

# Ensure Program Quality: Assessment A Necessity

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**Abstract**— In an effort to achieve high quality programs and courses both formal and informal measures are used the teaching and learning process through direct and indirect methods. Assessment has become even more important since education institutes show great interest in the educational experience outcomes and how they map to institutional goals as well as to the needs of the society. Institutes either develop a formal internal assessment process or through external accreditation try to continuously improve and revamp their programs. It is now perceived that students are more active in building their knowledge rather than simply listening to the lectures. Assessment of student work therefore helps us to determine the effectiveness of programs from student's point of view. This also gives an opportunity to the students to show us what they have learned and how they can contribute when they graduate. It is therefore all that important, for institutes interested in accreditation, to assess learning outcomes as a component of program review process. The accreditation guidelines in general seek to encourage institutes to think about accreditation as a continuous process and go one step further to data collection, analysis and change in order to ensure good quality program. This paper addresses the necessity of assessment through seeking accreditation and also provides a more structured mechanism for accessing, evaluating and improving the quality of the program. This paper details various assessment tools (AMS, Web-Based, Directory Structure, etc.) used by different institutes, to help in organization and gathering of the related material. The paper also presents a model for sharing responsibilities to monitor and evaluate gathered material and assessment data.

*Keywords-component; Accreditation, Assessment, Course Learning Outcome, Program Learning Outcome, Rubrics.*

## INTRODUCTION

Aiming for good quality programs is on the wish list for almost all the institutes. A collection of good quality courses is thus essential to ensure high quality program. In an effort to achieve quality among the courses both teaching and learning

process should include assessment using direct and indirect measures. We see a widespread interest in the educational experience outcomes and their link to the goals for students, institutions and society, making assessment even more important instrument. Students at this time and age participate actively in the building of their knowledge rather than passively receive what we lecture; this gives us a better understanding of the student learning process. In that respect, a assessment gives us a n opportunity to evaluate effectiveness of our programs from the learner's perspective. In addition it gives an opportunity to students so they can show what they know by the time they graduate. One of the ways to ensure this is by assessing learning outcomes of the program.

In general, universities support the assessment of student learning as an integral part of their core commitment to graduate students with high value degrees. Institutes in general review their academic programs, to ensure continuous improvement, through a formal automated or manual internal assessment process. As per definition by the U.S. Department of Education, accreditation can be considered as a process by which a third party accrediting agency assures that a program meets quality standards that are established by the respective profession [4]. Generally, preparing for an accreditation visit, at regional or national level, is a huge task for everyone involved. The accreditation guidelines in general recommend not viewing accreditation as a one time event rather it is a continuous and progressive process especially when accreditation agencies place lot of emphasis on not only outcomes and assessment, but also on continuous improvement, in order to endure good quality program.

The Accreditation Board for Engineering and Technology (ABET) USA criteria for program accreditation require that programs make decisions using assessment data collected from students and other program constituencies thus ensuring a quality program improvement process. This requires development of quantitative measure to make sure that students have satisfied course learning outcomes and consequently the program learning outcomes. Figure #1 show this cycle of continues growth and improvement involving activities like revising program learning outcomes (PLOs), course learning outcomes (CLOs), and assessment leading to yet further improvement in program.

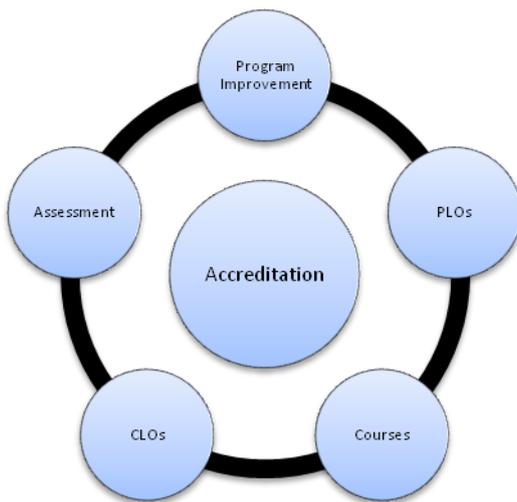


Figure #1 Accreditation and associated activities

We argue that seeking accreditation is a desire that leads to providing a very structured mechanism that helps to assess, evaluate and eventually improve the quality of the program. Following sections detail various assessment approaches used by various institutes seeking accreditation, emphasizing that computer assisted assessment would help in organization and gathering of the related material. A brief review is provided of different tools (AMS, Web-Based, Directory Structure, etc.) that can be used for assistance in collecting data for program assessment. The paper also presents a model for sharing responsibilities to monitor and evaluate gathered material and other assessment data.

