

Assessing usage, satisfaction, effectiveness, and learning outcomes for an engineering peer tutoring program

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Abstract – Peer tutoring programs are an important service colleges and universities can utilize in pursuit of increased student success. Peer tutoring offers numerous benefits to students: individualized, active learning opportunities; the increased comfort and understanding that comes from working with a peer; and greater financial efficiency compared to hiring professional tutors or additional TAs. Additionally, peer tutoring is known to have positive academic and personal impact on tutors as well. Recognizing these potential benefits, the University of Virginia’s School of Engineering and Applied Science (UVA Engineering) recently increased its commitment to its peer tutoring program. It is therefore important that the program be regularly evaluated on key measures of success: usage, satisfaction, effectiveness, and learning outcomes. We are interested in learning outcomes related to study skills and learning attitudes, specifically regarding deep versus surface learning. This paper details the pilot test of this assessment, initial results, and lessons learned from the experience. The goal is to provide resources for other institutions pursuing peer tutoring programs by providing sample methods and instruments for program evaluation, as well as critical thoughts on peer tutoring assessment.

Index Terms – Assessment, best practices, survey, tutoring.

BACKGROUND

Colleges and universities are increasingly turning towards coordinated tutoring and academic success services to improve students’ educational outcomes and experiences. Peer tutoring in particular is known to be an effective practice which offers benefits to both tutored students and the tutors themselves. Tutors benefit from ‘learning by teaching,’ while students who receive tutoring benefit from the individualized, active learning experience, as well as the increased comfort and understanding that comes from working with a peer [1]. Tutoring also offers financial advantages, as supporting a peer tutoring program is generally more cost efficient than hiring professional tutors or additional TAs. Engineering and applied science programs have adopted peer tutoring programs, resulting in significant improvements in academic outcomes such as grades and retention [2, 3]

The University of Virginia School of Engineering and Applied Science (UVA Engineering) provides free peer tutoring services for its students. UVA Engineering provides

funding, recruitment, training, and coordination for the program, and tutors are largely responsible for setting and managing their own schedules. Tutoring is focused primarily on large, required, lower level classes, but several higher level classes saw significant student demand as well. In fall 2016, both student-scheduled one-on-one sessions (“on-demand”) and drop-in group tutoring (“drop-in”) were available to students. In spring 2017, only on-demand tutoring was offered because of lack of interest in the drop-in format, as well as the inherent inefficiencies of that system.

This study was conceived not only to assess usage and satisfaction of tutoring services, but also effectiveness and learning outcomes as well. Our desire was to investigate whether tutoring improved student’s academic skills (e.g., time management, study habits, etc.), as well as their attitudes and values towards their studies. We approached this last topic from the perspective of deep learning versus surface learning [4]. In short, surface learning is when knowledge is received and reproduced, while deep learning is when knowledge is understood, interpreted, and transformed. Research suggests that deep learning is associated with higher quality learning outcomes [5], so it would be beneficial to students for tutoring to involve and encourage deep learning strategies. To measure deep versus surface learning approaches, we used a modified “Revised Two-Factor Study Process Questionnaire” adapted from Biggs, Kember, and Leung [6], which we have shortened and supplemented with questions specifically related to tutoring.

This paper details a semester-long pilot test of this tutoring assessment. Survey response rate was low and sample sizes small, so we do not feel comfortable making any firm claims or conclusions regarding satisfaction, effectiveness, or learning outcomes. Instead, these results serve to establish some baseline numbers for UVA students who receive tutoring, as well as provide a model for continuing this assessment in future semesters.

METHODOLOGY

The tutoring survey (Appendix) was distributed as a Qualtrics web survey via email to students tutored in the spring 2017 semester; the survey was sent first in February, and then again in April. Tutored students’ email addresses were obtained from the session reports all tutors are required to submit. Part 1 of the survey (usage, satisfaction, and effectiveness) was analyzed using means, while part 2 (deep versus surface learning) was analyzed using means in the categories

specified in Table 1. Motive questions concern motivation for learning or studying, strategy questions concern learning strategies, and tutoring questions concern how the student approaches tutoring; question numbers refer to the survey numbering seen in the Appendix.

