Original Article

Curriculum Evaluation of Physiology subject of medical undergraduate using 'FIPO model'

Sonali Choudhari[1,2], Alka Rawekar[2,3], Vedprakash Mishra[4], Tripti Srivastava[5], Sunita Vagha[6,7]

Departments of [1]Community Medicine and [3]Physiology, Jawaharlal Nehru Medical College, [2]Department of Assessment and Evaluation, School of Health Professions Education and Research, Datta Meghe Institute of Medical Sciences, Wardha (MS); [4]Pro-Chancellor, Datta Meghe Institute of Medical Sciences, Wardha (MS), [5]Member, Faculty Development Committee, AMEE, Convener, MCI Nodal Centre for National Faculty Development, Professor, Physiology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha (MS), [6]Ex-Director, School of Health Professions Education & Research, [7]Professor, Pathology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha (MS), Maharashtra, India

Abstract

Background: After the formal process of developing/revising and implementing the curriculum, the need arises for its 'Evaluation'. A plan of evaluation is an integral part of the process of curriculum development, which ultimately yields an evaluation report, giving us the directives for the curriculum reforms in the future. 'Curriculum Evaluation' is one of the six steps of curriculum development as given by David E Kern. **Objective:** The present study was undertaken with an objective to evaluate the whole process of curriculum revision and effectiveness of the Physiology curriculum in achieving the goals, objectives, and outcomes. **Methodology:** A framework or model is developed named 'FIPO model' of curriculum evaluation. According to this, all four components (Formative phase, Input, Process, Output and Outcome) are evaluated for the 'Curriculum'. In addition, the model also states the key/concerned person/persons responsible and the assessment/monitoring modality for each component. **Result:** All parameters included in the 'Formative phase' of the model, helped to evaluate the initial preparation for carrying out the curriculum revision. For 'Input' evaluation, various resources of Physiology department for curriculum revision, implementation, and evaluation, were assessed. It includes Manpower, Infrastructure, Material, Time, Money, etc. The third component of the FIPO model, i.e. process evaluation dealt with two processes, i.e. curriculum revision and curriculum implementation. Evaluation of 'Output and Outcome' of the entire exercise of undertaking curriculum revision was undertaken. **Conclusion:** The curriculum evaluation report stated that the curriculum of Physiology subject of MBBS (Phase I) is revised, implemented and evaluated systematically as per the prescribed guidelines using the available resources in an effective and efficient manner. The demonstrable output for the same was the document of 'Revised Curriculum' and significant outcomes were in the form of satisfactory result and distinctions for the subject Physiology.

Keywords: Curriculum evaluation, model, physiology

Address for correspondence: Dr. Sonali Choudhari, Professor, Community Medicine, Jawaharlal Nehru Medical College, Head, Department of Assessment and Evaluation, School of Health Professions Education and Research, Datta Meghe Institute of Medical Sciences, Wardha (MS), Maharashtra.
E-mail: sonalic27@yahoo.com

Received: 29-01-2020 **Revised:** 13-03-2020
Accepted: 07-04-2020 **Published:** 30-07-2020

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_175_20

Introduction

'Curriculum' is a formal plan of educational experiences and activities offered to a learner under the guidance of an educational institution. In view of the advances in medical sciences and technology, changing patterns of diseases, changing

How to cite this article: Choudhari S, Rawekar A, Mishra V, Srivastava T, Vagha S. Curriculum Evaluation of Physiology subject of medical undergraduate using 'FIPO model'. J Family Med Prim Care 2020;9:3487-91.

healthcare needs, expectations of society, increasing intricacy of the healthcare system, integration of health and changing socioeconomic veracities, a curriculum gets outdated within a few years. Hence, periodic updating or renewal of a curriculum is necessary. The ultimate aim of undergraduate medical education is to develop competent, confident, concerned, compassionate, and globally relevant healthcare professional (Indian Medical Graduate) who would serve as a physician of the first contact for the community, practicing affordable, accessible primary healthcare.[1]

After the formal process of designing/revising and implementing the curriculum, the need arises for its 'Evaluation'. Evaluation is the process where the principal aim is to improve the system. It is the consensus of most curriculum developers that once a developed or revised curriculum is implemented in educational institutes, appropriate evaluation procedures shall be undertaken to examine the effectiveness of the curriculum in achieving the goals, objectives, and outcomes of the curriculum.[2] Rather a detailed plan of evaluation is an integral part of the process of curriculum development, which ultimately yields an evaluation report, giving us the directives for the curriculum reforms in the future. 'Curriculum Evaluation' is one of the six steps of curriculum development as given by David E Kern.[3] Thus, evaluation of curriculum helps in curricular reforms, which is mainly inquiry-based, rather than instinct-based.

