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Strategies to develop an efficient feedback system in medical education and its outcome – An interventional study

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ABSTRACT

Objective: The main aim of this study is to know the loopholes in the feedback system, strategies to remove these loopholes, and to measure the effects of an efficient feedback system in an institution.

Methods: This research has three stages. In the first stage, we tried to find out the flaws in the feedback system of the institution based on published benchmarks. Then we tried to remove these flaws with the collaboration of different stakeholders. In the last stage of the study, we tried to measure the effectiveness of these corrective procedures by certain key performance indicators (KPIs).

Results: After improvement strategies, there was a significant improvement in the KPIs like, the knowledge and attitude toward the feedback improved from 3.1 to 4.23 in students, and from 3.46 to 4.34 in faculty members, on a five-point scale, and the teaching standards improved as measured by students' performance in different courses in terms of learning objectives achievement, for example in internal medicine from 70.8% to 75.3%. Similar improvement was recorded in other KPIs as well.

Conclusion: An efficient feedback system is the backbone of education and by adopting effective feedback, individuals and institutions can excel in the field of medical education.

Introduction

Feedback

Defining feedback in simple words, it is a corrective response by one party to the action of the other party. Merriam-Webster defined it as, 'the transmission of evaluative or corrective information about an action, event, or process to the original or controlling source'. In medical education, feedback is giving specific details regarding how learners' performance compares to a standard, aimed to help the learners to improve their performance.

Feedback plays a key role in modern medical education which is obvious from the literature published till now [1,2]. Though the concept of feedback in education is ancient, it came into practice in the late twentieth century [3]. Nowadays it is one of the main components of medical education that promotes learning standards [4,5]. In universities, there is a lot of controversy around feedback. Everyone acknowledges how crucial it is. Yet, students express a great deal of unhappiness, saying that they don't get the feedback they seek on their work and that it's not timely. Teaching staff finds it demanding, worries that learners are not participating, and questions whether their efforts are worthwhile.

Classification

Based on different characteristics feedback can be classified into different types, like constructive feedback and corrective feedback on the basis of the purpose of feedback, formal and informal based on the feedback setting, formative and summative feedback on the basis of breadth of the

Practice points

- Feedback plays a crucial role in enhancing medical education and student learning outcomes.
- Regular evaluation and audits of the feedback system are essential to identify areas for improvement.
- The effectiveness of the feedback process should be measured using specific Key Performance Indicators (KPIs) to ensure it aligns with educational goals.

feedback, sandwich and Pendleton on the basis of the delivery of the feedback [6].

Importance

For learning to be properly promoted, feedback is essential. Without feedback, students have fewer tools at their disposal to evaluate their development and alter their performance in the future. Feedback is the key to helping students make wise decisions and the foundation for better learning outcomes. The assumption that feedback will enhance future conditions, or impact, determines how valuable it is. There is, however, a growing body of research on feedback design, including the potential of various sources (such as peers, automated systems), modes (such as written, audio, and video), agency (such as learners seeking specific feedback), sequencing, and the influence of context, but there has not been a similar focus on the impact

of feedback. The goal of feedback is to provide direction for learning in a particular subject area or task, as well as an incentive for the learning process, while also guiding trainees in how to make sense of the experiences they have in the workplace and chart a course for the future [7,8]. It aims to help the student growth in his or her ability to evaluate and modify their learning style in accordance with their unique learning requirements [9].

Process

An effective feedback process can be divided into four phases

1. Planning phase: prior planning of the feedback, and incorporating it into the schedule so that the participants come prepared for the feedback.
2. Delivery phase: feedback should be mutual and there should be a balance between positive and corrective feedback.
3. Analysis: the feedback obtained should be statistically and critically analyzed.
4. Implementation of results: the results obtained from the analysis should be incorporated/applied for future improvement of the given subject.

Challenges/issues

Feedback seems a simple process but in depth, it is a quite complicated process needing extensive planning and background workup. Based on the literature published up until now, the following challenges and issues have been identified [10–12].

- Lack of communication
- Under-importance
- Personal Issues (Conflict of Interest)
- Lack of faculty and students' training on the process of feedback.
- Underutilization or skipping the feedback.
- Improper feedback questionnaire, unplanned two short, inappropriate questions.
- Delayed feedback
- Feedback results not shared with the stakeholders
- Improper analysis of the feedback responses.
- Lack of implementation of feedback analysis results in the given subject.

