

AC 2009-188: MEET THE ABET “STUDENT WORK SAMPLE” REQUIREMENTS: DOCUMENT STUDENT LEARNING

Barbara Christe, Indiana University-Purdue University, Indianapolis

Barbara Christe is the program director for the baccalaureate program in Biomedical Engineering Technology at Indiana University Purdue University at Indianapolis. She is an Associate Professor and a member of the University College faculty.

Elaine Cooney, Indiana University-Purdue University, Indianapolis

Elaine Cooney is professor of electrical and computer engineering technology at IUPUI. She is the author of RFID+ The Complete Review of Radio Frequency Identification. Her areas of focus include analog circuits, radio frequency, signal processing and engineering technology education assessment. She holds an MS in electrical engineering from Purdue University.

Meet the ABET “Student Work Sample” Requirements: Document Student Learning

Abstract

Assessment theory has expanded from traditional examinations that are focused on the *result*, to include the *process* of learning. ABET program evaluators (PEVs) have been instructed to look for documentation of student learning in the samples of student work required of institutions seeking accreditation. Educational theory supports this change as a positive shift to promote student success. This paper will explore the techniques which institutions can use to successfully exemplify the achievements and transformation of their students, which will meet the expectations of ABET evaluators. The benefits of this new approach, for faculty, students and the program will be highlighted.

Introduction

Section II.E.3.c (10) in the Accreditation Policy and Procedure Manual of ABET describes the requirements regarding samples of student work. It states:

Representative samples of student work that reveal the spectrum of educational outcome. In order to make a qualitative evaluation of a program, it is necessary that the institution exhibit teaching materials such as course outlines and textbooks for all courses required for graduation. Sufficient examples of student work in technical, mathematics, and science courses must be available to the visiting team for the entire campus visit. The examples should show a range of grades for assignments, including homework, quizzes, examinations, drawings, laboratory reports, projects, and samples of computer usage in technical courses. Examples must also be presented to demonstrate compliance with the requirement for student competence in written and oral communications.¹

To meet this directive, student assignments such as quizzes, homework assignments, laboratory reports and tests, related to a particular course, were typically duplicated and grouped in binders as display items for ABET evaluators. Each course would contain examples of poor, average and exceptional student work gathered in a tabbed binder. This was provided to ABET program evaluators as an illustration of the achievements of students, proof of student learning.

Then came the shift in ABET criteria to a more assessment driven process. Now there is an expectation to demonstrate student learning and active engagement. Clearly, Xeroxed copies of traditional assignments are not adequate evidence of group work, experiential learning and other active instructional techniques. Simply providing these traditional assignment samples does not adequately reflect student-student interactions, learning which occurs through group activities and other instructional methods which do not readily translate to paper. Certainly, these creative endeavors benefit the student, enhance learning and are important evidence of the achievements of students. A disconnect results between the expectations of program evaluators and the ability of faculty to successfully document learning activities in forms which neatly fit into binders.

Several years ago, ABET began an intensive program of face-to-face training for new ABET program evaluators. This in-depth program includes pre-work to build a foundation for the weekend-long training session. During both the pre-work and face-to-face sessions, great effort has been put forth by ABET to help program evaluators (PEVs) set expectations for needed assessment evidence from the institution. PEV training materials include the following section:

“What to Look for in Course Materials:

- Courses appear appropriate to accomplish the Program Educational Objectives and Program Outcomes.
- Student work indicates active engagement and demonstration of learning.
- Evidence with respect to specific Outcomes (including those in the criteria) as appropriate to the assessment plan.”²

With this in mind, newly trained evaluators may be looking for multifaceted types of student learning evidence in contrast to established ABET evaluators who have many visits to their credit. In the years to come, there will be more evaluators who have heard the call for the demonstration of student learning rather than quizzes and tests in a binder. What techniques can colleges and universities employ to meet this challenge? How can the students benefit from this change? Will the successes of a program be better illustrated when student achievement and learning are clearly evident?

