

# Perceptions On Reciprocal Peer Teaching Among Medical Students As Learners And As Tutors

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**Objectives:** The College of Medicine at Imam University has incorporated reciprocal peer-teaching into the curriculum in the form of peer-led seminars. The aim was to evaluate this program and ascertain student perceptions.

**Methods:** A cross-sectional survey of medical students attached to the Internal Medicine I and II courses was conducted in 2018. The questionnaire evaluated perceptions about the peer-teaching program, tutors' knowledge, skills and attitudes, both from a student and a tutor perspective.

**Results:** Based on a 63% response rate from a total of 410 students, 34.5% of learners agreed that peer-tutoring was the most effective method of clinical teaching and 30.3% disagreed. More students reported that peer-led seminars did not prepare them for their exams (38.4%) compared to those who reported it did (27.9%). More than 40% of participants reported the tutors were approachable, created a welcoming learning environment and provided targeted information. From a tutor perspective, more than 70% of participants reported that they developed personally and professionally, improved their collaborative, communication, tutoring and presentation skills and confidence. Female students reported they benefited more as tutors compared to male students.

**Conclusion:** Students regard obligatory reciprocal peer-teaching in the form of peer-led seminars as similar to faculty teaching and an overwhelming majority report that they benefit both personally and professionally from leading seminars. As doctors are expected to teach and train younger generations, medical schools should prepare all students for such roles. A system that provides an opportunity for every student to become a peer-teacher can fulfil this need.

**Keywords:** curriculum, peer group, students, medical, teaching methods, undergraduate medical education

## Introduction

Peer-teaching in general improves academic achievement,<sup>1</sup> although there is equivocal evidence that in a healthcare setting it results in better academic performance based on objective outcome measures.<sup>2</sup> Furthermore, it offers numerous other benefits not only to the tutees but to the peer tutors themselves<sup>3</sup> and the institutions;<sup>4</sup> it trains leadership, confidence skills and ability to provide effective feedback, it enhances intrinsic motivation, and it offers alternative methods of studying.<sup>5</sup>

It appears there is an increasing adoption of peer teaching in undergraduate medical schools, in many instances as part of the formal curriculum.<sup>6</sup> In some countries, this is encouraged by the relevant regulatory bodies, such as the General

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Medical Council in the United Kingdom,<sup>7</sup> as a recognition that it helps students prepare to become educators and supervisors,<sup>6</sup> roles and responsibilities that are required from most modern doctors.<sup>7,8</sup>

Despite the positive attitude towards peer-teaching, implementation and subsequent monitoring requires careful consideration.<sup>2</sup> Tutees may experience stress when pairing them with higher-achieving peer-tutors,<sup>9</sup> and students in higher education may worry about their peer-tutors teaching skills and effectiveness.<sup>10,11</sup> It is acknowledged that peer-tutors should receive some form of training,<sup>2</sup> and there is still a question as to whether peer-teaching should remain voluntary or if all students should be expected to have teaching roles.<sup>2</sup>

In the Kingdom of Saudi Arabia, preparing doctors for their future roles as teachers is an essential component of a national competence framework developed by medical schools to guide curriculum design and assessment.<sup>12</sup> The College of Medicine at Al-Imam University, Saudi Arabia, was founded in 2007, it followed an innovative approach to medical education with a curriculum that was developed by a committee consisting of national and international experts.<sup>13</sup> The benefits of peer-teaching in improving learning, communication and teamwork, teaching skills, and knowledge<sup>14</sup> were acknowledged early in the design and hence reciprocal peer-teaching became an integral part of the curriculum, alongside tutor-led lectures, case scenarios, and tutorials. All students are required to lead seminars and discussions on pre-determined topics starting from their 2nd year all the way to the 5th final year. Although there is merit in other forms of peer-teaching, such as non-reciprocal or near-peer<sup>1</sup> or when performed by selected few purposefully trained students,<sup>4</sup> our institution considered it was a unique opportunity to expose all students to engage in teaching and thus potentially benefit from such role.

The aim of the study was to evaluate the peer-teaching program as perceived by the medical students. The objectives were to survey medical students as to their perceptions of peer-teaching in general, identify perceived benefits, and evaluate if the organizational support is adequate, both from a tutor and a student perspective.

## Materials And Methods

This descriptive cross-sectional survey examined perceptions of students and interns about the peer-teaching program using a questionnaire disseminated via email on November 2018.

## Sampling Procedures

The sample population was selected via convenience sampling; all 4th and 5th year medical students and medical interns attached to the Internal Medicine I and II rotations were eligible and asked to participate. Although students actively participate in reciprocal peer-teaching, interns have completed their training and are attached to clinical firms before becoming fully registered doctors. They were included because they could offer insight into the lasting perceptions of peer-teaching.

