

# Motivational Factors Influencing In-Class Peer Tutors in Engineering: A Functional Approach\*

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Tutors have been shown to have positive effects on a multitude of important student outcomes in educational settings, and are a cost effective, valuable, but often under-utilized resource. Although extensive literature exists on motivation, findings have not been rigorously applied to understanding tutors' motivations for participating in unpaid tutoring programs. The purpose of this study is to investigate motivational factors behind students' participation in an in-class peer tutoring (ICPT) program utilizing a combined inductive approach and the established functional approach theoretical framework. Tutors were interviewed using a semi-structured format with an open-ended interview protocol using both general questions about their experience with ICPT, and specific questions related to the functional approach. Interviews were analyzed by two researchers using a multi-phase collaborative analysis procedure. Our analysis indicates that the most prevalent reasons students are motivated to participate in ICPT programs are to reinforce engineering concepts, to help others, and to contribute to courses and the department. Students were also influenced by career and social factors. Findings suggest that token compensation did not have a major affect on motivation. Future efforts investigating volunteer tutoring programs should use a modified functional approach that includes factors found in this study. These findings can help improve the recruitment and retention of volunteer tutors for this and other programs. This study also illustrates that it is possible to maintain an effective peer tutoring program at no cost through the use of volunteers.

**Keywords:** tutoring; motivation; functional approach

## 1. Introduction

The field of engineering is known for the rigorous demands it places on students, and suffers from low student retention rates [1]. The value of social resources [2] and tutors [3] for improving learning is well-documented. With the goal of improving the classroom climate in engineering courses, an in-class peer tutoring (ICPT) program was implemented at two large land-grant universities. The first program started in fall 2007, and the program was implemented at least once in three courses: Statics, Mechanics of Materials, and Water Resources Engineering. The program was used at the second university in a Statics course beginning the winter of 2009. The ICPT program functions by using more-experienced students to act as tutors to less-experienced students during in-class active learning exercises. Tutors were initially compensated with a \$100 gift certificate in both programs. Both programs are still operating, but are now run on a completely volunteer basis, without compensation.

A wide variety of theoretical perspectives on motivation can facilitate the understanding of motivational factors and processes, including self-determination theory and expectancy theory. The main tenets of these perspectives are represented in the functional approach discussed below. The goal of

this project is to investigate the motivational factors of tutors who participate in the ICPT program.

## 2. Literature review

Schunk *et al.* defined motivation as, “the process whereby goal-directed activity is instigated and sustained” [4, p. 4]. Motivation is an internal process, and as such, is properly studied by examining verbalizations of reasons for participation in a goal-directed activity, rather than by direct observation of the activity [4]. This definition also incorporates goals that are a part of an individual's cognitive process, because the individual is conscious of what he or she is trying to attain. Goals are achieved through activity, either mental or physical. After an individual has decided to engage in this activity, motivation helps to sustain it [4].

From a large body of work on motivation, we narrowed the focus of our literature review to studies that investigated motivation of volunteers, and tutors specifically. Within this focus, several motivational theories were explored to assess their appropriateness for application to this program, including self-determination theory [5], Maslow's Hierarchy of Needs [6], and expectancy theory [7, 8]. These all present motivation in terms of the satisfaction of various needs that guide and influence

human behavior, and in that sense, the essence of these theories is captured in the functional approach [9], which was selected to guide our research. The functional approach is more directly applicable to our setting, because motivational needs are operationalized in a manner that is specifically related to volunteer settings.

The functional approach posits that individuals engage in activities to achieve desired outcomes, and adapts it to volunteer settings. The functional approach is composed of three major theoretical assumptions [9, 10]. The first is that motivational processes lead to initiation and continuation of an activity. The second assumption is integral to this study because it posits that different people engage in the same activities for different reasons. The final claim is that individuals engage in situations or activities to satisfy needs or achieve expected outcomes. The three assumptions that the functional approach is founded upon are operationalized within six concepts: values, understanding, social, career, protective, and enhancement [9].

Much of the literature regarding volunteer motivation simply sought to discover reasons for motivation from an empirical perspective, with no grounding in motivational theory. Common motives for volunteering found in this literature include altruism, affiliation, personal improvement, duty to others, personal benefit, philanthropy, religiosity, humanitarian causes, enjoyment, and elimination of negative feelings [11–15]. Though much of the previous research on volunteer motivation often fails to connect findings to theory, Clary *et al.* [9] proposed that the functional approach helps “systematize and organize” this literature and represents major components and findings from previous work on volunteer motivation.

Clary *et al.* [9] developed the Volunteer Functions Inventory (VFI) to investigate the motivations underlying volunteer activities. The VFI has been validated, and has been used in several studies to

provide empirical data in support of the functional approach. These studies showed that functional theory provides an effective lens to investigate motivational factors of volunteers [16]. Additionally, several studies have used the functional approach, the six functions, and the VFI to study various motivational constructs in efforts to refine theories of motivation [17, 18]. Because the six factors in volunteer settings are found both in studies lacking a framework and those using the functional approach, they were deemed to be applicable, and adopted as a framework for this study (See Table 1).