Discussion

Changing definitions of assessment

There has been a recent shift in teaching strategies from assessment which is based on test construction and scoring to the consideration of techniques like portfolios and reflection. Essentially, traditional student assessment focused on “measurement.” This resounded well with engineers who are very good with problems which result in numerical answers. Traditionally, the word assessment and test were synonymous.³ Yet, there is emerging evidence that there are limitations to this model. Assuming assessment and learning are closely linked, objective tests, written on paper, do little to document student learning of a wide variety of important course objectives, such as working in groups or creatively synthesizing ideas. Essentially, assessment has shifted in its focus to include the wide variety of experiences which lead to the achievement of course and program outcomes. Good assessment documentation has shifted to encourage the evaluation of the *educational process* (how did the student learn) not just result (an exam grade).⁴

ABET, in its shift to a wide spectrum of student benchmarks (the development of a-k learning outcomes), supports the use of multidimensional assessment tools to evaluate both the achievement of individual outcomes and the student experiences which led to that achievement. Thus, faculty need to provide (and site evaluators want to see) documentation of the unique student activities that lead to a successful exam or laboratory report.

Educational theory provides several types of assessment which can drive instructor activities. Autonomous assessment shifts the burden of assessment to the student themselves. Examples of

this type of assessment include self and peer reflections, contracts and portfolios. Competence-based assessment integrates Blooms Taxonomy to include case study analysis and simulations. In this type of activity, students must demonstrate what they “can do” (put into practice) not what they know (repeat back). Fundamentally, this educational theory expands assessment from the quiz/exam model to the need to analyze transferable skills such as the ability to work in a team, search for information, analyze data and communicate effectively on a variety of levels.

Benefits to both the students and the institution

One of the greatest frustrations reported by faculty is student surprise at the receipt of a grade. Reality for some students does not include adequate or appropriate understanding of the success in a particular class. “The teacher gave me a C” is a common complaint heard from students, when the reality is that the student earned the grade. When assessment is frequent and in a variety of forms students can self-monitor, self assess and self adjust their efforts in a course or program. Students can proactively self monitor and self adjust, evaluating what strategies are working, what activities are not. In addition, they can evaluate what should be done to improve their understanding of course material.⁵ Self-understanding is the cornerstone of life long learning. Multifaceted feedback, occurring frequently in a course, can support the important educational outcome of life long learning, built on self awareness.

While not overtly stated, materials reflecting assessment efforts must be easily available and understandable to the ABET program evaluators. From a practical perspective, assessments must be copied and stored in binders or available electronically. There is a tremendous derived benefit for the students who participate in these activities. A piece of paper, reflecting student achievement, is indisputable evidence of progress in a course. There can be a transfer of ownership of grades from the faculty member to the student.

A second positive impact on the students reflects the creativity and consistency which is required to document student learning through assessment. As faculty identify and implement new assessment techniques, students essentially are provided more opportunities to reinforce the course material. For example, a course at our institution encouraged informal study groups to assist the students. In the search for the documentation of student learning, formal study groups were assigned and required short, self-reflections, based on the activity of the group. This demonstrated the value the instructor placed on the benefits of the study groups (resulting grade analysis showed marked improvement) promoting student commitment to the idea. The student perception that the study group “counted” towards their grade also impacted their intrinsic motivation to participate. Overall, this implementation was very positive for students and provided some evidence of student transformation and success in achievement of course objectives.

When program evaluators visit institutions, they have a very short period of time to understand the program and its impact on society. The addition of enhanced student work materials, which reflect student achievement and learning, can substantiate the positive outcomes documented in the institution’s self study booklet. This allows the program to be portrayed in a very positive light (assuming thorough and timely assessment matches appropriate learning activities). The student work samples can provide evidence of student success in irrefutable ways.

Documenting student learning, techniques for success

As instructors have become more creative in their teaching methods, they must become more creative in the ways they document student learning. Tools to assess and document student learning in the classroom include the use of minute papers, as presented by Angelo and Cross.⁶ Similar to the minute paper is a short, yes/no topic survey shown in the appendix. Handed-out at the very last minute of a lecture period, these very short reflections require students to summarize their perception of the instructor's lecture message. This facilitates the critical thinking of students as they identify and summarize the most important concept of the day. In addition, this approach provides the instructor a measure of student understanding of the material presented.