## Reciprocal Peer-Teaching

Students rotate through 5–10 placements per year in groups of approximately 50 divided into two sub-groups. Reciprocal peer-teaching, starts in the 2nd year of study, is in the form of small group seminars where a lead student presents a topic to their subgroup and directs the further discussion. Students are given the topic and the learning objectives for the session and there are otherwise no strict guidelines for the format of either the presentation or the discussion. Students are free to implement their own teaching methods, although the sessions invariably involve a slide presentation and answering questions from the other students. All students present at least once per placement, and the subject topic and objectives are pre-determined within the curriculum focusing on knowledge rather than clinical skills. The seminars last 1–2 hrs, depending on the placement and year of study, and a faculty member is present as a strict observer with no active involvement during the presentation or discussion.

Formal preparation for this role is through two modules: The Learning Skills II course during their 1st year, where the students learn about presentation skills, and the Evidence-Based Medicine course during their second year, where they learn how to identify and present relevant evidence clearly and concisely. The students prepare for these seminars during their own study time and are given contacts to seek help and support from faculty members throughout the course. There are no specific learning goals relating to the peer-teaching program itself, only those defined by the individual topics presented, and a faculty member is a passive observer during the sessions to provide informal feedback at the end of each session to help the student to identify their strengths and areas to focus on relating to their presentation and teaching skills, as well as the topic coverage.

## Survey Design

A 39-item questionnaire (Q1–Q39) with responses on a 5-point Likert scale (strongly disagree to strongly agree) was devised by panel of educators to explore learners' general perceptions, perceptions of tutors' knowledge, skills and attitudes, and organizational support, as well tutors' perceived benefits and support. The questionnaire was based on previous reports in the literature (Q1–3, Q5–6, Q9–15, Q21, Q23–25, Q27, Q34–35),<sup>4,15,16</sup> to allow for generalizability and comparison with other studies. It has two parts requiring responses as learners (general perceptions, tutors' knowledge, tutors' skills, tutors' attitudes, organizational support), and as tutors (own knowledge, own skills, own attitudes, organizational support), and there is also a free-text option. Content validity was addressed by including questions on all domains of benefits (knowledge, skills, and attitudes) and incorporating questions used in other studies.

## Statistics

Analysis was performed using Jamovi v 0.9.5 software. Answers were given a score ("Strongly disagree"=1, "Disagree"=2, "Neither disagree or agree"=3, "Agree"=4, "Strongly Agree"=5). Descriptive statistics in the form of percentages and medians were used. For descriptive analysis, results were described as students disagreeing with a statement (included both "strongly disagree" and "disagree" responses) and agreeing with a statement (included both "agree" and "strongly agree" responses). A Mann–Whitney *U*-test was used to compare two independent groups (female–male), and the Kruskal–Wallis for more than 2 independent groups (year of study). The Wilcoxon–signed rank test was used for comparing two paired samples (different questions of the questionnaire), and the Friedman test for comparing more than two paired samples. Spearman correlation coefficients were used to identify correlations between various questions. Level of significance was set at  $\alpha = 0.05$ . A Cronbach alpha was calculated to evaluate internal consistency.

## Ethical Considerations

The study was reviewed and approved by the internal review board (IRB) of Al-Imam Muhammad Ibn Saud Islamic University. All study participants were given information about the study and they indicated their consent by completion of the questionnaire. Data were collected and analyzed anonymously to preserve privacy and confidentiality.

## Results

Sixty-three percent (258/410) of students responded. Fifty percent were year 4 students (Table 1) and 85.7% male ( $n=221$ ). Only year 4 had female students at the time of the study, 40 in total, resulting in a 92.5% response rate for female students and 59.7% response rate for male students. Learners' perceptions of the peer-teaching in general are shown in Table 2, of the peer-tutors and organizational support in Table 3. Peer-tutors' perceptions about themselves and of organizational support are shown in Table 4. The section relating to learners' perceptions (general perceptions, peer-teachers, and organizational support) has good internal consistency with a Cronbach's alpha of 0.912, and so did the section on tutors' perceptions (Cronbach's alpha of 0.935).

## Learners' General Perceptions About The Peer Teaching

Eighty-nine (34.5%) learners felt peer-tutoring was the most effective method of clinical teaching (agreed or strongly agreed) and 78 (30.3%) disagreed or strongly disagreed (Q1, Table 2). Most of the other responses had a similar distribution except for Q7, where more students felt peer-led seminars did not prepare them for their exams (38.4%) compared to those who felt it did (27.9%). Friedman test and pairwise comparisons (Durbin–Conover) confirmed that only the responses to that question were different among the questions on general perceptions ( $P < 0.003$ ). Cronbach's alpha was 0.886 for this set of questions.