Few studies have addressed tutor motivation, especially at the university level. Carmody and Wood [19] note that university volunteer mathematics tutors are motivated by multiple factors included filling free time, a good addition to the resume, increasing communication skills, meeting other people, helping younger students, taking pressure off other tutors, and giving back to the department. Their results could be classified into the six functions in the functional approach. For example, giving back to the department could be categorized under the values function, and improving communication skills could be a manifestation of the enhancement function. Terrion and Leonard [20, p. 89] compared the motivations of paid and unpaid mentors in a university setting who were involved in “one-on-one, private consultations” using the functional approach, and found that both paid and unpaid mentors were motivated by self-oriented reasons. However, paid mentors’ primary motivations were related to productivity, while unpaid mentors were primarily motivated to fulfill social needs. ICPT differs significantly from the contexts explored in both studies in that it is based on in-class interactions between tutors and students. In order to develop a robust model of motivational factors for tutors, this phenomenon must be studied in a diverse set of contexts. Addi-

**Table 1.** Functions served by volunteering and their assessment on the Volunteer Functions Inventory (VFI) [10]

Function	Conceptual definition	Sample VFI item
Values	The individual volunteers in order to express or act on important values such as humanitarianism.	I feel it is important to help others.
Understanding	The volunteer is seeking to learn more about the world or exercise skills that are often unused.	Volunteering lets me learn through direct, hands-on experience.
Enhancement	One can grow and develop psychologically through volunteer activities.	Volunteering makes me feel better about myself.
Career	The volunteer has the goal of gaining career-related experience through volunteering.	Volunteering can help me get my foot in the door at a place where I would like to work.
Social	Volunteering allows an individual to strengthen his or her social relationships.	People I know share an interest in community service.
Protective	The individual uses volunteering to reduce negative feelings, such as guilt, or to address personal problems.	Volunteering is a good escape from my own troubles.

tionally, in these two studies there was little effort to prioritize tutors' motivations to understand the factors that are most influential for their participation. Prioritization is important in tutor motivation research to understand how aspects of some tutoring programs may align differently with important motivators for participation.

### 3. Research questions

The purpose of this study is to identify the motivational factors for students who volunteer to participate as tutors for in-class peer tutoring programs in engineering programs at two large public universities. The following research questions guided the study:

- How do motivational factors relate to the six functions proposed by Clary and Snyder [9]?
- Which, if any, additional factors aside from the six functions motivate students to participate?
- Which factors are more influential than others?

### 4. Research setting

This research project is part of a larger investigation of an in-class peer tutoring (ICPT) program that has been in place at two universities, Washington State University and Oregon State University. Our study focuses on motivation within the context of the ICPT program in engineering at both universities.

Both public land-grant universities are in rural settings with between 20 000 and 25 000 students. Each has an engineering college, with six departments at one, and eight departments at the other. The classes that incorporated peer tutoring had between 60 and 120 students. Peer tutors volunteered in two Statics classes at one university and several Statics, Mechanics of Materials, and Water Resources classes at the other. At both institutions, Statics is a sophomore-level engineering class offered by the department of Civil Engineering. Students take Mechanics of Materials the term after Statics. Water Resources is a junior-level class taken by all students in the Civil Engineering department.

All but one of the instructors for these classes are non-tenure-track faculty who focus primarily on teaching undergraduate courses within their departments, with minimal time spent on research. Students reported in the interviews that the teachers who participated in this study are concerned about them and their learning. Students often indicated a preference for these teachers over others because of the clarity of their teaching styles, organization, and realistic expectations of their students. Because of the important role of the researchers in data collection and analysis, it is also important to note that the

two principal researchers were aware of ICPT before undertaking this project. Both were graduate students at one of the institutions, had volunteered as peer tutors for Statics and Mechanics of Materials, and had worked with or taken classes from the instructors who implemented ICPT. One of them had also completed other projects involving ICPT at both universities. In a few cases, the interviewers knew the students that they interviewed, either through acting as peer tutors in the students' previous classes, or as fellow students in the engineering program. In these cases, interviewers made an extra effort to help the students feel comfortable answering interview questions honestly.

#### 4.1 What is in-class peer tutoring?

In the ICPT program, peer tutors are students who volunteer for the position after completing the course during a previous term, and are selected by their teachers based on academic performance, personal interest, and attitudes towards teaching. Peer tutors are intended to facilitate student interaction in class, as well as understanding of course concepts.

Peer tutoring differs from other forms of tutoring, and consists of two components. The first component takes place during designated class meeting time. Approximately one week prior to each class, peer tutors are given an exercise so that they can work through it on their own and gain a solid understanding of the problem and applicable concepts. Peer tutors also meet with the course instructor for between 30 and 60 minutes to discuss the exercise at least two or three days before the class period in which the ICPT session will occur; this helps peer tutors to understand the concepts required to complete the in-class activity. Peer tutors then attend the class during the scheduled lecture period one day a week, and assist students as they work through the in-class active learning exercises. This activity lasts approximately 15–25 minutes, and both the teachers and peer tutors are present during this time to help students with the activity.

The second component of the ICPT program takes place outside of scheduled class time. Peer tutors hold office hours each week, when they are available for students to ask for help with homework, studying, or class projects. Unlike the in-class portion, there is little structure during this time.

