

# WHY VOLUNTEER? WHAT *STIMULATES* INVOLVEMENT IN A STEM PEER LEARNING FACILITATION PROGRAM?

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## ABSTRACT

There is an acknowledged need for strategies to enhance participation, learning and graduate capabilities for students engaged in STEM disciplines given the central importance of these skills to the future economy. The STIMulate program provides support for learning across maths, science and IT to all QUT coursework students regardless of course of study or campus. Central to the success of the program is the provision of face-to-face peer support by a team of high-achieving, experienced student volunteers; the Peer Learning Facilitators (PLFs). Understanding the motivations and expectations of the diverse team of STIMulate student volunteers is necessary to appropriately manage the program. A survey instrument was adapted from the Volunteer Functions Inventory (Clary, Snyder, Ridge, Copeland, Stukas, Haugen & Meine, 1998) to assess three drivers of participation - autonomy, mastery and purpose, and provided to all commencing PLFs at the initial 2016 training session. Principal Component Analysis (PCA) identified three classifications of motivators for beginning PLFs: relationships and experiences (most important criteria), intrinsic motivators and extrinsic motivators (least important criteria). The findings of this work represent an important first step towards enhancing evidence-based practice for the management, reward and recognition of student volunteers engaged in academic support programs.

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## INTRODUCTION

The projected value of STEM (Science, Technology, Engineering and Maths) skills in shaping the future Australian workforce and economy has been highlighted in recent years (Office of the Chief Scientist, 2014; Australian Government, 2015; Education Council, 2015). However, for the higher education sector, this poses a new set of challenges; as demand for high-quality STEM graduates is anticipated to increase, there is a decline in both the participation and proficiency in maths and science at the secondary school level (Engineers Australia, 2015; King & Cattlin, 2014; Kennedy, Lyons & Quinn, 2014). The implication of these findings is that our future STEM graduates are embarking on degrees that they may not be best equipped to successfully complete.

Acknowledgement of the increased diversification of the Australian higher education student cohort has prompted consideration of the characteristics and specific needs of students to better facilitate access, participation and engagement (Budge, 2010; Thomas, 2013; Thomas & Heath, 2014). Responding to these challenges, the STIMulate program was established in 2013 to provide support for learning for all QUT coursework students, regardless of their course, learning needs and background, in the broad areas of maths, science and IT. Drawing on a social justice framework (Nelson & Creagh, 2012), the program promotes the inclusion of strategies and experiences to enhance engagement and participation from the outset and to contribute to the 'normalisation of help seeking behaviours'. Delivery of the program integrates peer support by a team of experienced student volunteers and academic support by discipline specialists. The face-to-face delivery mode is complemented by online resources (available via Blackboard) and collaborative spaces (Facebook community) to enhance access and build community (Lightbody, Wilson, Farr, Crane, Medland, Devine, Moody, Mealy & Lane, 2015).

A key aspect of the program is the support provided by a team of trained student volunteers, known as Peer Learning Facilitators (PLFs). Since the inception of the program in 2013, 280 PLFs have been trained in learning facilitation, contributing 14,700 hours of volunteer service to assist in excess of 9000 students in the STIMulate drop-in spaces. These statistics highlight the central role the PLF team plays in program delivery. Peer-to-peer support, or peer learning, is an important element of social constructivist learning theory, which highlights the importance of social interaction between peers in expanding understandings and transferring learning across contexts (Vygotsky, 1978). To be considered for a PLF role with STIMulate, students must have completed a minimum of two semesters of full-time study and achieved a cumulative GPA of 6 or above. In addition, prior to commencing with the program, potential PLFs must attend a compulsory training session which enables the building of skills in learning facilitation, communication and cultural competency (Van Ryt, Menzies & Tredinnick, 2015) and acknowledge they have time in their schedules to commit to attending a regular drop-in session each week (generally 2 hours) during the semester.

So why do it? What motivates high-achieving students to give up their own time to volunteer to support the learning of their peers?