Only four students responded to the free-text question if they had anything else to add:

One thing needs to be well-established and well-understood: any Basic information or learning process must be given by a tutor NOT by peers or students. Peers and

**Table 1** Response Rates Based On Year Of Study

Levels	<i>n</i>	Respondents	% Of <i>n</i>	Cumulative %
4th year medical students	180	129	71.6%	50.0%
5th year medical students	110	94	85.5%	86.4%
Medical interns	120	35	29.2%	100.0%

**Notes:** Year 4 students were 140 males and 40 females, of which 37 responded. All other years are comprised solely of male students. Medical interns are effectively 6th year students and do not participate in peer teaching.

**Abbreviation:** *n*, total number of students at that year.

**Table 2** Learners' General Perceptions Of Peer-teaching

Question	SD		D		N		A		SA	
	n	%	n	%	n	%	n	%	n	%
1 Peer tutoring is the most effective method of clinical teaching <sup>a</sup>	20	7.8	58	22.5	91	35.3	67	26.0	22	8.5
2 I prefer being taught by peer tutors compared to faculty teachers	27	10.5	60	23.3	85	32.9	65	25.2	21	8.1
3 I am more willing to engage in sessions taught by peer tutors compared to faculty teachers	20	7.8	56	21.7	92	35.7	69	26.7	21	8.1
4 I learn at least as well when taught by peer teachers compared to faculty	24	9.3	61	23.6	84	32.6	64	24.8	25	9.7
5 I feel more confident learning from peer tutors compared to faculty teachers	27	10.5	63	24.4	81	31.4	61	23.6	26	10.1
6 I am satisfied with the peer-tutored clinical teaching that I received in internal medicine	21	8.1	59	22.9	93	33.7	69	20.9	16	7.0
7 The peer-tutored teaching which I received in internal medicine is enough to prepare me for my clinical year exams.	40	15.5	59	22.9	87	33.7	54	20.9	18	7
8 I spent more time out of the classroom reading on what I learnt during a peer-led seminar than I did after other faculty-led teaching activities – put 1 for less time, 3 for equal time and 5 for more time	27	10.5	51	19.8	93	36.0	46	17.8	41	15.9

**Note:** <sup>a</sup>Female students agreed less than males in these questions.

**Abbreviations:** SD, strongly disagree; D, disagree; N, neither agree or disagree; A, agree; SA, strongly agree; n, number; %, percentage of row totals.

**Table 3** Learner's Perceptions Of Peer-Tutors And Organizational Support

Question	SD		D		N		A		SA	
	n	%	n	%	n	%	n	%	n	%
<b>Tutors Knowledge</b>										
9 The tutors' knowledge was appropriate for the required level of teaching	13	5.0	43	16.7	101	39.1	77	29.8	24	9.3
10 They provided appropriate information and resources that targeted my needs <sup>a,b</sup>	13	5.0	47	18.2	93	36.0	79	30.6	26	10.1
11 The tutors addressed learning objectives relevant to the exam <sup>b</sup>	24	9.3	53	20.5	87	33.7	71	27.5	23	8.9
<b>Tutors Skills</b>										
12 The tutors employed effective teaching strategies during the seminars <sup>a,b</sup>	16	6.2	50	19.4	97	37.6	76	29.5	19	7.4
13 The tutors were able to explain concepts and answer questions that were clinically relevant <sup>a,b</sup>	9	3.5	52	20.2	96	37.2	67	26.0	34	13.2
<b>Tutors Attitudes</b>										
14 Tutors were approachable and happy to answer questions <sup>a</sup>	13	5.0	45	17.4	80	31.0	83	32.2	37	14.3
15 Tutors created a welcoming learning environment <sup>a,b</sup>	14	5.4	46	17.8	79	30.6	78	30.2	41	15.9
<b>Organizational Support</b>										
16 The seminar rooms were appropriate for the activity	13	5.0	49	19.0	82	31.8	73	28.3	41	15.9
17 The timing of the seminars was appropriate	11	4.3	47	18.2	91	35.3	71	27.5	38	14.7
18 We should have more peer-led seminars	29	11.2	45	17.4	97	37.6	59	22.9	28	10.9
19 There was not enough time during a seminar to cover all the objectives	18	7.0	48	18.6	96	37.2	68	26.4	28	10.9

**Notes:** <sup>a</sup>Female students agreed less compared to males, and <sup>b</sup>Medical interns more likely to agree than other students.

**Abbreviations:** SD, strongly disagree; D, disagree; N, neither agree or disagree; A, agree; SA, strongly agree; n, number; %, percentage of row totals.

students may engage in debating issues or subjects that are not considered basic or important-to-know.