TABLE 1
DEEP/SURFACE LEARNING CATEGORIES & QUESTIONS

Category	Deep Learning	Surface Learning
Motive	- Q11. Any topic can be interesting once I get into it. - Q17. I come to classes with questions in mind that I want answered.	- Q12. My aim is to do well in class with minimal work. - Q18. I see little point learning material that's not likely to be on exams.
Strategy	- Q13. I test myself on important topics until I understand them. - Q19. I spend free time finding out more about interesting topics from class.	- Q14. I focus my studying on what's in the course outline/syllabus. - Q20. I study for exams by remembering answers to likely questions.
Tutoring	- Q15. I seek out tutoring to help me understand important concepts and ideas. - Q21. I often discuss class material, concepts, and applications with my tutors.	- Q16. I seek out tutoring to help me complete hard/confusing assignments. - Q22. I try to keep my time with tutors focused on my specific homework/assignments.

While we only consider the results across the entire semester in this report, future studies should consider different time periods by themselves, and look for changes over time. This methodological suggestion and others will be discussed more fully in the discussion section.

This study was approved by the UVA IRB.

ANALYSIS

Out of 195 tutored students, 18 submitted completed surveys in either February or April of the spring 2017 semester. The survey results for Part 1, concerning usage, satisfaction, and effectiveness, can be found in Table 2.

TABLE 2
PART 1 RESULTS (USAGE, SATISFACTION, AND EFFECTIVENESS)

Question	Mean
Q1: This semester, about how often have you used SEAS tutoring?	3.50
Q2: My tutor(s) was /were knowledgeable of the subject/course material	4.11
Q3: My tutor(s) successfully answered my questions and helped me with my work	3.94
Q4: My tutor(s) improved my overall understanding of the subject/course material	4.17
Q5: My tutor(s) helped my study skills (e.g., test taking, time management, study habits)	3.56
Q6: In our sessions, I noticed that my tutor(s)... (count)	2.06
Q7: It was easy to find information about SEAS tutoring.	3.39
Q8: The tutoring information I found was helpful.	4.28
Q9: Tutoring times were convenient for my schedule.	3.50
Q10: Overall, how would you rate your experience with SEAS tutoring?	4.00

All questions have a maximum possible score of 5, rated from strongly negative (1) to strongly positive (5), except for Question 6 which counts the number of tutoring strategies reporting (out of 4 possible strategies). On average, students participated in tutoring around three times per month, and overall reported high scores regarding tutor knowledge and program satisfaction. The lowest scores related to the accessibility of tutoring information, as well as scheduling availability and convenience.

The survey results for Part 2, concerning deep versus surface learning approaches, can be found in Table 3. All questions have a maximum possible score of 5, rated from strongly negative (1) to strongly positive (5).

TABLE 3
PART 2 RESULTS (DEEP/SURFACE LEARNING APPROACHES)

Category	Deep Learning	Surface Learning
Motive	3.69	2.97
Strategy	3.50	3.31
Tutoring	4.11	3.86
Total	3.77	3.38

Tutored students overall identified positively with both learning approaches in all categories except 'surface motive' (essentially neutral). That said, they identified more strongly with the deep learning approaches, especially in the 'deep tutoring' category.

DISCUSSION

As stated above, the sample sizes were so small and response rates so low that we do not feel comfortable drawing general conclusions from these results. Instead, this pilot test establishes some baseline numbers for future comparisons, while serving as a model for continuing this assessment in future semesters. With that in mind, we learned several lessons from the experience.

First, we must find a way to increase the survey response rate. Our sample size is currently too small to conclude anything with reasonable validity, and prevents the opportunity for more sophisticated analysis (discussed further below). An obvious option is to enlist the tutors somehow in distributing or advertising the survey, though this runs the risk of being seen as coercive, and would have to be approached carefully and with full IRB approval. Another option is for a non-tutor, non-faculty person to go to the central tutoring location and invite students to participate in the survey at the end of their sessions. We could also explore incentives for survey completion, such as small cash prizes or entry into a raffle. Finally, in addition to their other beneficial functions, many tutoring management platforms (e.g., TutorTrac, GradesFirst, etc.) can automatically distribute surveys to students after their tutoring sessions. This feature may lead to higher response rates and more efficient data collection.

