1.0
Mean Pre-Service	13	1.71	0.68	0.6	2.8
Mean In-Service	13	1.65	0.86	0.6	3.4
Mean Management	13	0.82	0.36	0.1	1.5

Unconditional means model results (as shown in Tables 10 and 11) indicate that variance components at all 3 levels are statistically significant for intensity, hence a 3-level HLM is necessary to study intensity of engagement. However, between-college variance is not significant for breadth ($p > .50$), suggesting that while effects of individual-level predictors on intensity vary across colleges, this is not true for breadth of engagement. Specifically, 69.39 percent of variance in intensity is attributable to within-person factors, while 14.18 percent and 16.43 percent are attributable to between-person and between-college factors. Variance in breadth is evenly shared by within-person and between-person factors (8.47 vs. 8.53).

Table 10: Decomposing 3-Level Variance Components for Intensity.

Random Effect		Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1,	R0	13.712	188.018	106	149.116	0.004
level-1,	E	30.335	920.207			
INTRCPT1/INTRCPT2,	U00	14.760	217.845	12	43.860	0.000

Table 11: Decomposing 3-Level Variance Components for Breadth.

Random Effect		Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1,	R0	2.910	8.467	106	374.292	0.000
level-1,	E	2.921	8.532			
INTRCPT1/INTRCPT2,	U00	0.053	0.003	12	8.505	>.500

Group mean-centered temporal order variables and engagement breadth predicted more than 40 percent of the variance in intensity. As shown in Table 12, participating in MSP activities for a second year was related to diminished intensity of engagement in the MSP by about 4 hours per task ($p < .05$). Participating in one more MSP activity relative to the average number of activities engaged in during a year decreased engagement by an average of 5.8 hours per activity ($p < .01$). In other words, increased breadth of engagement means decreased intensity.

Table 12: Estimation of Level-1 Fixed Effects for Intensity.

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. df	P-value
For INTRCPT1, P0 For INTRCPT2, B00 INTRCPT3, G000	35.119	4.407	7.969	12	0.000
For Breadth slope, P1 For INTRCPT2, B10 INTRCPT3, G100	-5.826	1.704	-3.419	12	0.006
For year slope, P2 For INTRCPT2, B20 INTRCPT3, G200	-3.930	1.769	-2.222	266	0.027

In order to examine whether effects of breadth and time vary across college settings, whether an IHE was a two-year college and the average hours an institution invested in MSP activities were included in the three-level model. Results show no main or interaction effects attributable to being a two-year college, but organizational time investment in MSP activities did exert positive effects on individuals' levels of engagement. For each extra hour an institution engaged in the program, individuals' engagement increased by 20 minutes.

Regarding breadth, a two-level HLM with repeated measures at level one and between-person factors at level two was specified. Level three was eliminated from the model as there was no significant variance attributable to institutional variables. Effects of repeated engagement on breadth were not detected. Intensity of engagement has a negative but small effect on breadth, i.e., an extra hour spent on an activity relative to usual time investment is associated with reduction in breadth by .056 units. Faculty's tenure status has a significant interaction with

intensity and suppresses effects on breadth of engagement. After attaining tenure, intensity is likely to reduce breadth of engagement by additional .048 units. Tenure status itself, however, has a large positive effect on breadth, associated with increase in engagement of 1.8 units ($p <$ .01), suggesting that professors with tenure have more time to engage in a variety of activities compared with engagement among assistant professors and lecturers.