Internet-based testing programs allow faculty to offer iterative self-assessment quizzes. Requiring students to repeat the quiz until they can successfully meet a pre-determined score encourages students to master the concepts using immediate feedback indicating wrong answers. The number of attempts required to reach the minimum score and the overall achievement of a class are excellent indicators of material mastery for instructors. In addition, the repetition can document persistence and determination of class participants. Fundamentally, the data available from this type of exercise can be more fruitful and meaningful than basic results from a single quiz attempt. To an ABET program evaluator, student efforts reflect their desire to learn the concepts and document actual mastery of it.

Audience participation devices, often called clickers, can engage students in the classroom in a variety of ways. These devices allow course participants to provide individual responses wirelessly which are analyzed by software and collectively reported on a projected image. Brief questions interspersed within a lecture document the learning process in the classroom. Instructors can use integrated software to track student grades, commonly chosen incorrect answers and progress over a semester. Spreadsheets summarizing this data are especially poignant to program evaluators as they can illustrate the student learning process throughout one lecture, not just throughout a semester.

Blogging can be useful to encourage student self-reflection over time. Traditional journals have been incorporated into the classroom for years. However, the use of a technologically enhanced journal is attractive to younger students (especially those in STEM fields) and yet provides documentation of student transformation during a course. Instructors can interpret the blogs to identify student concerns and difficulties as well as celebrate successes. ABET evaluators are provided concrete evidence of self-reflective student observations.

In some classes, application cards can be a useful assessment technique. In this process, students are provided an index card at the end of the lecture. On the cards, they must identify a use or application for the technique or process which has been explained during that lecture. Students are encouraged to examine common consumer applications or other elements from their personal experience in order to link the theory from the classroom into the practical world of application. These cards can assist the instructor in determining the ability of students to synthesize information into everyday experiences.

Most faculty hope that students spend time reviewing graded exams, identifying areas of weakness and reworking difficult problems which contained errors. To encourage this desirable behavior, written reflection assignments, which require students to complete a short reflection piece, can identify areas of strength or weakness. This can encourage the return pathway of information which guides the student in self-awareness. In addition, students who are required to rework problems as part of this exam reflection can improve concept understanding. Lastly, this multilayer information flow between student and instructor documents the learning process in unique ways to ABET site visitors.

Rubrics are powerful tool for assessment and once designed, can be very simple to use. Rubrics clearly articulate specific and usable criteria to evaluate student performance. Students are provided very clear expectations over a range of performance levels. Rubrics are a valuable way of documenting objectives that do not lend themselves to traditional grading techniques. Examples include team work, appreciation of diversity and societal awareness and understanding.

Within the laboratory setting, rubrics can be used to include several layers of assessment. For example, at the beginning of the semester, the instructor provides the list of behavioral qualities found in the center of the lab partner rubric in the appendix. Students are asked to prioritize these qualities and discuss their rankings with their group. At the end of selected laboratory experiences, the group members are asked to complete the survey portion of the lab partner rubric, evaluating both their partner and themselves on the same items discussed on the first day. This process not only articulates behavioral expectations (important among lab partners) but enables the instructor to obtain data which reflects the success of group work. A second teamwork rubric is shown in the appendix. This is useful for larger groups and is also a method for analyzing collaboration and cooperation.

The Angelo and Cross book is an exceptional resource for many, many additional ideas which can be adapted to unique classroom or laboratory situations. The examples provided in this paper are only a tiny fraction of the multiple assessment techniques available in this useful tool.

Evaluator experiences

Informal interviews with current ABET site evaluators indicates few have seen the types of documentation described earlier in the paper and encouraged by ABET. Evaluators were specifically asked whether they had visited institutions that provided samples of student work which expanded beyond tests and homework assignments. One evaluator spoke of the use of senior projects to illustrate the breadth and depth of student learning but most experienced the traditional model of a binder filled with Xeroxed copies of student papers (homework assignments, laboratory reports, exams).

Interestingly, several evaluators mentioned that student work samples have been a subject of team conversation and discussion. For example, one evaluator described a situation where concerns were raised when student learning (outcome) was solely based on the grade that the student received. These reports suggest that program evaluators look for multi-faceted

documentation and have concerns when the evidence is not available. With this in mind, one interesting anecdote was quite informative. During an ABET visit, the site evaluator expressed dissatisfaction with the samples of student work provided. Clearly he was looking for “more” although he did not articulate his needs. After the visit, and based on the evaluator comments, it was obvious that the institution did not present clear and convincing evidence of the tremendous transformation and success of its graduates during their classroom experiences. Additional documentation, which could demonstrate the classroom success of the students, was seen as vital to the overall impression of the instructional quality of the program.

