

The role of anatomy demonstrators: surgical trainees' perspective

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1 **The Role of Anatomy Demonstrators: Surgical Trainees' Perspective**

2

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11 **ABSTRACT**

12

13 Core Surgical Trainees (CST) in the London (UK) Postgraduate School of Surgery
14 receive clinical anatomy teaching in their first year of training, and, in their second
15 year, give thirty sessions of anatomy teaching to medical and other students. This
16 study set out to investigate the role of demonstrators from the perspective of the
17 trainees. A focus group was convened to ascertain trainees' perspectives on
18 demonstrating anatomy and to identify problems and improvement strategies to
19 optimise their ability to enhance students' learning. A questionnaire was formulated
20 and all second-year CST (n=186 – from two cohorts) in the London Postgraduate
21 School of Surgery were invited. A total of 109 out of 186 trainees completed the
22 questionnaire. A high percentage (98%) of trainees that completed the
23 questionnaire responded that demonstrating was an invaluable part of their training.
24 Sixty-two per cent responded that anatomy teaching they received in their first year
25 of core surgical training helped them in their teaching role and 80% responded that it
26 helped them prepare for surgical training. The study also revealed the need for
27 improved communication between trainees and the London Postgraduate School of
28 Surgery / Medical Schools / National Health Service Trusts to address issues such
29 as trainees' perceived difficulty in fulfilling their teaching session requirement. The
30 stakeholders have acknowledged and addressed the outcomes to improve the
31 experience for both surgical trainees and students. The results indicate that
32 anatomy demonstrating delivers important benefits to early surgical trainees, in
33 addition to those received by the students that they teach.

34

35 **INTRODUCTION**

36 Context

37 The London (UK) Postgraduate School of Surgery (LPSS) is one of the largest
38 surgical schools in the world, with over 900 trainees. Since 2010, the structure of
39 postgraduate medical and dental training in London has been organized in a
40 commissioner-provider model, through three local Health Education England (HEE)
41 offices: Health Education North Central and East London, Health Education North
42 West London and Health Education South London. Each trust within the HEE local
43 office acts as a Local Education Provider, delivering the training in partnership with
44 the local office. The LPSS involves a prestigious program of surgical training across
45 the following hospitals: Imperial College Healthcare National Health Service (NHS)
46 Trust, Kings College Hospital NHS Foundation Trust, Royal Brompton and Harefield
47 NHS Foundation Trust, University College London Hospitals NHS Foundation Trust
48 (including the Royal National Throat, Nose and Ear Hospital and National Hospital
49 for Neurology and Neurosurgery), Guy's and St Thomas' NHS Foundation Trust,
50 Barts Health NHS Trust, St George's University Hospitals NHS Foundation Trust and
51 Great Ormond Street Hospital for Children NHS Foundation Trust.

52

53 After graduation, doctors in the United Kingdom (UK) undertake a two-year
54 Foundation Program (F1 and F2). Doctors then choose a specialist field. Those who
55 wish to pursue a surgical career enter Core Training in surgery. This is a 2-year
56 program and comprises Core Surgical Training 1 and 2. Subsequently, Core
57 Surgical Trainees (CST) can progress to specialist training in a chosen surgical
58 specialty, providing they have passed the intercollegiate Membership Examination of
59 the Royal Colleges of Surgeons (MRCS).

60

61 In their first year, CST in the LPSS were given twenty half-day teaching sessions in
62 surgical anatomy by surgeons and anatomists at the Royal College of Surgeons of
63 England. This Core Surgical Anatomy project was funded by Health Education
64 London and the South East as a pilot project and, at the time of writing, has been
65 fully commissioned at Imperial College London. A similar programme could be
66 created for each region of the UK at a total annual cost of approximately £700, 000.
67 Most Core Surgical Anatomy teaching sessions involved three, one-hour stations.
68 Trainees rotated through the three stations that typically consisted of prosected
69 human cadaveric material, 'potted' specimens including pathology or surgical
70 anatomy. Further sessions involved specifically designed e-learning material e.g.,
71 physiology, radiology and embryology relevant to core surgical training. The syllabus
72 for the anatomy component was based on the learning outcomes of the Anatomical
73 Society's core syllabus for medical students (Smith et al., 2016). Subsequently,
74 CST2 undertook 30 teaching sessions (each approximately half a day) in which they
75 taught medical and other students at Imperial College London, Queen Mary
76 University of London, St George's University of London, or University College
77 London. The 30 teaching sessions included a range of gross anatomy sessions in
78 the dissecting room, living anatomy, radiological anatomy, clinical skills, and
79 histology/embryology/osteology teaching.