Results on Engagement Persistence

Among the 46 faculty participants who began their involvement in MSPGP in 2003, 29 stayed from 2003 to 2007 (a retention rate of 63 percent). Although there is no significant association between persistence and most demographic, career, and institutional variables (such as gender, racial/ethnic minority, academic discipline, and institutional type) due to the small sample size, mathematics faculty had the highest retention rate at 69.2 percent and education faculty had the lowest at 54.6 percent; two-year college faculty had higher retention rate (80.0%) relative to four-year college faculty (58.3%); and tenured faculty had higher retention rate (66.7%) relative to non-tenured faculty (57.9%). In addition, as shown in Table 13, it seems that those who were engaged for more than 200 hours during the first year had the lowest retention rate (40%) and those who were engaged for less than 20 hours had the next lowest retention rate (60.0%), while those who were engaged for about 30 hours during the first year had the highest retention rate (83.3%). This suggests either that a too-heavy or too-light workload may be negatively associated with faculty's persistence in the program. If the workload during the first year is too light, the program may not provide enough motivation or stimulate sufficient interest, resulting in participants who do not feel the need to continue in the following years. On the other hand, if the workload is too heavy during the first year (typically more than 200 hours), the participant may be burned out early and not be able to stay with the same amount of stamina and

productivity in the following years, or they may want to channel the energy to other types of

research or service projects.

Table 13: Persistence by Hours of Engagement during the First Year

Number of hours	Leavers		Stayers		Total
	Number	Percent	Number	Percent	
10	2	40.0	3	60.0	5
30	1	16.7	5	83.3	6
60	5	35.7	9	64.3	14
120	2	25.0	6	75.0	8
180	1	33.3	2	66.7	3
240	6	60.0	4	40.0	10
Total	17		29		

Finally, two multivariate logistic regression models were applied to predict persistence, with

individual and institutional attribute variables as predictors. The results are shown in Table 14.

Only coefficients for two predictor variables are statistically significant: intensity and two-year

college. However, the odds ratio of intensity is too close to 1 to be a practically significant factor.

In generally, being a two-year college faculty member elevated the odds of remaining in the

MSP by almost 29 times in comparison with four-year college faculty, while holding overall

engagement intensity and engagement breadth in management-related tasks fixed. This odds

ratio becomes even higher when other predictors are added to the model.

Table 14: Predicting Persistence in MSPGP Using Logistic Regression.

| | Logistic Regression Models | | | |
| | Multivariate 1 | | Multivariate 2 | |
Predictor Variables	*Odds Ratio*	*Confidence Interval*	*Odds Ratio*	*Confidence Interval*
Education discipline			0.63	.08–4.96
Hours			1.0	.98–1.01
Breadth Pre-service			1.05	.75–1.47
Breadth Management	.55*	.29–1.03	0.56	.27–1.19
Female			0.55	.10–2.97
Minority			1.12	.09–13.55
Intensity	.98**	.96–.996	.98*	.96–1.00
Community	28.99**	1.29–654.12	33.10**	1.28–854.62
c^a	0.773		0.792	

* p < .10. **p < .05. ªCoefficient of concordance with a possible value ranging from 0 to 1. The expected c under the null hypothesis of no relationship is 0.5 rather than 0. A value of c closer to 1 means the predictive model has simultaneously high sensitivity (proportion of true positives) and high specificity (1-proportion of false positives).

Discussion

This study not only advances the understanding of temporal, individual, and institutional factors that influence IHE faculty engagement in MSPs, but also addresses the need for innovative methods to examine the nuances between quantity and quality of services provided by faculty. Results from this study have several important implications. First, findings indicate that variations in institutional support have impacts on depth of engagement in partnership activities. Second, results support the argument that more is not necessarily better, as shown by the inverse relationship between intensity and breadth. Educational leaders need to think more about how to strategically deploy IHE faculty in order to best utilize their disciplinary expertise. Future investigations of faculty engagement include plans to use multilevel models to explore factors associated with faculty persistence in MSP activities.

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Appendix

Table A-1. Number of MSPGP Participating Faculty Members Representing Each Institution during 2003–2007 (Including Returning Participants).

