

Effective Teaching Learning Environment through Constructive Feedback: A Preliminary Study

Renumol V G¹, Krishna Kumar G², Gopeekrishnan G³, Nisha S Raj⁴

¹Division of Information Technology, Cochin University of Science and Technology, Kochi, Kerala

²Open Source Techno Labs, Kochi, Kerala

³Department of Computer Applications, Girideepam Institute of Advanced Learning (GIAL), Kottayam, Kerala

⁴Division of Information Technology, Cochin University of Science and Technology, Kochi, Kerala

¹renumolv@gmail.com, ²kkgkurup@gmail.com, ³gopankedaram@gmail.com, ⁴nisha.s.raj@gmail.com

Abstract: The two major contributing entities in any education system are the educators and the learners. This system can be made effective when there is continuous, reliable and valid feedbacks from the teacher to the learner and vice-versa. This paper proposes a methodology to elicit and use feedbacks from teachers and learners as a mechanism to improve effectiveness of teaching and learning. This is an on going work which is broken down into three phases for simplicity, management and better cohesion. The paper points out a set of prominent parameters to assess educators and learners. These parametric values are collected in the first phase and are properly communicated with the educator as well as the learner. Then in the second phase both of them incorporate the required changes in the teaching-learning process and again these parametric values are collected and analysed to see the progress. The final phase is an automated one which uses the information from the first two phases to develop a Personalised Learning Environment.

Keywords: Education; Classroom Observation; Feedback system; Learning quality; Teacher appraisal; Personalized Learning

1. Introduction

Any system is subjected to progress only through proper effectiveness assessments. Same is applicable to education system, from elementary school to higher university levels (Karen, 2010). There are many factors affecting the quality of education system, but the most important is the role played by the educators and learners for the high quality knowledge transfer. If effective teaching can be ensured, effective learning automatically follows. However, the fact is that the learners are not getting the required knowledge in a meaningful and understandable manner. Basically, in a conventional class, a low percentage of the knowledge only gets transferred from the teacher to the learner. Apart from mere learning-outcome analysis, there should be a proper methodology to evaluate the performance of both, educators as well as learners. This paper proposes a methodology to use assessments and feedbacks on a set of parameters as an effective mechanism to evaluate and improve the performance of teachers and learners. Traditionally feedbacks were communicated either written or verbal, whereas with technology enabled openness there are innovative ways for providing meaningful

Renumol V G

Division of Information Technology,
Cochin University of Science and Technology, Kochi, Kerala
renumolv@gmail.com

feedbacks. This ongoing work aims at developing a Personalized Learning Environment (PLE) for the learners as well as a self-assessment environment for the educators.

2. Literature review

Feedback enabled education research falls into two major classes: educator-centered and learner-centered.

A. Educator Centered Evaluation

One of the reasons why teaching usually fails is the unavailability of sincere feedback. If feedback is available, it acts as a catalyst for the self-evaluation of a teacher that will help him/her improve the teaching process. Researches in this direction are taken up at various institutions worldwide. Since 1900, many surveys are being conducted on teacher assessment. But these studies compared teaching effectiveness against learner achievements. Klemp (Klemp, 1977) studied the behavior of exceptionally good performers in their fields and found three key factors attributed to their excellence such as higher level cognitive skills, high degree of interpersonal skills and high level of motivation. Benjamin Bloom (Bloom, 1984), the major contributor to the mastery learning, has proved that assessment is intrinsic to effective instruction. Another early study (Cross, 1986) concludes that higher education sector can dig out knowledge on three critical conditions of excellence such as student involvement, high expectations, and assessment and feedback for a high quality education. The seven factors investigated and found key to assess educators (Money, 1992) are knowledge of subject matter, effective communication, ability to motivate, friendly and open, well organized course material, classroom control, and ability to inspire interest. Proper feedback system throw light to self apprehension of the educator. Everyday experience of teaching and learning in the classroom need to be studied. The findings (Tulis, 2013) suggest that there is a need to investigate how students' mistakes are rectified for different subjects and the studies were done through teacher evaluation. Helmke (Helmke, 2005) put forward 4 ideal steps for using the feedback for a quality teaching learning process. They are Perception (teachers must perceive and understand the provided feedback), Interpretation (teachers identify explanations for the results), Action (Depending on the interpretation, specific measures are conducted to optimize teaching) and Evaluation