The latest trend of getting institutional accreditation, for all the academic programs has sparked a greater interest in assessment. However, since majority of the faculty members are not too keen to get involved in the assessment process, mostly because they are not familiar with the assessment process and/or the methods used, so we need to explore avenues by which faculty can be engaged actively in the assessment of a program, at college or university level. The new accreditation standards for computing, technology and engineering disciplines put a lot more emphasis on course and program outcomes, assessment activities and continuous improvement in their statements of intent [10, 13]. This provides justification for an approach to get the entire faculty involved in the assessment process, while mapping outcomes and other collected data against expectations. Later each faculty member can plan curriculum revisions based on the analysis of this data. These curriculum revisions and developments, from accreditation perspective, can be seen as a part of continuous assessment process [12].

In order to establish clear criteria against which a program needs to be evaluated, one needs program learning outcomes (PLO) that are clearly stated. In addition course learning outcomes (CLOs), statements of student learning as well as development expectations are also required. All these will help to determine the basis for future program planning [7]. Clearly stated PLOs also serve as a guideline for the faculty teaching the course to be aware of the knowledge and skill set needs to be developed by the students. In a broader sense these objectives not only provide basis for curriculum development and revisions but also for selecting the faculty to teach the course. The PLOs therefore should be relatively stable over time however, at the same time be expected to change because of the results from assessment activities. In general, the stated assessment objectives are quite similar to these PLOs. For the sake of not overburdening the faculty with extra task it is recommended to not assess all of the program

learning outcomes in one given year. It therefore leads to establish a set assessment schedule to make sure that all of the given program learning outcomes are assessed by the end of 4-5 year cycle and before the institute decides to seek accreditation.

In an effort to have faculty involvement and understanding of accreditation and assessment we propose the concept of assigning a faculty to be the program lead with the understanding that this person will be responsible for not only staffing the courses in the program but also for leading and organizing an annual assessment of the program. A single person responsible for such an activity would lead to a more focused approach to assessment and more involvement of the faculty in the process of assessment itself. The lead faculty will also ensure PLO and CLO mapping and thus further revisions of CLOs and courses as well as, other assessment related activities. Departments establish their mission statement and the program leads will define their own program goals and determine how they are to be addressed, form an Academic Program Assessment Advisory Board or committee that provides timely feedback to facilitate the assessment process and help revise and improve program. The emphasis of assessment is on program evaluation to improve student learning, and to further a culture of student learning; assessment measures are employed to help achieve that goal. Therefore, for assessment to be effective and helpful, results obtained from various assessment activities need to be utilized to further develop new programs and improve existing programs. Finally, assessment results can also be helpful in decisions regarding resource allocations and reallocation for the program.

### III. ASSESSMENT

The assessment's role is to determine what a student can gain at various levels of a learning experience in typical educational setting or environment. There are two types of assessments, formative and summative assessment [3]. Formative assessment, determines the incremental outcomes and occurs during the entire learning process. Summative assessment on the other hand determines more

holistic and integrative outcomes at the end of the learning process. Assessment data collected during various stages are subsequently used for multiple purposes, as stated in [3]: (a) Management and monitoring of instructional part (b) Evaluation and accountability of the program (c) Placement and selection of students in the program. The information gathered from assessment activities is then utilized to develop a model of the student's ability to evolve a conceptual knowledge structure keeping in mind the target structure. Assessment provides means to focus our collective attention for examining assumptions that we have made and our efforts in creating a kind of a culture that is dedicated to improve the quality of higher education and associated learning. The assessment exercise requires that all of the expectations and standards, established for the program, be announced and available to public. It also needs that evidence be gathered systematically from time to time to determine how well these standards and expectations are being met. At the same time the analysis and interpretation of the gathered evidence data can be used to document the achieved performance, explain any shortcomings and to further improve the performance [14].