Institution of Higher Education		Year			
		2003–04	*2004–05*	*2005–06*	*2006–07*
Arcadia University	Liberal arts (private)	6	8	10	7
Bryn Mawr College	Liberal arts (private)	5	14	10	11
Cedar Crest College	Four-year (private)	2	2	2	2
Haverford College	Liberal arts (private)	1	9	5	6
La Salle University	Comprehensive (private)	9	9	12	12
Lehigh Carbon County	Two-year (public)	3	3	3	2
Lincoln University	Historically black university (state-related)	2	3	3	3
Moravian College	Liberal arts (private)	4	7	7	7
Muhlenberg College	Liberal arts (private)	3	3	2	2
Northampton Community	Two-year (public)	5	7	6	9
Villanova Univ.	Master's, Catholic	4	6	6	6
West Chester Univ.	Master's, Public	1	1	3	4
Widener Univ.	Comprehensive Research (private)	1	4	2	5
Total		46	76	71	76

Table A-2. Total Number of Participants by Gender during 2003–07.

Gender	Frequency	Percent
Male	64	54.24
Female	54	45.76

Table A-3. Total Number of Participants by Race/Ethnicity during 2003–07.

Race/Ethnicity	Frequency	Percent
White	103	86.55
Black	3	2.52
Hispanic	6	5.04
Asian	5	4.20
Other	2	1.68

Table A-4. Number of MSP Participants by Department/Discipline during 2003–07.

Discipline	Frequency	Percent
Mathematics & Computer Science	29	24.37
Science	66	55.46
Education & Humanities	20	16.81
Administrative staff	4	3.36

Figure A-1. Number of MSP Participants by Department/Discipline during 2003–07.
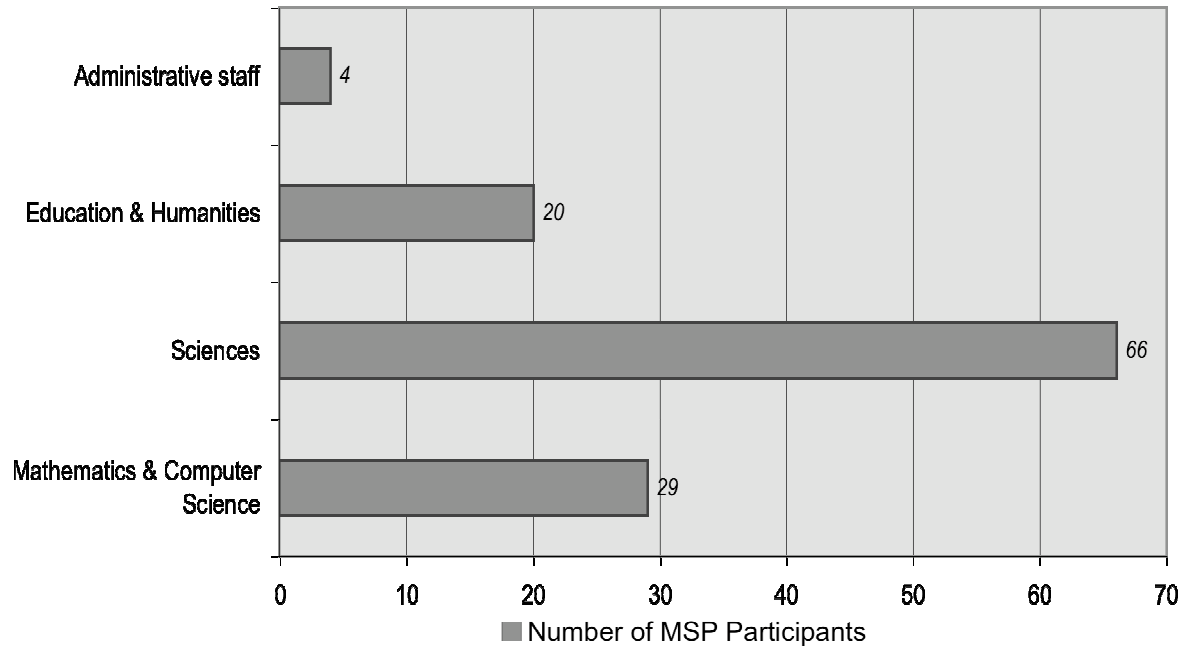
Table A-5. Number of MSP Participants by Faculty Rank during 2003–07.