Table 2 displays the courses in which ICPT was implemented, and how many students peer-tutored for each class. Enrollment in all courses was between 50 and 70 students, except for Statics in the fall of 2009, which had an enrollment of about 120. Some individuals tutored for several courses, so the sum of the Tutors column in Table 2 does not

**Table 2.** Implementation of ICPT

Term	Course	Teacher	No. of tutors
Fall 2007	Mechanics of Materials	Professor A	7
Spring 2008	Mechanics of Materials	Professor A	3
Fall 2008	Mechanics of Materials	Professor A	6
Spring 2009	Mechanics of Materials	Professor A	4
Fall 2009	Mechanics of Materials	Professor A	10
Fall 2009	Statics	Professor B	8
Fall 2009	Statics	Professor C	3
Fall 2009	Water Resources	Professor D	4
Winter 2009	Statics	Professor E	10
Spring 2010	Mechanics of Materials	Professor A	7

represent the number of individuals who have tutored.

When ICPT was first implemented, a \$100 stipend in the form of a gift certificate was offered to tutors. The first term was the only time that all tutors collected the stipend. Later, very few tutors collected it. In many cases, as will be discussed in the results section, peer tutors did not consider compensation to be influential in their motivation to volunteer for the ICPT program. The ICPT program is currently active at both universities, and no gift certificates are offered.

## 5. Research methodology

Our study was conducted using qualitative data collection and analysis methods. Miles and Huberman make the claim that qualitative data “are fundamentally well suited for locating the meanings people place on the events, processes, and structures of their lives” [21, p. 10]. Similarly, Patton describes qualitative data as “someone else’s experience of the world in his or her own words” [22, p. 47]. Because this study was aimed at discovering and interpreting the motivational factors behind student participation in the peer tutoring program, qualitative research allows the participants to tell their own stories, providing researchers with detail-rich, descriptive data on the experiences and process of their decisions.

Semi-structured interviews were utilized as the method of data collection, because this format allowed structuring of the interviews around research goals, while participants were still given the opportunity to answer in an open-ended fashion. Open-ended responses are desirable, because they allow a participant to relate his or her own experience without the influence of predefined response categories.

The intent of the functional approach [9] is to elicit the “functions,” or the interpretations of value that the activity brings to the volunteer. As discussed previously, volunteers may find function in a variety of ways, including learning or enhancement. The interview protocol (summarized in Table 3) was

developed with the dual goals of investigating any factors that motivated participation in ICPT, and to investigate specifically the role of the functional approach factors. These functions can be accessed through either open-ended questioning of how the tutor experienced the ICPT program, or questions related to how a specific function was served by their participation. Examples of the first approach are found in the study by Terrion and Leonard, here “open-ended questions were designed to provide rich narratives about their experience and motivation as a peer mentor. This approach results in an explanation of the meaning of action for the people involved” [20, p. 90]. The more specific approach is used by Clary *et al.*, with direct questions like, “Volunteering lets me learn things through direct, hands-on experience” [9, p. 1520]. Combining the inductive approach with the direct function approach allows for a more holistic view of the tutors’ motivation for participating in the ICPT program.

The beginning of the interview elicited responses about the ICPT experience as a whole, with open-ended questions concerning what they enjoyed about being a tutor, and what motivated them to participate in ICPT. The next portion of the interview was designed to elicit motivational factors related to the six functions in the functional approach [9]. In an attempt to elicit personal motivational factors, interviewers asked participants what they would tell someone who was considering becoming a peer tutor. The interviews concluded with general questions about benefits and disadvantages of the ICPT program, and whether any other motivational factors had not been covered. All students who had previously participated as peer tutors and who were still students were contacted to participate in this study, and offered a \$10 stipend for their time. A total of 22 of the 28 tutors contacted participated in the interview process. Individual interviews were conducted by one or both of the primary researchers, and lasted approximately 30 minutes. Two students were unavailable for interviews, but participated by answering interview questions via e-mail. The interviews were audio

**Table 3.** Interview questions**Motivation interview questions***General questions:*

What class and teacher were you a peer tutor for?  
 What did you enjoy about your experience as a peer tutor?  
 What personal characteristics are needed to be a good peer tutor?

*General motivation questions:*

What factors contributed to your decision to become a peer tutor?  
 What motivated you to participate in the ICPT program?  
 How did you find out about the ICPT program?  
 If you had to tell someone else why or why not to become a peer tutor, what would you say?

*Prior experience (as peer tutor or as a student)*

Were you a peer tutor more than once? Did you have peer tutors as a student?

*Function—Values (Enjoy helping, compensation)*

Were you compensated for participating in the ICPT program? Was this a factor in your decision to participate?  
 Would you have done it without compensation?

*Function—Understanding (Understand material, curriculum)*

Did you think being a peer tutor would increase your understanding of the material?  
 Was the curriculum influential to your decision?  
 Would you do it for other engineering classes? Upper level classes? Non-engineering classes? Why or why not?  
 Do you feel that you can perform better in your other classes because of your experience as a peer tutor? Why do you think this better performance is valuable/not valuable?