Our original intention was to investigate changes in the results over time, hoping to see that being tutored affected students' academic skills and learning outcomes. Our current low sample size prevented this type of analysis, which is

therefore a significant motivator for improving response rate. In addition to considering the overall results in each time period, we want to have enough repeat survey-takers that their responses can be matched and considered for any differences. That would allow a more accurate analysis of how the responses change over time. Receiving a sufficient number of repeated surveys might require targeting the initial survey responders to encourage them especially to take the survey again, explaining the reasons why we are asking students to retake the survey, or providing incentives as described in the previous paragraph.

This assessment currently suffers from relying exclusively on the indirect measure of the tutoring survey, so there is currently no way to verify if students' responses are accurate. Given that much of the survey concerns academic resource usage and learning behaviors, students may feel pressure to skew their answers in directions they perceive to be more socially desirable; it is therefore important to find other, more direct assessment measures to complement the survey. For example, tutors' session reports could incorporate information related to the apparent study skills or learning approaches of the tutored student, tutoring supervisors could directly observe some number of tutoring sessions and score the tutor on specific criteria via a rubric, or student data such as course grades could be obtained and compared against a student's survey results.

Finally, it is worth considering the experimental design of this assessment. It is challenging to assess the effectiveness of tutoring programs because it is hard to find control groups to compare against. After all, tutoring programs will rarely have the option of selectively denying service to some number of students (nor should they). We suggest two ways of overcoming this challenge. First, academic records could be analyzed using regression techniques, with one of the variables being participation in tutoring (other variables might include cumulative GPA or year). Second, a control group could be identified after the fact. That is, a group of non-tutored students that is somehow similar to the population of tutored students could be identified (for example by GPA), and their academic records compared. This group would have to be carefully selected to avoid the possibility of bias.

CONCLUSION

Tutoring is a valuable and increasingly-prevalent way of enhancing student success. But like all student support services, tutoring programs require assessment to ensure they are effective and delivering their intended outcomes. In this paper we have presented a pilot test of such an assessment, focused on measuring usage, satisfaction, effectiveness, and learning outcomes. This pilot test gave us valuable information about how to continue this assessment in future semesters, and our hope is that other student success professionals may find our resources, instruments, and reflections of use in creating and sustaining their own assessment programs.

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APPENDIX: TUTORING SURVEY

Coded values are in parentheses. Some demographic information (name, year, etc.) was also collected first.

Part 1. Usage, satisfaction, and effectiveness.

Q1. This semester, about how often have you used SEAS tutoring?

3+ times/week (1); 1-2 times/week (2); 3-4 times/month (3); 1-2 times/month (4); less than monthly (5)

The following questions pertain to SEAS tutors and. If you've had more than one tutor, try to give answers for your overall experience. If you have feedback about specific tutors, feel free to report that at the end of the survey.

Q2. My tutor(s) was /were knowledgeable of the subject/course material.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q3. My tutor(s) successfully answered my questions and helped me with my work.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q4: My tutor(s) improved my overall understanding of the subject/course material.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q5: My tutor(s) helped my study skills (e.g., test taking, time management, study habits).

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q6: In our sessions, I noticed that my tutor(s)...

Made me explain my reasoning or answers (1); Gave me practice problems (2); Rephrased my comments or explanations (3); Had me work with other students (4)

Q7: It was easy to find information about SEAS tutoring.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q8: The tutoring information I found was helpful.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q9: Tutoring times were convenient for my schedule.

Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q10: Overall, how would you rate your experience with SEAS tutoring?

Very negative (1); Negative (2); Neutral (3); Positive (4); Very positive (5)

Part 2. Deep versus surface learning approaches.

State whether you agree or disagree with the following statements.

Note: All questions below used the response scale: Strongly disagree (1); Disagree (2); No opinion (3); Agree (4); Strongly agree (5)

Q11. Any topic can be interesting once I get into it.

Q12. My aim is to do well in class with minimal work.

Q13. I test myself on important topics until I understand them.

Q14. I focus my studying on what's in the course outline/syllabus.

Q15. I seek out tutoring to help me understand important concepts and ideas.

Q16. I seek out tutoring to help me complete hard/confusing assignments.

Q17. I come to classes with questions in mind that I want answered.

Q18. I see little point learning material that's not likely to be on exams.

Q19. I spend free time finding out more about interesting topics from class.

Q20. I study for exams by remembering answers to likely questions.

Q21. I often discuss class material, concepts, and applications, with my tutors.

Q22. I try to keep my time with tutors focused on my specific homework/assignments.