The activity of curriculum evaluation was undertaken at a rural tertiary healthcare hospital and medical teaching institute of Central India. In the institute, the undergraduate curriculum was revised in the year 2014-15. The revised curriculum was implemented for the MBBS batch of the year 2015, which has a student intake of 200. After one year of implementation, the process of curriculum evaluation was started, i.e. in the year 2016 for the first year MBBS subjects including Physiology.

Methodology

There are various models for evaluation of a program.[4-6] While considering the curriculum renewal or update as a program, we thought to use one of them. But how to go for evaluation of the curriculum with all its inclusions is not specified in any of the models. Neither a handy tool nor a roadmap is available to be used for curriculum evaluation. Hence, a framework or *model* is developed for curriculum evaluation named 'FIPO model' of curriculum evaluation. According to this *FIPO model*, all four components (Formative phase, Input, Process, Output, and Outcome) are evaluated for the 'Curriculum'. In addition, the model also states the key/concerned person/persons responsible and the assessment/monitoring modality for each component.

The 'Formative phase' of the FIPO mainly deals with the formation of 'Departmental curriculum committee' and availability of guidelines, timeline, and training schedule with regard to curriculum development/revision. The second component 'Input' deals with all types of 'Resources' required for curriculum development/revision, implementation, and evaluation. The 'Process' component covers the evaluation of the process of curriculum revision as well as the process of curriculum implementation. The last component evaluates the Output and Outcome of the whole process of curriculum revision. The output is the revised curriculum itself while the measurable outcome mainly deals with the passing percentage of students, the number of distinctions, etc.

The said model (Annexure 1, 1a) is used for evaluation of the revised curriculum of Physiology subject for Medical Undergraduate at Jawaharlal Nehru Medical College, Sawangi, Wardha, Maharashtra, India.

Results

The very first step was the formation of a three-member Departmental Curriculum Committee (DCC) for curriculum revision, which was done as per the instructions given by the Department of 'Curriculum' of School of Health Profession Education and Research. (Hereafter referred to as 'Nodal authority'), the three members were the Chairman DCC and two faculty of the department as members of the DCC. The constitution of DCC was notified to the nodal authority (Annexure 2). The department of Physiology received the *guidelines (steps)* for curriculum revision, *timeline* to follow and the *schedule for the training* (Annexure 3,4) of the DCC committee in curriculum revision, from the nodal authority. All these documents were followed for the process of curriculum revision and the same was supervised and monitored by the nodal authority. These all parameters included in the 'Formative phase' of the model, helped to evaluate the initial preparation for carrying out the curriculum revision. The annexure, mainly the documents, letters of correspondence, document of guidelines, etc., ensured the accomplishments of the tasks required to be done.

For the next component 'Input', resources of the department of Physiology for curriculum revision, implementation, and evaluation, were assessed. It includes *Manpower, Infrastructure, Material, Time, Money,* etc.

Manpower mainly dealt with the 'skilled manpower' for carrying out the process of curriculum revision, implementation, and evaluation. For that, the DCC had the training (Annexure 5) scheduled by the nodal authority, which facilitated them, to get oriented to the stepwise process of curriculum revision. In addition, the list of departmental faculty (with some qualification in Medical Education Technology) who were involved in the process of curriculum revision and/or implementation, the evaluation was submitted (Annexure 6). The qualifications in Medical education technology that were considered were Basic course, Advance course, Fellowship or any other training in medical education technology. Apart from internal skilled staff, for the process of curriculum revision, an outside/

external subject expert was also needed. For that, the names of subject experts of physiology were sent to the nodal authority (Annexure 7). The subject expert was finalized after ensuring their feasibility to attend the presentation of the revised curriculum. The other human resources like the learners, patients, etc., are adequate as the institute is MCI recognized institute and it is fulfilling the norms of apical council from time to time. It has also received the accreditation by NAAC. In addition to these, the department received substantial internal support from administrative authorities, in terms of structure, communication, and operations.

