


Peer-Based Anatomy Tutoring for First-Year Medical Students: an Analysis of Peer-Tutoring from the Tutors' Perspective

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Abstract

Introduction In response to student demand for additional anatomy lab instructional time outside of typical teaching hours, a peer-based anatomy tutoring program was implemented at the David Geffen School of Medicine at UCLA. Peer tutoring is a well-studied form of supplemental instruction, and is known to benefit students and tutors alike. This study aims to address the effect of tutoring on the tutors themselves, specifically in the context of the gross anatomy laboratory.

Methods A one-time 12-question survey was distributed to all students who acted as tutors over a three-year period ($n = 57$), asking them to reflect on their experiences as tutors. Specifically, we aimed to address their thoughts on their career plans and academic achievement as they relate to their experience as tutors, as well as their opinions on effective tutoring techniques.

Results Based on a 100% response rate, 85.7% of tutors reported being “very interested” in incorporating a teaching component to their career, and 73.7% of respondents reported that their experience tutoring influenced this plan. In contrast to an expectation that tutors would skew their residency choices toward anatomy-focused specialties, the distribution of tutors' anticipated specialty choices actually reflected the overall distribution of the class. The tutors believed their

experience tutoring improved their academic and clinical performance. The overwhelming majority reported believing that their experience as a tutor improved their USMLE Step 1 score (90.2%, $n = 46$). Sixty-one percent ($n = 31$) reported feeling that the experience as a tutor helped with their clerkship evaluations. Finally, the most effective tutoring techniques were quizzing the students directly and using the tutors' own notes and study materials from the prior year.

Discussion This study supports the finding that tutoring provides a significant beneficial effect on the tutors based on their own perceptions, and further studies obtaining quantitative data on academic achievement and clinical performance of the tutors will be beneficial.

Keywords Anatomy lab · Peer tutoring · Preclinical curriculum

Background

Gross anatomy is a staple of first-year medical education. While traditionally taught with human cadavers, new complementary teaching methods are being implemented to expand anatomy learning. These include most notably using multimedia and computerized learning tools, and even newer technology like 3D printing [1–3]. Generally, these new tools are intended to augment the efficiency of time spent in the lab; still, the primary component of anatomy education remains hands-on training with human cadavers, whether through dissection, prosection, or a combination of the two [4–6].

Peer-based tutoring is a well-characterized form of instruction that has been used in numerous disciplines, including the anatomy lab [7, 8]. Due to increasing demand from first-year medical students for additional instructional time in the anatomy lab, particularly outside of required lab hours, our

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institution implemented a peer-based anatomy tutoring program that was piloted in the 2011–2012 academic year. Second-year medical students with fresh anatomy experience were hired to provide voluntary and cost-free tutoring to the first-year students. In our previous study [9], data collected from participating first-year students showed overwhelmingly positive results. As our data collection grew, it became apparent that the benefits of tutoring extended beyond just those students receiving the tutoring, and indeed included benefits to the tutors themselves. In this study, we collected data from those students who have worked as tutors and analyzed their perceptions of effective tutoring strategies, as well as the effect of tutoring on their own learning and careers.

Methods

The anatomy tutoring program at our institution began during the 2011–2012 academic year as a pilot program with five tutors, and it was expanded during the 2012–2013 academic year to 13 tutors. It was further expanded to 20 tutors in the 2013–2014 academic year, and again to 24 tutors in the 2014–2015 academic year, for a total of 62 tutors (data were not collected on five of them, as explained below) over a four-year period.

The structure of our institution's curriculum and of each tutoring session has been documented in our previous publication [9]. Briefly, first-year students sign up voluntarily to attend sessions led by second-year students. These sessions occur at times mutually agreed upon by the tutors and the students through online scheduling software. Tutoring groups are at a maximum of four students and a tutor. There is no grading by the tutors and no requirement that the students attend sessions. The intention of this tutoring program is to provide supplemental instruction beyond the traditional curriculum, which itself includes lecture, lab, and computer-based experiences.

