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Correspondence

Dr. Sumana Bajracharya
Department of General
Practice and Emergency
Medicine, Patan Academy of
Health Sciences, Lalitpur, Nepal
Email:
sumanabajracharya@pahs.edu.np

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Quality improvement in virtual classroom

Sumana Bajracharya¹, Ashis Shrestha¹, Pramod Jnawali²

¹Asst. Prof. General Practice and Emergency Medicine; ²Incharge, IT Section Patan Academy of Health Sciences, Lalitpur, Nepal

Abstract

Introductions: Online teaching method has shown to be equally effective as the traditional teaching method. An online teaching method, the virtual classroom (VCR) was developed for undergraduate medical students of Patan Academy of Health Sciences (PAHS). This study aims to present the outcome of complete audit cycle of VCR for quality improvement of the program.

Methods: Feedbacks were collected from final year medical students who are posted in four different rural sites of PAHS. A validated google feedback form was used to collect the feedbacks from individual students after every VCR sessions. Students from 2017 were group one and students from 2018 were group two. Feedbacks were recorded in Likert scale of five. Ratings were done for quality of video, sound and power supply. Plan, do, study, and act (PDSA) cycle was used for quality improvement process. The necessary changes were done after analysis of data from group A. Same process was repeated for group B.

Results: Fifty-six feedbacks were collected in first cycle. The complete PDSA audit cycle showed improvement in quality of VCR, with mean score on video of 3.0 and 4.1, audio 3.1 and 4.03, internet 3.6 and 4.03, power supply 4.0 and 3.98 in first cycle group A vs second cycle group B.

Conclusions: Improvement was achieved by running quality feedback cycle and quality improvement cycle should be continued to maintain the quality achieved with this process.

Keywords: audit cycle, PDSA cycle, virtual class room

Introductions

The online teaching has shown to be equally effective as the traditional class room teaching.¹ Traditional classroom teaching supports objectivism which is a distributive passive learning environment while online teaching supports constructivism which is distributive interactive learning environment.² While some researcher believe that online classrooms lead to isolation, frustration, overload and low course completion rate.³ Others believe that students prefer online teaching.⁴ An online teaching was designed for undergraduate medical students at Patan Academy of Health Sciences (PAHS) and named as virtual class room (VCR). For the sustainability of the program quality improvement cycle was planned. As quality improvement is an important tool for comparing one's practice against standard⁵, this quality improvement cycle is developed for the quality assessment and improvement of the virtual class room. This research aims to present the outcome of complete quality improvement cycle.

Methods

Patan Academy of Health Sciences (PAHS) is running VCR for undergraduate medical students since 2014. This quality improvement cycle was conducted from July 2017 to June 2018.

Technical details- Final year (year five) undergraduate medical students have mandatory twenty weeks district hospital posting at four teaching sites: Hetauda, Gorkha, Ampipal, Gulmi which are 80 km, 140 km, 160 km and 370 km respectively from PAHS. Audio-visuals from these four sites and PAHS was interconnected every week on Friday from two to four pm. Students from all four sites presents and faculty at PAHS facilitate the presentations. The connectivity was achieved through 1 mbps (megabits per second) fibreoptic dedicated internet at each site. Each site had desktop-projector, visual was by Logitech web camera and audio

through the multi-channel mixture devices connected to microphone. For video streaming and power point presentation, open meeting system was used and for audio streaming skype was used.

Population and Sample

Students posted during the academic session July to December 2017 at all four sites were labelled as group A. Similarly, students posted during academic session January to June 2018 were labelled as group B. Data collection cycle for group A was called first cycle and that for second cycle was called group B. There were 14 VCR sessions running simultaneously at 4 sites. Each site gave feedback at the end of the session so altogether there were 56 feedbacks estimated per group. Coordinator was appointed for each site amongst those students who were posted, they facilitated VCR feedback from their site.

Data collection tool- The feedback form developed and validated by the VCR committee was used for data collection. The first part of feedback form had general information like responding site and name of the session. Second part had items assessing each indicator. The response was assessed on Likert scale of one (not good) to five (excellent). Part three of the form had open question. Responses were collected from every student after each session using google form. To avoid duplication of data Google form was set to one response only so that each student could fill up data once per session.

Quality of video was assessed on Likert scale of 1-5; where, 5- excellent no pause in video, 4- some pause in video, 3- frequent pause however class is understandable, 4- pauses causing class to be not understandable and 1- no video. Similar rating was used with sound and power supply.