Rank	Frequency	Percent
Professor	30	25.21
Associate Professor	32	26.89
Assistant Professor	32	26.89
Instructor/Lecturer/	12	10.08
Administrator	5	4.20
Other	8	6.72

Figure A-2. Number of MSP Participants by Faculty Rank during 2003–07.
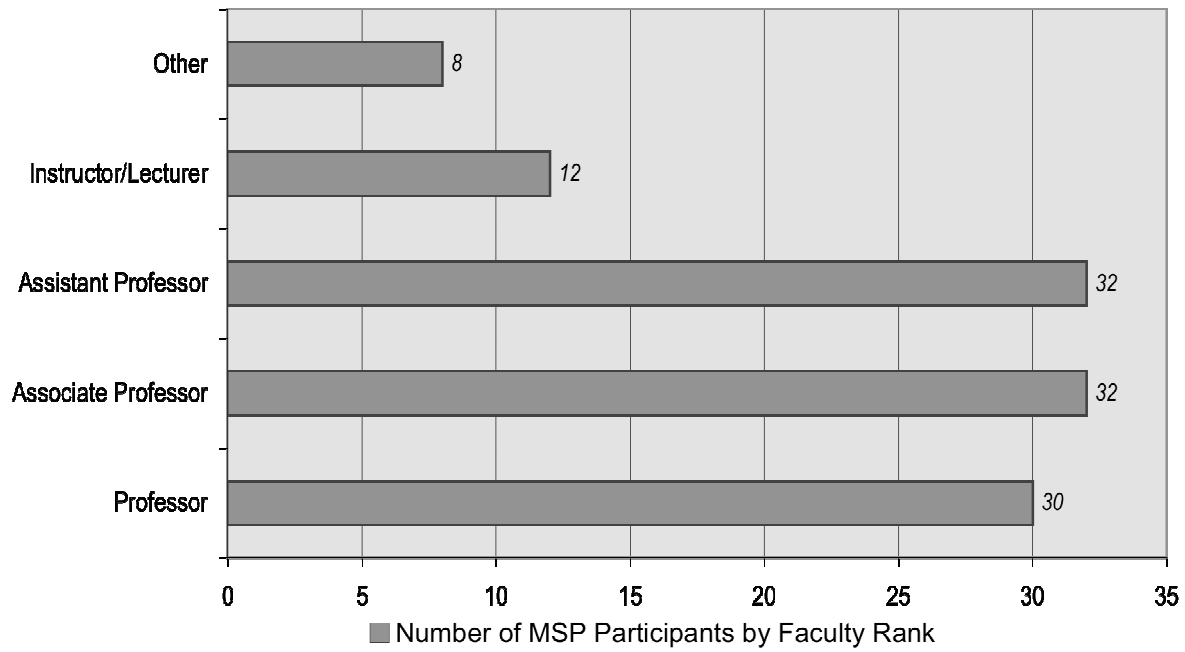
Table A-6. Distribution of Faculty Participation Year(s)

Participation year(s)	Frequency	Percent
1	43	36.13
2	31	26.05
3	16	13.45
4	29	24.37

