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PULSE Fellows Survey Results

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Background

The Partnership for Undergraduate Life Sciences Education (PULSE) Vision and Change Leadership Fellows program is a collaborative effort funded jointly by the National Science Foundation (NSF), National Institutes of Health (NIH), and the Howard Hughes Medical Institute (HHMI) to catalyze change in undergraduate STEM education. Originally, 40 Vision and Change Leadership Fellows were selected and charged with the task of inspiring and helping life science departments nationwide undertake the necessary work of transforming their programs, following the blueprints laid out in *Vision and Change in Undergraduate Biology Education: A Call to Action.*

The 40 Fellows came from diverse institutional backgrounds, with representation from community colleges, liberal arts colleges, comprehensive universities, and research universities. The Fellows were connected together by a Steering Committee made up of six members (two from each of the funding agencies). For communication purposes, the Fellows elected a Fellows Council of four members (one from each of the four university types) that met with the Steering Committee on a monthly basis to discuss progress the Fellows were making, challenges Fellows faced, and assist in planning Fellows' events. In addition, the Steering Committee used an outside consulting firm, Knowinnovation Inc., to assist in guiding the Fellows' conservation and activities.

The Fellows chosen were announced in September 2012. Fairly late in the first year, one Fellow was unable to continue and chose to drop out of the program leaving 39 Fellows as the main core working towards the initial goal. Their formal connection with the Steering Committee concluded in September 2013. Upon the official completion date, the PULSE Fellows began working independently of the steering committee but still stay in contact with several of the individual members. Funding and support of current and near term activities is continuing. An assessment of the PULSE program was initiated in June 2013 to assess how the PULSE Fellows program was working, to determine whether or not the PULSE Fellows program was achieving its intended goals, and to identify the challenges it faced. The assessment sought to understand the Fellows' experiences and to provide data that could be used to assist in the development of similar future programmatic initiatives.

Methods

Themes from focus groups conducted with the PULSE Fellows in August 2013 were used to create specific survey question items, namely why they chose to lead educational change, what they thought they were supposed to accomplish as Fellows, why they stepped into leadership roles in the Fellows group, why they stepped back and allowed others to lead in the Fellows group, and how they lead change at their home institutions. Previously tested and reliable instruments were used to measure commitment to change (Herscovitch & Meyer, 2002), motivational source (Barbuto & Scholl, 1998), transformational leadership (MacKenzie, Podsakoff & Rich, 2001) and transactional leadership (Podsakoff, Todor, Grover & Huber,1984). Questions were also developed and asked about the Fellows' level of influence on others before and after becoming a PUSLE Fellow and their level of physical and cognitive engagement throughout the PULSE fellowship.

The survey was drafted by the evaluation team and reviewed by a panel of experts with expertise in survey design and educational programming for face and content validity as well as reliability and clarity. The survey was sent to all 39 Fellows through an email link to the online survey developed in Qualtrics in December 2013-January, 2014. Thirty-four Fellows responded, for an 87% response rate.

Results

Leadership

There were several questions asked of Fellows about why they chose to lead, why they allowed others to lead, as well as their own leadership styles.

Reason for becoming a PULSE Fellow

Fellows were asked to indicate why they chose to lead educational change by becoming a PULSE Fellow. The choices given were taken from dominant themes that emerged from the focus group discussions. Fellows were allowed to choose all that apply (hence why the totals are more than 100%). Eighty-two percent of respondents indicated they believed there was a need for change in Biology education, and 61.8% felt they were capable of assisting in leading this change (Figure 1).

Figure 1: Reason for becoming a PULSE Fellow
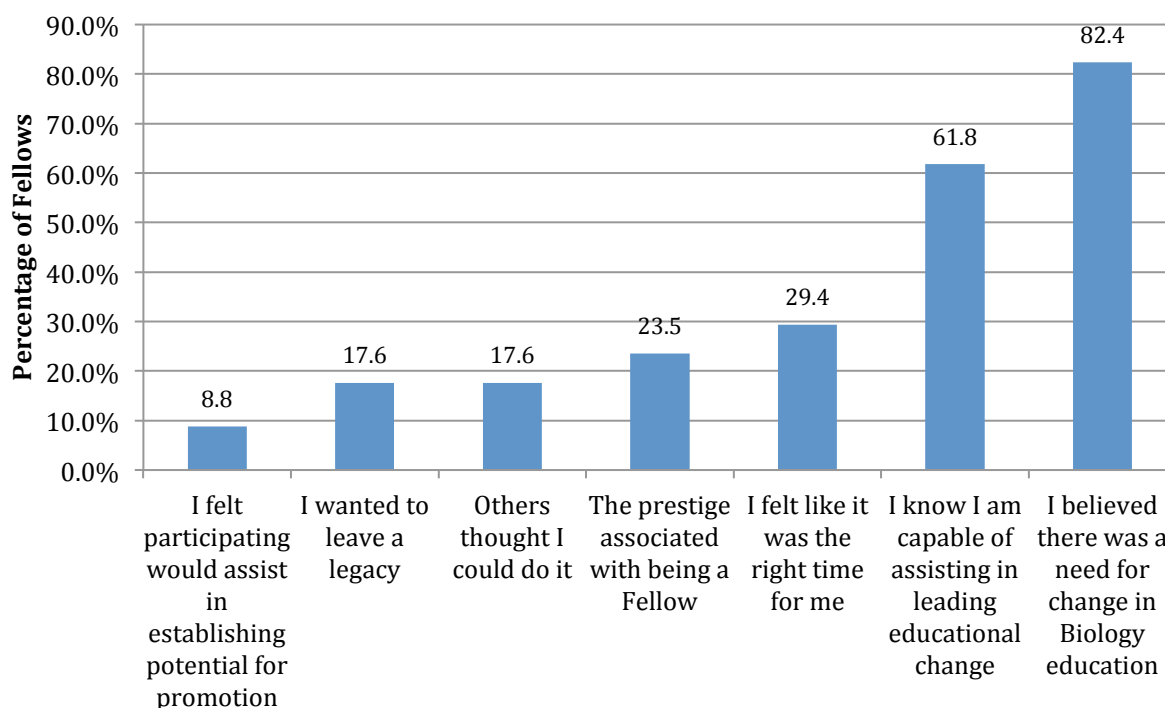
Thirty-eight percent of Fellows indicated "other" and where asked to describe what they meant in their own words. Their responses were organized into the following categories and the number to the right indicates the number of Fellows who mentioned this reason. Fellows wrote that they chose to lead educational change partly from a desire to connect with others, to learn, and to take advantage of a unique opportunity. All of the responses are listed below.

- Wanted to connect with others (4)
- To learn (4)
- An opportunity (3)
- Need for change (2)
- Action (2)
- Right match for skillset
- Recognition

- Interested in the challenge
- To represent Community Colleges

Taking on a Leadership Role

Fellows were asked to indicate whether they took on a leadership role within the PULSE Fellows group. The question stated:

> *Did you ever take on a leadership role within the PULSE Fellows group? This could have happened in both formal and non-formal ways. Examples include leading discussion, leading the development of a grant proposal, leading the development of a tool/website/program/workshop, as a council member, etc.*

Eighty-eight percent of Fellows indicated that "yes" they took on a leadership role within the Fellows group, while 12% did not take on leadership role (Figure 2).