The benefits of peer learning, both for the recipient and peer leader, are now well established in the tertiary setting (Lockspeiser, O'Sullivan, Teherani & Muller, 2008; Weiler, Zarich, Haddock, Zrafchick & Zimmerman, 2014). For the peer leaders, these benefits are linked to classic motivators of participation; an internal drive to reinforce knowledge and understand and enhance the learning process (intrinsic motivators), or external incentives which may be viewed as 'rewards' from the knowledge community (extrinsic motivators) such as recognition by peers and academic staff, professional development, leadership opportunities and enhancement of CV (Deci & Ryan, 2000). Recent work has demonstrated that intrinsic motivation is the predominant, but not exclusive, driver of participation in volunteer roles (Geiser, Okun & Grano, 2014). Classifying the motivations of volunteer groups provides an important framework in which to consider appropriate reward and recognition for service (Clary et al., 1998). While the notion of reward may seem at odds with intrinsic motivation, ensuring student volunteers feel valued for their contributions may be reflected in the duration of service (Pierce, Cameron, Banko & Sylvia, 2003). In the context of peer learning, Tredinnick, Menzies and Van Ryt (2015) demonstrated the perceived value of 'reward' evolves and changes through the peer leader journey (from beginner to senior peer leader) or with increasing duration of service.

Understanding the motivations of our extensive and diverse team of student volunteers is essential to build the capacity of the program through targeted recruitment and retention (enabling the support of a greater breadth of units that incorporate conceptual knowledge in maths, science and IT, including more advanced units) and develop the skills of PLFs, evidenced through the attainment of specific graduate capabilities. Here we present the analysis of the pre-service survey conducted with the commencing STIMulate PLF cohort at the start of Semester 1, 2016. The survey probed motivations for volunteering based around the themes of autonomy, mastery and purpose (Esplin, Seabold & Pinnegar, 2012, p.89). Analysis of measured responses revealed that individual motivations did not group neatly into these three themes. Instead, the dominant motivation for entering into a volunteer role with STIMulate was inclusive of all three elements and best categorised as 'relationships and experiences'. These findings build upon previous work identifying intrinsic motivators as key for commencing peer leaders and provide important insight into both the drivers for initial participation as a peer leader and the expectations of service, informing a more efficient and strategic approach to volunteer recruitment and program coordination.

## METHODS

A survey instrument was adapted from the Volunteer Functions Inventory (Clary et al, 1998) comprising twenty questions (Table 1), each aligned to one of three intrinsic motivators: Mastery, Autonomy or Purpose (Esplin et al., 2012) All questions were scored using a five-point Likert scale (1=strongly disagree to 5=strongly agree).

For this initial work, participants were limited to beginning PLFs who had accepted an invitation to join the program as a peer leader in semester 1, 2016. Commencing PLFs (n=80) were provided with ethics information regarding the survey and its purpose at the commencement of the STIMulate Peer Leader Training Day (February 2016). Participation was optional and completion of the paper-based

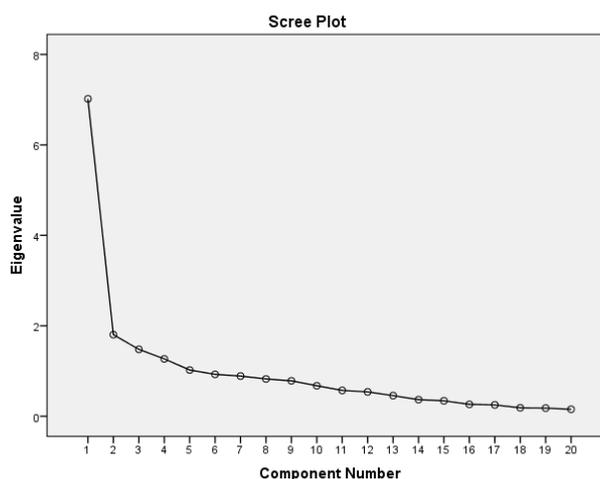
survey was viewed as consent to participate in the research (supplementary material). Survey responses were anonymous, however PLFs were requested to generate a unique code (first three letters of mother's maiden name and last 3 numbers of phone number) to enable planned follow-up surveys to be matched to the individual. All surveys were completed and returned in the first session of the training day.