80

81

82 Teaching

83 Junior clinician anatomy teachers / demonstrators have helped teach undergraduate
84 anatomy practical classes for many years and cadaveric dissection remains an

85 important part of medical education (Green et al., 2014). In many medical schools,
86 demonstrators are a key part of the teaching team. However, there is considerable
87 variability between institutions in the requirements and practical arrangements for
88 such teachers. Some institutions employ these teachers on a fixed-term basis, for
89 example six months, to teach full-time during the busiest parts of the academic year,
90 whilst others have a contract with a local private healthcare provider for Resident
91 Medical Officers to demonstrate on a one in five rota for 12 months. Other medical
92 schools have partnerships with local National Health Service Trusts that facilitate
93 demonstrating roles for Foundation or CT doctors. In the LPSS, all CST2 trainees
94 are required to undertake anatomy teaching as part of their training. In teaching
95 sessions, they typically teach alongside anatomy faculty and retired surgeons.

96

97 The role of the anatomy demonstrator is effectively an extension of peer-based
98 teaching, because these teachers are relatively close in age and experience to the
99 students they teach. Furthermore, being active in clinical practice, junior clinician
100 teachers can offer students first-hand experience of why they need, and how they
101 apply, their knowledge of anatomy in clinical practice. Demonstrators need to be
102 excellent communicators, enthusiastic, and have a good foundation in anatomy
103 (Lockwood and Roberts, 2007). Lockwood and Roberts (2017) emphasized that
104 integrating imaging and anatomy teaching is essential for effective application of
105 anatomical knowledge, and that demonstrators are ideally placed to be able to teach
106 image interpretation alongside anatomy. They also highlighted that demonstrators
107 can assist in the vertical integration of anatomy with other disciplines, because many
108 demonstrators also help teach parts of the undergraduate medical course that occur
109 after preclinical anatomy teaching, and they also help with postgraduate programs.

110 Furthermore, Davis et al. (2014) reported that first and second year medical students
111 and faculty believed students learnt better when taught by demonstrators in a small
112 group setting, compared to being taught by faculty alone. However, this may be due
113 to student preferences for large or small group teaching. The availability of
114 demonstrators may enable small group teaching in institutions where faculty
115 numbers are limited.

116

117 Recent research has demonstrated that the ideal experience difference between
118 near-peer teachers and students is two to three years (Hall et al., 2014). However,
119 because the CST2 in the current study typically taught preclinical undergraduates,
120 the experience difference between the CST2 and students was typically six to eight
121 years. Therefore, these demonstrators bridge the gap between true near-peer
122 teachers and anatomy faculty. This can be helpful in aiding students to understand
123 their own learning and to accurately predict their level of knowledge (Hall et al.,
124 2016). Student evaluation consistently shows that students value junior clinician
125 teachers, and benefit from their teaching, advice, and guidance about medical
126 training and career options (Evans and Watt, 2005).

127

128 All UK Medical Schools have anatomy in their curriculum as required by the General
129 Medical Council “Outcomes for Graduates” (General Medical Council, 2016); the
130 content can be guided by the Anatomical Society core syllabus (Smith et al., 2016).
131 However, there is considerable variation in how anatomy teaching is delivered
132 (Heylings, 2002). Anatomy is largely taught in the early years of the curriculum, with
133 some curricula offering spiral learning into later years (Evans and Watt, 2005). This
134 spiral learning frequently includes anatomy relating to laparoscopic, endoscopic, and

135 endovascular approaches (Ahmed et al., 2011). Anatomy demonstrating has proven
136 to be a successful means of contributing to early postgraduate anatomy education,
137 especially in terms of improving surgical trainees' knowledge of surgical and clinical
138 anatomy (Gossage et al., 2003). Demonstrating offers trainees the opportunity to
139 consolidate their own knowledge, and to revisit subjects about which, they may have
140 a poor understanding.

141

142 This study was designed to investigate the role of the anatomy demonstrator from
143 the trainees' perspective. The research questions included: 1. How do demonstrators
144 feel about teaching? 2. How do demonstrators benefit from demonstrating? 3. What
145 improvements to the demonstrating system would trainees like?