Figure 2: Adopted a leadership role in the group
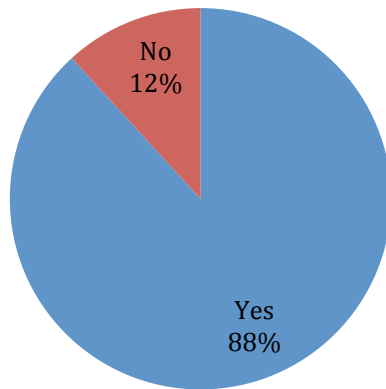
Those that indicated they had taken on a leadership role (n = 30) were then asked what factors made this possible, and were allowed to choose all that applied in their situation (Figure 3). The items were adapted from the themes that emerged in the focus group discussions. The most common responses were "I was committed to the process," (79.4%), "I trusted the other Fellows," (73.5%), and "I thought I could do it" (70.6%).

Figure 3: Factors that made it possible to lead
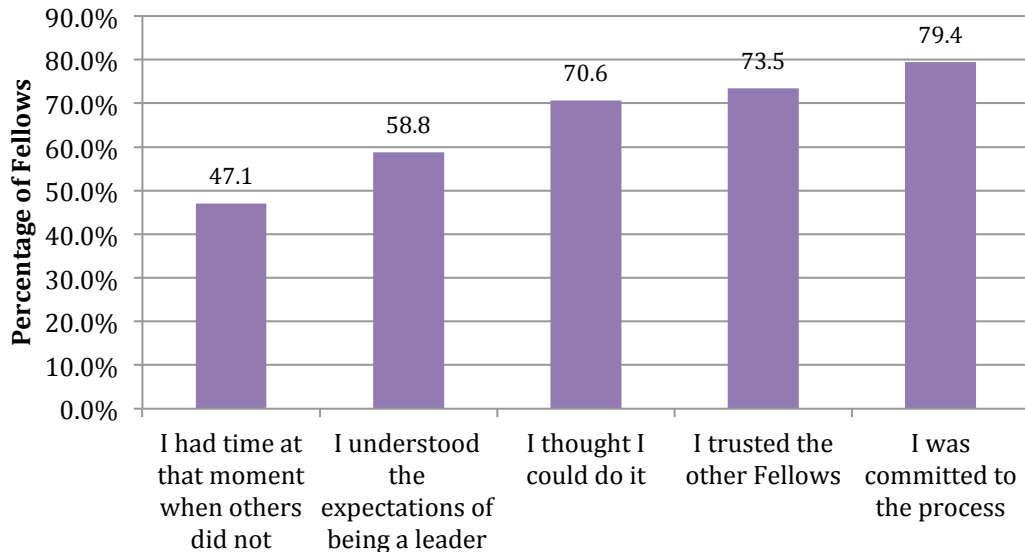
Twenty-four percent of Fellows who had taken on a leadership role mentioned "other" as one of their responses, and where asked to describe what they meant. Their responses are listed below.

- Had enough support to do so (2)
- Strong belief in the cause
- Could contribute needed input and perspective
- Wanted to be engaged more heavily
- Understood the expectations
- Others trusted me
- There was much to do

Allowing Others to Lead

Fellows were asked to rank the top four reasons for allowing others in the group to lead. These four choices emerged from the focus group data and included (a) trust in the abilities of other Fellows; (b) trust in the commitment of other Fellows; (c) trust in other Fellows' time management; and (d) the belief that another Fellow had more time than I did. Fellows were asked to drag and drop the four items from top to bottom, with those on the top indicating the highest ranking. The scores ranked from 1 = *highest reason* to 4 = *lowest reason*. The choice with the highest scoring ranking was "trust in the abilities of other Fellows," which had an average score of 1.65 (Table 1).

Table 1: Factors allowing others to lead

Factor allowing others to lead	*M (SD)*
Trust in the abilities of other Fellows	1.65 (.77)
Trust in the commitment of other Fellows	1.70 (.80)
Trust in other Fellows' time management	3.25 (.79)
The belief that another Fellow had more time than I did	3.40 (.82)

Note: 1 = *highest reason….*4 = *lowest reason*

Leadership and Commitment Scales

Fellows were given three separate scales that measured their commitment to change, their transformational leadership style, and their transactional leadership style. Descriptions of each are given below, and the overall Fellows' scores on each are seen in Table 2.

Table 2: Leadership styles and commitment to change scores

	N	**Minimum Observed**	**Maximum Observed**	*M*	*SD*
Commitment to Change	34	36	65	52.58	6.58
Transformational Leadership	33	41	65	54.12	4.73
Transactional Leadership	33	12	25	20.52	3.29

Commitment to Change

Fellows were asked a series of questions meant to measure their commitment to the change process. This instrument measures three components of one's commitment to change and creates an overall score and was developed by Herscovitch & Meyer (2002). The three components include *affective commitment,* which is one's desire to stay engaged in an organization, *continuance commitment,* which is one's perceived cost of leaving an organization, and *normative commitment,* which is one's perceived obligation to remain in the organization. All of these components are measured in the context of an organization undergoing change. This instrument has shown both good reliability and validity. The instrument has 16 questions in total, and all questions were asked on a five-point Likert type agreement scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, and 5 = *Strongly Agree*). Fellows' scores could range from 16 to 80. The average score amongst the Fellows was 52.58 (*SD* = 6.58), indicating a modestly high level of commitment to change. The lowest score amongst Fellows was a 36 and the highest was 65. Figure 4 shows the distribution of Fellows' scores for commitment to change.

Figure 4: Commitment to change distribution curve
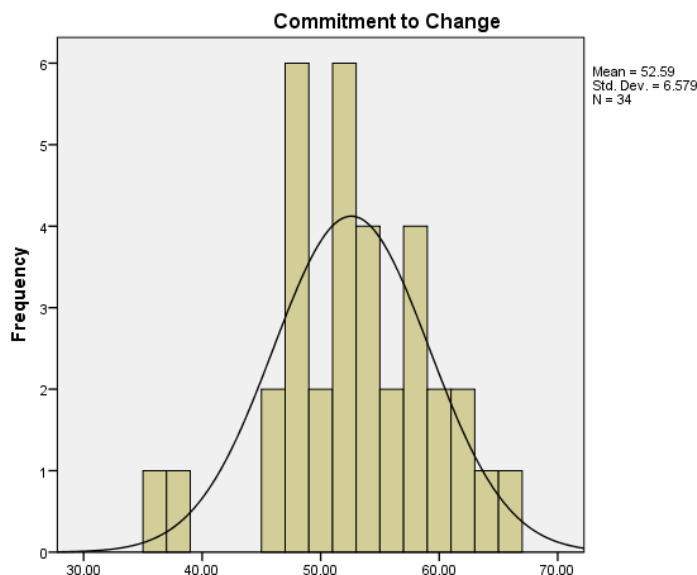
Transformational Leadership