Objective

To identify the deficiencies in the feedback system of the College of Medicine, and make an improvement strategy, in order to uplift the teaching and program standards.

Methodology

This study was conducted in the College of Medicine at Shaqra, Shaqra University, KSA, after the approval of institution's ethical review committee (ERC) under the approval number ERC_SU_20230027 dated 16th May, 2023 G (26/10/1444 H). This study was two staged. In the first stage, we searched for different flaws in the feedback system of the college. For this purpose, we met with different stakeholders, including course organizers, curriculum committees, the quality department, and the statistical unit. With their collaboration we identified the flaws in the feedback system of the institution.

In the second phase, based on the available literature we made some interventions and developed some strategies to improve the feedback in our institution [13,14]. These includes,

1. Meetings with different stakeholders of the feedback system (Students, Faculties, curriculum committees, quality and statistical departments, administration, alumni, Employers, and community).
2. With the collaboration of the faculty development unit, we arranged different orientation sessions and workshops on the topic of feedback in medical education, for faculties as well as medical students. A pre-session questionnaire on knowledge, attitude, and practices (KAP) regarding feedback was filled out by the participants dated 24 January 2023. Before filling out the questionnaire, informed consent was taken from the participants and they were given the liberty of filling out the questionnaire to be part of the study. The participants were then educated regarding different aspects of feedback in medical education like its importance, objectives, the process of making a fruitful feedback questionnaire (a standardized questionnaire), etc. They were also trained on how to apply feedback to the teaching strategies. The same questionnaire was again filled by the participants post-session (dated 16 March 2023) to measure the impact of these sessions on the KAP of the participants.
3. After these sessions, the curriculum committee, head of the statistical unit, and course coordinator were called and their suggestions were taken on how to incorporate the feedback process into all the courses including curriculum development, teaching sessions, assessment, research, community services, co-curricular and extracurricular activities, etc. Tasks were assigned to the statistical unit to prepare the feedback questionnaires on a five-point scale (Likert scale) in collaboration with all course organizers specifically and with other stakeholders in general.
4. The statistical unit was then assigned for the analysis of the received feedbacks. The reports prepared by the statistical unit were then analyzed by the quality department in order to incorporate them for the improvement of the program. Feedback was also provided to the participants about the fate of their feedback and its incorporation into the given subject/course.
5. The effect of these interventions was then assessed by certain key performance indicators (KPI) including, the level of involvement and understanding of different stakeholders in feedback, curriculum revision based on the feedback, improvement in faculty and student performance, improvement in research output and community services involvement.

The outcome of the above feedback improvement strategies was measured statistically by using MS Excel (Microsoft Corporation, Washington, USA) and Statistical Package for Social Sciences version 22 (IBM Corporation;

Armonk, NY, USA). The data were presented as tables and graphs wherever applicable.

Results

In the first phase of the study, the following flaws were identified in the feedback system of the college based on the published research. These flaws are listed as,

1. Lack of faculty and students' training on the process of feedback.
2. Underutilization or skipping the feedback.
3. Improper feedback questionnaire, unplanned, too short, inappropriate questions.
4. Delayed feedback.
5. Improper analysis of the feedback responses.
6. Feedback analysis results not shared with the stakeholders.
7. Lack of implementation of feedback analysis results in the curriculum.

After the identification of flaws, in the second stage, we planned and implement some improvement strategies.

The effects of our improvement strategies as measured by key performance indicators (KPI) are,

Improved knowledge, attitude and practices (KAP) toward feedback

Pre-session vs post-session statistics

Feedback obtained from the students and faculty pre- and post-sessions showed improvement in knowledge, attitude, and behavior toward the feedback in medical education.

Table 1 and Table 2 show the students' and faculty's pre- and post-session responses respectively.

The pre-session total score on a five-point Likert scale was 3.17, with students' score of 3.1, and faculty score of 3.46. Post-session this score increased to 4.25, i.e. 4.23 in students, and 4.34 in faculty members. There was an overall 33.9% improvement in the knowledge and attitude toward feedback. Among students, there was a 36.5% improvement, while among the faculty members, the improvement was 25.4% which is a quite significant improvement ($p = .001$). Questions 1,2,3 and 8 are pertaining to knowledge, 6 and 7 to attitude, and 4,5 to practices regarding feedback in our institution. Pre-session knowledge score on a five-point Likert scale was 2.55, with students' score of 2.42, and faculty score of 3.05. This score increased to 4.24, with students' score of 4.2 and faculty's score of 4.45 post-sessions. This was a 66.3% increase in the knowledge regarding feedback which is quite

Table 1. Pre-session responses.