### IV. ASSESSMENT: THE PROCESS

As Gloria in [2] states that, it is important that one understand the question before being able to come up with the correct answer. Similarly we should try to think about the questions related to a assessment process in connection with accreditation and program effectiveness. This exercise is very important since we may generate lot of random activities for collecting material that we do not need after all. So it is important to understand the question being answered and its implications on the assessment process design. A program or a department should first try to create mission statement to describe the programs in the whole department. A program can then establish its goal and learning outcomes. These outcomes basically describe what students should be able to do by the time they graduate from this program. In order to verify that the graduate do actually have these

attributes a thorough analysis of the student work (Written assignment or class project or capstone project) can be used as a direct assessment method to access program learning outcomes and goals. In order to quantify program indicators it is always beneficial to develop and use rubrics to measure student performance which ultimately leads to the measure of the program effectiveness. For example, a program outcome can be divided into various components. Later, each of these components can be evaluated using one of the developed rubrics. Finally merger of all of these individual components will lead to assess a range of program learning outcomes [4].

The assessment process begins when programs identify Program and Course Learning Goals and outcomes. In most cases goals are finalized based on both faculty expertise and requirement of the professional or accrediting agencies. Once learning goals are established, the departments and programs devise ways of measuring or assessing how well students are meeting those learning goals. These assessment methods most often directly measure student learning and are frequently embedded in courses offered in the program, including capstone courses. Appropriate assessments may also include indirect measures like employer surveys, alumni surveys, exit surveys or interviews and rates of enrollment to advanced degree programs. Departments analyze these data, identify strengths and challenges of the programs, and make appropriate changes to improve their success at achieving program learning goals. Program also need to evaluate their success in other critical areas, such as, meeting the needs of the general education program, offering service courses, and other functions that serve the university's broader mission [9].

Figure #2 shows the activities required to ensure a high quality assessment process that requires direct and indirect measures of the course and program learning outcomes as well as input from the advisory board. All these measures are vital both for credible assessment process and program quality.

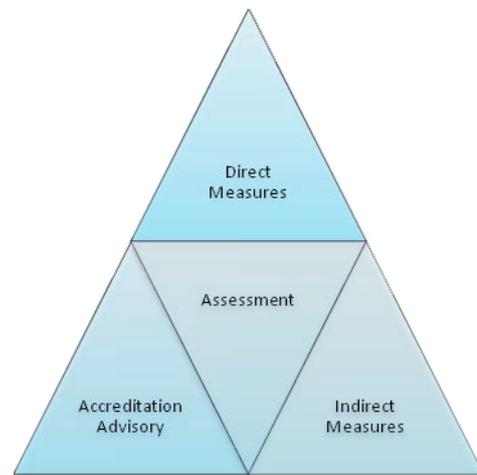


Figure #2: Quality Assessment

University graduate or undergraduate council, at most of the universities, is responsible to oversee assessment of each individual program. This council is also responsible for conducting the Annual and Five-Year Program Reviews to ensure quality and consistency among various programs offered by the university. Among its other assignments the Graduate or Undergraduate Council also examines the main components of assessment plan for each program, particularly student learning and program outcomes. For the purpose of review and assistance in the assessment process of the annual and five year assessment, each graduate or undergraduate degree program is required to provide information on [5]: (a) educational objectives of the program; (b) measures to evaluate success in achieving these objectives; (c) the goals that are being successfully met in addition to those that need attention as determined by the analysis of the gathered data; and (d) how assessment data is used to improve quality of the program.

