Voices of Students: Incorporating Focus Groups for Assessment

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Abstract – Improvement is imperative to success. With changes in technology, education, and engineering, ABET demands continual program development. Student feedback, although often gathered, does not have the same honed method for collection and analysis. This paper examines the effectiveness of student focus groups and synthesizes the gathering process and the resulting improvements in a Mechanical Engineering program at the US Coast Guard Academy. A subjective test is performed on each comment. By tabulating and summing these comments, ABET (a) through (k) student outcomes are indirectly assessed for the program overall and within each program element. This will provide active, quantitative data for ABET General Criteria 4—Continuous Improvement. Collated data from two years of student focus groups implicates different program improvements and demonstrates program successes. In addition, the study gives a better understanding of focus groups and the influences on their accurate assessments.

Keywords: Focus Group, ABET, Student Outcome, Continuous Improvement

INTRODUCTION

All institutions seek improvement. ABET General Criterion 4 requires continuous program improvement for all engineering education institutions. Multiple means exist to gather data, however they have inconsistent administration as not everyone completes them, their timing is questionable, and their success depends on the questions. Focus groups address many of these problems. Focus groups are defined as the collection of data on a topic the researcher determines through group interaction [8]. Complications include group dynamics, the proctor, the questions asked, and data analysis. Despite these drawbacks, the value provided outweighs the cost of the labor. It should be noted that focus group feedback should be combined with other program assessments.

The feedback can be from faculty, graduates, employers and students. Interestingly, student feedback often does not have a refined method for analysis. This study compares the results from 2009 and 2012 seniors at the Mechanical Engineering program at the US Coast Guard Academy. A subjective test is performed on each comment to establish which ABET student outcome the comment affects and if the comment is positive, negative, or neutral. By summing these comments, (a) through (k) outcomes can be assessed for the program over time. From these studies outcomes (c), (d), (e), and (k) display clear improvement, while (g), (i), and (j) still need improvement. The advances are made in the accessibility and use of the Machine Shop, the capstone time line, and a sense of pride in student accomplishments. The remaining program shortcomings demonstrate a lack of inter-major integration, minimal programming exposure, and inadequate faculty involvement in the capstone process respectively.

References

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CURRENT PRACTICES FOR CONTINUOUS IMPROVEMENT

Multiple methods assess strengths and weaknesses of an engineering program to allow for improvement in course content, faculty teaching, and program effectiveness. Few methods include student feedback. A literature review investigated current practices that incorporate student feedback for program improvement.

Faculty Course Assessment Report

The Faculty Course Assessment Report (FCAR) constitutes a standardized report from each instructor on their course content and the accomplishment of the student outcomes [6]. Self-reporting removes misunderstanding and third party bias as the source directly contributes information. Unfortunately, the FCAR system only requires the incorporation of student feedback if it can be obtained in a timely fashion. FCAR’s often lack student feedback because course surveys rarely provide timely enough feedback due to the necessity of data processing and comparing.

Gap Analysis

The existing ABET accreditation assessment includes evidence collection and gap analysis for course material [2]. Every instructor submits electronic copies of exams, projects, and assignments. Documents are reviewed and the applicable student outcomes are correlated with each piece of evidence [2]. Reviewing this evidence clearly displays which (a) through (k) student outcomes the program is lacking. Continuous improvement is created, but similar to the FCAR, it is lacking emphasis on how the student receives the program.

End of Course Survey

MAJ Dorminey and LIEUT COL Zimmerman give attention to student feedback in Bringing Feedback into the Course Development Loop. Troubles with students’ understanding of fluid mechanics concepts convinced the two teachers at the US Military Academy to alter the course’s design project [3]. The changes were based on the previous year’s end of course student feedback. The teachers found both the rapport between faculty and students as well as student motivation increased when they valued the students’ feedback [3]. The success of the course improvements suggests the significance of student feedback and questions why student feedback is not included in overall program improvement.

Each of the reviewed methods fulfills the ABET Criterion 4 of continuous program improvement by using a unique method. The fluid mechanics design project demonstrates the potential success of a program if more time and emphasis were dedicated to student feedback.