Fellows were also asked a series of questions meant to measure their level of transformational leadership. Transformational leadership is a type of leadership characterized by the ability to inspire followers to perform beyond

expectations by helping them to see how their work aligns with their personal values and goals. Transformational leaders help their followers do this by providing a clear vision for all to follow, being a role model in their behavior, creating group goals, providing individual support and intellectual stimulation to followers, and expecting followers to perform at high levels. The instrument used to measure transformational leadership was developed by MacKenzie, Podsakoff & Rich (2001) and includes 14 questions in total. The instrument has four separate constructs, which measure a leader's level of, *core transformational leadership, performance expectation, individual support, and intellectual stimulation.* This instrument has also shown to have strong reliability and validity. As in the commitment to change instrument, all questions were asked on a five-point Likert type agreement scale. Fellows' scores could range from 14 to 70. Fellows scored an average of 54.21 (SD = 4.73), indicating a relatively high level of transformational leadership. The lowest score amongst Fellows was 41 and the highest score was 65. Figure 5 shows the distribution of Fellows' scores for transformational leadership.

Figure 5: Transformational leadership distribution curve
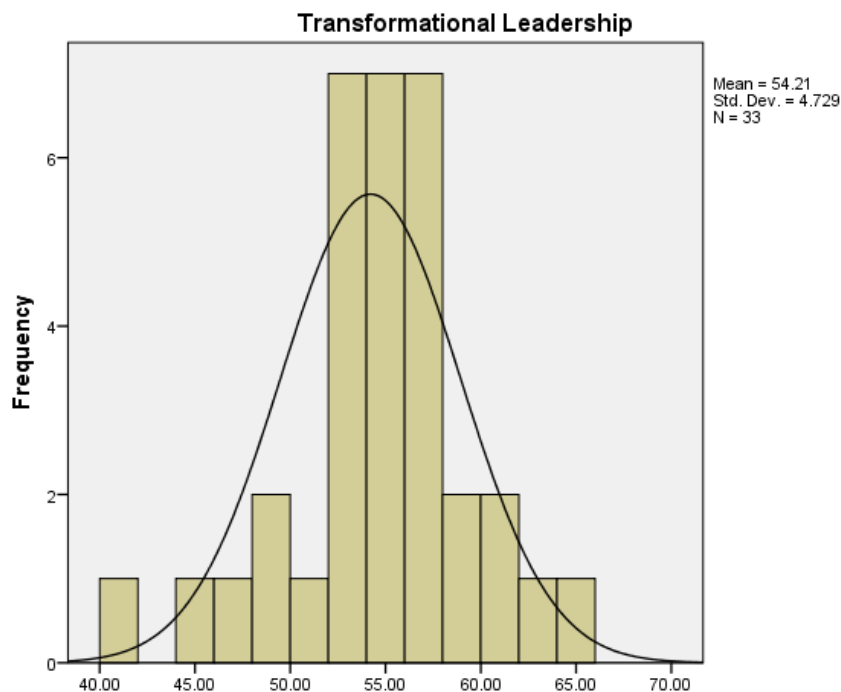
Transactional Leadership

Fellows were asked their level of transactional leadership. Transactional leadership differs from transformational leadership and is a more "managerial" type of leadership. Transactional leaders often use rewards to motivate followers to perform highly and punish them when they fail to perform. The instrument used to measure transactional leadership was developed by Podsakoff, Todor, Grover & Huber (1984) and includes eight questions in total, but for this survey, only five questions were used. While the transactional leadership scale measures two constructs, *contingent reward behavior* and *contingent punishment behavior,* only contingent reward behavior was used. This instrument has also shown to have strong reliability and validity. All questions were asked on a five-point Likert type agreement scale. Fellows' scores could range from five to 25. Fellows scored an average of 20.12 (SD = 3.29), indicating a relatively high level of transactional leadership. The lowest score amongst Fellows was 12 and the highest score was 25. Figure 6 shows the distribution of Fellows' scores for transactional leadership.
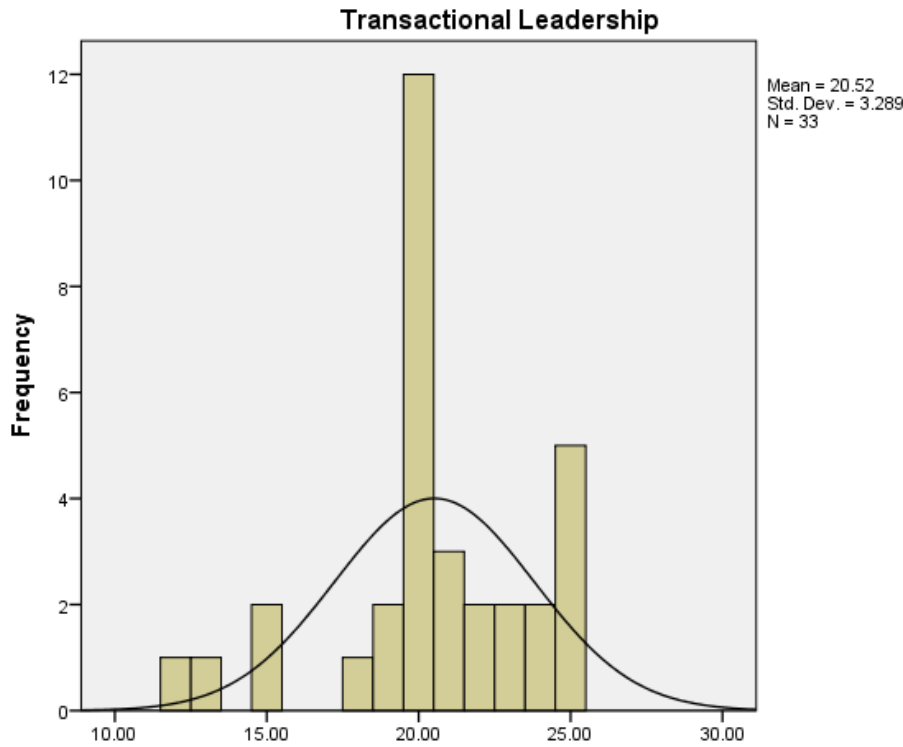
Figure 6: Transactional leadership distribution curve

Relationship between Leadership Style and Reasons for Leading in Fellows Group

Correlational tests were conducted to assess the relationship between leadership style (transformational and transactional leadership) and factors that allowed Fellows to step up into a leadership role within the group. Positive and negative correlations followed a distinct pattern. (Davis's convention was used to designate relational strength and is used throughout the report). Those with higher transformational leadership scores had positive relationships with factors of trust, commitment, belief in oneself, and understanding the expectations of being a leader in the PUSLE group. Those with higher transactional leadership scores had negative relationships with the previously mentioned factors, but a positive relationship with the factor of time. In practical terms, those who were more transactional in their leadership style stepped up into a leadership role because they felt they had the time when others did not. Those with a more transformational style of leadership stepped up into a leadership role for more intangible reasons. This confirms what theory would predict, that transformational leadership is one in which leaders demonstrate leadership and empower their followers, while transactional leadership is focused on delivering fair exchanges for performance. The correlation scores can be seen in Table 3.