			Responses			
			Students (136)		Faculty (35)	
S. no	Question	Options	Frequency	Percentage	Frequency	Percentage
1	How much do you weigh your knowledge regarding feedback in medical education?	1. Excellent	14	10.3	4	11.4
		2. Very good	13	9.6	7	20.0
		3. Good	28	20.6	17	48.6
		4. Average	20	14.7	5	14.3
		5. Poor	61	44.9	2	5.7
2	Is feedback important in medical education?	1. Strongly agree	7	5.1	5	14.3
		2. Agree	20	14.7	7	20.0
		3. No opinion	28	20.6	7	20.0
		4. Disagree	13	9.6	11	31.4
		5. Strongly disagree	68	50.0	5	14.3
3	Is the feedback process deficient in this institution?	1. Strongly agree	8	5.9	5	14.3
		2. Agree	21	15.4	3	8.6
		3. No opinion	28	20.6	6	17.1
		4. Disagree	43	31.6	17	48.6
		5. Strongly disagree	36	26.5	4	11.4
4	Do you think that you are not informed regarding the fate of feedback taken from you?	1. Strongly agree	81	59.6	12	34.3
		2. Agree	35	25.7	9	25.7
		3. No opinion	5	3.7	7	20.0
		4. Disagree	14	10.3	5	14.3
		5. Strongly disagree	0	0.0	2	5.7
5	Do you think your feedback is not incorporated into the future planning of the given subject?	1. Strongly agree	70	51.5	12	34.3
		2. Agree	39	28.7	9	25.7
		3. No opinion	15	11.0	6	17.1
		4. Disagree	12	8.8	6	17.1
		5. Strongly disagree	0	0.0	2	5.7
6	Are you dissatisfied with the feedback system of the College of Medicine?	1. Extremely dissatisfied	22	16.2	18	51.4
		2. Dissatisfied	43	31.6	8	22.9
		3. Neither	37	27.2	1	2.9
		4. Satisfied	23	16.9	5	14.3
		5. Extremely satisfied	11	8.1	3	8.6
7	Do you expect that these sessions will be helpful to improve your knowledge and attitude toward feedback?	1. Strongly agree	41	30.1	21	60.0
		2. Agree	39	28.7	4	11.4
		3. No opinion	9	6.6	8	22.9
		4. Disagree	28	20.6	2	5.7
		5. Strongly disagree	19	14.0	0	0.0
8	Do you think feedback is not applied in the teaching session?	1. Strongly agree	25	18.4	8	22.9
		2. Agree	6	4.4	13	37.1
		3. No opinion	29	21.3	5	14.3
		4. Disagree	58	42.6	3	8.6
		5. Strongly disagree	18	13.2	7	20.0

Table 2. Post-sessions responses.

S. no	Question	Options	Students		Faculty	
			Frequency	Percentage	Frequency	Percentage
1	How much you weigh your knowledge regarding feedback in medical education?	1. Excellent	88	64.7	24	68.6
		2. Very good	31	22.8	8	22.9
		3. Good	7	5.1	0	0.0
		4. Average	8	5.9	3	8.6
		5. Poor	2	1.5	0	0.0
2	Is feedback important in medical education?	1. Strongly agree	79	58.1	23	65.7
		2. Agree	36	26.5	11	31.4
		3. No opinion	7	5.1	0	0.0
		4. Disagree	11	8.1	1	2.9
		5. Strongly disagree	3	2.2	0	0.0
3	Is feedback process deficient in this institution?	1. Strongly agree	73	53.7	26	74.3
		2. Agree	31	22.8	5	14.3
		3. No opinion	12	8.8	2	5.7
		4. Disagree	13	9.6	1	2.9
		5. Strongly disagree	7	5.1	1	2.9
4	Do you think that you are not informed regarding the fate of feedback taken from you?	1. Strongly agree	81	59.6	12	34.3
		2. Agree	35	25.7	9	25.7
		3. No opinion	5	3.7	7	20.0
		4. Disagree	14	10.3	5	14.3
		5. Strongly disagree	0	0.0	2	5.7
5	Do you think your feedback is not incorporated into the future planning of the given subject?	1. Strongly agree	70	51.5	16	45.7
		2. Agree	39	28.7	9	25.7
		3. No opinion	15	11.0	4	11.4
		4. Disagree	12	8.8	4	11.4
		5. Strongly disagree	0	0.0	2	5.7
6	Are you dissatisfied with the feedback system of college of medicine?	1. Extremely dissatisfied	72	52.9	21	60.0
		2. Dissatisfied	37	27.2	11	31.4
		3. Neither	15	11.0	1	2.9
		4. Satisfied	0	0.0	1	2.9
		5. Extremely satisfied	3	2.2	1	2.9
7	Do these sessions improved your knowledge and attitude toward feedback?	1. Strongly agree	78	57.4	26	74.3
		2. Agree	36	26.5	8	22.9
		3. No opinion	3	2.2	2	5.7
		4. Disagree	5	3.7	0	0.0
		5. Strongly disagree	8	5.9	0	0.0
8	Do you think feedback is not applied in the teaching session?	1. Strongly agree	73	53.7	19	54.3
		2. Agree	32	23.5	11	31.4
		3. No opinion	3	2.2	1	2.9
		4. Disagree	13	9.6	2	5.7
		5. Strongly disagree	15	11.0	2	5.7