The other resource that was taken into consideration for evaluation was the infrastructure and material. The overall infrastructure of the department of Physiology (which mainly includes the Lecture halls, Demonstration rooms, practical hall, laboratory, etc., along with the availability of audiovisual facilities) is as per the norms of the apical council and it is adequate for implementation of the revised curriculum. The material (e.g. - stationery, computers, printers, Xeroxing, instruments/laboratory equipments, etc) was adequate for carrying out the process of curriculum revision and for its implementation too.

'Time' is an important resource. Here, the available working hours/time of faculty, support staff should be adequate to carry out curriculum revision, implementation which is an interactive cyclical process. Even the total teaching hours of learners, for the subject Physiology was taken into consideration. To ensure the timely compliance and justice to work, distribution of tasks, job responsibility with regard to curriculum revision, implementation of the revised curriculum, was done after considering the workload of respective faculties. All the departmental meetings, as well as the meetings called by the nodal authority, were attended by the members of DCC in a time-bound manner.

The money or the funds required for traveling, daily allowance for the outside subject expert was managed by University after appropriate sanctioning by the nodal authority.

The third component of the FIPO model, i.e. process evaluation dealt with two processes, i.e. curriculum revision and curriculum implementation. The process of curriculum revision revealed that 'Problem identification and General need assessment' was done as the first step. For that, a set of documents/literature was reviewed and taken into account and accordingly the changes were made in the Physiology curriculum, especially to make it competency-based. (Annexure 8). Similarly, the inputs/feedback from the stakeholders (e.g. Faculty, Peer, Alumni, Students, Parents, Community, etc) of the institute and other medical colleges were taken. *(*Annexure 9).

For carrying out the 'Need assessment for targeted learners' various modalities used were 'Fresher's Induction program', 'Introductory lectures in Physiology', 'Preceptorship Program' etc.

During Fresher's Induction program of newly admitted students, interaction with students was done to know their basic level of competency, their interests, future goals, and expectations from MBBS course, etc., Inputs from the senior students participating in the panel discussion during fresher's induction program were noted and taken into consideration for curriculum revision. Students were mainly interested in teaching methodology like Small group teaching, Project-based teaching, Early Clinical Exposure, quiz, etc., Introductory lectures in Physiology for first-year MBBS undergraduates were taken as an opportunity to interact with students to know their expectations for the MBBS-1st phase and the subject Physiology. Additionally, during preceptorship program, which is the part of regular practice in this University, reflections of the students regarding the curriculum and syllabus were noted and the same were discussed in departmental meetings for incorporation in the curriculum.

All the above activities were regularly undertaken in the institute and any formal or informal feedback regarding syllabus, instructional modifications, or assessment modality were received and incorporated accordingly in time-bound manner. In addition, any concerns/inputs regarding curriculum, Teaching-Learning, Student Assessment, if put forth in the meetings of College council, Board of studies, Academic council, by the council members and/or student representatives, these too were incorporated. As such, the DCC tried to have a comprehensive need assessment for carrying out the curriculum revision.

The next step was the 'Data compilation, analysis of feedback, and preparation of presentation'. The nodal authority provided the guidelines for the preparation of presentation/document of curriculum revision, to be done in the presence of Board of Studies members and outside subject expert. (Annexure – 10 a). Data compilation and analysis were done by DCC and the final presentation is done in front of an outside expert. (Annexure – 10 b).

The required modifications were done in the curriculum based on inputs, suggestions received by the internal and external experts, during the presentation and the revised curriculum is then submitted in prescribed format to Dean Academics, faculty of Medicine. (Annexure – 11). Next, the document of the revised curriculum was forwarded to the Academic Council for approval. Later, it is noted by the Board of management and recommended for implementation from the next academic year.

As per the FIPO model, the next process in the 'P' component was the evaluation of the process of implementation of the curriculum. After approval from the board of management, the revised curriculum was circulated amongst the faculty of Physiology for implementation as well as implemented to the learners of the new academic term (2015 batch). The modalities that were used for evaluating the proper implementation of curriculum and its progress were the review of *Monthly Information System Reports* (Annexure – 12), *Academic appraisal Program,* showing preterm and post-term report of marker points, both for Theory

and Practical in Physiology (Annexure – 13). In addition, in *monthly college council meeting*, stock of completion of the syllabus was taken regularly and deviation, if any, was taken on the record.