Conclusion

Assessment activities, well constructed and implemented, can demonstrate the continuous improvement of the educational experience. As higher education and ABET shift toward a multifaceted approach to assessment, samples of student work, available to program evaluators should reflect the learning process. Fundamentally, the traditional process of placing homework assignments, tests and quizzes into binders, sorted by course may not reflect the multifaceted student achievements expected in program outcomes ABET a-k. A new approach to student work samples will better meet the expectations of program evaluators and support institutional claims of student success. Faculty need to be creative in new ways, offering students a wide variety of opportunities to document their learning experiences. While these new techniques will enhance the course portfolios offered to program evaluators, they will also engage the students in new ways and support the learning process. In addition, programs will better document their powerful educational impact.

Bibliography

¹ABET. Accreditation ABET Policy and Procedure Manual. Baltimore, MD, 2007.

²ABET. Program Evaluator (PEV) Face-to-Face Training Materials. Baltimore, MD, 2008.

³Falchikov, Nancy. Improving Assessment Through Student Involvement. New York: RoutledgeFalmer, 2005.

⁴Banta, Trudy, et al. Assessment in Practice. San Francisco: Jossey-Bass, 1996.

⁵Wiggins, Grant and McTighe, Jay. Understanding by Design. Upper Saddle River, New Jersey: Pearson Education, 2006.

⁶Angelo, Thomas and Cross, K. Patricia. Classroom Assessment Techniques: A Handbook for College Teachers. San Francisco: Jossey-Bass, 1993.

Appendix

Example of a topic self-assessment short survey

	Yes	No
I have a good understanding of topic presented		
I believe the goals of the presentation were clearly identified		
The activities (sample problems, etc) presented supported my understanding of the material		
I found this topic interesting		
I feel confident this topic will support my overall degree objectives		

Example of Lab Partner Rubric, suitable for groups of two

Please complete the following table to evaluate your own work and that of your lab partner.

Me: _____			Did you/she/he	Lab Partner: _____		
Did not meet my expectations	Met my expectations	Exceeded my expectations		Did not meet my expectations	Met my expectations	Exceeded my expectations
			Arrive on time to lab.			
			Come prepared for lab.			
			Help wire the circuit.			
			Help take data.			
			Help organize data.			
			Help write the report.			
			Discuss and contribute to conclusions.			
			Do what s/he says s/he will do.			
			Answer OnCourse Mail promptly			

Example of a teamwork evaluation, suitable for larger groups

	<i>Excellent</i>	<i>Average</i>	<i>Poor</i>	<i>Ex</i>	<i>...</i>	<i>Avg</i>	<i>...</i>	<i>poor</i>
Contributions (quality/management of quality)	All members routinely contribute quality & useful ideas and information; the team evaluates all ideas and uses only the best.	Most (but not all) members contribute useful ideas & information; or the team as a whole adequately integrates the ideas presented	Internal conflicts results in team failing to achieve projects goals					
Division of labor (equality/quantity)	All members make significant contributions & are accountable to complete assigned tasks	Progress is satisfactory, but unequal workload is observed	Serious problems due to unequal workload					
Communication (within the team)	Consistent communication throughout project; insightful use of real and virtual meetings: meetings are productive	Adequate number of meetings (real or virtual)	Inadequate meetings and communications					
Professional conduct	All team members consistently behave in a professional manner (show up for meetings prepared and on time, treat other team members with courtesy & respect) & seek outside advise if team is not productive	Team members usually behave in a professional manner; do not repeat the same error & accept outside advise if team is not productive	Team members frequently fail to behave in a professional manner: team does not seek outside help					
Group discipline	Stays focused on task; finds solutions as problems are encountered. Uses sound principles of inquiry when analyzing problems & seeking solutions.	Adequate focus to complete task; some problems are discounted until a later time	Totally lacks focus; problems are discounted; team does not take responsibility for failures of the group					
Group dynamics	Synergy	Majority of team members willingly participate; team functions adequately	Everyone going their own way					