significant ($p = .001$). There was also an improvement in attitude toward the feedback. The pre-session attitude score was 3.5, with students' score of 3.35 and faculty's score of 4.1. This improved post-sessions to 4.2, with students' score of 4.1 and faculty score of 4.6, which was a 34.3% improvement ($p = .001$). Cronbach's alpha was calculated to assess the internal consistency of the questionnaire, which was 0.81 for pre-session and 0.83 for post-session responses showing high internal consistency and thus good reliability. Table 3 and Figure 1 show these statistics.

Stakeholders involved in the feedback process

- Previously there was no clear identification of the stakeholders of the program, this was the first time that these stakeholders were identified and approached for feedback.
- Students
- Faculty
- Administration
- Alumni
- Employers/Hospital Directors
- Community

Curriculum revision based on students, faculty, and administration feedback responses

On the basis of received, 390° feedback, the curriculum of different blocks was revised,

- PBLs revision (there were 136 PBL sessions in the whole program, all the Problems in the PBL were revised and as much as 85% of them were amended to meet the goals)
- Revision of different blocks (Blocks that were finished (17 blocks from first year to fifth year) were revised according to the feedback from different sources, including students and faculty.
- Rescheduling of some courses for the next academic year (the order of some of the courses was changed based on the students' and faculty feedback like **Growth and Development** was suggested to be placed after **Men and His Environment,** as many concepts of growth and development were cleared in men and his environment. Also, **Radiology** was run as a longitudinal course with **internal medicine**, which affected the quality of both courses badly, so for the next year it was planned to be taught after internal medicine on the basis of faculty and student feedback)

Table 3. Comparison of pre-sessions and post-sessions scores on a five-point Likert scale.

Q. no	Question	Pre-session			Post-sessions		
		Students	Faculty	Total	Students	Faculty	Total
1	How much you weigh your knowledge regarding feedback in medical education?	2.3	3.2	2.5	4.4	4.5	4.4
2	Is feedback important in medical education?	2.3	2.9	2.4	4.3	4.6	4.4
3	Is the feedback process deficient in this institution?	2.4	2.7	2.5	4.1	4.5	4.2
4	Do you think that you are not informed regarding the fate of feedback taken from you?	4.3	3.7	4.2	4.3	3.7	4.2
5	Do you think your feedback is not incorporated into the future planning of the given subject?	4.2	3.7	4.1	4.2	3.9	4.1
6	Are you dissatisfied with the feedback system of the College of Medicine?	3.3	3.9	3.4	4.1	4.4	4.2
7	These sessions will improve/improved your knowledge and attitude toward feedback.	3.4	4.3	3.6	4.1	4.8	4.2
8	Do you think feedback is not applied in the teaching session?	2.7	3.4	2.8	4	4.2	4
	Total	3.11	3.46	3.17	4.24	4.34	4.25
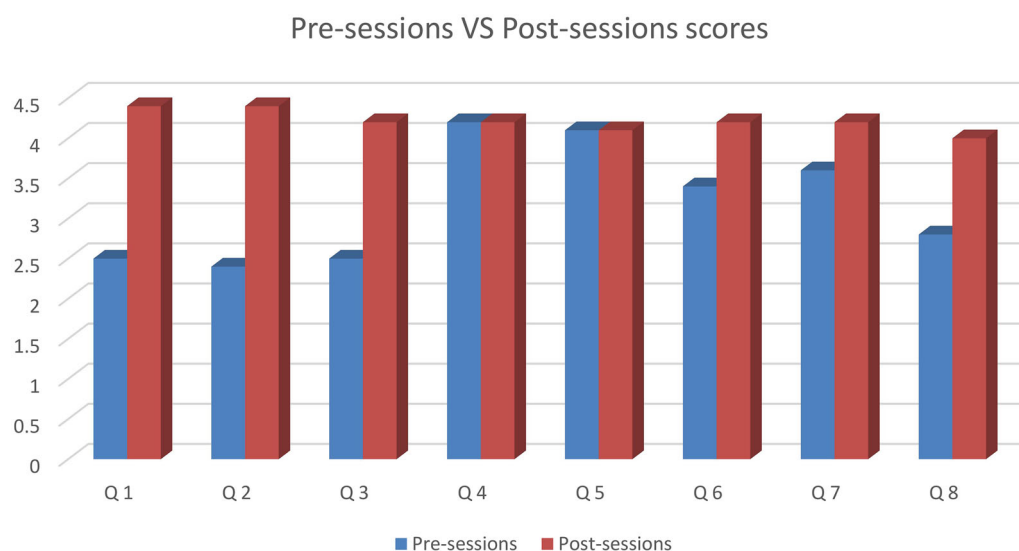
Figure 1. Comparison of pre-session and post-sessions KAP scores.