(teacher re-evaluates the measures taken and use the results of this evaluation as the starting point of a new evaluation cycle). Against the skeptical attitude towards student feedback reception, the results from a recent research (Gaertner, 2014) concludes that teachers often agree with their students on their perception of teaching. Also findings claim that the students' perceptions are more noticeable than teachers' self-perception (22%) and the reverse (14%). Most of the teachers surveyed in the context showed a positive attitude towards feedback

B. Learner Centered Evaluation

Traditionally, effectiveness of a class is assessed by assessing the amount of knowledge that the students have after attending the class. The main problem with outcome-based assessment is that the class outcome depends not only on the quality of the class, but also on how prepared were the students when they started taking this class. But there are little efforts taken in this direction till date. Assessments have got greater impact on students and when higher education is considered, technology enriched environments are demanded. Kellough and Kellough (1999) investigated seven purposes of assessment, which is applicable for feedback as well: (a) improve learner learning; (b) identify learners' strengths and weaknesses; (c) review, assess, and improve the effectiveness of different teaching strategies; (d) review, assess, and improve the effectiveness of curricular programs; (e) improve teaching effectiveness; (f) provide useful administrative data that may expedite decision making; and (g) to communicate with stakeholders. But at the same time researchers (Gibbs, 1999) empirically showed that the feedback mechanism may be degraded by semesterisation and modularization. The recent trends emphasize on the use of different learner-centered assessment techniques (Heywood, 2000; Pereira, Flores & Niklasson, 2015) and continuous feedback. Another study (Costello, 2013) offers an analytic framework for understanding classroom observation systems across contexts, distinguishing conceptual, methodological and policy aspects that shape these systems. Learning experiences are quite important and motivating for learners and inspiring for educators, the paper discuss about a feedback model which is technology demanding, in response to assessment and which is not discipline dependent. Feedback is not just the comments on a written assignment, or the grade on a test, but also includes the class discussions, questions, and many of the

interactions within the class group. Many strategies and technologies may be used in creating and dispersing this feedback.

3. Research Questions

This study aims at developing a model for the collection and assessment of teaching and learning parameters and ensure quality education with the help of technology. Such research is needed as the conceptualizations of effective pedagogy generally include teaching, learning and assessment. The research questions emerged in this context are:

1. What are the teaching parameters to be evaluated for a good quality assessment model?
2. What are the learning parameters to be evaluated for a good quality assessment model?
3. How data can be collected and efficiently used to develop an effective feedback system?

4. Feedback System for Effective Teaching and Learning

It is worth noting that, an effective teaching process automatically ensures effective learning. The objective here is to know the level of understanding of lessons/topics by learners and to suggest alternate ways of teaching to strengthen effective learning. Thus, to ensure that effective learning is occurring in the class, one has to go in for searching what happens in the class during the time of teaching. A quest for this, will definitely pave the way for meaningful feedback that helps in effective teaching, thereby ensuring effective learning also.

Hence, a feedback system is designed which has three phases. In the first phase, the data related to the teaching parameters as well as learning parameters in a class are to be decided, measured, analyzed and reported. In the second phase, the processed data from the previous phase is used as an input to modify the teaching learning process. Hence at the end of Phase-2, with the fine tuning of parameters that were identified and measured in Phase-1, the effectiveness of the teaching and learning process is to be improved considerably. Phase 3 is used to substantiate the previous phases with the introduction of automation to the entire feedback process in a class. Thus, it is established in Phase-3 that, the effectiveness of a class can be scaled up through feedback of parameter values to teachers and students.

A. Phase 1- Primary Analysis

Here, a conventional didactic method of instruction is considered, where knowledge flow is generally from teacher to learner. In this primary phase we need to collect data from the teacher and the learner.

To have an inclusive growth of all the learners, it is indeed imperative to know what went wrong in understanding a particular concept/theory, which alternate ways of explanation will be beneficial for learners, what self-corrections are possible for learners etc. On the other hand, teachers should have deliberate intention to improve teaching skills, to develop own style of teaching, to motivate and make curiosity among their learners, to make them remain as continuous learners etc. Hence we need to measure various parameters.

From the point of view of teaching process, the important parameters to be taken care of, are listed below. These are crucial for this current study. However, this list of parameters is not an exhaustive one.