Table 3: Correlation scores between leadership style and reasons for leading

	I trusted the other Fellows (*r*)	I was committed to the process (*r*)	I thought I could do it (*r*)	I understood the expectations of being a leader (*r*)	I had time at that moment when others did not (*r*)
Transformational Leadership	.10	.20	.19	.21	.00
Transactional Leadership	-.03	-.01	-.10	-.03	.19

Relationship between Leadership Style and Reasons for Allowing Other Fellows to Lead

Again, correlational tests were conducted to assess the relationship between leadership style and factors that allowed Fellows to step back and allow others to lead in the Fellows group. Positive and negative correlations followed a pattern when it came to differences between transformational and transactional leadership. Those with higher transformational leadership scores had a high positive relationship with trust in the abilities of other Fellows. However, those with higher transactional leadership scores had a small negative relationship with trust in the abilities of other Fellows. Rather, those with high transactional scores had large positive view in the trust in the commitment of other Fellows as a reason to allow others to lead. The opposite was trust of transformational leaders. Neither type of leadership had a positive relationship with "trust in other Fellows' time management skills" as a reason to allow others to become leaders, and while transformational leaders had a positive view towards belief that another Fellow had more time than they did; this had an opposite relationship for transactional leaders. See Table 4 for the correlational scores.

Table 4: Correlation scores between leadership styles and reasons for allowing others to lead

	Trust in the abilities of other Fellows (*r*)	Trust in the commitment of other Fellows (*r*)	Trust in other Fellows' time management (*r*)	The belief that another Fellow had more time than I did (*r*)
Transformational Leadership	.39	-.27	-.17	.12
Transactional Leadership	-.12	.46	-.17	-.19

Influence

Other questions in the survey sought to understand if, why and how the PULSE Fellows influenced others to enact change, and how they are personally influenced and motivated to pursue change.

Influence at Home Institution

The first question asked Fellows if they influenced educational change at their home institution. All Fellows who took the survey responded "yes" they have influenced educational change at their home institution. A follow-up question was asked of Fellows to indicate how they went about influencing change at their home institutions. Fellows were allowed to choose all that applied to them, and the response categorizes were developed as a result of findings from the focus groups. Fellow reported diverse activities they engaged in to influence change. Ninety-seven percent of Fellows fostered discussions and 94.1% mentored others (Figure 7).

Figure 7: Ways of influenced change at home institution
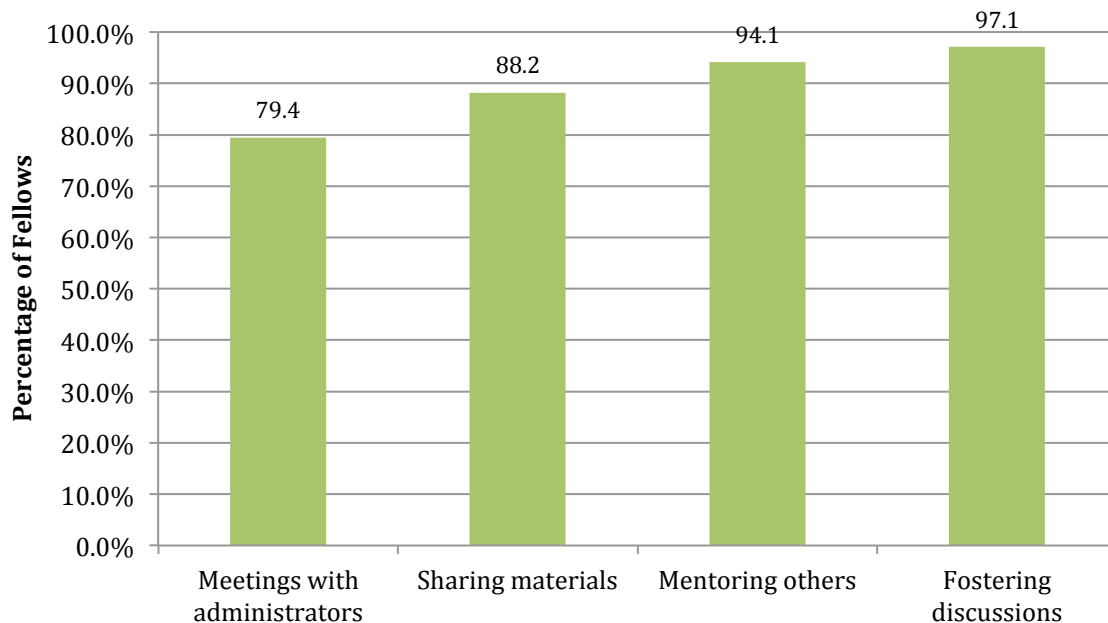
Fifty-percent of Fellows chose an "other" response and were asked to describe what they meant in their own words. Below are the categories of responses.

- Plan new curriculum and/or change courses (5)
- Write grants/bring in outside support (4)
- Encourage faculty to become involved and professionally develop (3)
- Leading discussions or presentations (2)
- Integrate V&C into policies (2)
- Take a leadership role on campus (2)
- Modeling success
- Hosting workshops

Influence Before and After Being a Fellow

Fellows were asked to rate their level of influence before and after being a Fellow with different types of audiences. The scale ranged from 1-5 with 1 = *None*, 2 = *A Small Amount*, 3 = *An Average Amount*, 4 = *A Large Amount*, and 5 = *A Great Deal*. While Fellows were the most comfortable overall with influencing young faculty in their departments, the largest before and after change occurred with peers at other institutions (Figure 8). Table 5 shows the average changes in the scores from before and after becoming a Fellow.