Data presented in this study include those collected from tutors starting in the 2012–2013 academic year after wide implementation of the program; thus, the five tutors participating in the pilot program during 2011–2012 are not included in the presented data. The 13 tutors from the 2012–2013 academic year, having completed their medical school education at the time of data collection, were surveyed in a focus group to gather recommendations and determine the content of the survey to be distributed to all tutors. Based on their recommendations, the data collection was categorized in two parts: first, the career plans of the tutors, and second, the efficacy of different tutoring strategies as perceived by the tutors. A 12-question survey was drafted and distributed to the aggregated 57 tutors (those who tutored during the academic years of 2012 to 2015), and all data obtained in this study are from this one-time survey.

Survey distribution via e-mail and data collection was staggered over a year in order to allow for as much retrospective experience from those who took the survey. The graduating class of 2015 received the survey shortly before medical school graduation, while the graduating classes of 2016 and 2017 received the survey halfway through their third year and fourth year of medical school, respectively.

Results

Career Planning and Residency Applications

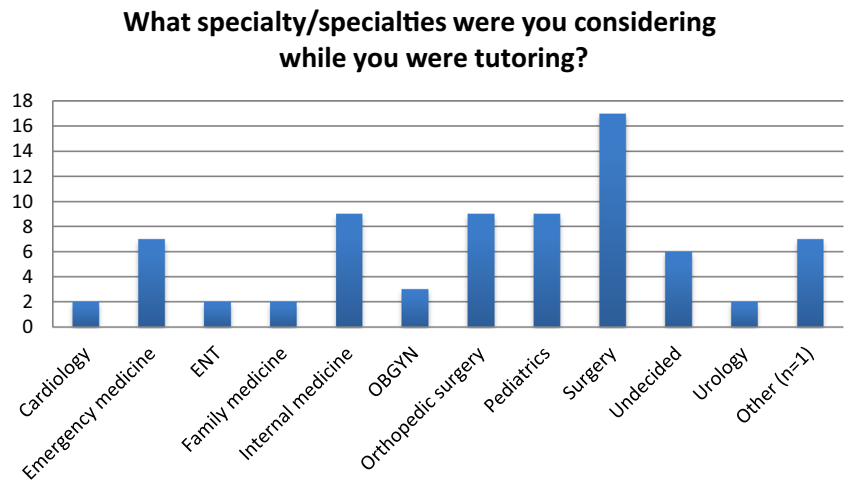
The survey was distributed to the aggregated 57 tutors, and 57 responses were collected (100% response rate). Ninety-eight percent of tutors ($n = 56$) responded that they were considering adding a teaching or academic component to their professional career, when asked as a binary yes or no question.

The survey then asked tutors to reflect on their intended career plans prior to their tutoring experience. Sixty-three percent of the tutors said that prior to their tutoring experience they were “very interested” in adding a teaching or academic component to their future careers. Eighty-six percent of these same tutors described themselves as “very interested” in teaching after their experience as an anatomy tutor, a 22.5% increase in teaching interest from before to after working as a tutor. 73.7% of all respondents stated that their experience as a tutor influenced their career plans in regard to continuing to teach in the future.

Tutors were also asked to reflect on their specialty choices prior to tutoring, as well as their specialty choice in which they had already matched (or were currently or planning on applying). Tutors were able to select multiple specialty choices. The most common plan prior to tutoring was surgery ($n = 17$) followed by internal medicine ($n = 9$), orthopedic surgery ($n = 9$), and pediatrics ($n = 9$). While we had expected a slant toward surgical specialties, or other anatomically oriented fields such as radiology, this was not the case. At the time of data collection, in which all tutors had either matched, applied, or preparing their application, the most frequent specialties were internal medicine ($n = 11$), orthopedic surgery ($n = 9$), and pediatrics ($n = 7$), followed by general surgery ($n = 6$) and anesthesia ($n = 6$). These data are summarized in Figs. 1 and 2.

The tutors were asked to retrospectively consider whether their experience as an anatomy tutor helped their performance on a number of exams after the conclusion of their preclinical years. The overwhelming majority reported believing that their experience as a tutor improved their United States Medical Licensing Examination (USMLE) Step 1 score (90.2%, $n = 46$). Sixty-one percent ($n = 31$) reported feeling that the experience as a tutor helped with their clerkship evaluations, 54.9% ($n = 28$) said their tutoring experience aided them with their surgery shelf exam, and 33.3% ($n = 17$) with

Fig. 1 What specialty/specialties were you considering while you were tutoring? Other ($n = 1$ of each): critical care, interventional radiology, diagnostic radiology, medicine-pediatrics, undecided primary care, psychiatry, and undecided surgical subspecialties



other shelf exams. At the time of data collection, only the senior class had completed USMLE Step 2, three of which believing their experience as a tutor helped with the exam (23% out of 13 tutors from that Class).