Figure A-3. Distribution of Engagement Hours Per Person Per Year: 2003–07.
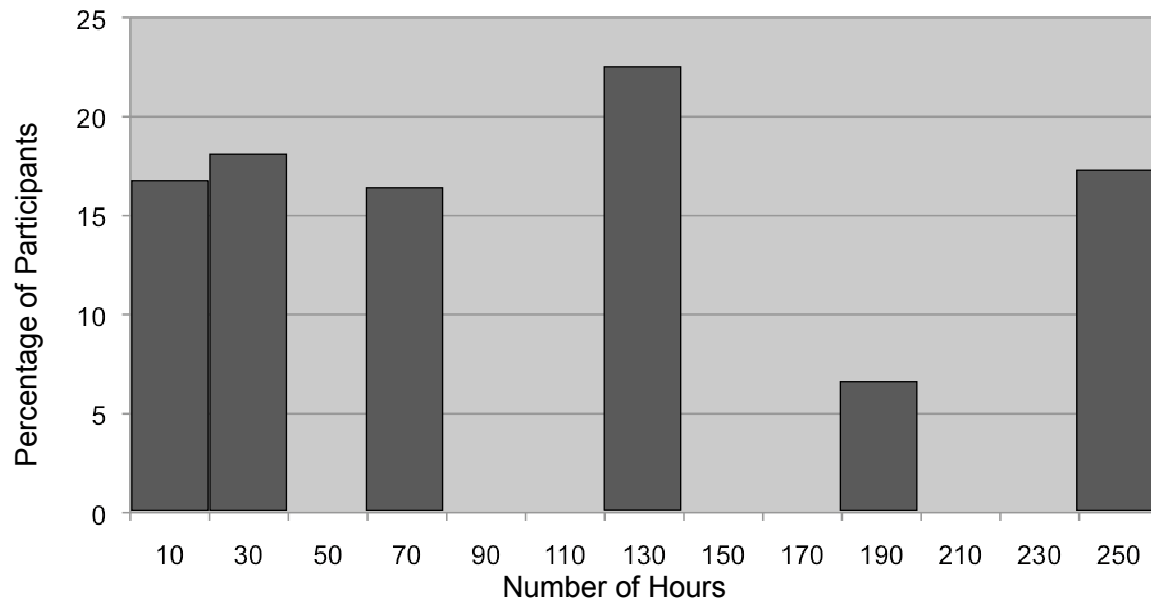
Table A-7. Descriptive Statistics of MSPGP Engagement for the 13 Participating Institutions

College	Institution Type	Avg # of participants per year	Tenure %	Minority %	Avg hours engaged per person per year	# hours on per activity per person	Types of activities one is engaged on average			
							Total	Preservice	In-service	Management
Arcadia	Liberal arts (private)	8	74.19%	6.45%	110.97	28.90	5.74	1.97	2.58	1.19
Bryn Mawr	Liberal arts (private)	10	47.50%	5.00%	59.75	18.61	3.38	1.33	1.20	0.85
Cedar Crest	2-yr	2	12.50%	0.00%	225.00	111.25	3.13	2.38	0.63	0.13
Haverford	Liberal arts (private)	5	47.62%	9.52%	48.10	23.32	2.43	0.9	0.86	0.67
La Salle	Comprehensive (private)	11	78.57%	4.76%	114.52	32.13	4.48	1.69	1.83	0.95
Lehigh Carbon	2-yr	3	90.91%	0.00%	107.27	26.74	4.55	0.64	2.45	1.45
Lincoln	Comprehensive (public)	3	27.27%	90.91%	95.45	44.65	3.09	2.36	0.55	0.18
Moravian	Liberal arts (private)	6	60.00%	16.00%	91.20	36.81	3.92	1.84	1.12	0.96
Muhlenberg	Liberal arts (private)	3	0.00%	0.00%	67.00	24.24	6.00	1.90	3.40	0.70
Northampton	2-yr	7	66.67%	33.33%	132.59	40.93	4.26	0.93	2.44	0.89
Villanova	Master's private	6	77.27%	4.55%	91.82	31.13	3.59	1.09	1.50	1.00
W. Chester	Master's public	2	22.22%	0.00%	121.11	44.65	4.78	2.33	1.67	0.78
Widener	Comprehensive (private)	3	66.67%	0.00%	128.33	33.53	4.92	2.83	1.17	0.92
	Average:	5	51.65%	13.12%	107.16	38.22	4.17	1.71	1.65	0.82

Note. Breadth of engagement is computed as the sum of types of MSP pre-service activities, in-service (K-12) activities, and

management activities engaged in during a year. Intensity of engagement represents the average hours one is engaged in each

activity per year