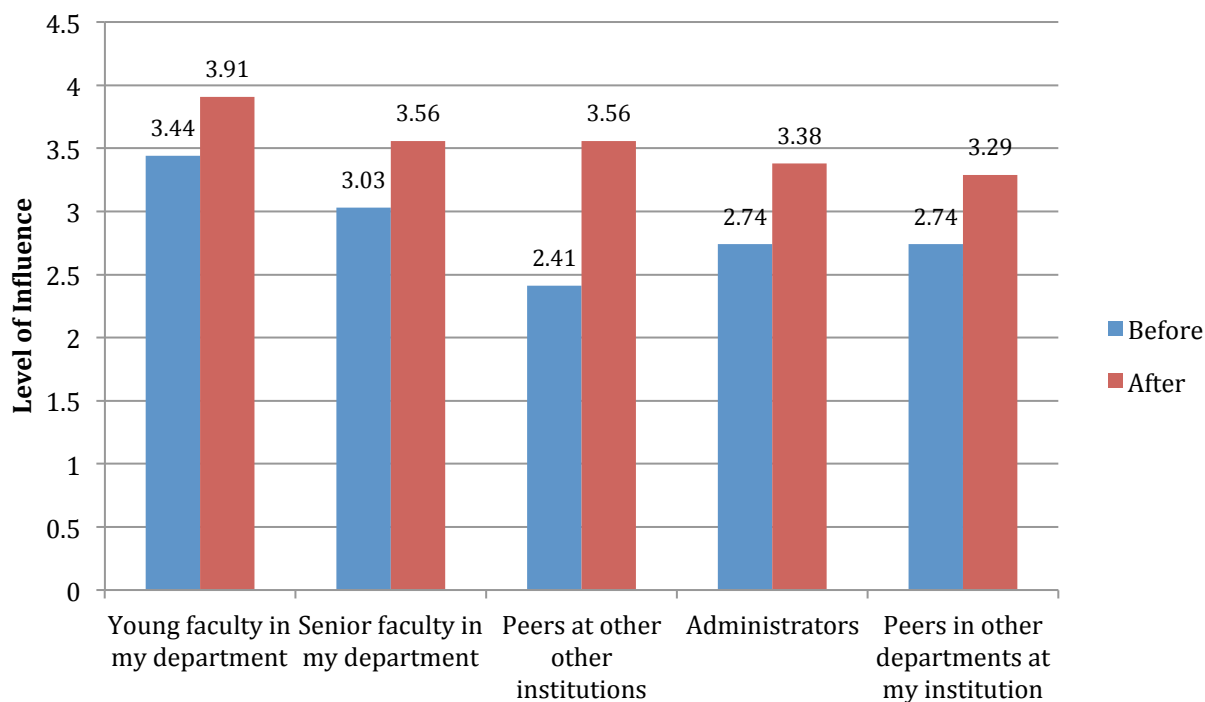*Figure 8: Change in influence before and after fellowship*

Table 5: Change in influence before and after fellowship

Activity	M Before (SD)	M After (SD)	Δ
Peers at other institutions	2.41 (1.21)	3.56 (1.11)	1.15**
Administrators	2.74 (1.14)	3.38 (1.18)	.65**
Peers in other departments at my institution	2.74 (1.08)	3.29 (1.12)	.56**
Senior faculty in my department	3.03 (1.00)	3.56 (.86)	.53**
Young faculty in my department	3.44 (1.08)	3.91 (.93)	.47**

Note: 1 = *None*, 2 = *A Small Amount*, 3 = *An Average Amount*, 4 = *A Large Amount*, 5 = *A Great Deal*; **= $p \leq .01$

Motivational Sources Inventory

Fellows were asked a series of questions to measure their levels of motivation from different sources. This scale was developed by Barbuto & Scholl (1998) and has shown good reliability and validity. While the original inventory has five constructs, only three were used. These three were *external self-concept*, which measures the extent to which one is motivated by the thoughts and approvals of others, *internal self-concept,* which measures the extent to which one is motivated by standards set by oneself, and *goal internalization,* which measure the extent to which one is motivated by the cause and mission of an organization. Due to the differences between these types of motivational sources, the scores were calculated and are reported separately from one another. All questions were asked on a five-point Likert type response scale. The external self-concept had six items, with a total score possible of six to 30. The average Fellows score was 15.74 (*SD* = 3.74). The internal self-concept had a total of six items, with a total score possible of six to 30. The average Fellow score for internal self-concept was 27.03 (*SD* = 2.49). Finally, goal internalization had four items, with a total score possible of four to 20. The average Fellows score was 14.67 (*SD* = 2.39). These scores indicate that Fellows had a higher level of internal self-concept (i.e. they derive more motivation from goals and expectations they set for themselves) than external self-concept. Also, Fellows have a high level of motivation towards goal internalization, meaning Fellows receive motivation from the goals, values, and mission of organizations they in which they are involved

(See Table 6). The distribution curves for *external self-concept, internal self-concept,* and *goal internalization* can be seen in Figures 9, 10, and 11.

Table 6: Motivation sources inventory scores

	N	**Minimum Observed**	**Maximum Observed**	*M*	*SD*
External Self-Concept	34	7	23	15.74	3.74
Internal Self-Concept	33	22	30	27.03	2.49
Goal Internalization	33	8	20	14.67	2.39

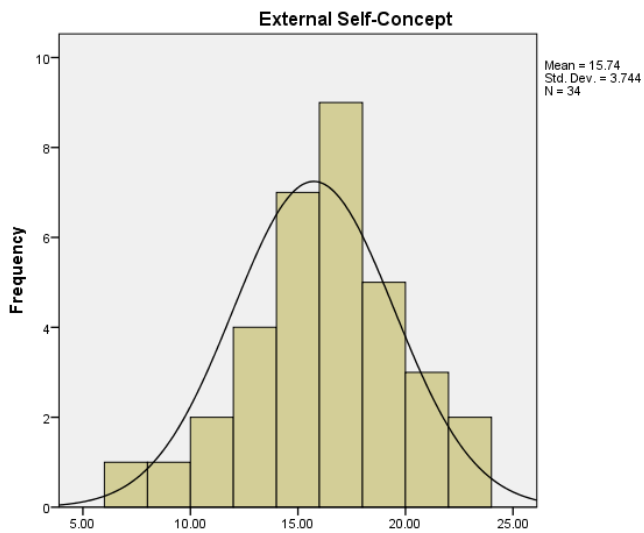*Figure 9: External self-concept distribution curve*

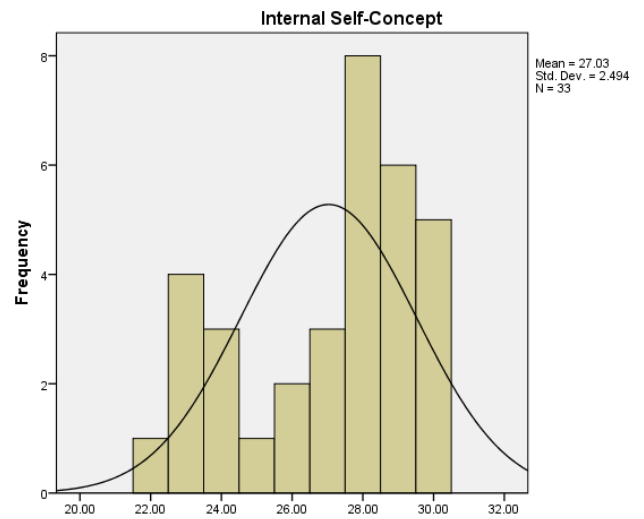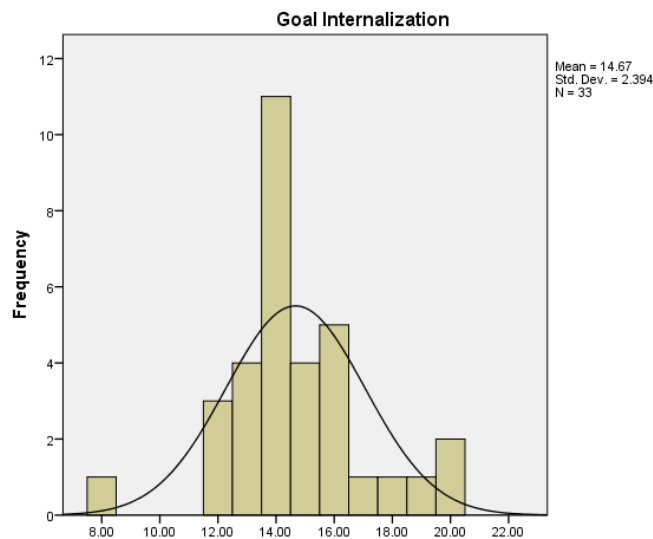*Figure 10: Internal self-concept distribution curve*