CURRENT PROFESSIONAL AND ACADEMIC FOCUS GROUP APPLICATIONS

Focus groups are common in small education and large professional applications. Yet, focus groups are infrequently included in overall program improvement for education. The difficulty of compiling data and directing focus groups usually causes this scarcity. An analysis of different focus group applications formulates effective procedures for a student-based focus group.

Library Construction at North Carolina State University

Industrial applications of focus groups revolve around customer behavior and preferences. A focus group allows different customers to directly provide personal feedback. The North Carolina State University utilized student and faculty focus groups to design a new library. This gave the consumers – students and faculty – an opportunity to react to the building plan, raise user-centric questions, and propose useful ideas [5]. Viewing students as consumers provided new understandings of how university libraries are used and yielded a library made for user interface.

Introductory Course at Ohio State University

Student focus groups improved individual courses at various institutions. The Ohio State University struggled to integrate first and second year students into the mechanical engineering program since an educational rift existed between the introductory level design material and capstone design expectations [1]. A new sophomore design course closed the gap. A combination of rubrics, surveys and focus groups assessed an initial pilot course. The student feedback stated that the course objective was solely the fabrication of a final project and not the establishment of the necessary groundwork. The full implementation of the course focused on growing foundational
knowledge and introducing the design process [1]. The feedback gathered from the focus groups determined the final curriculum. Information of equal value could be found in focus groups for an entire engineering program.

**Agile Teaching at the University of Washington**

Project development is a valuable application of focus groups. The software engineering department at the University of Washington uses a teaching technique known as agile in the senior design course. Agile teaching produces continuous project improvement with rapid feedback loops. One feedback method is termed *post-milestone project discussion meetings* [10]. Project advisors work with design teams to review the last milestone and project a direction for the next milestone. This format establishes a relationship between the advisor and design team that cultivates communication and allows the advisor to see the inner mechanics of the team [10]. The design process is driven by the dynamic nature and rapid assessments of the focus group. As a student moves through an engineering program a similar agile mentality would provide continuous feedback for program improvement.

An increasing number of venues capitalize on the valuable information found in focus groups. Industry finds valuable information regarding customers. Feedback from faculty, alumni, and students shapes courses. And team focus groups determine project direction. Each application yields large benefits to the constituent and suggests wider use of focus group feedback.

**ABET Significance of the Focus Group Format**

The Mechanical Engineering department at the US Coast Guard Academy is ABET accredited. Accordingly, it pursues all 8 general criteria. Criterion 4 requires the regular use of appropriate, documented processes for program assessment and evaluation to be used in continuous program improvement. Criterion 4 is loosely defined but a vital criterion to program longevity. A variety of methods help fulfill this requirement.

Gap analyses, end of course surveys, and exit interviews constitute a program assessment to determine its ability to accomplish the student outcomes. Each achieve Criterion 4’s requirement for concrete documented feedback and while also forming a benchmark to track program improvement. Despite providing useful information, all three feedback methods occur at the end of a course or degree. This frequency does not meet ABET’s demand for regular use of evaluation and feedback. Using focus groups throughout a course and throughout a degree would allow for continuous feedback and program improvement. In this fashion, the student could see immediate action resulting from their feedback.

Focus groups and similar interviews seek verbal feedback. The usefulness of the feedback found in this manner is largely due to its unfiltered nature. Verbal feedback provides insight into the sentiments of the group and general areas requiring improvement. Another benefit is participants can more easily provide weaknesses at the same time as proposing improvements. To properly fulfill Criterion 4 the focus group must be accurately and effectively documented in a reportable fashion.

**Benefits of the Focus Group Format**

The value of focus groups can be lost if care is not taken to ensure proper implementation. This requires a general understanding of what makes a successful focus group. The psychology of focus groups and the inherent factors such as the proctor, group dynamics, and topics all factor into the value of the focus group feedback. One of the aspects of focus groups that make them unique is their ability to provide insights into the underlying reasons and motivations for complex behaviors. This is largely because the participants explain themselves to each other as well as the proctor [8].