Tutoring Methods and Format

We further asked tutors about their experiences with different tutoring techniques. For this portion of the survey, tutors were allowed to select multiple answer choices. Those methods believed by the tutors to be most effective were “quizzing individual students” (91.2%, $n = 52$), “using the tutors’ own material from the prior year” (68.4%, $n = 39$), and “identifying structures for the students” (64.9%, $n = 37$). Interestingly, the methods receiving the fewest responses were “allowing students to quiz each other” (21.1%, $n = 12$), followed by “contacting students prior to each session” (43.9%, $n = 25$). Examples of responses listed under the “other”/write-in option include mock practical exams (during the 2012–2013 year

only), whiteboard drawings, and sending review notes after the session. These data are presented in Table 1.

A question was posed to the tutors for qualitative write-in data, asking what types of students did they perceive benefited most from the tutoring program. Across 45 free text responses, some recurrent themes arose. In general, the students who had a certain degree of foundational knowledge but needed to solidify the content or make specific clarifications of confusing subject matter were those who the tutors subjectively believed benefitted most. Twenty-four responses specifically used the verb “prepare” (as in, prior to the tutoring session) and/or the adjective “prepared” to describe those they perceived as benefitting most. Using the session as a “review” (six responses) or to “reinforce” what they had already learned (five responses) were also repeated themes in this section. Alternatively, when asked whether tutors had observed anything that detracted from a session, (Table 2) the most common answer was “students being unprepared” (83.6%, $n = 46$), followed by “one student dominating the discussion” (60%, $n = 33$).

Fig. 2 What specialty do you currently plan to pursue? Other ($n = 1$ of each): ENT, neurology, neurosurgery, plastic surgery, and OBGYN

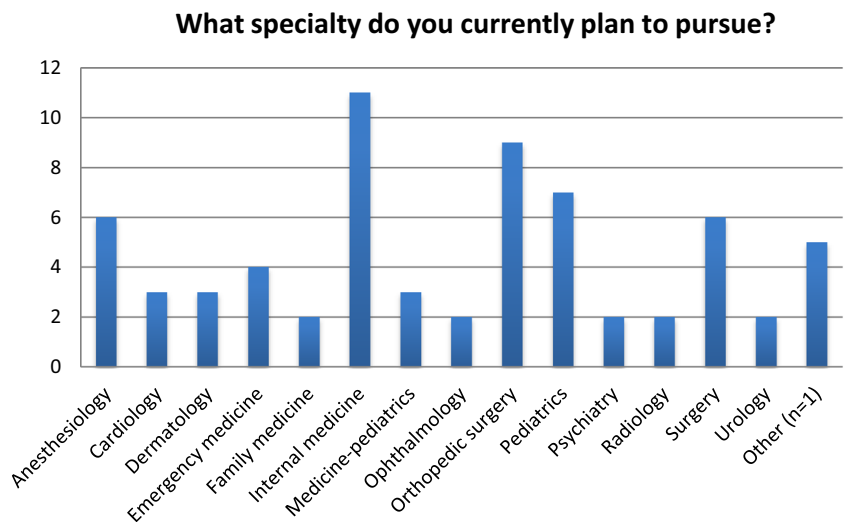


Table 1 What tutoring techniques did you find most effective for students who received tutoring? (Mark all that applies)

Answer options	Response percent	Response count
Quizzing individual students directly/rotating around the group	91.2%	52
Using your own materials from the prior year	68.4%	39
Identifying structures for the students	64.9%	37
Tagging structures for primary and/or secondary questions	56.1%	32
“Thumbs up” method or similar; wait until each student has had time to think about the question and then signal they are ready to answer as a group	56.1%	32
Contacting students prior to each session	43.9%	25
Allowing students to quiz each other	21.1%	12
Other (please specify)	10.5%	6
Answered question		57
Skipped question		0

Discussion

Peer tutoring is a well-established and well-characterized form of supplemental medical education that has proven effective in numerous settings, particularly for improving the quality of learning for the students receiving the tutoring [6, 7, 10, 11]. It has also been observed that the act of tutoring other students has an impact on the tutors themselves, and their motivations for tutoring have previously been analyzed [12, 13].