Figure 11: Goal internalization distribution curve

Relationship between Motivational Source Inventory and Commitment to Change

Correlation tests were conducted to assess the relationship between Fellows' scores on the commitment to change and motivational sources scales. A large positive relationship was found to exist between commitment to change scores and external self-concept ($r = .47$), as well as between commitment to change and goal internalization ($r = .46$). This means the higher a Fellow's score on the commitment to change scale, the higher they ranked in external self-concept and goal internalization. In practical terms, those Fellows with higher commitment to change attitudes also place higher importance on what external audiences think of their performance and are highly committed to the goals and mission of the organizations they work with. A medium positive relationship was found between commitment to change and internal self-concept ($r = .19$). Therefore, Fellows with higher commitment to change scores tend to have slightly higher levels of self-concept, meaning they have high standards for themselves. Correlation scores can be seen in Table 7.

Table 7: Correlations between commitment to change and motivation sources

	External Self-Concept (*r*)	Internal Self-Concept (*r*)	Goal Internalization (*r*)
Commitment to Change (Total Score)	.47	.19	.46

Engagement

Fellows were asked a variety of questions aimed at understanding their level of engagement in various activities supportive of Vision and Change before and after being a Fellow. They were also asked their level of involvement in activities since becoming a Fellow, and their perceived level of cognitive engagement in Fellow related activities throughout the PULSE Fellows process.

Engagement in Activities Before and After PULSE Fellowship

Fellows were asked how often they engaged in activities before they were a Fellow, and after they become a Fellow. They were asked "How many times per year did you engage in the following vision and change activities before and after becoming a PUSLE Fellow?" The activities related to Vision and Change included: (a) attending meetings, (b) involvement in professional organizations, (c) interactions with others, (d) reading written materials, (e) listening to talks, and (f) visiting blogs. Fellows were given frequency categories of 1 = *Never*, 2 = *1-5 times*, 3= *6-10 times*, and 4 = *Over 10 times*. All mean change scores were positively and statistically significant. The highest positive change occurred for "interacted with people associated with Vision and Change," with a positive mean score change of 1.36, and "attended meetings that discussed Vision and Change," with a positive mean score change of .94 (See Table 5). Figures 12 through Figures 17 show the changes for each activity individually.

Table 8: Change in engagement in Vision and Change activities

	N	*M* Before	*M* After	Δ
Interacted with people associated with Vision and Change	31	2.10 (.79)	3.45 (.68)	1.36**
Attended meetings that discussed Vision and Change	31	1.87 (.67)	2.81 (.70)	.94**
Visited online blogs discussing Vision and Change	31	1.42 (.62)	2.29 (1.07)	.87**
Read written materials discussing Vision and Change including articles, books and government reports	32	2.47 (.82)	3.31 (.82)	.84**
Listened to talks available online discussing Vision and Change	31	1.45 (.51)	2.19 (.87)	.74**
Involved yourself in professional organizations that focused on Vision and Change	31	1.71 (.69)	2.35 (.66)	.65**

Note: 1 = *Never,* 2 = *1-5 times,* 3 = *6-10 times,* 4 = *Over 10 times;* ** = *p ≤ .01*

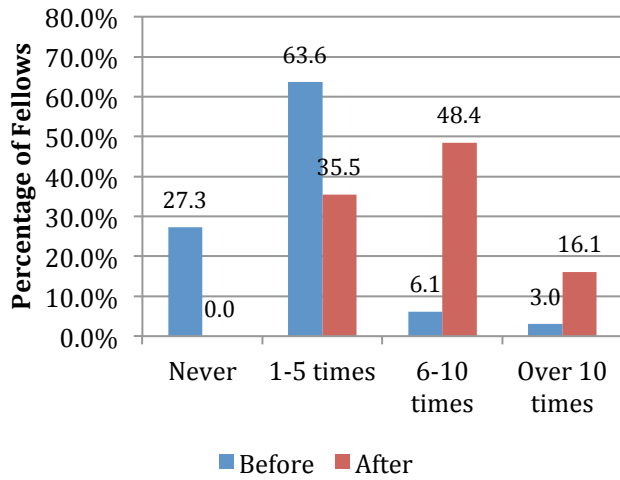### Figure 12: Attended meetings that discuss V&C

Figure 13: Interacted with people associated with V&C
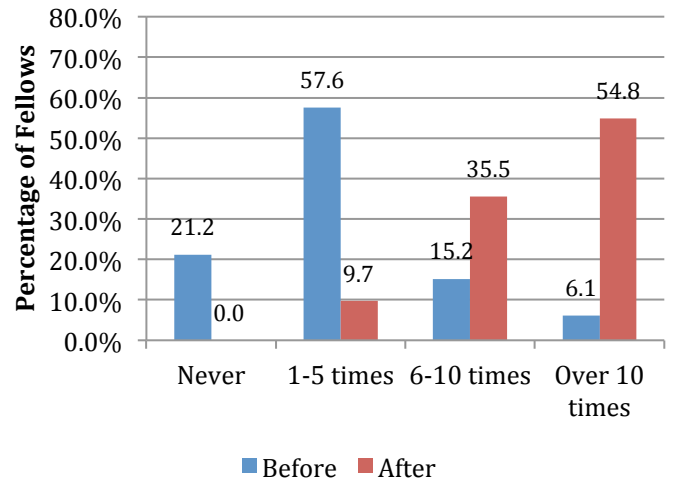

Figure 14: Involved yourself in professional organizations that focused on V&C
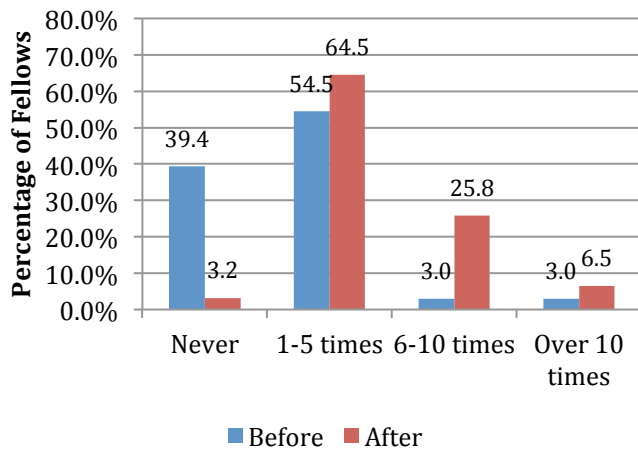

