
AC 2011-375: RELATIONSHIP BETWEEN ABET-TAC CRITERION 3 A-K STUDENT LEARNING OUTCOMES ACHIEVEMENT

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Relationship between ABET-TAC Criterion 3 a-k student learning outcomes achievement data and student's self-assessment of learning gathered from student evaluation of teaching surveys.

Abstract

Assessment and evaluation of student learning are important considerations for Engineering Technology programs. ABET-TAC standards require that educational objectives and outcomes be chosen by the program and its constituents, measured by various means, and that the results be used to improve the program. The data that is collected should be triangulated in some fashion for the results to be considered valid. A large part of our program's data assessment methods can be classified as direct assessment, that is, using tests, papers, homework, and lab exercises that measure the student's learning or achievement of Criterion 3 a-k student outcomes. We collect data all through the curriculum, in freshman through senior level courses, usually for two to four student learning outcomes per course.

In those same courses, the university requires a formal student evaluation of teaching survey at the end of the semester. Our university uses the IDEA system that includes asking the students to assess their own "progress on objectives" on up to 12 different objectives. The results of the IDEA student surveys can be classified as an indirect measure, which can be used to triangulate our own direct measurements. Our research into engineering education research literature did not find any results of studies that attempted this method of data triangulation.

Our program constructed a mapping table between our ABET-TAC a-k student learning outcomes and the IDEA learning objectives. We collected two years' worth of data on those matched outcomes and objectives, gathered from the same courses. Our analysis shows results that are statistically significant, but vary for different course instructors. We see either no correlation, or a small-value negative correlation, between these two measures of student learning. This type of conclusion has been reported by studies in educational fields other than engineering. The paper concludes with discussion of the results and suggestions for further research.

Introduction

Assessment and evaluation of student learning are important considerations for Engineering Technology programs. ABET-TAC standards require that educational objectives and outcomes be chosen by the program and its constituents, measured by various means, and that the results be used to improve the program. The data that is collected should be triangulated in some fashion for the results to be considered valid. This paper reports on a study to investigate a possible way to triangulate our program's ABET student learning outcomes assessment data. For our Electronics Engineering Technology (EET) program, a large part of our ABET assessment method is a data collection process that is classified as direct assessment¹ of student achievement, that is, using portions of tests, quizzes, homework, and lab exercises that measure the student's learning or achievement of ABET's Criterion 3 a-k student learning outcomes². We collect data all through the curriculum, freshman through senior levels, usually for two to four student learning outcomes per course. In those same courses, the university requires a

formal student evaluation of teaching survey at the end of each course. Our university uses the Individual Development and Educational Assessment (IDEA) system, out of Manhattan, Kansas, which includes asking the students to “describe the amount of progress you made on each [course] learning objective”, which is an indirect measure¹ of student achievement. Since this is a required activity, our program wondered if we could use this data as a part of our ABET assessment process. We constructed a mapping table (Figure 1 below) between the IDEA learning objectives and the ABET student learning outcomes. We developed this research question: Is there a correlation between the adjusted IDEA student survey progress on learning objectives scores and the corresponding ABET student learning outcome assessment scores?

Assessment definitions and concepts

Since 2000, under ABET criteria, institutions must directly demonstrate through assessment and evaluation that they are reaching the desired outcomes of the program³. We will start with some assessment definitions. Throughout this paper, we will change some of the terms used by the original authors of the research cited to our interpretation through a common set of definitions, which include:

Assessment - the act of collecting data or evidence that can be used to answer classroom, curricular, or research questions.

Assessment methods - the procedures used to support the data collection process and are an important consideration in any educational research design.

Evaluation - the interpretations that are made of the evidence collected by an assessment method about a given question.

Triangulation - using multiple measures to collect data and using the combined results of the measurements to better inform the researcher’s interpretation of the data

Validity – extent to which the evidence supports the interpretations made of assessment evidence are correct

Reliability – Consistency of repeated measurements of assessment scores³

Additional terms that need to be defined are:

Student learning outcomes – the ABET-defined term for what students should know or be able to do¹. These are defined by ABET in Criterion 3 a-k.

Progress on learning objectives – The IDEA-defined expression used to ask students their opinion on whether they learned more/are better able to do specific actions as a result of taking a course⁴. See Figure 1 below for the 12 IDEA learning objectives.