Any process of change or revision is bound to witness some or more resistance. The process of revising and implementing the revised curriculum not the exception to this. The barriers may be related to finances, resources, or people. For example, competing demands for resources, role security, credits, political power, etc.[3] Providentially, in the current scenario, there were no significant barriers related to resources. But the challenge was in getting thorough feedback from all the stakeholders for need assessment. This was overcome by constant follow-up of the stakeholders for getting the feedback.

The last but not the least component was the evaluation of 'Output and Outcome' of the entire exercise of undertaking curriculum revision. The '*Revised curriculum document*' itself was the immediate output of the whole procedure of curriculum revision. Evaluation of this output was done by taking the opinion/feedback from DCC and key stakeholders. For this, Annexure 1a (Proforma for output evaluation) is used. The key observations of the stakeholders for the Physiology subject were as follows: -

i. The problem identification was found to be relevant and need assessment was done comprehensively.
ii. The Goals and Objectives of the revised curriculum are well linked with the Teaching–Learning methods and assessment tools.
iii. The content of the curriculum is relevant and updated.
iv. Teaching–Learning methods are student-centered and focus on all the domains of learning and different levels of difficulty.
v. Assessment tools are valid, reliable, and these too cover mainly cognitive and psychomotor domains of learning and various levels of difficulty. 'Affective domain is somewhat less assessed' was the observation of faculty members.
vi. Continuous comprehensive internal assessment should have more weightage in the assessment process.
vii. Students prefer small group teaching.
viii. More problem-based learning sessions are requested by students.
ix. Hospital visits as a part of 'Early clinical exposure' is requested by students.

As such, the final output (revised curriculum) was in accordance with the desired expectations.

For 'Outcome evaluation' the parameter that was considered was the final university examination (Summative Examination) result of 1st MBBS, i.e. of the batch 2015-16 for the Physiology subject, which had both Theory as well as Practical components [Tables 1 and 2].

Here, the overall result for Physiology was found to be 98%. In addition to this, a total of six students got distinctions for Physiology (Annexure 14) [Table 3].

Table 1: Distribution of students based on the score of Physiology subject in the university examination

Particular	Appeared	Passed	Percentage
Theory	230	226	98.26%
Practical	230	230	100%
Overall result in Physiology	230	226	98.26%

Table 2: Gender wise distribution of students for the score of Physiology subject in the university examination

Marks obtained in Physiology in university examination	Male	Female	Total	Percentage
75% and above	1	5	6	2.65%
70% and above	6	22	28	12.38%
65% and above	16	28	44	19.46%
60% and above	30	37	67	29.64%
Below 60%	38	43	81	35.84%
Total	91	135	226	100%

Discussion

Curriculum evaluation is crucial in measuring curriculum effectiveness in any educational setting. The purpose of curriculum evaluation is to determine whether or not the newly adopted curriculum is producing the intended results and meeting the objectives set forth, and it is an essential component in the process of adopting and implementing any new curriculum in educational setting. Another purpose of curriculum evaluation is to gather data that will help in identifying areas in need of improvement or change. There are various stakeholders, interested in the process and results of curriculum evaluation.[7]

i. Parents are interested because they want to be assured that their children are being provided with a sound, effective education.
ii. Teachers want to know that whether their teaching is effectively achieving the results as expected by parents and administration.
iii. The community needs to be sure that local health care institutions are doing their best to provide solid and effective educational programs for the students local health care institutions are doing their best to provide solid and effective educational programs for the students in the area.
iv. Administrators need feedback on the effectiveness of their curricular decisions.
v. Curriculum publishers are interested because they can use the data and feedback from a curriculum evaluation to drive changes and upgrades in the materials they provide.