The proctor is vital to a successful focus group. The proctor controls which questions are asked, determines when a topic is concluded, and decides when amplifying information is necessary [8]. They require knowledge of the topic to prepare relevant questions and to ask questions for greater clarity when necessary. The proctor must display a neutral attitude so their presence does not influence what is said. They must also make it clear that disagreement is acceptable to allow for free flowing discussions as people give and explain their positions [9]. Intuitively, the proctor must have no influence over the future success of the participants.

Group dynamics influence what people say. One weakness of focus groups is understanding what people are willing and not willing to disclose in front of others. Many other means of gathering data such as surveys can be anonymous...
and allow the participant to be honest in ways they may not be in front of peers. This affect has not been measured
or quantified, but its presence in focus groups is undeniable [8]. Mitigating entails proper questions and recognizing
aspects individuals may not be willing to discuss openly and using alternative means for their analysis.

The influence of the majority is a concern as well. Studies have been conducted regarding the polarization of
people’s attitudes and decisions. Often polarization of attitudes in group settings can make decisions and opinions
more extreme, however they can also have the opposite effect and reduce the extremism [4]. Performing multiple
focus groups prevents any type of polarization from grossly affecting the results.

To mitigate the affect of these artificial pressures, group size should be moderated. Acceptable numbers generally
range from 5-12. The smaller the number, the better the focus group is for emotional topics while larger groups are
more beneficial for neutral topics. Smaller groups are better at hearing each participant while larger groups allow for
a more efficient means of reaching more opinions [8]. Multiple focus groups are performed on a particular topic to
accurately represent all apparent opinions. Krueger concludes that three to four separate focus groups is the
appropriate amount to achieve effective saturation of comments [7].

Given that focus groups can be affected by the psychological aspects discussed, it is imperative that they be given in
an effective manner. If performed well, focus groups will yield valid data for compilation and analysis. If not, results
may be incomplete. The following section discusses measures were taken in this study to maximize effectiveness.

**TWO PILOT FOCUS GROUPS AT THE US COAST GUARD ACADEMY**

For the US Coast Guard Academy study focus groups, the proctors are two professors. They have an intimate
knowledge of the Mechanical Engineering major and students. In addition, one is a graduate of the US Coast Guard
Academy and can relate to the military aspects of cadet life. The students will not have these professors for classes
again so nothing said can be held against them. When both professors were present, one recorded. In a few instances
only one was present and that individual recorded and questioned.

Each focus group contained 5-7 cadets. Given that the topic is more emotional for the students, smaller groups allow
for the opinions to be expressed more easily and allow each cadet to answer questions. The number is large enough
to provide sufficient conversation among the students. Since, a few voices may overpower those of the majority. The
focus groups are repeated up to five times for each class year to normalize the data.

The comments and testimonies of the students must be compiled and analyzed in a means that is accurate, efficient,
and repeatable. To best achieve these results, a spreadsheet was created. Comments are placed in the following
sections: Career, Class Material, Lab, Experiential Learning, Senior Design, Faculty, Program, and Underclass. If a
comment pertains to two or more, it is placed in each of them.

The implications of each must be organized to determine areas of concern and success. The ABET (a) through (k)
criteria is across the top of the spreadsheet. Any comment that applies to a specific criterion is marked under it. As is
important to establish what type of comment is under each criterion, comments are marked as positive, negative or
neutral. Some comments are both, i.e. “I like this, but...” In such instances, the two aspects are separated and what
is liked is marked as one comment and what needs improvement is a separate comment.

<table>
<thead>
<tr>
<th>Comment</th>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
<th>(f)</th>
<th>(g)</th>
<th>(h)</th>
<th>(i)</th>
<th>(j)</th>
<th>(k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pride in Accomplishments</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not Well Prepared for Programming</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Heavy Emphasis on Grades Over Learning</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lack of Recognition</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>
Table 1 demonstrates the process for some senior design feedback. Comments are often repeated so a tally is kept of similar comments. The tally of positive, negative and neutral comments is summed for each (a) through (k) category. The totals for each are then compared on a line graph to give a visual representation of the results.