Note that the phrases “student learning outcomes” and “learning objectives” mean basically the same thing; they use different terms as defined by different organizations.

An assessment plan for a program needs to be a well-defined system. McGourty in 1998 described his group’s work in developing a comprehensive assessment program for engineering education. He says that assessment methods can include surveys, portfolio reviews, capstone projects, embedded work samples, interviews, self and peer assessment, and industrial advisory boards⁵.

Gloria Rogers breaks down assessment methods into the categories of direct and indirect assessment, and reports that there has been much confusion in the ABET community about these

concepts, such as “Do you have to use both when measuring student learning?” Direct assessment methods are most familiar to faculty, in that they are direct examination or observation of student knowledge or skills, gathered from exams, quizzes, demonstrations, and reports. These assessment methods provide a sampling of what students know and/or can do and provide strong evidence of student learning. Indirect assessments of student learning assess opinions or thoughts about student knowledge or skills. Indirect measures can provide information about student perception of their learning. However, as evidence of student learning, indirect measures are not as strong as direct measures because assumptions must be made about what exactly the self-report means.¹ Rogers also asserts that it is important to remember that all assessment methods have their limitations and contain some bias. A meaningful assessment program would use both direct and indirect assessments from a variety of sources¹.

Our EET program received its initial ABET-TAC Accreditation in 2006. We spent much time in the preceding years deciding on what direct measures of assessment we should do in which courses in the curriculum. After our process was set up, we wanted to do what Moskal recommends, which is after an initial assessment process is set up, “greater attention can be paid to concerns of validity, trustworthiness, triangulation, and the completeness of the plan”⁶.

In Borrego’s review of engineering research including such topics as assessment, it was found that the reliability and validity of the tests and homework assignments developed by programs are usually not established⁷. This is certainly the case for our EET program. We write all our own tests, quizzes, etc., with no peer review, pre-test/post-test or random group testing of the instruments. That is something that we hope to do in the future, as a part of our continuous-improvement process. So, as Borrego continues, it is important for us to consider other sources of data for triangulation when evaluating our assessment data⁷.

In a review of research literature we did not find any examples in the engineering education field that in general have tried to find a relationship between direct and indirect learning assessments, but Terenzini proposes to do so⁸. In 2004, ABET commissioned *Engineering Change*, a study of the impact of Engineering Criteria 2000 (EC2000) on the preparation of undergraduates for careers in engineering. Collected from that study is a database of EC2000-specific self-reported student learning outcomes, including engineering program outcomes. A second dataset, the Multiple-Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD), compiles institutional data, including Fundamentals of Engineering (FE) scores. In his paper, Terenzini proposes a design to combine data from the two databases to assess the correspondence between the self-reported student learning outcome measures in the *Engineering Change* study and the MIDFIELD dataset's information on program-level performance on the FE examination, which Terenzini asserts is the only objective test of students’ engineering knowledge⁸. At the time this paper was written, the author could not find the results of this study.

Literature review of student evaluation of teaching

According to Cashin in 1995 “There are probably more studies of student ratings than of all the other data used to evaluate college teaching combined”⁹. One side of the argument is that student

evaluations are not only invalid, but are actually dangerous to use. Nuhfer sums up the main objection to evaluations with this statement “Either by design or default, institutions often place great weight on student rating data in making decisions that impact faculty rewards, career progress and professional growth¹⁰.” McKeachie called this practice “deplorable”¹¹. Even Marsh, in a positive review of student evaluation, says that student opinion surveys are viewed with some skepticism by faculty as a basis for personnel decisions¹². Unfortunately, student opinion survey data is often used in promotion and tenure decisions.

Feldman, in another favorable review of student opinion practices in 2007, states what he calls the “Not-true Myths” about student evaluation of teaching. A few of those are:

- Most student rating schemes are nothing more than a popularity contest, with warm, friendly, humorous instructors emerging as winners every time.
- Students are not able to make accurate judgments until they have been away from the course and possibly from the university for several years.
- Student ratings are both unreliable and invalid¹³.

All of these negative views of student opinion surveys have to be considered, but the facts are that many universities require their use, so we need to make sure that properly constructed student evaluation systems take these negative views into account.