Likert-scaled responses were entered into an excel spreadsheet (rows representing individuals and columns representing their responses to the statements) and analysed using quantitative statistical methods. Principal component analysis (PCA) and hierarchical cluster analysis (HCA) were utilised in this exploratory data analysis. This methodology allows the extraction of a number of principal components (PCs) which can then be used to explain the whole of the data by reducing and extracting the most important information from the data (Abdi & Williams, 2010; Wold, 1987). PCA was performed using IBM SPSS 23 (IBM, 2015), with the use of KMO (Kaiser-Mayer-Olkin) and Bartlett's test of sphericity and Varimax rotation with the component scores saved as regression variables. The Scree plots and two dimensional loading plots of PC1 against PC2 were then used to display the resulting PCs. HCA based on PCA component scores was performed to explore the heterogeneity of motivations among the surveyed PLFs.

PROMETHEE (Preference ranking organization method for enrichment evaluation) and GAIA (Geometrical analysis for interactive aid) are a related set of multiple criteria decision making (MCDM) tools (Brans & Vincke, 1985) which have seen use in a wide variety of fields, from business, to science, to sports management (Behzadian, Kazemzadeh, Albadvi & Aghdasi, 2010). Visual PROMETHEE software (Mareshal, 2013) with a flat or "usual" preference function (same weighting to all) along with the PROMETHEE II protocol were used to rank the statements from those most important to least important for commencing PLFs.

## RESULTS

On the basis of the Scree plot (Figure 1) it was decided to extract three principal components (PC), which explained 51.5% of the variance. Membership of these components is illustrated in the response profiles (Figure 2) where a correlation greater than 0.5 indicates membership of that PC. The first principal component (PC1) consists of seven of the twenty statements from the survey instrument; all four of the mastery statements (M5, M10, M12 and M15), two of the purpose statements (P13 and P14) and a single autonomy statement (A6) and accounted for 35.1% of the variance in the data. Thematic analysis of these statements led us to propose that this grouping be described as *positive relationships and experiences*.



**Figure 3: Scree plot showing eigenvalues of the Principle Components. Three PCs have an eigenvalue greater than 1, making them significant.**

The second principal component (PC2, 9.0% of variance) consisted of purpose (P2, P3 and P9) and autonomy (A4, A11 and A16) statements. These statements are associated with developing confidence and self-determination, leading us to propose that this grouping be identified as *intrinsic motivators*. Finally, the third principal component (PC3, 7.4% of total variance) consisted of four statements; a single purpose statement (P20) and three autonomy statements (A17, A18, A19).