146

147 **METHODS**

148

149 A cross-sectional case study of trainees in the LPSS was undertaken, utilising both
150 qualitative and quantitative data-gathering methods. To facilitate evaluation of the
151 experience of demonstrators, a progressive focusing approach was adopted (Parlett
152 and Hamilton, 1977). Informed consent was obtained from all participants. The study
153 took place in two stages: Stage 1 used a focus group to gain an in-depth
154 understanding, and Stage 2 was designed to elucidate generalizable findings from
155 the wider cohorts, using a questionnaire. The participants of Stage 1 were not
156 involved in Stage 2.

157

158 Stage 1

159 A focus group (n = 13) was convened, comprising a convenience sample of CT2
160 trainees teaching at Imperial College London. The aim of the focus group was to
161 ascertain the surgical trainees' perspectives on teaching anatomy, and to identify key
162 problems and improvement strategies to enhance their experience, and to optimise
163 the use of the trainees' skills to enhance students' learning. The focus group was
164 designed using a grounded theory approach (Glaser and Strauss, 1967), to allow the
165 features and perceptions of the experience of teaching anatomy to be established. A
166 focus group guide sheet was created, and an expert in this methodology unknown to
167 the CST2 led the focus group, rather than their 'employer', to optimise the trainees'
168 willingness to talk freely about their experiences. The output of the focus group was
169 transcribed verbatim, and the data reviewed, categorised, patterns delineated and
170 themes developed. The data were analysed using thematic analysis. Line-by-line
171 coding generated codes that were brought together into themes. Blind triangulation
172 by another researcher then checked the themes. The main themes were discussed
173 by the research team and fed into the design of a quantitative questionnaire.

174

175 Stage 2

176 Two successive cohorts of trainees in LPSS were invited to complete the
177 questionnaire (Table 1) arising from Stage 1, at the end of their second year of Core
178 Surgical Training. The questionnaire (questions = 25) utilised a mixture of Likert
179 scale questions and free text responses. Data were entered into Excel and analysed
180 using descriptive statistics.

181

182 RESULTS

183 Stage 1. Focus Group

184 Thematic analysis of the focus group discussions revealed four emerging themes:
185 *positives, negatives, teaching, and logistics*. The principal positives highlighted the
186 trainees' enjoyment of teaching, and that teaching was a privilege, as reflected by
187 the statement *'It's a fantastic opportunity and a privilege to have it and I love*
188 *teaching'*. The negatives focused on the trainees' perception that the requirement to
189 complete 30 sessions of anatomy teaching was unrealistic, reflected by statements
190 such as *'they want 30 sessions, no less, that's too much'*. When discussing teaching,
191 the trainees reflected on different teaching techniques, how to teach most effectively
192 using cadaveric specimens, student issues they had encountered during teaching
193 and how they had developed as educators. Two major areas for improvement were
194 suggested: 1) better course information from the host Medical School, e.g., how
195 does a teaching session fit into a course overall, and 2) structured feedback was
196 desired, to help demonstrators improve and reflect on their development as
197 educators. The major logistical theme highlighted by the trainees centered around
198 their difficulty in planning and booking into teaching sessions, as reflected by the
199 statement *'it's an exercise in organizational ability'*. Figure 1 displays the key positive
200 and negative themes arising from the focus group.

201 Stage 2. Questionnaire

202 A total of 109 out of 186 trainees completed the questionnaire (59%) either online or
203 on paper at the time of their Annual Review of Competence Progression meeting.
204 The most important factor influencing the responding trainees' choice of Medical
205 School at which to teach, was its proximity to their clinical workplace (68%). In
206 addition to medical students (both undergraduate and graduate entry), the trainees
207 also taught a range of other students, including: biomedical science (55%), biology

208 (10%), dental (16%) and allied healthcare students (40%). Trainees were required
209 to participate in a wide variety of teaching, including dissecting room classes, living
210 anatomy, imaging, clinical skills and osteology. Class sizes were typically up to 100
211 students and the commonest ratio of faculty to trainees was 1:8 (64%). Training
212 prior to beginning teaching was largely in the form of induction sessions, but some
213 (37%) trainees also participated in teaching workshops, tutorials and / or used online
214 teaching resources. Fifty-six per cent of trainees agreed and 5% strongly agreed that
215 this training prepared them for teaching. Evaluation of trainees' teaching was mainly
216 given verbally by faculty and by student feedback. The majority (94%) of trainees
217 agreed (48%) or strongly agreed (46%) that their ability to relate the anatomy they
218 taught, to clinical scenarios they had experienced, helped students learn. In addition,
219 the majority (88%) spent one (48%) or two (40%) hours preparing for a teaching
220 session (Figure 2). Most trainees (89%) reported that they had taught students after
221 having worked a clinical shift the night before; over a third of respondents (36%) felt
222 that teaching after a night shift was not productive and the teaching suffered.