The issue is the preparation of some students, it minimizes the benefit of peer teaching

At the time you are preparing yourselves for the seminar presentation, you can study a lot of useful subjects instead.

I'll agree with the seminar if it's only one time per course

### Learners' Perceptions On The Peer Teachers

The learners were generally satisfied with the level of knowledge, skills and attitudes of the peer tutors, since a higher

**Table 4** Peer-Tutors' Perceptions

Question		SD		D		N		A		SA	
		n	%	n	%	n	%	n	%	n	%
<b>Own Knowledge</b>											
20	I had the opportunity to consolidate my own knowledge.	4	1.6	14	5.4	69	26.7	123	47.7	48	18.6
21	Being a clinical peer tutor has increased my confidence in my own exam performance <sup>a</sup>	2	0.8	19	7.4	62	24	107	41.5	68	26.4
<b>Own Skills</b>											
22	Being a clinical peer tutor has increased my confidence in my tutoring and presentation skills	4	1.6	14	5.4	53	20.5	114	44.2	73	28.3
23	I have a better understanding of teamwork and understanding roles within the team <sup>a</sup>	6	2.3	22	8.5	51	19.8	104	40.3	75	29.1
24	My communication skills with my colleagues has improved <sup>d</sup>	5	1.9	17	6.6	49	19	109	42.2	78	30.2
25	I can collaborate better with my colleagues <sup>a</sup>	5	1.9	14	5.4	53	20.5	106	41.1	80	31
26	Teaching is a very hard skill and I felt myself getting better each time <sup>a</sup>	2	0.8	13	5	55	21.3	115	44.6	73	28.3
<b>Own Attitudes</b>											
27	I am a better role model to my peers <sup>a</sup>	6	2.3	20	7.8	82	31.8	90	34.9	60	23.3
28	I gained many benefits from this experience and I am willing to repeat it <sup>a</sup>	7	2.7	12	4.7	71	27.5	99	38.4	69	26.7
34	I have developed both personally and professionally	4	1.6	17	6.6	47	18.2	112	43.4	78	30.2
35	Being a clinical skills peer tutor has made me consider pursuing teaching in the future <sup>a</sup>	13	5	27	10.5	70	27.1	83	32.2	65	25.2
<b>Organizational Support</b>											
29	The seminar rooms were appropriate for the activity <sup>a</sup>	9	3.5	24	9.3	80	31	89	34.5	56	21.7
30	The timing of the seminars was appropriate <sup>a</sup>	10	3.9	29	11.2	79	30.6	84	32.6	56	21.7
31	We should have more peer-led seminars <sup>a</sup>	15	5.8	36	14	66	25.6	88	34.1	53	20.5
32	There was not enough time during a seminar to cover all the objectives <sup>a</sup>	15	5.8	39	15.1	68	26.4	94	36.4	42	16.3
33	The objectives and content to cover in the seminar were clearly and sufficiently detailed <sup>a</sup>	7	2.7	30	11.6	74	28.7	97	37.6	50	19.4
36	I think the students benefited from this teaching experience <sup>a</sup>	7	2.7	20	7.8	64	24.8	103	39.9	64	34.8
37	The available infrastructure teaching rooms, learning material was appropriate <sup>a,b</sup>	10	3.9	33	12.8	57	22.1	104	40.3	54	20.9
38	I had support from faculty or other peers <sup>a</sup>	15	5.8	31	12	56	21.7	97	37.6	59	22.9
39	Overall, I feel I was adequately prepared for this role <sup>a,b</sup>	6	2.3	27	10.5	64	24.8	91	35.3	70	27.1

**Note:** <sup>a</sup>Female students agreed more compared to males, and <sup>b</sup>5th year students less likely to agree than other students.

**Abbreviations:** SD, strongly disagree; D, disagree; N, neither agree or disagree; A, agree; SA, strongly agree; n, number; %, percentage of row totals.

percentage agreed or strongly agreed with the statements rather than disagree (Table 3). Friedman test revealed there were statistically significant variations, attributed to the questions on the objectives (Q11) and the tutors employing effective teaching methods (Q12), both showing slightly less positive trend in the responses. Spearman rho correlation revealed positive correlation between all these responses. Cronbach's alpha was 0.874 for this set of questions.

## Learners' Perceptions On Organizational Support

Overall, 114 (44.2%) students thought the facilities were appropriate and 109 (42.2%) that the timing was right

(Table 3). Ninety-six (37.3%) students felt the allocated time was not enough, and 87 (33.8%) would prefer more seminars compared to 76 (28.6%) who do not. Friedman test and pairwise comparisons (Durbin-Conover) confirmed that there was a difference between all these responses ( $P < 0.001$ ) due to the above questions (Q18, Q19). Spearman rho correlation revealed positive correlation between all these responses. Cronbach's alpha was 0.876.