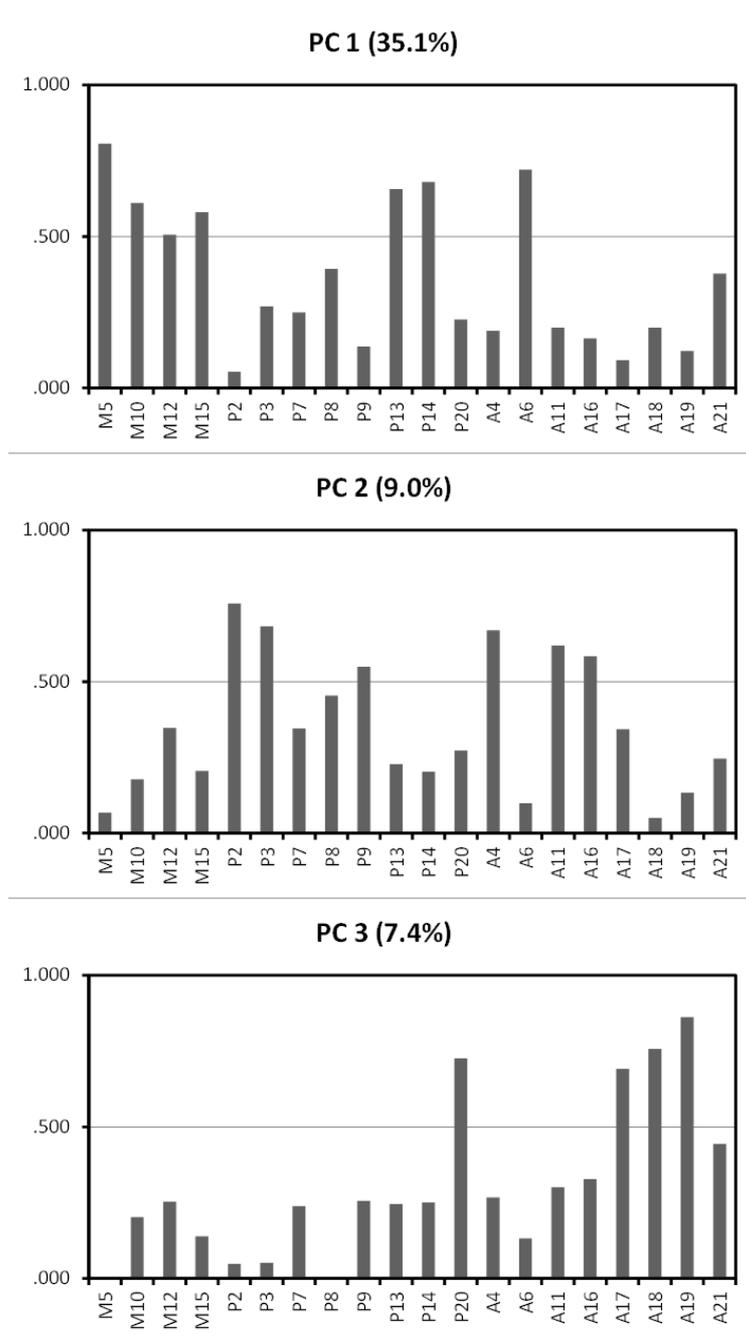
These statements are associated with reward and recognition and have been grouped here as *extrinsic motivators*. Three statements were not assigned to one of the three components. These were P7 (I understand the life and learning challenges faced by other students), P8 (I value the opportunity to network with other students) A21 (I feel confident to take on other roles and responsibilities at QUT).

**Table 1: Statements from survey instrument and assigned groupings based on PCA, HCA and GAIA analyses.**

Statement	Related PC	HCA Cluster Membership	GAIA Clusters
<b>M5:</b> I can develop my own capabilities and strengths	Relationships and experiences	1	A
<b>M10:</b> My experience contributes to my own success at university	Relationships and experiences	1	A
<b>M12:</b> I work well with others	Relationships and experiences	1	A
<b>M15:</b> I can learn through my PLF experience	Relationships and experiences	1	A
<b>P13:</b> I am able to build positive relationships with other students	Relationships and experiences	1	A
<b>P14:</b> I am able to build positive relationships with staff	Relationships and experiences	1	A
<b>A6:</b> I can gain new perspectives	Relationships and experiences	1	A
<b>P2:</b> I feel confident to talk about my role with others	Intrinsic motivators	2	B
<b>P3:</b> I can give back to the university	Intrinsic motivators	2	B
<b>P9:</b> I feel connected to my STIMulate community	Intrinsic motivators	2	C
<b>A4:</b> Currently, I feel confident about my role	Intrinsic motivators	2	B
<b>A11:</b> My contribution to STIMulate is valued	Intrinsic motivators	2	B
<b>A16:</b> I am able to choose how I get involved in STIMulate	Intrinsic motivators	2	B
<b>P7:</b> I understand the life and learning challenges faced by other students:	*	2	B
<b>P8:</b> I value the opportunity to network with other students:	*	2	A
<b>P20:</b> I feel valued by the STIMulate team	Extrinsic motivators	3	C
<b>A17:</b> I feel my voice is heard	Extrinsic motivators	3	C
<b>A18:</b> I have more clarity about my own professional/career pathway	Extrinsic motivators	3	C
<b>A19:</b> I feel rewarded for my involvement	Extrinsic motivators	3	C
<b>A21:</b> I feel confident to take on other roles and responsibilities at QUT	*	3	B

\*: Not originally grouped in PCA analysis

The make-up of these components demonstrates that the structure revealed in this sample differs from the expected structure of autonomy, mastery and purpose.