- 1) Fixing the learning objectives of the current session.
- 2) Style of performing in a class.
- 3) Level of knowledge of the teacher in the portion being taught.
- 4) The oratory skills of the teacher.
- 5) The dependence of ICTs in the class by the teacher, like heavily, medium or loosely-dependent.
- 6) The skills of the teacher in making curiosity in the subject among students.
- 7) The ability of the teacher to clarify doubts of the students.
- 8) The ability of the teacher to draw neat diagrams on the board.
- 9) The degree of interaction among the students and the teacher.
- 10) The rapport built among the students and the teacher.
- 11) Classroom management skills exhibited by the teacher.
- 12) The promotion of asking questions by the teacher i.e., the teacher encouraging question-answer sessions or not. For this, it is to be specifically noted the following points.

- a) Asking thought-provoking questions to the students.
 - b) Response of the students in answering the questions and the style of answering.
 - c) The appreciation of the teacher towards the correct answer to the question asked.
- 13) The trait of the teacher in summarizing the class just delivered.
- 14) Formative evaluation taken up by the teacher.
- 15) Feedback mechanism employed by the teacher and its effectiveness.

In line with teaching parameters, there are a number of learning parameters, that must be tracked in this phase. Some of these, again not exhaustive, is listed below.

- 1) Familiarity of the student with the subject being learnt.
- 2) The level of expertise a typical student has in the subject like basic, intermediate or advanced.
- 3) Whether he/she can follow the pedagogical approach of the teacher.
- 4) Desire of the student towards the subject being learnt.
- 5) Ability to concentrate on the subject being learnt.
- 6) If an alternate way of presentation is used by the instructor, whether the student is able to grasp clearly, the topic being taught.
- 7) Ability to interact with the teacher effectively.
- 8) Ability to answer questions posed before him/her by the teacher.
- 9) Ability to attempt quizzes in the subject.
- 10) Ability to complete assignments based on the subject.

The above parameters need to be measured through a valid questionnaire based survey and analyzed. Then the results got from this preliminary analysis must be conveyed to the teacher and learner without hurting their feelings. They must interpret the results accurately and plan remedial actions for the next phase. In short, the procedure in Phase-1 is summarized in Table 1.

Table 1. Summary of Phase 1

Data	Pertaining to the didactic method in a class and learning. That is, the parameters that could affect an active class have to be noted
Instrument Used	Reliable and valid questionnaire. The questions can be open -ended or closed-ended
Respondents	Teacher, Students

B.Phase2 -Secondary Analysis

In Phase-2, the teacher continues the class after incorporating suggestions got from the sample survey in Phase-1. In Phase-2, efforts are taken to know about the significant improvements to the effectiveness of teaching as well as learning that are again tracked using the parameters noted in Phase-1. The same set of questions used in Phase-1 can be used for eliciting information from the respondents. While comparing the results of Phase-1 and Phase-2, it is expected that the effectiveness of the teaching process as well as that of learning process will be improved considerably.

C. Phase 3 - Tertiary Analysis

Phase-3 is designed to substantiate the results that have got from Phase 1 and 2 and it is an automated version of the procedure. The plan is to measure the data using a customized analytic system. Thus, from the point of view of an analysis process, more data on the learners as well as teachers may be required.

In Phase-3, the whole process is under the scanner of an analytics system. The system will have the ability to record every activity of the learner and teacher through intelligent tracking. This system will serve as a recommender system for the students and for the teachers. It will act as a reflective system to evaluate, analyze and improve one's teaching skills and learning skills. .

Each and every student in a classroom must be under the constant scan of the analytics system to drill down for helping improving the predictions, suggestions, and recommendations to the students. Data related to a specific student can be got from every activity of him/her while at school/college. That is, patterns in the activities of students are under active

analysis here. Such activities include the way students utilize the library and other resources, the behavioural patterns of the students, the tendency of the students to bunk classes, whether the student is not punctual in the classroom or not, the attendance of the students, the perfection in assignments of a student, the assignments of the student in which he/she is most interested in and thereby a subject (this may or may not suggest the fact that he/she may be weak in some other subjects), the grading in different subjects, the hobbies of the students, the background of students etc. In the case of utilization of library, a number of activities of a student can be tracked. The degree of compulsion from a teacher for the student to be in the library, the time one student spends in the reference section, the time one student spends in the library that includes reference as well as issue, the area in which the student is interested in, type of book (i.e., fiction or nonfiction, academic etc.) the student interested in, the specific author the student is most interested in etc.

With such a tracking of the students, it is easy for the system to recommend certain corrections where they are weak at. The intention, here, is to develop a Personalized Learning Environment (PLE) by suggesting a probable learning curve for the student's success.