223 Some trainees raised concerns about the difficulty of obtaining release from clinical
224 duties to attend teaching sessions. Free text comments from the questionnaires
225 revealed that some trainees perceived that their NHS employers or colleagues were
226 not accommodating with regards to allowing time out of their clinical day for
227 demonstrating, and felt that the LPSS should better communicate the importance of
228 teaching to their employers. Furthermore, some trainees considered that the LPSS
229 requirement for the number of teaching sessions they were expected to complete
230 was ambitious and that it should be flexible, depending on the individual trainee's
231 circumstances.

232 Thirty-six per cent of trainees agreed and 15 % strongly agreed that the existence of
233 Core Surgical aAnatomy teaching in the first year of Core Surgical Training and the
234 the subsequent opportunity to teach students, influenced their application to train in
235 the LPSS. Furthermore, many trainees (79%) agreed (62%) or strongly agreed
236 (17%) that the anatomy teaching they received as CST1 helped to prepare them for
237 their teaching role, and 56% agreed and 24% strongly agreed that this teaching
238 helped prepare them for surgical training. Overall, 62% agreed and 13% strongly
239 agreed that the teaching program in anatomy for CST lived up to their expectations.

240 **DISCUSSION**

241 The focus group and questionnaire results of the current study revealed that the
242 CST2 trainees in the LPSS found teaching anatomy to medical and other students to
243 be valuable for improving their own anatomy knowledge, and hence a positive
244 contribution to their overall surgical training, especially as it was not limited to gross
245 anatomy. Anatomy education and medical education in general has changed in
246 recent years, and in some institutions, this has meant the decision to teach anatomy
247 without human cadavers (Willan, 1996; Older, 2004; Hanna and Tang, 2005; Ullah et
248 al., 2012). The results of the current study have shown anatomy demonstrating using
249 cadavers to be of benefit to trainees, and the opportunity to teach anatomy was one
250 of the reasons that trainees applied to join the London Core Surgical Training
251 Program.

252

253 Demonstrator Training

254 Most surgical trainees in the current study considered that they had received
255 adequate training at CST1 level to teach anatomy to undergraduates as CST2. In
256 addition, they reported that the CST1 Core Surgical Anatomy teaching helped

257 improve their own knowledge and understanding of anatomy, and support the spiral
258 notion of learning anatomy, as described by Evans and Watt (2005). However,
259 additional learning aids, to be used in conjunction with their host institution's course
260 guide, would be welcomed by trainees. Medical Schools may find it productive to
261 provide a 'demonstrator's workbook' indicating key anatomical structures and the
262 clinical / functional significance that should be highlighted to facilitate delivery of the
263 learning outcomes identified in the students' course material.

264

265 A major problem highlighted by the CST2s was that their clinical timetable meant
266 that they could rarely teach a whole course from start to finish. Therefore, trainees
267 considered that more background information was required to allow an individual
268 teaching session to be delivered in context. This reflects a wider issue in anatomical
269 education that demonstrators may teach on one component of a course, without an
270 understanding of the program as a whole. Whilst the perspective of students on this
271 issue was not investigated, it is important for teachers to feel that they have an
272 understanding of the sequence of material within an individual course, and what else
273 students are learning.

274

275 There is an increasing trend for junior doctors to undertake formal qualifications in
276 teaching or undergo training in pedagogical theory. Many CT2s demonstrated a
277 willingness and indeed keenness, to learn more about educational theory to help
278 underpin their teaching. "*Trainees may not be naturally born teachers*" (Beaton et
279 al., 2016); therefore, providing them with an introduction to anatomy education
280 theory would be beneficial and would, for example, allow them to understand that
281 individual students, on different courses, adopt a variety of approaches to learning

282 anatomy (Smith and Mathias, 2011; Smith et al., 2014). In this way, trainees would
283 be better placed to provide high quality personalized education for students.