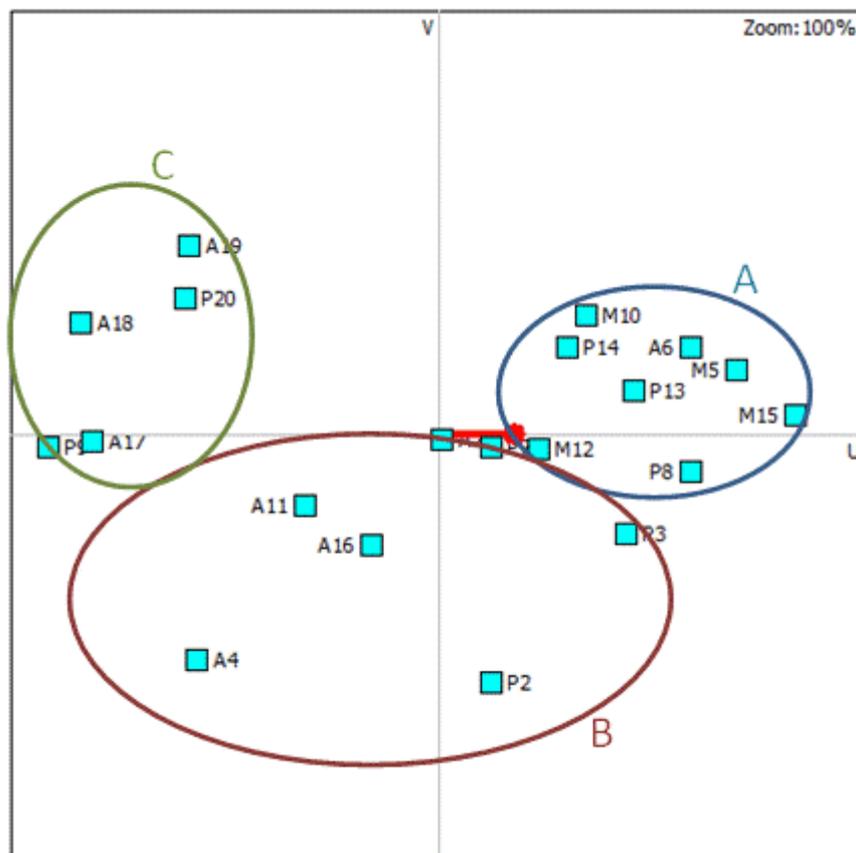
**Figure 4: Response profiles from PCA. Correlations greater than 0.5 indicate membership with that response profile.**

Hierarchical cluster analysis is a complimentary technique to PCA through which it was possible to identify three major clusters of statements. These clusters matched very well to the PCA analysis, as shown in Table 1, suggesting that the analysis and resulting groupings are valid. Taken together, these analyses of the pre-service motivational statements from beginning peer leaders identified three unique groups which we have classified based on thematic analysis of the correlated statements and labelled as *relationships and experiences* (PC1), *intrinsic motivators* (PC2) and *extrinsic motivators* (PC3).

In order to validate the new modelling of the student volunteer responses, PROMETHEE and GAIA were performed on the data. PROMETHEE II is an updated ranking method which assigns a ranking to each variable (statement) from most important to least important, based on a number of user-set

criteria. GAIA illustrates the results of the PROMETHEE rankings in a plot which contains a decision axis ( $\pi$ ) pointing to the group of variables which is most important in decision making.