Process- Plan-Do-Study-Act (PDSA) cycle which is a standard method of quality improvement cycle was used for this study.⁶ The following process was undertaken with group A and the same process was repeated in group B to collect data.

Plan*Step 1: Identifying indicators*

On the basis of the possible barriers listed by consensus of VCR committee, indicators were identified. Indicators were divided into two broad categories: structural and process. The identified indicators were aimed for both Group A and B. Each of these indicators were divided into subgroup as follows:

Structural Indicators

1. Audio visual equipment for communication
2. Equipment for continuous power supply
3. Manpower to support the system

Process Indicators

1. Good two-way communication
2. Objective of the session fulfilled

Step 2: Setting standard

As standards for the indicators that we have defined was not available in online search (Google Scholar, Google), so we set the standard based on the consensus of the VCR committee (five-member committee formed by PAHS for running VCR, the committee consist of member from information technology and medical sciences). Each of the indicators are set to the standard of 80% to be called good practice. The standard was kept same for both Group A and B.

Do

Compare the existing practice with standard questionnaire in the form of feedback to assess structural and process indicators. This set of feedback was collected from group A. After first cycle was over same questionnaire was given to group B in second cycle.

Study

The collected data was used to compare with the standard. Recommendations was formulated after completing first cycle with group A. The same process was used for group B in second cycle.

Act

The necessary changes were done after analysis of data from group A. Same process was repeated for group B.

Data analysis- Mean score of each item in second part was calculated, this score was converted into proportion, data in third part was divided into the thematic groups and proportion of each theme was calculated. Data from first cycle was compared with the standards. Items were in Likert score of one to five, the maximum mean score would be 5. So, unitary method was used to calculate proportion of score by taking score of five as 100% [$x = \text{obtained mean score}$; converted proportion = $(x*100)/5$]. After implementing the recommendation, data of second cycle was compared to the standards to find out the proportion of change.

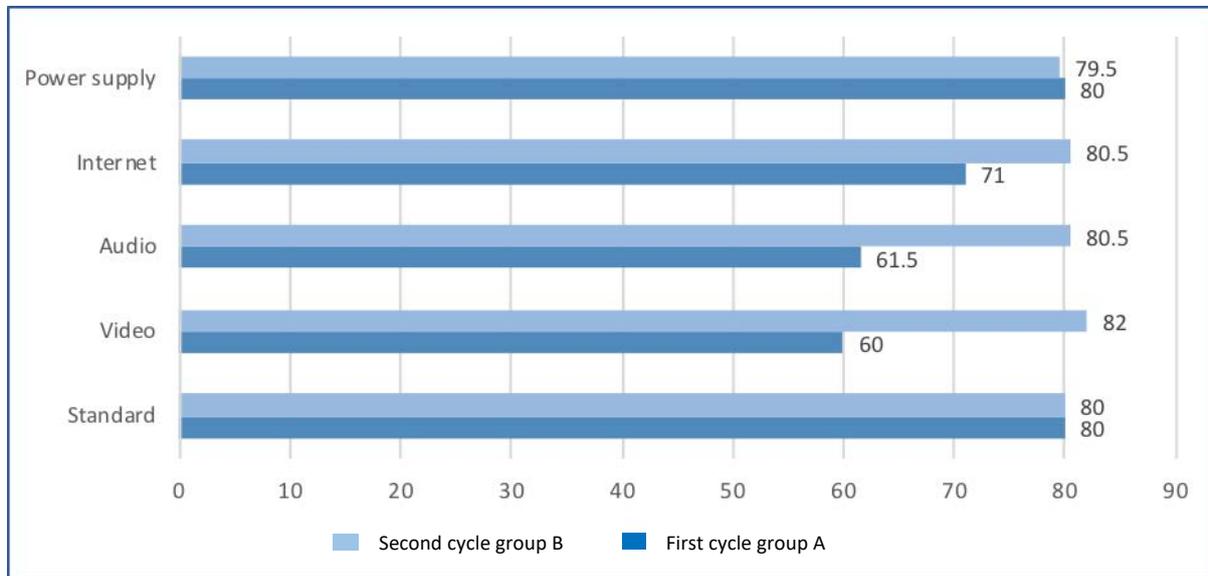
Results

Fifty-six feedbacks were collected in first cycle, one feedback per site from four sites and from 14 sessions, 54 feedbacks in second first cycle. Test of linearity was done to confirm uniform distribution of data and mean was used to calculate central tendency. Mean score on video was 3.0 for group A and 4.1 in group B; for audio it was 3.1 for group A and 4.03 for group B; for internet it was 3.6 in group A and 4.03 in group B; for power supply it was 4.0 in group A and 3.98 in group B, Table 1.