284

285 Mentorship

286 The free text comments from the questionnaire revealed that feedback on teaching
287 performance from a senior colleague was welcomed by trainees. There may be
288 logistical considerations that make this difficult, but it was suggested that a rota
289 system could be introduced, whereby a senior colleague could be paired up with a
290 trainee for three to four sessions, for example, at the beginning, middle and end of
291 the term / semester, to provide progressive one-to-one feedback. This feedback
292 would be a valuable component of trainees' surgical portfolios, to demonstrate the
293 development of their teaching skills. Trainees also recognized the value of
294 references provided by the Head of Anatomy for their future careers. From a wider
295 perspective, it is important that all teachers receive regular peer review, and
296 demonstrators could use the same systems that the institutions have in place for
297 their faculty.

298

299 Organization

300 Trainees reported that their clinical employers were not always supportive of allowing
301 them time out of their clinical duties for anatomy teaching, which is evident from the
302 large number of trainees who taught directly after having worked a night shift.
303 However, despite working the night before, two thirds of trainees still reported that
304 they were effective in their teaching. Trainees considered that improved
305 communication would help to ensure that NHS employers understand the LPSS's
306 requirements of the trainees, and that protected time should be provided for

307 education. Clinical pressures within the NHS cannot be overcome easily, but the
308 fact that the demonstrators turned up ready to teach after a night shift reflects their
309 dedication to teaching and 'giving back' to medical education. It also reflects that
310 they clearly gain from the experience, because it was made clear that they did not
311 need to teach after a night shift.

312

313 The expanding the role of demonstrators

314 The role of demonstrators has evolved from the traditional focus on teaching
315 anatomical facts in the dissecting room. Trainees explained how they provided
316 several key support systems for students, which are unique to the role of
317 demonstrating. For example, they provided key tips on learning resources such as
318 mobile applications and key web links that they use in clinics. Trainees also provided
319 career advice to students, and informal network contacts. They are ideally placed in
320 the early part of an anatomy course to help students who have difficulty with the
321 dissecting room environment. Demonstrators also provided students with informal
322 advice and support about several issues including learning difficulties, career breaks
323 and maternity leave. This informal curriculum provides many of the benefits
324 associated with near-peer teaching. Current demonstrators were students who were
325 part of the early digital generation, and are involved in developing digital literacies
326 within medical schools to assist with learning. Demonstrators also undertook
327 teaching involving emerging methodologies, for example, the use of ultrasound in
328 living anatomy teaching.

329

330 **LIMITATIONS**

331 The authors acknowledge that the current study has limitations. First, it only
332 investigated the demonstrator experiences of trainees in the LPSS, and this may not
333 reflect the situation elsewhere. However, the LPSS is the largest postgraduate
334 school of surgery in the UK and is currently responsible for the education of
335 approximately 27% of UK surgical trainees, who qualified at a wide variety of medical
336 schools in the UK and are therefore, likely to be representative of the UK as a whole.
337 Second, the study did not investigate the experiences of students or faculty.
338 However, research highlighted in the Introduction to this paper has already drawn
339 out perspectives from these interest groups.

340

341 **CONCLUSION**

342 Our research suggests three key conclusions:

- 343 1. trainees thoroughly enjoyed the experience of teaching anatomy.
- 344 2. several strategies could be employed to improve the quality and efficacy of
345 teaching.
- 346 3. the role of anatomy demonstrators is not just of a teaching role but also that of
347 mentorship.

348

349 The results of the current study emphasize the reciprocal relationship between
350 teacher and student, and that demonstrator teaching could be further improved by
351 the implementation of a teaching evaluation system, enhanced demonstrator training
352 and the provision of more information about how a teaching session fits into the
353 wider curriculum. The themes generated and the strategies proposed to rectify
354 perceived problems have been relayed to stakeholders, including anatomy

355 departments / teaching institutions and the LPSS. Thus, it is hoped that the results of
356 the current study will help enhance surgical trainees' experience and indirectly help
357 to improve the experience of medical and other students taught by them.
358 Demonstrators bring a wide range of benefits to the student experience and the
359 results of this study indicate that the demonstrators also benefit from the teacher -
360 student partnership.