## Tutors' Perceptions

Perceptions from a tutor perspective were overwhelmingly positive across all questions relating to perceived benefit (Table 4). Friedman test and pairwise comparisons

**Table 5** Perceptions According To Gender

Question	Group	N	Mean	Median	SD	SE	P
<b>Learners' Perceptions</b> Peer tutoring is the most effective method of clinical teaching	Female	37	2.76	3	0.76	0.125	0.045
	Male	221	3.1	3	1.103	0.0742	
They provided appropriate information and resources that targeted my needs	Female	37	2.89	3	0.774	0.127	0.014
	Male	221	3.28	3	1.05	0.0706	
The tutors employed effective teaching strategies during the seminars	Female	37	2.78	3	0.75	0.123	0.012
	Male	221	3.18	3	1.037	0.0698	
The tutors were able to explain concepts and answer questions that were clinically relevant	Female	37	2.92	3	0.795	0.131	0.027
	Male	221	3.31	3	1.06	0.0713	
Tutors were approachable and happy to answer questions	Female	37	2.81	3	0.845	0.139	<0.001
	Male	221	3.42	4	1.091	0.0734	
Tutors created a welcoming learning environment	Female	37	2.97	3	0.928	0.152	0.019
	Male	221	3.39	3	1.126	0.0757	
<b>Tutors' Perceptions</b> Being a peer tutor has increased my confidence in my own exam performance	Female	37	4.16	4	0.688	0.113	0.03
	Male	221	3.8	4	0.947	0.0637	
I have a better understanding of teamwork and understanding roles within the team	Female	37	4.24	4	0.796	0.131	0.009
	Male	221	3.79	4	1.029	0.0692	
My communication skills with my colleagues has improved	Female	37	4.22	4	0.787	0.129	0.042
	Male	221	3.87	4	0.983	0.0661	
I can collaborate better with my colleagues	Female	37	4.24	4	0.796	0.131	0.028
	Male	221	3.89	4	0.968	0.0651	
Teaching is a very hard skill and I felt myself getting better each time	Female	37	4.22	4	0.75	0.123	0.042
	Male	221	3.9	4	0.889	0.0598	
I am a better role model to my peers	Female	37	4.08	4	0.954	0.157	0.003
	Male	221	3.62	4	0.981	0.066	
I gained many benefits from this experience and I am willing to repeat it	Female	37	4.11	4	0.809	0.133	0.036
	Male	221	3.77	4	0.989	0.0665	
Being a clinical skills peer tutor has made me consider pursuing teaching in the future	Female	37	4.11	4	0.906	0.149	0.003
	Male	221	3.54	4	1.134	0.0763	
The seminar rooms were appropriate for the activity	Female	37	4.24	4	0.796	0.131	<0.001
	Male	221	3.51	4	1.034	0.0696	
The timing of the seminars was appropriate	Female	37	4.14	4	0.751	0.124	<0.001
	Male	221	3.48	3	1.085	0.073	
We should have more peer-led seminars	Female	37	4.19	4	0.908	0.149	<0.001
	Male	221	3.38	3	1.132	0.0762	
There was not enough time during a seminar to cover all the objectives	Female	37	4.19	4	0.739	0.122	<0.001
	Male	221	3.29	3	1.108	0.0745	
The objectives and content to cover in the seminar were clearly and sufficiently detailed	Female	37	4.19	4	0.845	0.139	<0.001
	Male	221	3.49	4	1.007	0.0678	

(Continued)

**Table 5** (Continued).

Question	Group	N	Mean	Median	SD	SE	P
I think the students benefited from this teaching experience	Female	37	4.19	4	0.845	0.139	0.003
	Male	221	3.69	4	1.007	0.0677	
The available infrastructure teaching rooms, learning material was appropriate	Female	37	4.16	4	0.688	0.113	<0.001
	Male	221	3.52	4	1.098	0.0738	
I had support from faculty or other peers	Female	37	4.05	4	1.053	0.173	0.003
	Male	221	3.52	4	1.134	0.0763	
Overall, I feel I was adequately prepared for this role	Female	37	4.14	4	0.976	0.161	0.007
	Male	221	3.68	4	1.041	0.07	

(Durbin-Conover) indicated there was a difference between the answers, mainly because of the different distribution of Q20 (“consolidate my own knowledge”), Q27 (“I am a better role model”), Q28 (“I have gained benefits and willing to repeat it”), and Q35 (“consider teaching in the future”). Spearman rho correlation revealed positive correlation between all these responses. Cronbach’s alpha was 0.898 for this set of questions.