The questions posed in this study are specific to the gross anatomy laboratory, and the data indicate several new findings. First, although the group of tutors might have had an initial interest in an academic or teaching component of their career (by virtue of the fact that they applied to and accepted positions as tutors), the experience of peer tutoring seems to have reinforced and, in some cases, broadened these plans.

Table 2 Did you experience any of the following which detracted from a tutoring session? (Mark all that applies)

Answer options	Response percent	Response count
Students being unprepared	83.6%	46
One student dominating the discussion	60.0%	33
Students being unable to agree on a topic to study	20.0%	11
Students being unable to agree on a particular style of tutoring (ex. quizzing vs. identification)	10.9%	6
Disruptive/bad attitude	18.2%	10
Other (please specify)	9.1%	5

Specialty Data It would be impossible to establish direct causality between tutoring and specialty choice, but it is worth noting the wide variety of specialty choices in terms of students who acted as tutors. One might expect that the specialty distribution would be weighted very heavily in favor of surgical specialties, but the data presented here actually reflects a more generalized representation of the specialty profile of the entire class. Instead of attracting students with a particular interest in any one field, the experience as a tutor appealed most to those students interested in teaching and academics, regardless of intended specialty.

Which Students Benefit Most The qualitative data show that students who were prepared but needed help with solidifying concepts which they had previously studied were those who benefitted most. Tutors believed that students who dominated the discussion took a valuable tutoring spot from students who perhaps needed the help more. Alternatively, tutors also reported that students who came to the tutoring session unprepared likewise detracted from the group. Therefore, the tutors reported that the sessions were of most benefit to the majority of students who fell into the middle in terms of prior preparation before the session. That is students who seemed to benefit the most were those who were prepared for the session but who did not dominate the discussion, while any outliers (both over- and underprepared) could disrupt a group’s dynamic. These findings are consistent with our previous study in which students who received tutoring also felt the same way regarding achievement levels and group dynamics.

Tutoring Techniques The data regarding tutoring techniques can be compared to our previous study, in which we asked the students receiving tutoring the same question about their perceived efficacy of different teaching methods and group dynamics. The most effective methods observed by tutors in this study were quizzing students directly (91%), followed by using their own material from the prior year (68%), and then identifying structures for the students (65%). These findings are somewhat consistent with our previous study in which students receiving tutoring believed the two most effective tutoring methods were structure identification by the tutors followed by tutors quizzing students directly. However, it is interesting to note that the tutors believed quizzing students was more effective than structure identification, and vice versa for students receiving the tutoring. Tutors reporting using materials from the prior year more specifically refer to any notes, tables, or diagrams created by the tutors or their classmates during their own anatomy experiences as students, and this tutoring method was believed to be very effective. This reinforces our own belief that students benefit from processing or “digesting” materials provided by creating tables, summaries, or diagrams that reorganize the information provided into an individualized format that is most conducive to internalizing

information. More than half of the tutors also reported “Thumbs up” method or similar (wait until each student has had time to think about the question and then signal they are ready to answer as a group) and tagging structures for primary and/or secondary questions, as effective teaching techniques (both 56%). Slightly less than half of the tutors reported contacting students prior to each session as an effective technique (44%) in which tutors would contact students who had signed up for an upcoming session, most often via e-mail, asking if there were any areas on which they would like to focus. This outside contact was driven by the initiative of the tutors and was not an expectation put forth by the anatomy faculty.

Future research is needed to quantify the effectiveness of anatomy tutoring programs on student academic achievement, clinical performance as third- and fourth-year medical students, and acumen as practicing physicians. Further research is also needed to evaluate the cost effectiveness of this tutoring program, which relies on billable tutoring hours. Still, the past several years of peer-based anatomy tutoring at our institution has demonstrated a considerable benefit for students and their tutors alike.

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