361

362

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424

425

426

LEGENDS FOR ILLUSTRATIONS

427

428

Table 1. Questionnaire

429

Figure 1. Key positive and negative themes identified from the focus group

430

Figure 2. Likert responses to selected questions

431

432

433

434

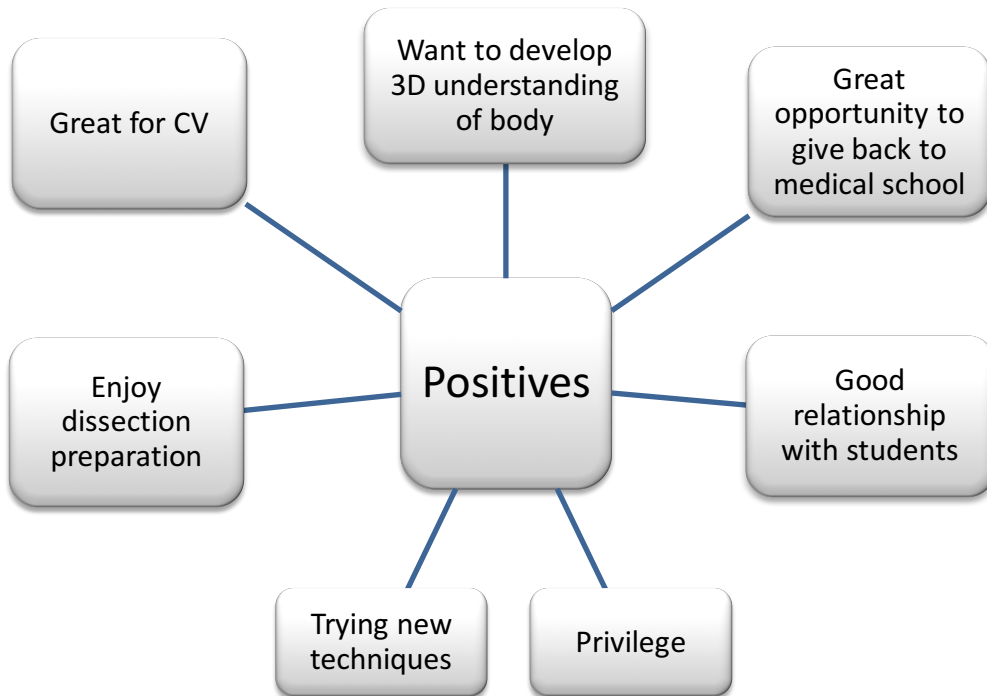
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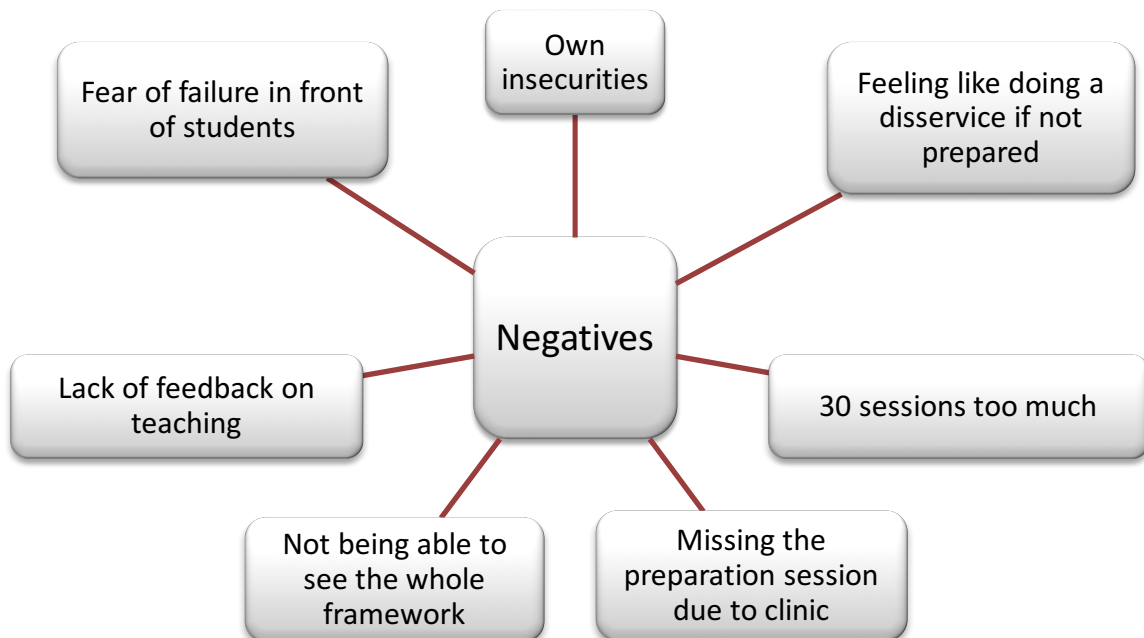
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438 **FIGURES**