- Addition of some important leftover topics to the courses (e.g. in **Internal Medicine** the topics of infectious diseases were too less, so other topics were included in it)
- Removal of some redundant and repeated topics from the courses (e.g. in the **Accident and Emergency** block some of the topics were overlapping with Internal Medicine and Family Medicine, these were removed from Accident and Emergency)

Improvement in teaching and faculty performance

Due to regular feedback on the teaching sessions, the quality of teaching and faculty performance improved. It was evident by,

- Students' performance during the continuous assessment of different sessions (e.g. Average attendance in different courses was almost 87% (Range 72–100%) against the minimum target of 75%. Similarly post-PBL continuous assessment averaged 71% (Range 49–89%).
- Students' performance in mid and end-of-block exams, based on achievement of learning outcome (CLOs) in all domains. Table 4 shows the comparison of pre- and post-intervention mean CLO achievement in different basic medical and clinical courses, showing marked improvement in almost all the courses.
- Students' feedback regarding course and faculties (the students' satisfaction rate for different courses/blocks on a five-point scale was averaged 4.2 (Range 3.7 to 5%).

Improvement in assessment

Feedback regarding the assessment and exams improved the whole process of assessment. Previously there was no assessment committee and no uniform assessment system. With the help of students, faculty, and experts' feedback, an assessment committee was established, and a uniform assessment system for all the blocks and courses was designed, with prior assessment blueprinting and evaluation of all the assessment tools by the assessment committee.

Improvement in research activities

The research output of the college significantly increased as compared to the previous year in terms of the number of research proposals and publications. There were 79 research proposals and 46 publications this year as compared to 43 proposals last year. This was a 45.5% increase in the research proposals as compared to the last year.

Improvement in community services

- Measured by the increasing number of community sessions and by community satisfaction regarding different community services, like smoking clinic, and different awareness campaigns.
- Up till now, 13 community campaigns are arranged on smoking, obesity, COVID-19, diabetes, hypertension, road safety, psychological well-being, and the importance of sports activities and the average community

Table 4. Pre- and post-intervention comparison of mean course learning outcomes (CLOs) in different courses.

Block/course	Before intervention	After intervention
Basic medical sciences		
Hematology	58.6	64.3
Endocrinology	49.3	76.12
Health in community	70.9	86.37
Urinary system	77.1	86.9
Integrated medical sciences	93.6	86.2
Clinical sciences		
Medicine	76.2	89.7
Surgery	91.7	93.3
Otorhinolaryngology (ENT)	100	97.7
Ophthalmology	91.8	84.1
Radiology	83.7	86.8

satisfaction regarding these campaigns on a five-point scale was 4.8 (range 4.2–5).