The GAIA plot (with the assistance of Fuzzy Clustering, a supervised grouping method) revealed three distinct clusters which match with the groups identified by PCA/HCA analysis (Figure 3). Cluster A (blue) represents Relationships and Experiences (M12, M10, P14, A6, M5, P13, M15 and in this case, P8) while Cluster B (red) represents Intrinsic Motivators (A11, A16, A4, A21, P2, P3 and P7, in this case, P8 fits with Relationships and Experiences, while P9 is linked to Extrinsic Motivators) and finally Cluster C (green) represents Extrinsic Motivators (A19, P20, A18, A17 and in this case, P9). In this study, the Decision Axis ( $\pi$ ) points weakly towards Relationships and Experiences, which suggests that Relationships and Experiences are the major motivator for students choosing to volunteer as STIMulate PLFs.



**Figure 5: GAIA plot with fuzzy clustering showing three distinct clusters (A, B and C)**

The PROMETHEE II rankings (Table 2) demonstrate that Cluster A (Relationships and Experiences) was the most important factor, followed by Cluster B (Intrinsic Motivators). Extrinsic Motivators were found to be the least important factor for initial involvement with the STIMulate program. In summary, the analyses performed here suggest that the initial motivational elements upon which the survey instrument was designed (Autonomy, Mastery and Purpose) were not best-suited to explaining the motivations of students choosing to become PLFs with STIMulate. When four exploratory statistical methods were used to investigate the data, a different set of motivators were elucidated, namely Relationships and Experiences, Intrinsic Motivators and Extrinsic Motivators. These results suggest that students volunteering to become PLFs with STIMulate for the first time are seeking to develop positive relationships with peers, while extrinsic motivators, such as rewards for service, were found to be the least important factor for students choosing to participate in a volunteer role with the program.

**Table 2: PROMETHEE II rankings for the survey questions. A higher rank indicates higher importance in motivating students to volunteer as PLFs.**

Rank	Action	Phi	Cluster
1	M15	0.4553	A
2	M5	0.3217	A
3	P8	0.2862	A
4	A6	0.2842	A
5	P3	0.2336	B
6	P13	0.2322	A
7	M10	0.1678	A
8	P14	0.1414	A
9	M12	0.1211	A
10	P2	0.0638	B
11	P7	0.0408	B
12	A21	0.0322	B
13	A16	-0.0316	B
14	A11	-0.1408	B
15	A19	-0.2421	C
16	P20	-0.2842	C
17	A4	-0.2868	B
18	A17	-0.4211	C
19	A18	-0.4329	C
20	P9	-0.5408	C

## DISCUSSION

Identifying and understanding the motivations of students that volunteer to facilitate the learning of their peers is necessary for effective program management. The survey instrument applied in this instance was designed to probe three aspects of intrinsic motivation – autonomy, mastery and purpose (Esplin et al., 2012) in beginning PLFs. What has emerged through this work is that student volunteer motivations are complicated; they do not align exclusively with one of these factors. By identifying how the statements that underlie these motivating factors correlate to one another, we have enhanced our understanding of volunteer motivations, enabling ‘profiles of motivation’ to be extrapolated from each of the three clusters identified here. These profiles will drive improvements in recruitment strategy and program experience for STIMulate PLFs.

Beginning STIMulate PLFs are more likely to be motivated by relationships and experiences than by other factors (clustered here as ‘intrinsic motivators’ and ‘extrinsic motivators’). PLFs displaying this profile are motivated to learn through their experience, develop their capabilities and strengths and build positive relationships with other students. PROMETHEE analysis identified the highest ranked statements as those with importance placed on developing skills and breadth of knowledge. The statement M15 (I can learn through my PLF experience) was the highest ranked, and therefore of most importance in motivating students to volunteer as PLFs. STIMulate PLFs are high achieving students: to be considered for a PLF role, students must have completed two semesters of full-time study (96 credit points) and achieved a cumulative GPA of 6 or above. In this case, evidencing knowledge acquisition and academic skills development is not seen as an endpoint: PLFs recognise the value of teaching to enhance the learning experience for themselves and their peers.

Provision of the survey to commencing PLFs at the start of the training day enabled some control for the variable of ‘experience’ in influencing volunteer motivation. The value of this first analysis can be considered from the perspective of understanding the ‘naïve’ or ‘beginning’ peer leader. The beginning PLFs do not have a clear idea of the structure of the program, as reflected in statements that probe their expectation for the program (e.g. P9: I feel connected to my STIMulate community; P20: I feel valued by the STIMulate team). While PLFs can see the advantages to their academic studies, they do not yet see how the program will value their contribution, or contribute to their future endeavours.