*Function—Enhancement (Confidence)*

Do you feel more/less confident after this experience? In what ways?  
 On course work

*Interacting with other students/teacher*

Did you feel prepared for your responsibilities as a peer tutor? How come?

*Function—Career (Connection to department/college)*

How did you feel more or less connected to the department/faculty/students after this experience?

*Function—Social (Interaction with tutors/students)*

Had you previously worked with [course instructor]?  
 Did you know anyone else who was going to be a peer tutor that term?  
 Was this particular teacher influential in your decision to become a peer tutor? How or why?  
 Would you have done it for other teachers? Explain.  
 What teacher characteristics would encourage/discourage you to participate?

*Wrap-up questions:*

What is good about the ICPT program?  
 How could we improve it?  
 Are there any other reasons that we haven't mentioned why you participated or why you would do it again?

taped and transcribed verbatim for analysis. Participants were assigned gender-appropriate pseudonyms to protect their identities.

### 5.1 Data analysis

The employment of validation methods can provide credibility by strengthening confidence in findings [23]. One validation method is for multiple researchers to code the same data set and discuss differences, ensuring a consensus on which blocks of data best fit each code [21]. Interviews were analyzed by two researchers using a multi-phase collaborative analysis procedure. The two researchers who conducted the interviews analyzed interview transcripts concurrently over five weeks, using the coding process described below. The researchers coded each interview line by line, discussing the meaning of each code and how it should be assigned. During this process, codes were revised, added, or removed, and researchers discussed emerging trends and themes. This form of validation served to fortify trends in the data, and lend credence to the findings of this study.

The general coding process followed that of Miles and Huberman [21], and has been frequently utilized for reviewing qualitative data, especially interview transcriptions. The process dissects meanings and themes while maintaining links between statements. Labels or “codes” are assigned to words or sections of text that convey a particular meaning so that data can be organized for analysis [24]. Coding for this project was completed in two phases with the assistance of ATLAS.ti, a qualitative data analysis software program [25]. The first phase consisted of relatively unstructured categorization of data to identify common statements made by students. This phase was designed to help the researchers become familiar with the data and its general patterns. Examples of first-phase categorizations include any statement referencing motivations and peer tutor characteristics.

The second coding phase was more analytical, and has been referred to as “pattern coding” [21]. The purpose of this phase is to identify trends within the general patterns established during the first phase, and to verify these trends. The intent of this

phase is also to identify the specific reasons why students volunteer, and which reasons are more important than others, such as reviewing material or helping other students. Reasons were revealed as more important than others through repetition, and by the strength of the statement.

## 6. Results

While findings from this study were based on, and generally support the functional approach framework, important findings outside of this framework that influence individuals' participation in volunteer tutor programs also surfaced. These include the fact that compensation was available, faculty asked students to participate, and student's identified several prerequisites for their participation in ICPT.

An area of particular interest for this study involved the use of compensation. In order to investigate ICPT as a volunteer program, it was necessary to establish the importance, or lack thereof, placed on compensation. As part of the program, \$100 gift certificates were made available to students at the end of the semester at both universities. The six functions do not address compensation, because they are designed for purely voluntary activities, which inherently exclude compensation. Prior to the study, compensation was assumed to be a major motivational factor for students. However, students indicated that this was not the case. Most students did not collect their gift certificates. When asked about compensation, 10 of the 22 students who participated said they had not received compensation at all. Those students who did collect the compensation said that it provided little or no motivation. Some felt that the stipend was a generous gesture of thanks for their time and effort, but would not be required for participation. The following quotation is representative of many students' views on compensation.

*Nick:* If there wasn't [compensation], I would probably still do it . . . I think compensating people even just a small amount, \$100 for a semester's work, it's a nice way to say thank you. It doesn't cost a whole lot. But it's definitely not the reason that I do it.

Nearly all of the students mentioned that they participated in response to faculty invitation. Students also expressed that they likely would not have participated had they not been asked. Being asked to participate provided an entry point for student interest in the program. Students then relied on other motivational factors to make their final decisions.

*Interviewer:* How did you find out about [ICPT]?

*Leanne:* [Professor] sent me an e-mail and said she

was looking for peer tutors. I don't know if she sent it to the entire class or if she selected people, but I got an e-mail and thought it would be good.

*Interviewer:* Would you have sought it out had she not approached you?

*Leanne:* Probably not. I don't think I really knew much about peer tutoring. I saw those people walking around in my lower-level classes. But I don't think I'd go up to a teacher and say, "Hey, do you want a peer tutor?"

Other students expressed similar thoughts about how they became involved with the ICPT program. This is consistent with the findings of Freeman [26], who concluded that volunteering is "something that people feel morally obligated to do when asked, but which they would just as soon let someone else do." Knowledge of this entry point is needed in order to initiate student participation, and clearly plays a role in student decisions to participate.

Student responses also indicated several other prerequisites for their participation in the ICPT program. Many students stated that they needed to have sufficient time available for this commitment, an aptitude for the subject matter, and an interest in the course material. Students indicated that they would be reluctant to tutor a subject in which they lacked confidence or felt underprepared. Similarly, the subject matter needed to reflect students' personal interests or areas of academic focus for students to be willing to participate. These prerequisites can help predict likely entry points for participants in this or similar programs.