In the end, the goal is always to make sure that students are being provided with the best education possible. Because the curriculum is a huge part of this, curriculum evaluation is a means to decide whether or not the chosen curriculum is going to bring the institute closer to that goal.[7]

Table 3: List of Annexure of Curriculum evaluation report

Annexure	Details
1	Document of 'FIPO model' of curriculum evaluation
1a	Proforma for 'Output evaluation' in FIPO
2	Document/correspondence by Dept. of Physiology with nodal authority with regard to 'Formation of Departmental Curriculum Committee' (DCC) of Physiology.
3	Guidelines (steps for curriculum revision), timeline for curriculum revision as received by the Dept. of Physiology from nodal authority.
4	Training schedule for curriculum revision given by Dept. of Curriculum (of nodal authority)
5	Training of the DCC members of Physiology by the Curriculum Dept. of nodal authority.
6	List of departmental faculty with an extra qualification in Medical Education Technology. (Skilled manpower to be involved in the process of curriculum revision, its implementation & curriculum evaluation)
7	List of the outside/external subject expert recommended, to be called for presentation of the curriculum revision.
8	Set of documents/literature that were reviewed and taken into account for problem identification & need assessment.
9	Feedback questionnaire (as given by nodal authority) for need assessment filled by the stakeholders (e.g. Faculty, Peer, Alumni, Students, Parents, Community, etc) of J N Medical College, Wardha, and other medical colleges/institutes.
10-a	Guidelines provided by the nodal authority for the presentation of curriculum revision in the presence of Board of Studies (BOS) members and outside subject expert.
10-b	Handouts of the final powerpoint presentation, done in presence of BOS members and outside subject expert.
11	Copy of submitted curriculum to Dean Academics (Faculty of Medicine) in the prescribed format (as given by nodal authority)
12	MIS reports for the MBBS batch 2015-16 in relation to the number of classes held, topics covered, and progress of curriculum.
13	Academic appraisal Program reports, showing preterm and post-term analysis of identified marker points for both Theory and Practical in Physiology.
14	Result of 1st MBBS Physiology for the year 2015-16, depicting the overall result and number of distinctions in Physiology.

Conclusions

FIPO model of Curriculum Evaluation' developed by authors was used to evaluate the curriculum of Physiology for Medical Undergraduates.

From the above *curriculum evaluation report*, it is concluded that the curriculum of the Physiology subject for the MBBS (Phase I) is revised, implemented, and evaluated systematically as per the prescribed guidelines using the available resources in an effective and efficient manner. The demonstrable output for the same is the document of '*Revised Curriculum'* and significant outcome in the form of university examination results and distinctions for the subject Physiology.

Limitation

In this study, the curriculum evaluation was done immediately at the completion of prescribed one academic year of implementation for Physiology subject of first-year MBBS. However, the exercise of curriculum evaluation ideally should be ongoing and repeated for each successive batch of MBBS especially with regard to Output and Outcome components of FIPO. The reason being, the curriculum may need some time to "mature"; for example, faculty development may enhance the quality of curriculum delivery and assessment methodology, which may change the outcome. Hence, an extended time point is desirable to verify the obtained results.

Recommendations

1. The curriculum evaluation should be made an integral part of the process of curriculum development/revision in all subjects not only for Medical Faculty but also for Dental, Ayurveda, Paramedical, and Nursing faculties too.
2. The various academic programs like Academic Appraisal Program, Preceptorship program etc., should be utilized maximally to get feedback from the students regarding the curriculum.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Competency Based Undergraduate Curriculum For The Indian Medical Graduate. Volume -I, 2018. Medical Council of India. Pocket-14, Sector- 8, Dwarka, New Delhi 110077.
2. AMEE Education Guide no. 29: Evaluating educational programmes. Med Teach 2006;28:210-224.
3. Kern David E, Thomas Patricia A, Howard Donna M, Bass Eric B. Curriculum Development for Medical Education: A Six-Step Approach. The Johns Hopkins University Press/ Baltimore and London. Second Edition1998.
4. Coles CR, Grant JG. Curriculum evaluation in medical health care education. Med. Educ. 1985:19:405-22.
5. Patton MQ. Utilization-Focused Evaluation: The New Century Text. 3rd ed. Thousand Oaks, CA: Sage;1997.
6. Stufflebeam DL. Evaluation Models. Volume 2001, Issue 89, Spring 2001. Available from: http://www.wmich.edu/sites/default/files/attachments/u58/2015/Evaluation_Models.pdf.
7. Curriculum Evaluation: Process and Models. Study.com, 15 March 2018. Available from: study.com/academy/lesson/curriculum-evaluation-process-models.html.