Figures 1 and 2 contain the results from each year. The outcomes are listed below and the positive and negative tallies are side by side. The lack of positive comments does not necessarily indicate weaknesses, as the focus group is more concerned with possible improvements. Far more students were involved in the 2012 study, thus while the number of comments for each category may be higher, it is the overall comparison that must be analyzed.

### PROGRAM RECOMMENDATIONS AND FOCUS GROUP IMPROVEMENTS

Focus groups were performed at the conclusion of the 2009 and 2012 academic years with small groups of graduating students. The data from each was analyzed and compiled in the ABET outcomes spreadsheet. Notable changes had taken place in the sentiments of the students regarding different elements of the mechanical engineering program. Some of these changes represented program improvements that were made in the three-year period between the two focus groups while others represent outcomes that need further improvement.

After the 2009 focus group, program improvements were made from feedback provided by the students. These improvements were observed in the 2012 focus group as a commendation or lack of comment. Outcome (c) was improved through alterations of machine shop management and operation. The power lab was reorganized and machinery was more readily available, which provided a venue to better learn the designing, prototyping and manufacturing process associated with component design. The senior capstone class became a year long class consisting of one semester of design and a second semester of prototyping, which grew the understanding of multidisciplinary groups and thus improved outcome (d). Finally, teams were charged with more engaging capstone projects, which honed the teams’ abilities to solve complex engineering problems. This bred pride in the students’ capabilities while also improving outcome (e). Outcome (k) likewise improved as there was better Solid Works training for both students and faculty, greater use of the CNC machine and an additional 3D printer. This allows for increased ability to use techniques, skills and modern engineering tools.
Other comments were repeated in both years. Outcome (g) needs further innovation to increase communication between students and faculty as well as between faculty. Although students had more pride in their accomplishments, a negative atmosphere and focus on quantity over quality made grades emphasized over learning thereby hindering student ability to recognize the need for life-long learning affecting outcome (i). Outcome (j) is also lacking as little is told to the students regarding engineering in the fleet and modern world. Although outcome (k) did improve greatly, more programming classes earlier in the degree and increase familiarity with available technologies was still desired.

After performing and analyzing two focus groups, two improvements to the focus group process became evident. First, if the focus group participants are shown the direct impact of previous focus groups, the students will be more inclined to share valuable commentary. Second, focus groups should be performed earlier and more regularly throughout a student’s progression through the mechanical engineering program.

We also found that when presenting data from focus group feedback two considerations must be made. The analysis of each comment is subjective based on the data analyzer and could be more objective with the use of a panel of analysts. Focus groups must also be appreciated as a critique session and therefore the data they yield will be critical in nature.

The noted improvements to student outcomes (c), (d), (e), and (k) were reported to the mechanical engineering department as strengths and likewise the deficiencies in student outcomes (g), (i), and (j) as areas for improvement. More frequent focus groups will be implemented earlier in the program with the participants being shown the impact of past focus groups’ feedback.

**CONCLUSION**

ABET demands continuous improvement, but student feedback is often disregarded for changes. FCAR does not even require it from students if it is not obtained in a timely fashion. Yet, treating the students as consumers has been successful in understanding how students receive a program. Different techniques exist to understand student opinions and thoughts; one such is focus groups. Focus groups reveal aspects of peoples’ opinions other means do not. It should be noted that focus groups should be used in conjunction with other inputs for best success.

The Mechanical Engineering department at the US Coast Guard Academy used two sets of focus groups to understand what improvements students desire. Data was taken from seniors of the classes of 2009 and 2012. The success of any focus group depends on the proctor, group dynamics and the willingness of the participants. Care was taken to ensure the success in choosing the proctor, focus group size and repetition. The results give value to the program and to understanding focus groups.

Comments were quantified and compared to the ABET (a) through (k) criteria. Results showed some improvements had been made in certain criteria while others were lacking. Better understanding of focus groups also became evident. More focus groups other than just senior year would allow the students to benefit from their own input and be more involved in the major. Finally, the analysis is subjective to the data analyzer and a panel would be a more subjective means of analysis. Given the results of these focus groups, it is clear that they should be used more often and student feedback should be incorporated more often in a program for better improvement.

**REFERENCES**


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