Discussion

Feedback is not just an assessment or evaluation, rather it is a very effective mode of learning and is the social constructivist approach to learning [15]. One of the facts we found in this study was, that the knowledge and attitude of the students and even faculty regarding feedback were not up to the mark and they considered it a useless practice and a waste of time. This is contrary to studies and literature published regarding feedback in medical education. Hewson MG et al. in their study concluded that feedback is an integral and essential component of medical education in order to maintain the highest standards of education [4]. Similarly, Boud et al. in their study postulated that feedback is not just a simple input or just a single event rather it is a continuous process on the basis of which future improvement strategies are built to enhance the learning [16]. Similar conclusions were deducted from the work of Carless et al. [17]. To obtain fruitful and high-yield feedback, it should be a formal type questionnaire. N Weiner et al. in their book stated that, for proper feedback, it should have a sense-making and an impact on future learning [18]. Considering all these facts, feedback obtained should have a proper analysis that can be used for future improvement strategies. For this purpose, a proper questionnaire, having questions with measurable responses is crucial for obtaining feedback so that they can be further analyzed to be incorporated into future planning and learning. To achieve this aim, we designed feedback questionnaires, with questions having measurable responses based on a five-point Likert scale. Ng Chirk J, et al. in their study also favored questionnaires based on a five-point or seven-point Likert scale as they are more favorable for data analysis [19]. Among the indicators of the effectiveness of the interventions that we did to improve the feedback system of the institution, was the overall academic achievement of the students. Research has demonstrated that feedback enhances the deep learning approach among students and this deep learning approach has a direct relation with high academic performance, as evidenced by the work of Román et al. and Lüdeke and Zúñiga [20,21]. In our study, The students' performance in achieving learning objectives was significantly improved as compared to the previous year which is an indicator of improved feedback in enhancing learning. However, we acknowledge that an improved feedback system may not be the sole reason for the improvement in the learning outcomes achievement, but keeping the other variables almost constant as for the previous years, i.e. the same curriculum, the same faculty members, the same modes of information transfer, etc., it can be deduced that an improved feedback system might be the major contributor to the improvement in the learning outcomes achievement. Also, the students' attendance in different blocks was quite satisfactory which indicates their interest in the teaching sessions and is evidence of improved teaching quality. One of the pieces of evidence for the quality teaching was students' feedback regarding courses and faculties. The students' satisfaction rate for different courses/blocks on a five-point scale averaged 4.2 (Range 3.7 to 5%) which is quite satisfactory. Similarly in the field of research (one of the improvement indicators), 97% of the faculty was actively involved with the students in research, and 51.4% of the faculty published their research in collaboration with the students. There was a 45.5% increase in the research proposals as compared to the previous year.

In our study, we included community services and participation as one of the indicators of feedback effectiveness. Community services are one of the three main aims, along with education and research, of medical education worldwide and also of our institution. (The World Federation for Medical Education (WFME), WHO 5-star doctor, PMDC 7-star doctor) [22,23]. A similar concept has been stated by Adcroft et al. in their research, where they argued that feedback should be centered on social and community inter-relationships with the learner rather than just the activities among the teacher and the students in order to enhance learning and quality [24].

Though these are some of the quantitative indicators of effective feedback in a medical institution, the beneficial effects of effective feedback are not limited to just quantitative results. As deducted by Hounsell D et al. an efficient feedback system enhances lifelong learning by fostering abilities for goal-setting, self-monitoring learning processes, and assimilating the feedback in order to improve performance in both educational and future professional contexts [9].

Our study has a limitation in that we did not get enough time to measure the long-term effect of our improvement strategies in the feedback system, due to the shorter duration of the study but we are planning to gauge the long-term effects of our improvement strategies in terms of betterment in the teaching infrastructure, in the percentage of students passing the board and competitive exams, in the graduates' employment rate, in the community satisfaction rate and employer satisfaction rate. Another limitation is the generalizability of the results on other medical institutions throughout the world since it was a single-institution study. However, our institution can serve as a model system, as medical education and its objectives are uniform universally with a slight variability according to the variation in health systems of different countries of the world, these improvement steps can be generalized to other health institutions with insignificant differences in the outcome. We are expecting to get fruitful results in the near future as evidenced by the effectiveness of similar strategies in the literature.

Conclusion

An efficient feedback mechanism is the backbone of education in general and medical education in specific. By adopting an effective feedback system, individuals and institutions can excel in the field of medical education.

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Author contributions

Conception and design: Sarwat Huma, Junaid Sarfraz.
Analysis and interpretation of the data: Himayat Ullah.
Revision: Junaid Sarfraz.
Final approval: Himayat Ullah and Junaid Sarfraz.
All authors agree to be accountable for all aspects of the work.

Disclosure statement

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