Relating to organizational support from a tutor perspective, perceptions were overwhelmingly positive, across all questions (Table 4, Q29-39), except for Q32, where most students felt there was not enough time in the seminars to cover all objectives (52.7%), and Q21, where students thought they need more peer-led seminars (54.6% agree or strongly agree). Friedman test and pairwise comparisons (Durbin-Conover) indicated there was no difference between the answers, except for Q36 (“I think the students benefited from this teaching experience”) and Q39 (“I was adequately prepared”), both of which had even more positive responses than the other questions. Spearman rho correlation revealed positive correlation between all the responses. Cronbach’s alpha was 0.866 for this set of questions.

A Wilcoxon signed ranked test revealed statistically significant difference between the pairs of the same questions relating to organizational support asked in the learners’ (Table 3, Q16–19) and the tutors’ (Table 4, Q29–32) sections ( $P<0.001$ ). Students were more likely to agree or strongly agree to the same questions in the tutors’ section.

## Gender Comparisons

Female students were less likely to agree that peer teaching is the most effective method (median=3, IQR=2–4) compared to males (median=3, IQR=2–5) ( $P=0.045$ ), although there was no difference in preferring peer-teaching over

faculty ( $P=0.536$ ) (Table 5). They were also less likely to agree with the questions relating to the peer-tutors’ abilities compared to male students ( $P<0.030$ ) in all questions apart from tutor knowledge ( $P=$ and addressing objectives relevant to the exam).

In contrast, when answering the questionnaire relating to them leading a seminar as a tutor, they had more positive perceptions about the benefits they received in all questions apart from consolidating their own knowledge, confidence in tutoring and presentation, and developing personally and professionally. They also agreed with all the questions on organizational support more than male students ( $P<0.007$ ).

Across responses only from the 4th year (since there are currently no female students in the other years), the differences were more pronounced. Female students agreed less that tutor information targeted their needs compared to male students,  $p = 0.041$ , or that the tutors tackled clinically relevant concepts,  $P=0.027$  (females median=3, IQR=2–3, males median=3, IQR=3–4 to both questions). They were less likely to agree that tutors were approachable ( $P<0.001$ ) or that created a welcoming environment ( $P=0.001$ ) (median=3, compared to males median=4 to both questions).

Female tutors from the 4th year cohort had more positive perceptions compared to males of the same 4th year cohort: they agreed more that peer-teaching increased their understanding of teamwork ( $P=0.006$ ), improved their communication skills ( $P=0.036$ ) and collaboration ( $P=0.042$ ). They also felt they were a better role model (median=4, compared to male median=3,  $P=0.002$ ), and that they gained benefits ( $P=0.002$ ). They were also more positive about the infrastructure (appropriateness of the rooms, timing of the seminars, and well-defined objectives,  $P<0.001$ ), though they also reported there was not

enough time ( $P<0.001$ ). They also felt generally more supported than male students ( $P=0.016$ ).

## Year Of Study Comparisons

Medical interns were slightly more likely to agree compared to year 4 or year 5 students in the questions about the information targeting their needs ( $P=0.009$ ), the objectives being relevant to the exam ( $P=0.017$ ), tutors employing effective methods ( $P=0.023$ ) and creating a welcoming environment ( $P=0.011$ ). Year 5 students agreed less in questions about the infrastructure ( $P=0.045$ ) and being adequately prepared ( $P=0.035$ ). No differences were found in the other questions.

## Discussion

Reciprocal peer teaching is inadequately addressed in the literature.<sup>2,14</sup> Although this study is not an interventional comparative study, it addresses this issue by presenting real-world perceptions of a program that does not limit student participation as peer-teachers based on skill or voluntary basis. Even though the students were apprehensive in making firm decisions as to the effectiveness of the peer-teaching program, with the majority neither agreeing nor disagreeing (Figure 1), they acknowledged that leading a seminar resulted in improvements in their knowledge, skills, and attitudes. This is in alignment with other literature which suggests that same-level peer teaching has many benefits beyond academic performance<sup>17</sup> and strengthens the notion that a peer-teaching program does not necessarily need to focus on improving exam results but rather on training students for other roles, and as such it should be accessible to all.

In our study, there was no clear positive perception that peer-teaching was the most effective way to learn,

preference over faculty teaching, confidence in learning from peer tutors, being more willing to engage in sessions taught by peer-tutors, and being confident in the knowledge of peer tutors, although there was still an overall positive impression (Figure 1). Peer-teaching is seen in a more positive light by students when the tutors are from more advanced years and specifically selected and trained for this role.<sup>4,15</sup> Khalid et al<sup>4</sup> evaluated a two-year program where preclinical students believed that peer-teaching was the most effective way to learn clinical skills, and this positive attitude was also evident in the questions mentioned. Khalid et al attributed their results to similarities between students and peer tutors in both demographic characteristics and in sharing similar experiences. In our case, peer tutors are not selected based on competitive assessment and actual and perceived competence of the tutors likely plays a larger role than learner-tutor similarities.