Several meta-analysis studies of independent studies on the validity of student evaluation of teaching have been conducted over the years. Cohen, in 1981, found that the average correlation between an overall instructor rating and student achievement was +0.43. These results provide strong support for the validity of student ratings as measures of teaching effectiveness¹⁴. In 1987, Marsh found that student evaluations are multidimensional, quite reliable, reasonably valid, and are relatively uncontaminated by many variables often seen as sources of potential bias¹². He also details some negative implications, such as that student ratings may have some halo effect, have at least some unreliability, have only modest agreement with some criteria of effective teaching, are probably affected by some potential sources of bias¹². Feldman states that almost all of the available research does show a small or even modest positive association between grades and evaluation (usually a correlation somewhere between +0.10 and +0.30), whether the unit of analysis is the individual student or the class itself¹³. Feldman concludes that current research evidence does show that when teacher evaluation forms are properly constructed and administered, the global and specific ratings contained in them, as interpreted with appropriate caution, are undeniably helpful in identifying exemplary teachers and teaching¹³. Stapleton in 2001 asserts that the student evaluation literature indicates that in general there are strong positive correlations between instructor excellence and learning production¹⁵.

Most of these studies are correlating student evaluation of teaching excellence to final grades in the course, which is not directly relevant to this study, for several reasons. One, we are gathering ABET assessment data using specific course assignments, not final course grades. Two, we are looking at student’s opinions on specific learning goals, not an overall teacher excellence rating, and three, the IDEA survey is anonymous, so we cannot match individual student evaluations to the direct assessment data of those same students.

Reviews of the literature of student evaluation done specifically in the marketing and management fields have developed some more specific assertions. Although student evaluations may be generally valid statistically, Stapleton finds that this does not prove that each student

evaluation conducted by every school will be valid in the case of every faculty member included¹⁵. Clayson states that a meta-analysis of the literature shows that a small average relationship exists between learning and the evaluations, but that the association is situational and not applicable to all teachers, academic disciplines, or levels of instruction¹⁶. Clayson concludes that “In fact, when learning has been defined in more objective terms, removed from the students’ and/or instructors’ own subjective interpretations, the correlation tends to fall into nonsignificant or even into negative ranges”¹⁶.

The research done for this paper did find two reported examples of IDEA use in engineering programs. Karimi reports using extra questions beyond the standard IDEA questions to seek student opinions on their knowledge of prerequisite topics and their success in meeting the learning objectives of the course¹⁷. Steichen discusses their use of IDEA assessment, and summarizes the student progress ratings for course objectives selected by instructors as important or essential¹⁸. Neither of these two papers reported on any relationship between direct measures of student learning outcomes and the IDEA student evaluation of teaching results.

IDEA student evaluation of teaching definitions

Our university uses the Individual Development and Educational Assessment (IDEA) student evaluation of teaching system in all courses. IDEA defines itself as a “nationally normed, research-driven” student evaluation service¹⁹. The IDEA system does agree with some of the criticisms of student evaluations in general, that there are important aspects of teaching that students are not competent to rate. These include:

- No single source of data, including student-rating data, provides sufficient information to make a valid judgment about teaching effectiveness;
- No single student rating item or set of related items will be useful for all purposes. A well-designed form will be multidimensional and will preferably rate twenty or more facets of teaching; and
- To make appropriate use of these forms, all facets must be considered, and simple averaging of all the items is not appropriate consideration²⁰.

The IDEA student evaluation system is based on this assertion:

“Question: How do we know that teaching is effective or ineffective?

Answer: Do students make progress in achieving class objectives?”¹⁹

All the other detail that can be measured using student opinion surveys are used to statistically support and validate the information gathered from the “progress in achieving class objectives” questions.

The IDEA student survey form asks 47 questions. The first 20 are about faculty characteristics and teaching styles, which IDEA uses to make recommendations to the faculty on how they might improve their teaching. This process is not detailed in this paper. The instructions for the next 12 questions, which are the questions we are looking at in this study, are stated as:

Twelve possible learning objectives are listed below, not all of which will be relevant in this class. Describe the amount of progress you made on each (even those not pursued in this class) using the following scale:

1-No apparent progress

2-Slight progress; I made small gains on this objective

- 3-Moderate progress; I made some gains on this objective
- 4-Substantial progress; I made large gains on this objective
- 5-Exceptional progress; I made outstanding gains on this objective

The 12 IDEA learning objectives are listed, as they match our program’s ABET student learning outcomes, in Figure 1.