Open question of first and second cycle from all four sites were analysed. The response was categorized as satisfactory and unsatisfactory. Total response of open question in first cycle was 32 (57.1%). Twenty responses (62.5%) were satisfactory and rest unsatisfactory. Satisfactory responses were on usefulness of educational activity (13 out of 20), audio (4 out of 20) and video (3 out of 20). Unsatisfactory comments were on video (5 out of 12), sound (4 out of 12) and power supply (3 out of 12). Total response of open question in second cycle was 23 (41.07%). Nineteen (82.6%) were satisfactory and rest

Table 1. Comparison of average scores for virtual class room (VCR) during district postings of undergraduate medical students of Patan Academy of Health Sciences (PAHS)

	Group A - first cycle year 2017 district hospital sites				Group B - second cycle year 2018 district hospital sites			
	Ampipal	Gorkha	Hetauda	Gulmi	Ampipal	Gorkha	Hetauda	Gulmi
Video	2.9	3	3.1	3	4	4.1	4.2	4.1
Audio	3	3.1	3	3.2	4	4	4.1	4
Internet	3.3	3.4	3.6	3.9	4	4.1	4	4
Power supply	4	4.1	4	3.9	4	4	4	3.9

**Figure 1. Comparison with set standards for quality of VCR audit of 'Group B second cycle' and 'Group A first cycle' during district hospital postings of undergraduate medical students of PAHS**

unsatisfactory. Satisfactory response was on usefulness of being connected to colleagues (12 out of 19), video (4 out of 20) and audio (3 out of 20). Unsatisfactory comments were on video (3 out of 3). Proportion of score for internet, audio and video crossed that standard set in second cycle, Figure 1.

Discussions

After analysis of data of first cycle, video (60%), audio (61.5%) and internet (71%) were observed to be below the expected standard

(80%). The barriers identified were complexity of audio system which had a mixture device connected to microphone and speaker. It had too many mixing channels, and was difficult for students to find a balance. Another barrier identified was camera which had limited field of vision and also had inbuilt microphone

which could have interfered in sound. So, VCR committee decided to replace sound system with a single device having function of both microphone and speaker. The second group received improvised system.

Satisfaction with quality of video improved from 60% to 82%. The expected standard was achieved. Quality of video is directly related to the user engagement.⁷ This will play important role in contributing to the educational objective of the session. Wide angle camera allows coverage of all who are staying in the classroom. So, seeing each other improved the communication and satisfaction. There was also improvement in audio score from 61.5% to 80.5%. The improvement of sound quality was due to channelizing sound through single channel. Score of internet increased from 71 to 80.5% without intervention. This may be due to improved audio and video which was perceived as improved internet connectivity. Power supply score decreased from 80% to

79.5%, this was mainly due to power problem at one site during second round.

This quality improvement audit was conducted using Plan-Do-Study-Act (PDSA) cycle, an essential tool to draw a reliable conclusion.⁶ Concerns on complexity and appropriateness of PDSA has been raised.⁸ Its strength is quick detection of the problems for desired intervention for improvement.

This quality improvement process needs to be continued for sustainability of the program. There are evidences showing that quality improvement cycle improves aspects of care in clinical and other practices.^{9,10} It is essential that quality improvement cycle is completed so that the outcome is evaluated. Some of possible barriers like, resources, expertise may limit the completeness of cycle.¹⁰ In a study which analysed completeness of the quality improvement cycle, only 24% of the quality improvement completed its cycle.¹¹ Considering its effectiveness, quality improvement cycle should be taught as a part of curriculum. A study analysing perception of general practitioner residents on quality improvement found 39% felt data collection boring or very boring but 60% felt feedback session very interesting or interesting. Both the data collection and the feedback were considered relevant by the majority (57% and 70% respectively) and self-reported knowledge also dramatically increased.¹²

Conclusions

Improvement was achieved to set standard by running quality improvement cycle and its completeness. This practice helps maintain the improved level of quality of virtual class room, VCR.

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