Students expect the peer-tutors to be trustworthy,<sup>10</sup> and judging from the free-text responses, some students do not view their peers as efficient tutors. This is expected in a system where all students become peer-tutors irrespective of commitment or skill. The provision of efficient training is important to enhance the tutoring skills of students. In our institution, students receive training in presentation skills as part of the Learning Skills II course during the 1st year of university, and on how to identify and present relevant evidence as part of the Evidence-Based Medicine course during the 2nd year. Although the majority of students felt supported and prepared for their role, incorporating training on adult education principles and methods as well as more specific issues such as time management, dealing with group dynamics and with

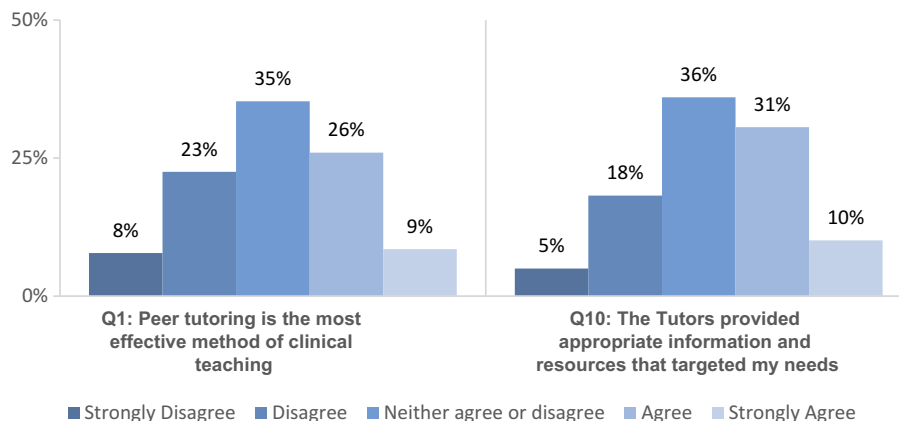


Figure 1 Responses to sample questions about the program and the tutors.



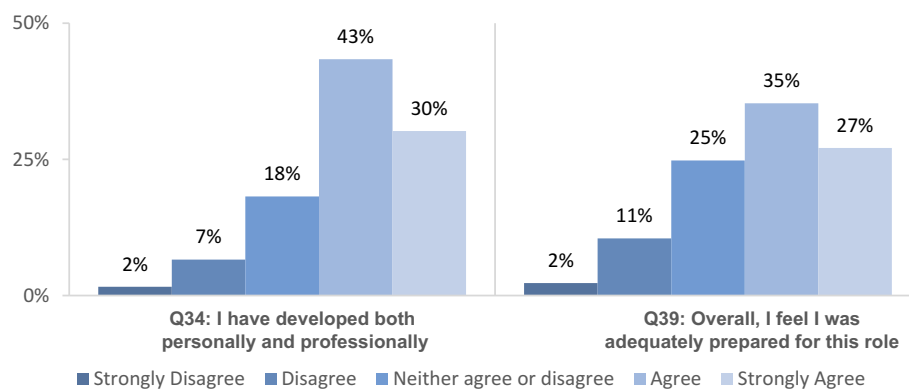
learners in difficulty during these courses will likely increase peer-tutor confidence<sup>18,19</sup> and skills,<sup>20</sup> and thus improve the perceptions of students.<sup>21</sup> A review of the feedback the students receive at the end of each seminar, which was not explored in this study, may also highlight further areas of improvement.

In our institution, the peer-teaching is reciprocal, and this also likely reduces the effectiveness according to the literature. Leung et al<sup>3</sup> report in their systematic review that peer-tutors benefit from enhanced academic performance with a moderate effect size ( $d=0.38$ ). However, they advocate shorter and fewer weekly training sessions, more frequent and longer peer-tutoring sessions, and same-sex and same-age non-reciprocal tutoring for maximum effect. Increasing the number and length of peer-tutoring sessions could be attempted, as many students have expressed a need for both.

Although most of the students had positive perceptions of the knowledge, skills, and attitudes of the tutors, and the peer-tutors in our study felt they were supported for this role (Figure 2), more effort should be placed in elevating the role of the peer-tutors. This is important because peer-tutors can face a lack of role clarity,<sup>22</sup> since they want to know which are their responsibilities without taking on extra roles, and they want to be trusted by the students.<sup>22</sup> The faculty also has a role in ensuring that the students are aware of the trust endowed by the faculty on the peer-tutors, providing clear goals and expectations to the tutors, and setting up appropriate training so that peer tutoring is performed by knowledgeable and skillful students, usually from more advanced years.<sup>22</sup> This is an area that should be explored by our institution, possibly through incorporating specific modules on teaching methods as discussed previously.