### 6.1 The six functions

The overall themes expressed in the interviews can be classified into the six functions proposed by Clary *et al.*, which are designed to include any and all motivational factors for a variety of volunteer activities. However, not all functions apply to every volunteer setting. In the case of ICPT, the most influential functions were *understanding* and *values*, while *career* and *social* reasons played minor roles. No participants indicated that their motivation was influenced by either the *protective* or *enhancement* functions, which will therefore not be discussed further.

As part of the data analysis, themes and codes were categorized into the four motivational functions related to ICPT, as well as an "other findings" category. Table 4 provides an overview of major themes from interview transcriptions, and their classification into the four functions. In order for a quote to be included in Table 4, a student must have mentioned that factor as motivational for them to participate. The numerical values indicate the frequency with which students indicated that

**Table 4.** Interview themes

	Percentage of total quotations	Percentage of students	Overall percentage of total quotations
<b>Understanding</b>			<b>27%</b>
Learn material	14%	91%	
Learn for other classes	7%	64%	
EIT review	6%	50%	
<b>Values</b>			<b>26%</b>
Help students	14%	95%	
Help professor	5%	68%	
Give back to department	6%	59%	
<b>Career</b>			<b>6%</b>
Resume	6%	55%	
<b>Social</b>			<b>9%</b>
Connect to students	5%	55%	
Connect to department/faculty	4%	55%	
<b>Other findings</b>			<b>33%</b>
Asked to do it	7%	77%	
Compensation	7%	64%	
Prereq: Enjoy the material	8%	77%	
Prereq: Free time	4%	45%	
Prereq: Personal strength	7%	64%	
<b>Total</b>	100%		

this theme was an important motivational factor for their participation. For example, if a student indicated that preparation for the Fundamentals of Engineering Exam (FE or EIT) was not important for them, then it would not be included in Table 4. The bold numbers show the total number of statements associated with each function. While numbers do not adequately represent qualitative data, they do provide insight into the general predominance of the different functions. These quantifications provide a rough estimate of the prevalence of functions; however, they do not account for the strength of statements within each category. *Understanding* and *values* are clearly the two most important motivational functions, evident in the high frequency with which students mentioned these over the *career* and *social* functions. Furthermore, the conviction with which students spoke of the function of *understanding* indicated that this was more influential than the *values* function. Likewise, responses indicate that the *career* function plays a larger motivational role than the social function. Our analysis found no discernable differences in our main findings between students at the two universities.

### 6.1.1 Understanding

Of the six functions, *understanding* was the most prevalent among student responses. As illustrated in Table 3, students discussed understanding in terms of three major themes. These include learning the material, learning for other classes, and reviewing for the Fundamentals of Engineering Exam. These

are three distinct ways that students sought to increase their understanding.

The first response that indicated that students were motivated to participate through understanding was expressed by their desire to learn or review the material. A peer tutor indicated that the opportunity to teach the material to others allowed him to review and revisit old topics.

*Interviewer:* What did you enjoy about your experience as a peer tutor?

*Frank:* My personal aspect was the learning. It was nice to review all the material to get refreshed. You'd be amazed how much you forgot . . . I know when you teach something, you learn it a lot better. So that was really good.

Since the ICPT program provides the occasion to relearn course content, many students mentioned this as a factor contributing to their motivation to participate. For many students, learning the material was a primary motivational factor, as demonstrated by this typical student's statement: (Gary) "I did [peer tutoring] because, honestly, I learned the material that much better." A student also spoke favorably about how his participation helped to reinforce his understanding of basic engineering principles.

*Interviewer:* Do you think being a peer tutor helped increase your understanding of the material?

*Cameron:* Yeah, definitely. No question. You've done it, brushed it aside, moved onto different things. Then you come back and it reinforces your

basic understanding, because everything goes back to Statics.

While many students indicated that learning the material was an important motivational factor, others made the distinction that participation in the ICPT program allowed them to learn material that aided them in their current coursework. A peer tutor commented on the benefit of the peer tutoring experience in Water Resources as it related to Open Channel Flow, a course she was currently taking.

*Interviewer:* You said you were taking Open Channel Flow at the same time [as peer tutoring for Water Resources]?

*Leanne:* Yeah.

*Interviewer:* Did that help you review for that class as you were in it?

*Leanne:* Absolutely. Sometimes [the teachers'] lectures were almost identical at the beginning of the semester. Because [the Water Resources teacher's] review was what [the Open Channel Flow teacher] was teaching that morning, so it kind of rolled over a lot. So that was good.

Several students expressed similar ideas. Another student expressed this benefit when talking about the ease of completing homework for a current class.

*Interviewer:* Do you feel that you can perform better in your other classes because of your experience as a peer tutor?

*Nick:* Yeah, just coming across problems in my homework and in class . . . it seems to go a little more easily. And oftentimes I'll go, "Oh yeah, we just did this the other day in tutoring." And remembering exactly how to do it, and not having to go back and look it up, find the formula or the process.

Tutors reported that the experience also served as a good way to prepare for the Fundamentals of Engineering Exam (FE or EIT). A number of students commented on how this benefit affected their motivation to participate in the program.