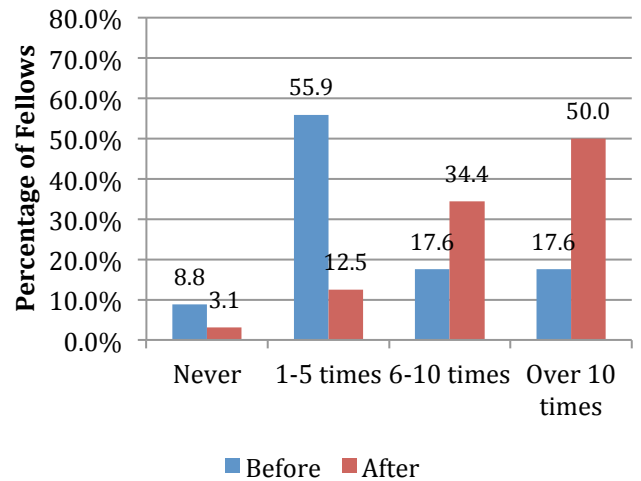### Figure 13: Read written materials discussing V&C

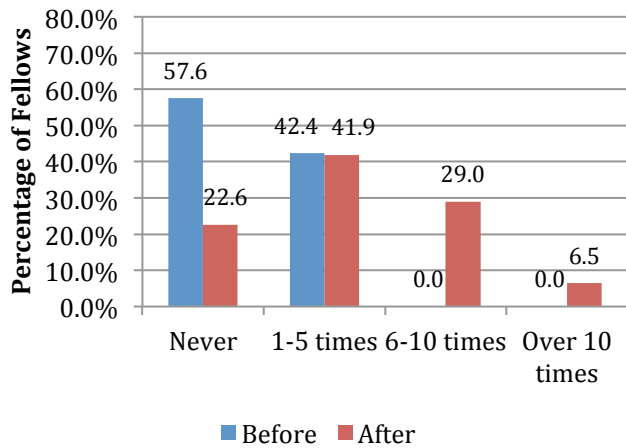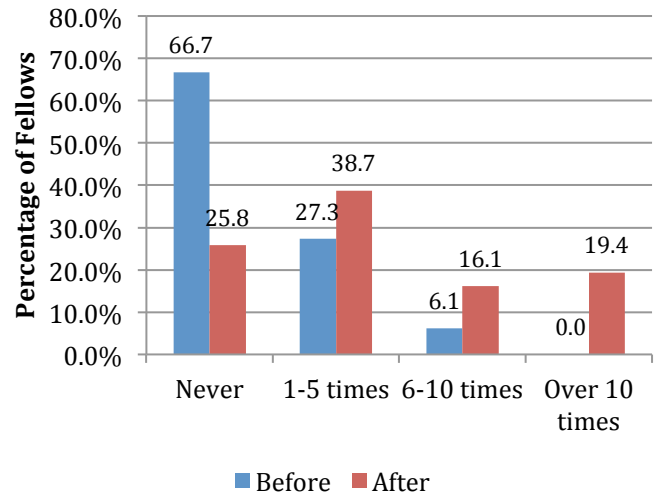*Figure 14: Listened to talks available online discussing V&C*

*Figure 15: Visited online blogs discussing V&C*

Engagement in Activities since PULSE Fellowship

Fellows were also asked about activities they engaged in since becoming a Fellow. They were asked to fill in a blank with an estimated number of times they have engaged in (a) Vision and Change regional workshops, (b) Vision and Change focused conferences, (c) PULSE conference calls, and (d) proposals for funding related to Vision and Change.

Regional Workshops

Nearly 59% of Fellows have only participated in 0 or 1 regional workshops since becoming a PULSE Fellow. Only 2.9% of Fellows have participated 4 times (Figure 18).

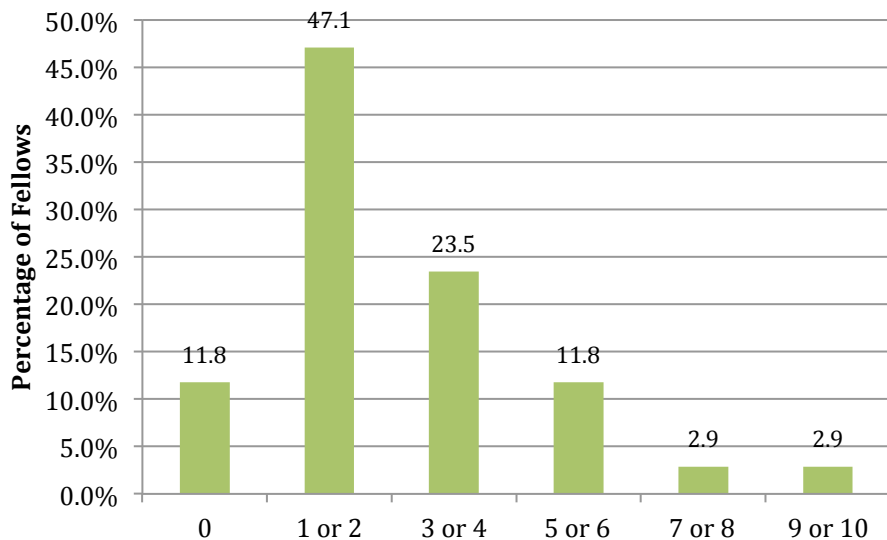*Figure 16: V&C regional workshop*
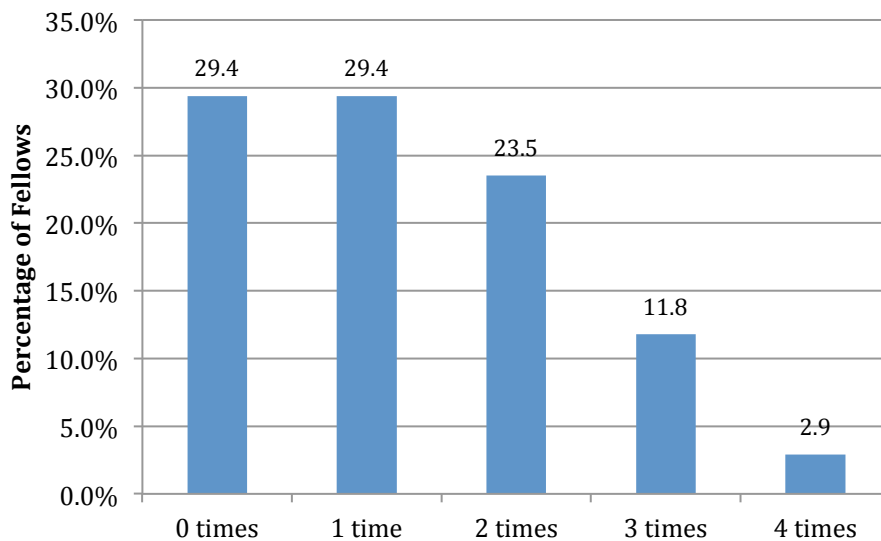
Vision and Change Focused Conference

Most Fellows (58.9%) have only participated in Vision and Change focused conference 0, 1, or 2 times. Nearly 6% of Fellows have participated 7 to 10 times (Figure 19).