ABET Student Learning Outcomes a-p (16 total) EET graduates have:	IDEA Learning Objectives (12 total) Describe the amount of progress you made on:
a. an appropriate mastery of the knowledge, techniques, skills, and modern tools of electronics engineering technology	1. Gaining factual knowledge (terminology, classifications, methods, trends) 2. Learning fundamental principles, generalizations, or theories 4. Developing specific skills, competencies and points of view needed by professionals in the field most closely related to this course
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, statistics, science, engineering, and technology.	3. Learning to apply course materials (to improve rational thinking, problem solving and decisions)
c. an ability to conduct, analyze, and interpret experiments and apply experimental results to improve processes	None
d. an ability to design systems, components, or processes appropriate to program objectives	6. Developing creative capacities (writing, inventing, designing, performing in art, music drama, etc.)
e. the ability to function effectively in teams both as a member and as a leader	5. Acquiring skills in working with others as member of a team
f. an ability to identify, analyze, and solve broadly-defined engineering technology problems	3. Learning to apply course material 11. Learning to analyze and critically evaluate ideas, arguments, and points of view
g. an ability to communicate effectively	8. Developing skills in expressing oneself orally or in writing
h. a recognition of the need for, and an ability to engage in lifelong learning	12. Acquiring an interest in learning more by asking questions and seeking answers
i. an ability to understand professional, ethical and social responsibilities	10. Developing a clearer understanding of, and commitment to, personal values
j. a respect for diversity and a knowledge of contemporary professional, societal, and global issues	10. Developing a clearer understanding of, and commitment to, personal values
k. a commitment to quality, timeliness, and continuous improvement	None
l. the knowledge to manage change and improve productivity	None
m. an ability to use the concepts learned in fundamental communication courses and possess more developed skills in research and writing in a discipline specific context.	9. Learning how to find and use resources for answering questions or solving problems 11. Learning to analyze and critically evaluate ideas, arguments, and points of view
n. the ability to apply project management techniques	None
o. the ability to use appropriate engineering tools in the building, testing, operation, and maintenance of electronic systems	None
p. the ability to analyze, design, and implement industrial control or computer network systems	None
None	7. Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)

Figure 1. EET program’s ABET student learning outcomes mapped to IDEA learning objectives

The last 16 questions on the IDEA student survey are called student characteristics, and are on such things as the amount of work in the course, perceived difficulty of subject matter, students desire to take the course and how much effort they put forth. The answers to these questions are used by IDEA to make the statistical adjustments to the raw scores that they report to the course

instructor, so that ratings of progress on learning objectives are controlled for confounding variables, those beyond the influence of the course instructor.

IDEA has found from its own research that their survey process has high degrees of reliability, consistency or inter-rater agreement, stability, generalizability, and validity, in how several factors affect student ratings, and in how they measure some aspect of teaching effectiveness²⁰. They have found that some variables not requiring control are age, teaching experience, gender of instructor, race, instructor personality and faculty research productivity. They find several variables that do require control, such as student motivation, if the course is required or elective, expected grades, level of course, size of class, faculty workload and academic field²⁰. Hoyt lays out all the data analysis used and interested readers can pursue that in much greater detail than this paper can provide⁴. For our EET program, we accept that the IDEA system produces valid information on how students perceive their progress on specific learning objectives.

Assessment data definition and collection methods

Each semester, before the IDEA student surveys are administered during the last three weeks of the semester, the program faculty discuss what the course instructor should mark on the IDEA form as Important or Essential objectives, and therefore what progress on learning objectives data is gathered, statistically adjusted, and reported back to the course instructor. A summary of this recommendation is Figure 2.