*Interviewer:* Why did you choose to be a peer tutor? What motivated you to do it?

*Sarah:* Well, initially I thought it would be good to help me study for the FE, which I took last semester . . .

*Interviewer:* Did it help you with the FE?

*Sarah:* Yeah, I think it did, because I didn't get a lot of chance to study for the FE. There was about a week that I studied for it. But the Mechanics and Materials part, I didn't really study for at all, because I'd been a peer tutor.

While studying for the FE exam was a principle motivational factor for some students, most stu-

dents only briefly mentioned it as a motivational factor. A possible explanation for this could be the timing of the FE. Peer tutors who participated more than one semester prior to taking the FE would likely not be focused on studying for the test at such an early stage.

### 6.1.2 Values

The second major function mentioned by students was *values*. Three distinct manifestations emerged. Students spoke about their altruistic motivations to help students, help teachers, and give back to the department.

Many students demonstrated an altruistic desire to help two distinct groups of individuals: students and instructors. A common theme in student responses related to the rewarding intrinsic feelings that result from tutoring other students. One student thought that this was one of the most important reasons for participation in the ICPT program.

*Interviewer:* If you had to tell someone else why or why not to become a peer tutor, someone who was considering doing it, what would you tell them?

*Cameron:* I think the result you get out of it is pretty rewarding. Not monetarily. Just being able to say, I helped this person. Just knowing you helped someone, it's a good feeling.

Another student indicated that helping her peers was an enjoyable factor that motivated her to participate.

*Interviewer:* What did you enjoy about [ICPT]?

*Leanne:* I liked being able to help out students that were my age and were only, say, a semester behind. It was kind of nice to be able to bestow my wisdom.

Findings indicate that nearly every student was motivated by the desire to help other students. While most peer tutors sought to provide assistance to other students, several also saw the ICPT program as a way to help instructors. These students often thought that peer tutoring provided a means to decrease instructor demands, while creating a more interactive classroom.

*Interviewer:* What about [ICPT] do you like so much that you want to pursue it?

*Frank:* It's good for the students . . . And it's got to be easier for the professor. She doesn't have to sit up there . . . and talk to a dead class on Friday. And this way, the students are forced to work. And you get students who are peer tutors who are hopefully energetic and want to be there. Then you get [students] working together and I feel like you can learn more.



Another student was motivated to participate because of his affinity for a specific instructor.

*Gary:* I guess one of my reasons for wanting to do it in Mechanics of Materials is the personal relationship with [Instructor]. She's helpful and really nice, and easy to get along with. So I figure I might as well return the favor. If you have a really good professor, why not come back and help them make it even better for someone else's experience?

While many participants did not volunteer exclusively out of a sense of obligation to a specific instructor, many did indicate that instructors could negatively influence the decision to participate. Students commonly stated that they would not have been willing to work with an instructor they did not like or respect. One student summarized this concern:

*Bob:* I would not do something to help a teacher who I did not like on a personal or professional level. Instructors can play both a positive and negative role in the student decision to participate in the ICPT program.

A less commonly mentioned theme was the motivation to give back to the engineering department. Several students were motivated to give back to the engineering department because someone had previously given help to them. One student mentioned this as a major motivational factor to participate in the ICPT program.

*Interviewer:* What factors contributed to your decision to become a peer tutor? Why did you do it?

*Kyle:* . . . Maybe because I felt like someone else helped me along the line, so I owed it back to some students to bring that back to the table.

Students also expressed a general desire to strengthen or improve the engineering department of which they are a part. One student compared the department to a team, and expressed how he was motivated to help the team.

*Kyle:* I guess you feel more like a team player . . . You feel like you're helping out the department . . . You take a bunch of classes and see the same people. So you feel like you're . . . on the same team . . . So if you're able to benefit that team, you kind of feel like you're helping out that situation.

Though not as prevalent, giving back provided an important source of motivation and encouragement for student participation in the ICPT program.

### 6.1.3 Career

The *career*-related implications that resulted from

participation in ICPT were an important motivational factor for some students, but appear to be less influential than other factors. Students recognized the possible career benefits of working closely with faculty. Specific examples of these benefits included resumes and letters of recommendation.

*Interviewer:* Do you think that your experience as a peer tutor helped you feel more connected to the department?

*Frank:* A little bit, yeah. I got to know [professor] a little better. I could use her for a reference for some job applications. I emailed her Civil Engineering questions I have.

Other students related benefits directly to their chosen career path. One student explained how ICPT allowed him the opportunity to teach and be in a leadership position, which he thought would be looked favorably upon by a future employer.

*Interviewer:* If you had to tell someone else why or why not to be a peer tutor who was maybe considering it, what would you tell them?

*James:* I would tell them it's a wonderful opportunity to show employers or grad schools on your resume that you've been in a teaching role or, like, a leadership position.

The student further elaborates that these benefits relate specifically to a career in an academic setting to which he aspires:

*Interviewer:* Are there any other reasons that you participated, or anything we haven't talked about that you want to bring up?

*James:* Well, I want to go into academics eventually . . . That's one of the career paths I'm looking at. I'd like to do research, so that's definitely my motivation behind getting more involved with classrooms and being in a teaching position.