## V. DIRECT AND INDIRECT MEASURES

These measures are considered as the primary source of data in assessment of a program. To ensure consistency as well as equal quality and rigor in all of the courses in the program [7] suggests writing a Program Quality Improvement Report (PQIR) by each faculty member teaching in the program. The report contains (1) Assessment data displayed, (2) a complete analysis of the assessment

data, (3) evaluation of the conclusions regarding course strengths and weaknesses, (4) course modifications as a result of analysis of the assessment data. These modifications may be in goals, objectives, or strategies (5) modifications proposed for course improvement, (6) projected time lines for implementation of all the suggested modifications, (7) any additional resources requirement estimation for implementing recommended changes, (8) assessment methods evaluations, and (9) the annual assessment plan update. In our proposed setup, all of the PQIRs are then analyzed by the program lead for an academic program and approved not only by the program lead but also by the Chair of the department, the Dean of the Academic School or college, and the provost. Collective PQIRs can be used as the basis for initiating any actions aimed at improving the corresponding individual academic program.

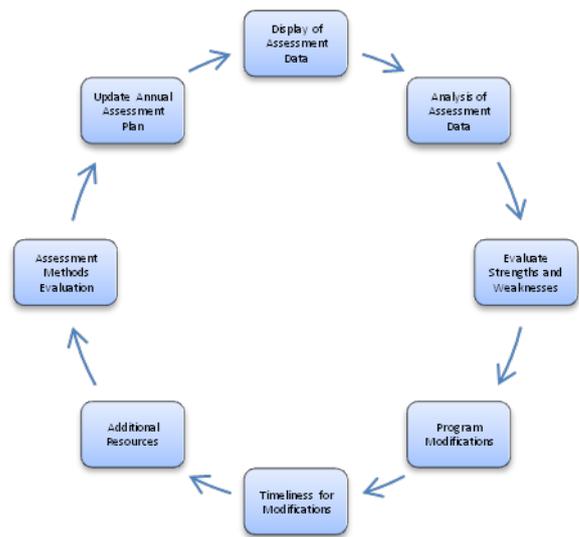


Figure #3: Assessment Process

## VI. ASSESSMENT TOOLS

The capstone experience becomes a very effective direct measure if it is clearly linked with the identified learning outcomes. This can be achieved when standards are carefully structured and documented, with well defined rubric for written and oral communication. A very qualitative internal and external review of senior project can be used to legitimize the entire capstone experience and evaluation. Among other means for direct measure are; Student performance certification or professional exams, for internship an external evaluation, based on stated program objectives, of performance. For indirect measures; alumni, employer, and student surveys, exit interviews or survey of graduates, graduate taking higher degree programs, length of time to graduate, job placement can be used as indirect measure for the program quality. Assessment process also include the faculty and staff members input to the process when the next year's academic plan is prepared by the department chairs in consultation with the faculty and staff outlining realistic budget requests, including both operating and personal costs. Figures #3 outlines different components of the assessment process.

To prepare for an accreditation visit generally involves a lot of preparation work and hence is viewed as a huge task. However, the accreditation guidelines suggest that accreditation should be looked at as a continuous process; an iteration of data collection, analysis, and modifications. The accreditation should not be viewed as a one-time event. Authors in [10] report a prototype system to automatically map ABET-CAC's outcomes to the department and course learning outcomes for Information Technology Programs. In this system students are required to submit their work through the web, these assignments are then mapped to program and course outcomes. Program as a whole or an individual course is then revised using the assessment data. Assessment methods and tools cover the measurement options that can be used for each program learning outcome; which courses are to be considered based on the PLO to be assessed in a particular year; assessment data collection and analysis needs to follow a certain time line; analysis methods used on the collected assessment data; formulate conclusions from the analyses results drawn using a certain rubric or criteria. Rubrics are used in assessment as a good technique to improve communication and feedback between faculty and students. Faculty use rubrics to relate the contents that they want to evaluate with some feedback,

taking into account the possible results of the students in an exam, work or exercise. Learners use rubrics to know which topics they have to improve and why [20]? The assessment model in [7] relates program strengths and weaknesses to conclusions concerning student weaknesses and strengths. Each analysis method and the assessment data collection is evaluated every year using assessment results. Then suitable modifications and updates are included into the program for the next year's assessment cycle.