### Implications for coordinating peer leader programs

STIMulate, like many peer programs, is reliant on trained volunteer students for service delivery. Accordingly, it is important to understand the motivations and expectations of the students who

choose to become involved and respond by structuring programs guided by their expectations, aspirations and needs.

STIMulate is the largest peer-led support for learning program at QUT. A key aspect of program design and delivery is the breadth and depth of units supported across QUT. This is made possible through the combined expertise of the PLFs and academic staff. STIMulate PLFs are visible on all three campuses and come from a diverse range of courses. In joining the program, beginning PLFs are motivated to engage in learning experiences - they expect to have the opportunity to assist their peers. For the program coordinator, it is necessary to ensure that the number and specific skill sets of newly recruited PLFs are aligned with the anticipated demand for these skills by visiting students. Effective data capture can provide insight into periods of projected increased demand for support (such as around assessment). Program coordinators should ensure PLF rostering procedures are aligned to anticipated demand for skill sets and availability of visiting students.

Recruitment and demand for service are also dependent on marketing and program message. Recognising that beginning PLFs are motivated by relationships and experiences validates our new approach to program promotion. STIMulate supports a broad range of learning needs – we see students aiming to pass alongside those aspiring for a high distinction. Recognition that ‘success’ is unique to each individual student is reflected in our current marketing: we aim to create a collaborative and inclusive learning community at QUT. For our PLFs, we hope this will enable opportunities to learn alongside similarly motivated, high achieving students, across course and faculty boundaries. However, while evidencing graduate capabilities through volunteer service will be of importance to the PLFs, it is imperative that academically-oriented peer programs continue to build aspiration and unlock opportunities for high-achieving and engaged students to enhance their connection and networks within their discipline.

### **Future Directions**

The QUT Peer Leader Capacity Building Model (Menziez, Tredinnick, & Van Ryt, 2015) incorporates a rewards framework established through institution-wide consultation with peer leaders. This work identified beginning peer leaders as being intrinsically motivated, however appropriate and timely reward with increasing duration of service is necessary to maintain motivation and build efficacy, supporting the acquisition of an enhanced set of graduate capabilities (Tredinnick, Menziez & Van Ryt, 2015). Our work supports and extends the findings of Tredinnick et al., (2015). We demonstrate that while beginning PLFs are intrinsically motivated, the profile of these motivating factors is complex.

Our analysis is currently limited to beginning PLFs. While this directly informs recruitment practices and provides some insight into expectations, to build capacity in the program and capability in the PLFs, we must next assess to what extent motivation influences retention of trained student volunteers. The responses to the initial survey were coded, enabling us to assign a dominant motivational profile to each PLF and assess how it changes with experience through a similar follow-up survey administered at the end of the semester. Do the ‘profiles of motivation’ and their membership shift over the course of the semester with the addition of PLF experience? Further, consistent with the QUT Peer Leader Capacity Building Model, if PLFs choose to continue to volunteer with the program over successive semesters, to what extent (if any) do dominant motivating factors shift? How does the program support the acquisition, and recognition, of enhanced capabilities of experienced PLFs? How can optimisation of this process provide pathways for mentoring and leadership positions within the program to acknowledge the developing skill sets of the volunteers?

Finally, while the beginning PLF sample size reported here was large (n=80), these PLFs are sourced from 24 courses, across four faculties at QUT. For a cross-institutional program such as STIMulate, identifying potential differences in motivations between, for example, health students and science students may assist in the more targeted marketing of the program to both peer leaders and participants.

In conclusion, analysis of measured student volunteer responses to a pre-service survey revealed that the dominant motivating factor influencing participation was ‘positive relationships and experiences’. The findings presented here extend upon previous work identifying the importance of intrinsic motivators in driving volunteer service and will inform enhancements in program coordination, specifically in the areas of student volunteer recruitment, program experience and retention.

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