Career-related motivational factors played a role in students' decision to participate in the ICPT program, but were not as important as *understanding* and *value*-related motivational factors.

### 6.1.4 Social

The last motivational function observed in this study was the *social* function. Participation in ICPT allowed students to connect and build social relationships with both other students and faculty. Without peer tutoring, many of these relationships would not have been developed. A student explained how ICPT helped form relationships between upper and lower classmen, and how this can be beneficial.

*Sarah:* Well, I really like the student interaction. I guess it's good to get to know upper and lower

classmen. Because they kind of shuffle classes right now, but you still don't really get to know a lot of your classmates because they're so big. But it's nice to kind of get to know under classmen, and for under classmen to get to know upper classmen, I'm sure . . . Well, for the under classmen, the upper classmen have taken a lot of the classes you're going to take or you are taking. So you can ask them about it, about teachers, who's a good teacher for this, or what is this class about, or stuff like that. And it just generally builds kind of a more pleasurable environment, I think. Because you know people around you and you talk to them. It's just more pleasurable.

Other students developed valuable social relationships with faculty members as a result of participation in ICPT. The following student described how his involvement in ICPT allowed him to develop a working relationship with a faculty member with whom he had not had a previous relationship.

*Interviewer:* Do you feel more connected to the department during [ICPT]?

*Quimby:* Definitely. Especially, personally, to the professor. Because when I was in her class, we didn't really develop a relationship or anything. So I have meetings each week with her, so you get to know a person within the department and it definitely makes you feel more connected.

Students often spoke about social connections as an added benefit to the ICPT program, rather than a motivational factor.

## 7. Discussion

Key motivational factors for entry and participation in the ICPT program were found that did not fit within the constructs of the functional approach, suggesting that for this type of program, and possibly others, the functional approach should be expanded to include additional constructs. These include the fact that compensation was available, that faculty asked students to participate, and that there were several student-identified prerequisites for tutor participation in ICPT. The fact that some students reported appreciating compensation but that it is not necessary for participation may seem like an artificial report of motivation, (i.e., that students really do want the compensation, but won't admit it in an interview). However, this finding is supported by the presence of more than fifty volunteer tutors in the past three years who never accepted any kind of monetary compensation, and the current existence of the ICPT program in the absence of offering any compensation.

The functional approach would be more robust to settings where participation in a volunteer effort

was determined by invitation or an explicit social decision by including a "who asked you?" construct. For example, tutoring programs, both paid and volunteer, normally have a somewhat formalized and explicit process of inquiring and being accepted for participation (i.e. an individual expresses interest and is either accepted or denied by an individual or group of individuals). In these programs both the perceived benefit of the activity (e.g. tutoring) and the individuals who accept/deny participation potentially play a role in the motivation to participate. In our research it was clear that ICPT volunteers considered carefully their relationship with the individual who asked them when making their decision to participate. The fact that faculty requests for participation were a key factor for participation may speak to the importance of the culture in supporting a volunteer tutoring program, especially as they relate to the values function in the functional approach. Students want to help out faculty who have been helpful in their lives in the past, and seem to be more likely to help faculty than others. It may be the case that being asked by faculty is an implicit declaration of the student's capabilities, which motivates students to perform. A culture characterized by faculty willing to help students in terms of things such as availability and writing letters of recommendation is not guaranteed at any institution, and may play a key role in students' volunteerism. The "who asked you" construct could consist of questions about the interactions between the volunteer and the individual who asked them for help prior to the request of volunteering, in order to determine the role this relationship played in the decision process.

The third finding that is not explicit in the functional approach but was influential on tutors' motivation is related to tutors' perception that they had the appropriate skills and knowledge to be tutors. The degree to which this is important is very likely to vary depending on the level of skill necessary, the environment in which the skills are displayed and assessed and the opportunity to improve these skills in the volunteer environment. In the case of ICPT, some opportunity exists to practice the problems ahead of time and prepare for the tutoring. Students' skills or abilities with both the engineering material and ability to help someone learn this material were displayed in a very public and transparent environment of tutoring in a classroom, likely emphasizing the perceived need to be "good" at the subject to be a good tutor. The importance of skills would likely be different in a tutoring environment outside of the classroom, or online, because of the student's interpretations of the opportunity for individuals other than the tutors to assess their capabilities as the tutoring is occur-

ring. Addition of “skills” in the functional approach could consist of questions on what knowledge and abilities students think they would need, whether they feel they have these skills, and what role this played in their decision to volunteer and would yield a more robust model of motivation for tutoring programs.

This study begins to illuminate a very important aspect of volunteer activities that is rarely addressed explicitly in the motivation literature: differentiating factors that are influential in the decisions to initially participate (initial participation decisions) with factors influential on decisions to continue to participate (continuing participation decisions). For example, students reports that participation helped them in their study for the FE exam is likely a factor to continue to participate, but not part of the initial decision to participate. In contrast, student’s relationship with individuals who asked them to participate was more influential in initial than continuing decisions to participate. This is an important distinction for this and other volunteer programs for practical and methodological reasons. Practically, in terms of recruitment of volunteers initial decisions are important, and in terms of retention of volunteers, continuation decisions are much more important. This factor is also important methodologically related to the purpose of studies and the related timing of data collection. It is very common in motivation studies to conduct data collection as the volunteers are participating in the volunteer activity, and much more rare to do so as the initial volunteer decisions are being made. Increased transparency about the purpose of motivation studies (initial or continuing decision) and related timing of data collection is essential to future contributions to the motivation literature.