There are many assessment tools proposed by researchers and practitioners with the aim of facilitating faculty by using good techniques for assessment. A research line of interest in technology enhanced learning is focused on integrating good assessment techniques in Computer Assisted Assessment (CAA) [17]. It enables the provision of formative feedback to students in a more efficient way than with the traditional assessment. A user-friendly assessment editor helps faculty in the design of eQuestionnaires and rubrics. Brinke et al. [16] propose an educational model for CAA where rubrics are used in the response stage of assessment when reviews of assessment material are evaluating program learning outcomes. [11] proposes a novel more interoperable solution supporting interoperability through the IMS Test Interoperability Specification (QTI) specification [18], by using rubrics more extensively, and enhancing user support through a new editor implementation. In this paper, they add an editable rubric functionality into previously implemented QTI compliant eQuestionnaires CAA editor [15]. By means of this functionality, faculty can create a rubric using QTI *questionsItems* ((re)using existing items or creating new ones), and relate them with the assessment activities they want to evaluate and the grades and feedback they have to assign depending on the students' results (which are facilitated by the use of QTI).

The North Carolina Agricultural and Technical (A&T) State University has been experimenting with standardized exam questions in their chemical engineering program. In this effort a large database of questions has been created. These questions are

prearranged by CLOs, difficulty level and type of questions. The questions are made available to students via WebAssign® (a web-based homework system) [1]. The statistical analysis of student performance validates these individual questions in the database. This assessment tool further supports the idea that the assessment should create minimum extra work for the faculty. The tool will quickly and easily provide assessment data to the individual faculty in the program. It is understood that faculty will adjust both their teaching style and the course material by using this readily available assessment data. This will also help them to meet two objectives; be well informed to advise students who may not be willing to take such a course and to satisfy student's demonstrated needs. An alternate assessment instrument used for design learning is reported in [3]. The paper presents three tools (portfolios assessment, cognitive maps and a writing technique called "freewriting") for assessing a freshman level Introduction to Design course based on the development of design skills and knowledge.

## VII. ASSESSMENT MODEL

It is important that program faculty is involved in every step of the assessment. This is the basis for the design and development of the assessment model presented in this section. The faculty has a key role in the decisions regarding the control and development of the data collection. The committee level involvement to monitor and control course and program development is also essential. Faculty should be free to make any kind of decisions regarding program and course improvement, this also ensures academic freedom. The Accountability Management System (AMS) by TaskStream [21] provides the tools to assist educators for uploading the data required to show institutional effectiveness. AMS is a system that can be modified to help facilitate and manage institution-wide strategic planning and assessment initiatives to strengthen teaching and learning. Institution and program level learning goals can be documented and managed through the use of AMS by universities and colleges. Activities at the program level are planned

to define essential student skills and for measuring performance outcomes using institutional learning goals. The results of the student achievements, institutional goals and initiatives and community participation collectively provide new powerful ways for the demonstration of effectiveness and improvement over time.

For all of the institution's initiative regarding outcomes assessment and continuous improvement AMS provides a resource and communication center. It also helps in promoting communication and collaboration among campus wide community. Great communication and collaboration capabilities of AMS also allow university management and administration to share with third party stakeholders' access to the entire accreditation process. Educational excellence culture is effectively promoted when both administrators and faculty use real time activity status reporting facility of AMS during the entire assessment process. Faculty and other administrators do not anymore need to document the entire accreditation process on papers. The system will allow them to effortlessly add their comments, detailed instructions and already agreed templates. Accreditation agencies can utilize online reporting capabilities of the system if given access to this system by the institution. Real time access to data allows faculty to analyze, recommend or implement changes in a timely manner.

Accreditation as well as reporting process is facilitated and accelerated because of the instant feedback provided due to the review of the contents and reports provided by the online content and documentation review capability of the system. Program faculty can define their own program learning goals for a specific program using objective and learning outcome definition facility provided in the system. This assessment model helps in building an agreement among the faculty and administration regarding defining PLOs, assessment planning, analyzing results and then later implementing the changes based on the analysis. It also allows use of appropriate terminology as well as terminology to customize templates and thus making using of the system even

easier. Curriculum mapping, courses (Course Learning Outcomes) versus PLOs, provides a clear indication to all the strengths and weaknesses in the program. Any gaps in the curriculum are also exposed through this mapping.