439 Figure 1



440

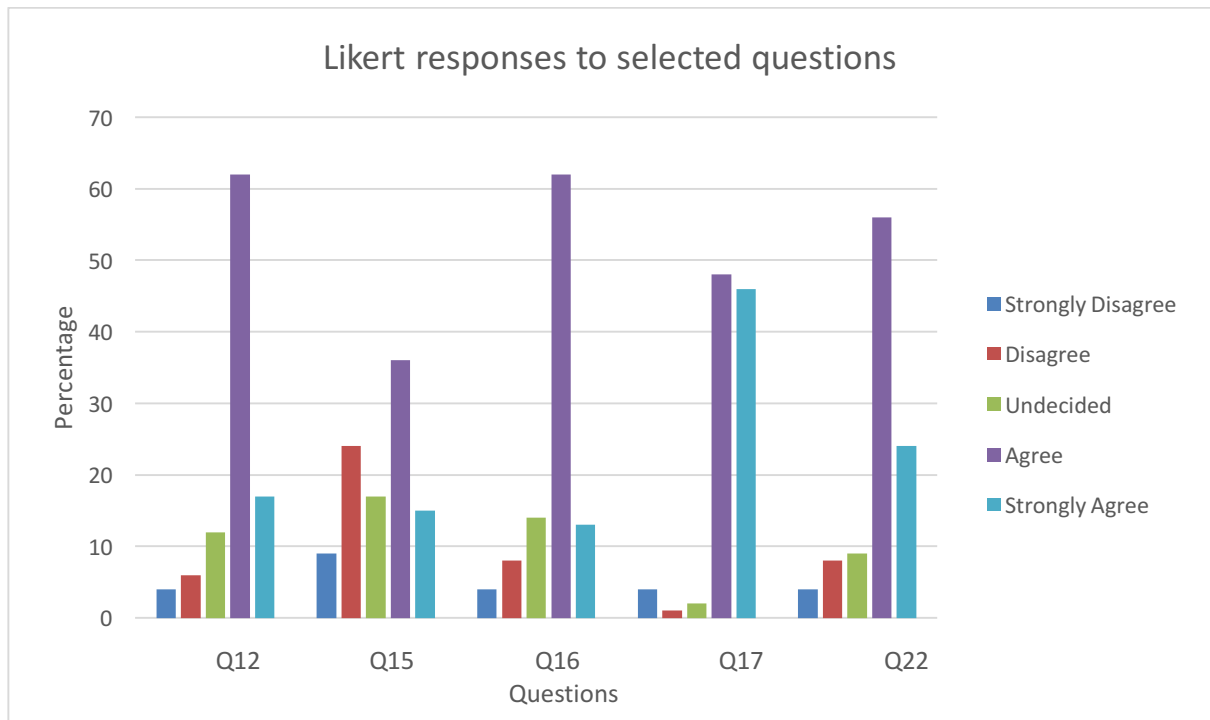


441

442

443

444 Figure 2



445

446 Q12. Anatomy teaching in CT1 helped me prepare for anatomy demonstrating.

447 Q15. Existence of the demonstrating programme influenced my application to the
448 Postgraduate School of Surgery, London.

449 Q16. Demonstrating in anatomy lived up to expectations.

450 Q17. The ability to relate anatomical knowledge to clinical scenarios helped students
451 learn.

452 Q22. Anatomy teaching received as a Demonstrator helped prepare for surgical
453 training.

454

455 GLOSSARY OF TERMS AND ABBREVIATIONS

456 CT: Core Trainee (the first two years of postgraduate surgical training)

457 GMC: General Medical Council (regulatory body)

458 HEE: Health Education England

459 LPSS: London Postgraduate School of Surgery

460 MRCS: Member of the Royal College Surgeons

461 NHS: National Health Service

462 UK United Kingdom

463

464

465