The contribution of this study to the motivation literature is enhanced and limited by the uniqueness of the ICPT program, which is a combination of students tutoring one subject related to their field of study and the experience being centered on an in-class component. Learning about engineering content was found to be the most influential factor for participation in the ICPT program. Learning is a consistent factor in motivational studies in other settings. For example, participants in Wikipedia are motivated by learning source tools and code by the benefits of participation to developing recognition and reputation in their field [27, 28]. In a similar nature in this study volunteer tutors found value brushing up on subjects that are important to the discipline, studying for the FE, and complementing and reinforcing learning in other courses. The in-class experience and associated structure appears to be the facilitating factor for tutors who believed that they learned from this experience. In interviews,

peer tutors noted that it was important for them to prepare for lectures so that they would be ready to help students during class. They also valued using a structured way to study for a course that is important to their discipline, and noted that this is akin to retaking the course. In a tutoring program without an in-class component and that did not require specific preparation, it is doubtful that students would describe their experience in this way. This is highlighted by the contrast to Carmody and Wood’s [19] findings on college volunteer mathematics tutors, in which learning mathematics was not a motivational factor. Further support is found in some students’ reports that the particular courses in which ICPT is implemented is influential in their participation decision. Although not as consistent as findings on learning, students did often mention that it was important for the course to be related to their discipline, and challenging enough to require the help of tutors. They noted that they were more interested in spending time on subject matter that they felt was challenging and important for their future engineering careers.

The effectiveness of tutoring programs relies on the individual effectiveness of tutors. In the ICPT program we have found at times that we have more volunteers than need for tutors, allowing us to be selective based on who we believe would be a good tutor. Research that investigates relationships between “initiation” decisions and quality of tutors is needed. Specifically what characteristics make a good tutor (communication skills, caring about student learning, etc . . .) and how does this correlate with who decides to volunteer and why and how they make their decision? Specific future research on “initial” participation decisions could focus on participant identified prerequisites (e.g. the need to be able to explain things, good at the subject matter, etc.) for participation in ICPT, and how these characteristics relate to the assessed quality of tutors. In other words, tying findings from motivation theories to evaluations of effectiveness of tutors would provide the beginnings of models for optimizing the selection process of tutors in instances where selection is possible. Investigating volunteer characteristics would enable faculty to more readily and accurately identify students who would be likely to participate in a volunteer program, and who would be most effective as tutors.

## 8. Limitations of study

The limitations of this study are related to the use of qualitative methodologies and the investigation of a tutoring phenomenon that is unique from other college level tutoring programs. The qualitative focus allows for in-depth individual accounts for

their motivation to participate in ICPT and investigating individualized lines of reasoning motivational factors that were not explicitly included in the theoretical framework and resulting interview protocol. However, broadly generalizable results that are possible with survey-based research and quantitative analysis are not possible. Results from this study, however, can inform future qualitative and quantitative studies by suggesting other constructs for inclusion in the functional approach and methodological and practical issues related to “initiation” and “continuing” participation decisions.

The presence of ICPT at only two universities and the uniqueness of the program also limit the application of results from this study to other settings. ICPT is the only tutoring program that the authors are aware of that includes tutoring during class time, and this aspect of the program is influential in how and if students participate in ICPT. Simultaneously, however, it limits the ability to apply these results to other settings. Future investigations could address this limitation by exploring tutor motivation in other single or multiple settings. This could include implementing ICPT in courses less directly related to engineering, such as calculus and physics, in less challenging courses and programs, and in tutoring programs where tutors help with more than one subject and there is no in-class component. It could also include variables such as different sized universities, different departments or colleges, and settings with a different focus.

## 9. Conclusion

This study provides valuable insight into the motivational factors that affect student participation in an in-class peer tutoring program, and provides evidence for including additional constructs in the functional approach. While each student participated for specific reasons, major themes emerged, with some functions found to be more influential than others. Understanding and values were the two primary factors indicated by participants in this study. Most tutors were motivated by a desire to learn, as well as an altruistic desire to help others. Career and social functions played less important roles in students' decisions to participate in ICPT, while enhancement and protection functions were not identified. These findings clearly support the functions of volunteering, and provide further evidence for the validity of the functional approach, including the refinements to the approach suggested above, in assessing tutor motivation.

The findings of this study suggest that it is possible to have an effective and sustainable in-class peer tutoring program at the university level at no cost. This is important for universities that

currently use paid tutoring programs, as well as those seeking to implement new tutoring programs. Knowing how and why students are motivated to participate can influence the recruitment and retention of tutors in the future. Educators should consider the major motivational factors expressed by students in this study when advertising the program or recruiting new participants. An in-class peer tutoring program that can be implemented using volunteers without compensation allows departments to provide a sustainable resource to their students without requiring an additional source of funding.

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