It is also imperative to note that, the system will also be able to make reflexive suggestions to the teachers which help them improve own performances and transform them into effective teachers

Table 2. Summary of Tertiary Analysis Phase

Data	pertaining to the didactic method teaching in a class and learning.
Instrument Used	analytics software system which does the surveillance activity for predicting success to both learners and teachers.
Respondents	Instructor, Students.

D. Design of questionnaire

In this research study, two different sets of questionnaires are to be prepared: one for the instructor/teacher and, the other for students. Both Phase-1 and Phase-2 require questionnaires.

A teacher is to be given with a questionnaire framed mainly with questions that would help them

retrospect into their teaching styles, the desired level of knowledge in the subject that he/she is teaching, the quality that must be brought in the teaching etc. In fact, this practice is part of educational action research that enables teachers themselves to investigate and evaluate their work (Chatti, 2012).

Students are to be given with questionnaires prepared based on the teaching parameters and learning parameters already noted. Preparing questions for the questionnaire is an important milestone in this research. Some parameters require open-ended questions while some others warrant closed-ended questions (Rossi, 2013). We have started the design of questionnaires for phase 1 and 2.

5. Conclusion

In this research study, it is discussed, how effective teaching can be ensured for the effective learning of students in a class. Though this is a preliminary study, it is understandable that an effective teaching automatically increases the receptive power of the students and enhances the effective learning experience of them.

This ongoing work is spread across three phases; first two phases are completely questionnaire-oriented data elicitation and analysis of the results. The third phase needs the automatic analysis of teaching and learning in a class. This needs the construction of an appropriate analytics tool that has the flexibility to make suggestions to the students as well as helps teachers make decisions regarding teaching and interventions.

References

- [1] Klemp, George. (1977) Three Factors of Success in the World of Work. Cambridge, M.A.: McBer & Co.
- [2] B S Bloom (1984) The search for methods of instruction as effective as one-to-one tutoring Educational Leadership, 41(8) pp 4-17
- [3] Cross, Patricia (1986) Improving Learning in Community Colleges. Innovation Abstracts, Vol VIII, No. 18.
- [4] Money SM (1992) What is teaching effectiveness? A survey of student and teacher perceptions of teacher effectiveness. Toronto: Humber College
- [5] Kellough, Richard D., and Noreen G. Kellough. (1999) Middle school teaching: A

- guide to methods and resources. Merrill, One Lake Street, Upper Saddle River, NJ 07458,
- [6] Heywood, John(2000) Assessment in higher education: Student learning, teaching, programmes and institutions. Vol. 56. Jessica Kingsley Publishers
- [7] Helmke, Andreas, and Ingmar Hosenfeld(2005).Standard-based evaluation of teaching [" Standardbezogene Unterrichts evaluation." Schlüsselfragen zur externen Schulevaluation]. Bern: hep 127-151.
- [8] Villaverde, Karen, and Olga Kosheleva.(2010) Towards more detailed value-added teacher assessments Fuzzy Systems (FUZZ), 2010 IEEE International Conference on. IEEE
- [9] Rossi, Peter H., James D. Wright, and Andy B. Anderson (2013.), eds. Handbook of survey research. Academic Press
- [10] Chatti, M.A., Dyckhoff, A.L., Schroeder, U., Thus, H(2012).A Reference Model for Learning Analytics. In: International Journal of Technology Enhanced Learning. Volume 4 Issue 5 / 6, January 2012, Pages 318-331
- [11] Maria Tulis(2013) Error management behavior in classrooms: Teachers' responses to student mistakes, Teaching and Teacher Education 33 56-68
- [12] Costello, Jane, and Daph Crane (2013) Technologies for learner-centered feedback." Open Praxis 5.3 217-225.
- [13] Gaertner, Holger (2014) Effects of student feedback as a method of self-evaluating the quality of teaching. Studies in Educational Evaluation 42 :91-99.
- [14] Pereira, Diana, Maria Assunção Flores, and Laila Niklasson.(2015) Assessment revisited: a review of research in Assessment and Evaluation in Higher Education., Assessment & Evaluation in Higher Education pp 1-25.
- [15] Martinez, Felipe, Sandy Taut, and Kevin Schaaf.(2016) Classroom observation for evaluating and improving teaching: An international perspective, Studies in Educational Evaluation 49 ,pp 15-29.