IDEA Survey Learning Objectives – ABET Outcomes		
The IDEA Survey form asks faculty to choose 3 – 5 class Learning Objectives as either Important or Essential. Be careful what you mark as Essential; those items are counted double.		
Each EET class also has specific ABET Student Learning Outcomes to be measured, selected by the program as important enough to measure for that course. The list below is a mapping of these two sets of objectives.		
Fall courses	ABET Student Learning Outcomes measured	Recommended IDEA Learning Objectives that faculty should mark as Important/Essential
118	a, b, c, o	1, 2, 3, 4
220	a, b, d	1, 2, 3, 6 (emphasize “designing” to students)
230	a, b	1, 2, 3, 4
230L	a, h	4, 12
330	a, j	1, 2, 4, 10
472	h, f, p, j	3, 10, 12
320	b, h, m, c, d	2, 4, 6 (emphasize “designing” to students), 12
470	a, h, m, d, f, k, l, o, p, e, g, n, i, j	4, 5, 6 (emphasize “designing” to students), 8
Spring		
122	a, d, o	1, 2, 4, 6
232	a, h	1, 2,
232L	a, h	4, 12
252	a	1, 2
252L	a	4
370	a, o, p, i	1, 2, 4, 10
380	b, d, o, g, i	3, 6, 8, 10
426	a, b	1, 2, 3, 4
474	p, g, i	8, 10
471	a, h, m, d, f, k, l, o, p, e, g, n, i, j	4, 5, 6 (emphasize “designing” to students), 8

Figure 2. IDEA Important and Essential objectives recommendations to EET faculty

Results from the IDEA surveys are reported back to the course instructor in the IDEA Diagnostic Form Report, which is returned to the course instructor early in the next semester after the course is delivered. In that report the course instructor sees data for what the students report as the “amount of progress you made” on the learning objectives chosen. Figure 3 shows an example of how this information is presented.

Learning Objective	Importance Rating	Your Average		Percent of students rating	
		Raw	Adjusted	1 or 2	4 or 5
1. Gaining factual knowledge...	Important	4.5	3.9	0%	100%
2. Learning fundamental principles...	Minor				

Figure 3. IDEA Diagnostic Report example

The line after Learning Objective 2, which was given an importance rating of “Minor” by the course instructor, is blank, because IDEA only reports statistics on the learning objectives marked Essential or Important by the course instructor. The adjusted scores are what we used as data for this study.

In our EET program, we begin assessment with the ABET-TAC Criterion 3 a-k student learning outcomes definitions. As a program, we altered the wording slightly from the standard ABET-TAC definitions to better fit our program. In addition, we have added student learning outcomes labeled l through p for two reasons: first, to include university graduation requirements in advanced communications, and second, to include the program-specific requirements listed in ABET Criterion 9 for Electrical/Electronics Engineering Technology programs. Figure 1 previously showed the EET program’s ABET a-p student learning outcomes for the EET program, mapped to the IDEA learning objectives.

For each of the ABET outcomes measured in each course, we define a specific outcome and tool (homework, quiz, test, or paper) we will use to measure how well the students have met that outcome. For our program’s continuous improvement process, we have set standards that we try to meet for each course, which we call the measure of success. Figure 4 shows a typical outcome-tool-measure of success strategy.

ABET SLO	Specific Student Learning Outcome	Tool	Measure of Success
b.	Demonstrate ability to select the appropriate device and circuit configuration to meet specifications and calculate the component values required.	Circuit design problem on test	80% score 8 or better, based on rubric

Figure 4. Student Learning Outcome assessment method and measure

All assessment methods or tools are given a score of 1-10, based on a rubric. An example of a rubric for general circuit design can be seen in Figure 5.

Rubric	Superior	Excellent	Good	Fair	Poor
	10	9	8	7 - 6	5 - 1
Circuit design	Correct, complete, and efficient design	Mostly correct and complete design	Not correct; Complete but with component value errors	Not correct, not complete, some component values correct	Not correct or complete, few or no component values correct

Figure 5. Example rubric

For the purposes of this study’s analysis, the meet/did not meet the measure of success criteria is not sufficiently detailed to allow direct correlation analysis. So, we took the original ABET student learning outcome data and generated a numerical average for each student learning outcome measured.

Results and data analysis

To attempt to understand the relationship is between the ABET and IDEA data collected, we developed this research question: Is there a correlation between the adjusted IDEA student survey progress on learning objectives scores and the corresponding ABET student learning outcome assessment scores?

Our two sets of data are the ABET student learning outcomes data and the corresponding IDEA adjusted score of progress on learning objectives. For this study, we collected data over a two year period, a total of four semesters. That includes two instances of each course that is taught by the EET program, with the same faculty teaching the course both years. We have a total of 108 instances of ABET student learning outcomes measured, with a mean score of 8.9 and a standard deviation of 0.92. For the corresponding IDEA adjusted learning objective scores, we have a mean score of 4.1 and a standard deviation of 0.33. We chose to do a 2-tailed test, because the correlation r could be positive or negative, and we chose to test to a $p = 0.05$ level of significance, and with 108 points of data, our degrees of freedom is $df = 106$. Our null hypothesis is

[H0: $r = 0$ – there is no correlation between the two sets of data]

versus the alternate hypothesis

[H1: $r \neq 0$ – there is a correlation between the two sets of data.]