Peer-tutors have positive opinions about the process and feel that they benefit, both professionally and personally (Figure 2), with improved communication skills, presentation skills, teamwork, and knowledge. Many also report they will consider teaching in the future. These positive perceptions are shared among many students who teach clinical skills<sup>4,15–17</sup> or even other subjects, such as ECG interpretation, although this is not always associated with an objective improvement in actual performance.<sup>18</sup> In the study by Khaw and Raw,<sup>15</sup> more peer-tutors strongly agreed with the above-mentioned benefits compared to our study, and this likely represents the different set-up; year 6 students are offered a medical education elective where they teach year 1–2 students on clinical skills, rather than knowledge as in our institution, and hence the sample population is different (respondents are motivated). The reasons behind these gains are many and relate to motivation, self-monitoring and having to organize the knowledge and retrieve it during the teaching session.<sup>18</sup>

Our students are separated in terms of gender so peer-teaching is performed by students of the same group, and same-sex peer-tutoring has been associated with better objective outcomes.<sup>3</sup> Female students are more likely to identify perceived benefits in our study compared to male students, possibly related to the better academic performance of female students, especially in pre-clinical years.<sup>23</sup> In contrast, they were also less positive about the abilities of the tutors to be approachable and create a welcoming environment. The reasons are unclear, and other studies have shown conflicting results, from reporting no difference in perceptions between male and female students<sup>24</sup> to reporting that male students score male presenters more highly<sup>25</sup> and female students finding peer-assisted learning useful and a safe learning environment;<sup>26</sup> in contrast to this study, there is no segregation of students by gender during



**Figure 2** Responses to sample questions from a tutor perspective.

their studies and the social environment is too different to make meaningful comparisons. Nonetheless, student perceptions are likely influenced by the subtle psychosocial differences between genders, such as that male medical students score higher in loneliness and female students higher in anxiety evaluations,<sup>27</sup> and by unconscious gender biases in student evaluations of teaching.<sup>28</sup>

The study also included medical interns who have completed their training to gain an understanding of the long-lasting perceived benefits. Compared to 4th and 5th year students who shared similar opinions, medical interns were more positive about the abilities of their peers. This could relate to the low number of medical interns in our study, recollection bias, or reflect true differences in the tutoring abilities of that cohort.

## Limitations

The main limitation of this study is that all students have led a seminar and their views as learners and as tutors are not independent. However, the questionnaire was divided into two sections with clear heading as to whether the questions related to their role as students and as tutors, and the students responded differently with a statistical significance to similar questions asked in both sections. This likely means that the questionnaire was successful in focusing the students to answer from two different perspectives.

The inclusion of a middle response resulted in many of the questions being answered with a neutral response, somewhat limiting our findings. A forced-choice format where the respondent is forced to choose agreement or disagreement provides more meaningful results.<sup>29</sup>

The convenience sampling employed in this study could introduce bias of students responding about their current experiences and not about the peer-teaching in general. Nevertheless, students were recruited from three different years and two placements, thus ensuring a somewhat expansive sample and limiting this bias.

Although the questionnaire has not been used in its exact form in other studies, it has face, external, and construct validity. Questions used in other studies were incorporated, and a panel of educators examined the questions for factorial validity, relevance and clarity. The questionnaire and its individual subsections show internal consistency with high Cronbach's alpha. The questionnaire can be improved further by examining correlations between questions and objective outcomes for internal (criterion) validity in our population, such as between

perception of benefit in exam performance and actual exam results.

## Conclusion

Students regard obligatory reciprocal peer-teaching in the form of peer-led seminars similar to faculty teaching and have generally positive perceptions about the program. An overwhelming majority reported that they benefited both personally and professionally from leading seminars. Since it is a fundamental duty for doctors to teach and train younger generations, it is equally important for medical schools to prepare all students for such roles. Therefore, there is a lot of merit in a system that provides an opportunity for every student to become a peer-teacher.

## Ethical Approval

The project was reviewed and approved by the internal review board (IRB) of Imam Muhammad Ibn Saud Islamic University.

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## Author Contributions

Saad Mohammed AlShareef generated the idea, conceived and designed the study. He also analyzed the data and wrote/drafted the manuscript. Abdulrahman Yousef Aldayel, Hamid Mohammed Alghamdi, Mohammed Buraik Alosaimi, Muteb Mousa Alharbi, Abdulaziz Abdulrahman Aldayel and Hamad Abdulaziz Alhussain equally participated in collecting and analyzing the data and contributed to the writing and drafting of the manuscript. All authors approved the final version for publication, and they agree to be accountable for all aspects of this work.

## Disclosure

The authors report no conflicts of interest in this work.

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