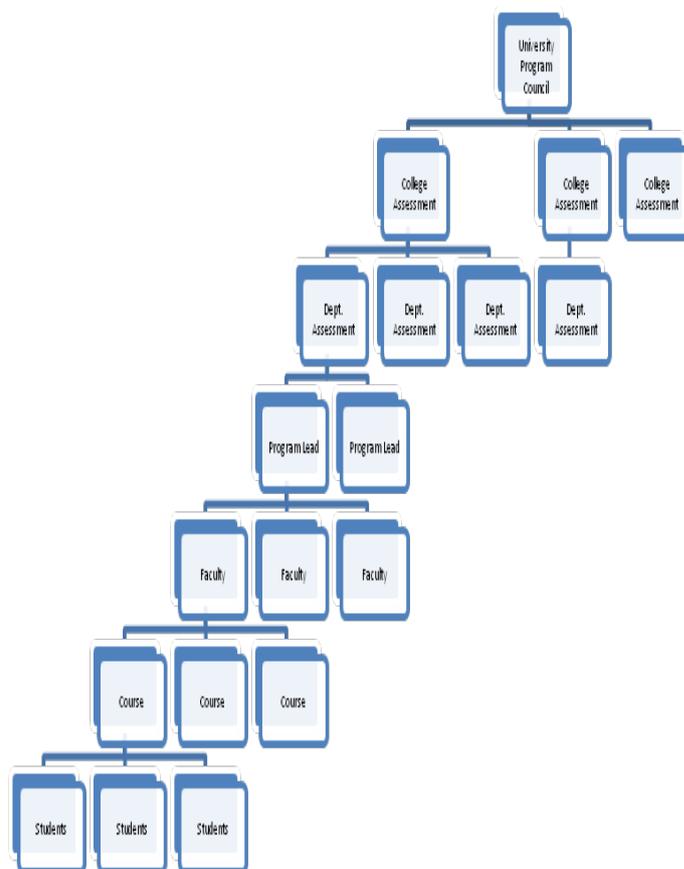


Figure #4: Assessment Model

Programs under consideration for accreditation need to participate in all of the program assessment activities. However, in most of the cases the faculty with the responsibility to get the program accredited asks this simple question where do I get started? The response to this question is very simple and straightforward just follow these steps;

**Develop plan:** Start with identifying the program learning objectives or outcomes, criteria and measure for the program.

**Program Input:** Insert all program related data to the system.

**Implement your plan:** During each academic year assess your programs based on selected program learning outcomes for that year.

**Report your results:** All the data from the program assessment should be reported to the system using assessment tool.

**Close the Loop:** This is the most important step in the accreditation process. Once the assessment results are available examine the data. The analysis of the result will help you determine if changes in curriculum (or instruction) are required. Once these changes have been implemented start your assessment again.

The use of any assessment tool to facilitate assessment activities will still need to follow a certain assessment model. Figure # 4 present a assessment model that ensures faculty involvement at every step either as teaching faculty, assessment committee, or at the top as undergraduate or graduate council.

## VIII. CONCLUSION AND FUTURE WORK

The work proposed in this paper represent a preliminary approach towards the use of assessment in combination with various tools as a useful method to organize assessment information and to provide automatic formative feedback, so that assessment activities can be meaningfully embedded in learning flows. Results from this study suggest that although participants in the assessment process generally accepted the responsibilities in the assessment process, they did not necessarily fully appreciate the potential benefits of assessment and reflection activities. Thus, it is apparent that greater effort, further support in the form of tutorial input, extended explanation are needed to embed the assessment process as part of the learning culture. We are also aware of a need to revise assessment approaches in relevant courses. The overall aim of such revision is to reassure participants that formative and reflective assessment is a safe and effective means for improving courses and programs. This paper presents some of the prominent features for most effective and efficient assessment process. The paper also describes the

important step to serve as a guide for the faculty member who wishes to engage in the accreditation and hence assessment of their programs.

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