Using SPSS software, and Pearson’s Correlation, the overall data indicates a result of $r = -0.30$, $p = 0.01$, as the correlation between the two sets of data. So we reject the null hypothesis and accept the alternate hypothesis that there is a statistically significant correlation between the IDEA learning objectives data and the ABET student learning outcomes data. We had hoped to find a positive correlation, so we could use the IDEA data to triangulate our own ABET data, but we did not.

To look in more detail, we considered, as Stapelton¹⁵ asserts, that correlation factors can depend on the faculty member. So we broke the data down further, to each individual faculty, and we found that two of the faculty had very small r -value positive correlations: Instructor A had $r = +0.034$, $p = 0.01$, and Instructor B had $r = +0.042$, $p = 0.01$. For these two faculty there was essentially no correlation between the two measures of student learning. Instructor C had a

relatively large negative correlation of $r = -0.36$, $p = 0.01$, and this affected the results for the program's faculty as a group.

In addition, we considered an assertion by Clayson¹⁶ that progress on different learning objectives may be perceived differently by students. So we calculated a partial correlation, controlling for specific IDEA objectives, and found for the faculty as a group a correlation factor of $r = -0.31$, $p = 0.001$, or virtually the same results as when not controlling for which learning objective was chosen.

Summing up, we found statistically significant results, but they were either close to zero correlation or negative correlation, depending on the faculty involved. These results seem to agree with what Clayson asserts, that when learning has been defined in more objective terms, removed from the students' and/or instructors' own subjective interpretations, the correlation tends to fall into nonsignificant or even into negative ranges¹⁶.

What can we do with these results? In general terms, negative correlation implies that when students perceive their progress on specific learning objectives as relatively low, the ABET student learning outcomes data says it is actually relatively high. A result of zero correlation means that the two methods do not result in data that is consistent in any way. Can we make a recommendation for use of the IDEA progress on learning objectives data by other Engineering Technology programs' ABET assessment process? These results would say no.

As a side note, we can still use the overall summary evaluation number that IDEA provides for the faculty, which compares the course instructor to three groups: all faculty in the IDEA database, all faculty in the field of Engineering Technology, or all faculty at our university. These are results we can include in our ABET self-study, just not as a triangulation method for our ABET student learning outcomes data.

Recommendations for further research

First, our EET program averages 80 students and we have three faculty in the program. We recognize that this is a limited sample and also a limited educational field to choose from, although we did gather enough data to attempt to ensure that the results of the analysis were statistically significant. We realize that limits whether the results are generalizable to other areas. We feel that we describe our research process well, so further, similar research could be done.

Second, our own ABET assessment methods have not been validated by standard methods. We have a relatively small number of students, so, for example, no multi-section analysis is available. We perhaps could team with other EET programs to validate our specific assessment tools. Third, we could team with the other engineering and engineering technology programs at our own university, where we share a common IDEA student evaluation use.

Lastly, using an independent party so that faculty would not directly see the student's survey, we could gather the results of the IDEA survey in a non-confidential manner, and be able to directly compare each student's perception of their progress on learning objectives to their ABET student learning outcome scores. This is the least likely method to attempt, as students depend on the fact

that their evaluations are anonymous, and would probably not be willing to participate in such a study.

When we started this study, we had hoped to find a positive correlation of the two measures of student learning, so we could use the external IDEA data to triangulate our own ABET data. We did not find that result, but good research protocol says that we should report the results regardless of the outcome. In addition, our study was different from most research into student evaluation. As stated above, most of studies about student evaluation of teaching are correlating student evaluation of teaching excellence to final grades of the course, which is not directly relevant to this study, for several reasons. One, we were gathering assessment data using specific course assignments, not final course grades. Two, we were looking at student's opinions on specific learning goals, not an overall teacher excellence rating, and three, the IDEA survey is anonymous, so we cannot match individual student evaluations to the direct assessment data of those same students. This study did attempt to fill in some gaps in research that have been published.

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