Figure 17: V&C focused conference

PULSE Conference Calls

Fellows were asked to estimate how often they have participated in PULSE Fellows conference calls since becoming a Fellow. There was a wide range of responses, from 0 to over 60 times. Eighty-two percent of Fellows reported they engaged in conference calls less than 30 times, while 17.5% reported they had engaged in conference calls more than 30 times (Figure 20).

Figure 18: PULSE conference calls
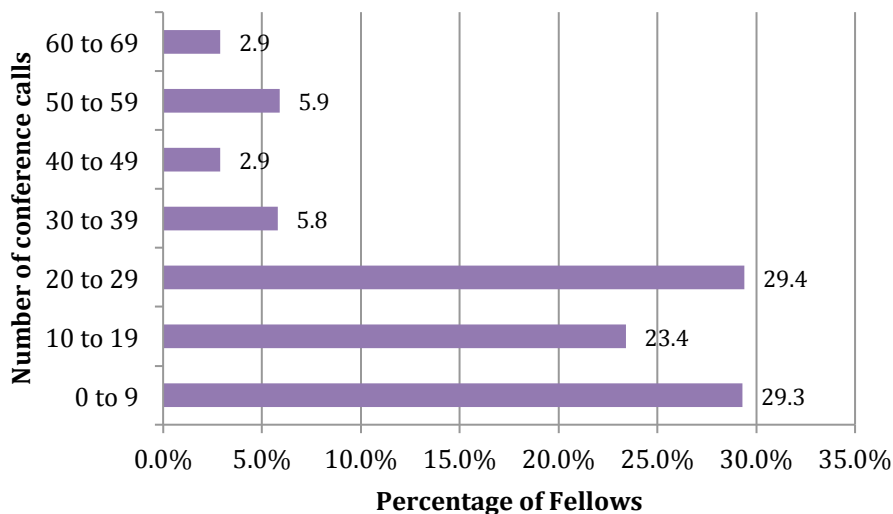
Proposals for Funding

Fellows were asked how many times they have engaged in creating proposals for funding. Fifteen percent reported they had engaged in 0 or 1 proposals, sixty-two percent reported they had engaged in 2 to 3 proposals, and 23% reported they had participated in writing 4 or more proposals for funding (Figure 21).

Figure 19: Proposals for funding
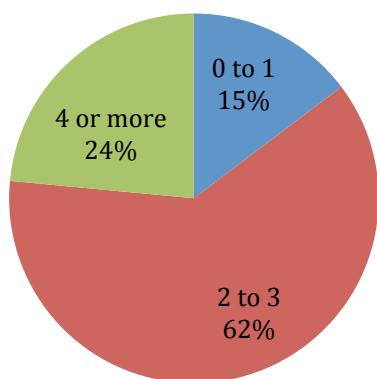
Cognitive Engagement

Fellows were asked to rate their cognitive engagement as a PULSE Fellow from 0= *not at all engaged* to 10= *highly engaged* at different points in the PULSE Fellows process. PULSE Fellows indicated they were slightly more engaged at the conclusion of Fellows' meetings than halfway through the program or at the current time (Figure 22).

Figure 20: Level of cognitive engagement over time
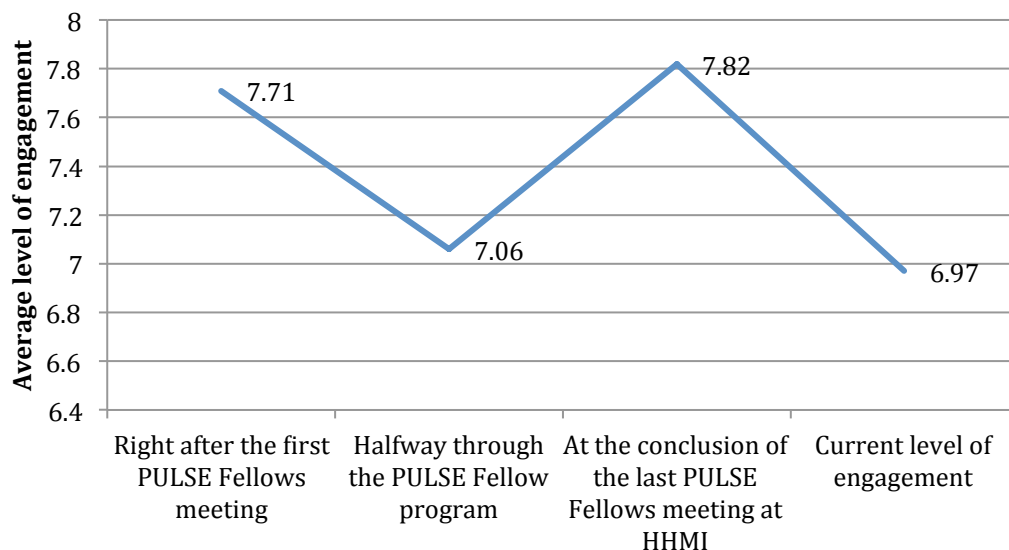
Levels of Engagement and Factors Encouraging Fellows to Take Leadership Role

Correlational tests were conducted to assess the relationship between overall engagement scores (a sum of all engagement activities reported by Fellows since becoming a PUSLE Fellow) and the factors that enabled Fellows to take on a leadership role within the Fellows' group. There were positive correlations between all the factors with engagement score. The two highest correlations were for those the factors "I was committed to the process" ($r = .46$) and "I had time at that moment when others did not" ($r = .38$). This indicates that those who were the most engaged in PULSE related activities were also those who were committed and had the time to do so. See Table 9 for all correlations.

Table 9: Correlations between engagement and factors that enabled Fellows to lead

	I trusted the other Fellows (r)	I was committed to the process (r)	I thought I could do it (r)	I understood the expectations of being a leader (r)	I had time at that moment when others did not (r)
Engagement Score	.13	.46	.29	.01	.38

Levels of Engagement and Factors Allowing Other Fellows to Lead

Correlational tests were conducted to assess the relationship between overall engagement scores and the factors that allowed Fellows to let other Fellows lead. Those with higher engagement scores had a small to medium positive relationship with trust in other Fellows' time management ($r = .16$) and the belief that another Fellow had more time ($r = .11$) as reasons for why they allowed other Fellows to step into a leadership position. However, there was a small to medium negative relationship with trusting in the abilities of other Fellows ($r = -.19$) and trusting in the commitment of other Fellows ($r = -.11$). This suggests that those who are highly engaged in activities related to being a PULSE Fellow put more importance on other Fellows' time and time management as reasons for allowing them to lead, rather than trust in their abilities or level of commitment. See Table 10 for all correlations.

Table 10: Correlations between engagement and allowing others to lead

	Trust in the abilities of other Fellows (r)	Trust in the commitment of other Fellows (r)	Trust in other Fellows' time management (r)	The belief that another Fellow had more time than I did (r)
Engagement Score	-.19	-.11	.16	.11

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