2006-2149: STUDENTS' PERCEPTIONS OF THE IMPORTANCE OF FACULTY TEACHING TECHNIQUES FOR THEIR LEARNING/SUCCESS IN A TECHNOLOGY BASED BACCALAUREATE PROGRAM

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Abstract

The primary objective of this study was to explore the relationships between students' perceptions of the importance of faculty teaching techniques and their learning/success, expressed in terms of self-reported technical competencies and GPA in a technology-based baccalaureate electronics engineering technology (EET) program at a teaching university.

The sample (N=225) was composed of seniors of the BSEET program from 13 geographically diverse campuses of a teaching university. Regression analyses revealed significant and direct relationships between faculty teaching techniques (FTT) and student learning/success in terms of self reported technical competency (effect size is medium-to-large). Student GPA failed to reveal any significant relationships with faculty teaching techniques. The recommendations based on the study suggest ways to improve faculty development and training activities to promote student learning in the domains of engineering technology.

I. Purpose of the Study

The purpose of this research project was to explore the relationship between students' perceptions of the importance of faculty teaching techniques and their self-reported learning and success. The research project addresses the following question:

> Are there associations between students' perception of the importance of the faculty teaching techniques (FTT) [in terms of lectures, use of a variety of technological teaching tools, use of PowerPoint, use of a variety of teaching strategies, coordinating lab work with lecture, organization and preparation of class/lab activities, use of group presentations, use of individual lab projects, and providing timely feedback on class/lab projects] and student's self-reported success/learning (expressed in terms of self-reported technical competency and GPA), as perceived by seniors in the EET program?

The study used a quantitative paradigm. The associational research approach was used to study the relationship between independent variables and dependent variables (See Table I).

Table I
Description of Variables

Variable Type	Variable Description
Independent Variable • Faculty Teaching Techniques (FTT)	Faculty teaching techniques construct is expressed in terms of following factors: • Lectures • Use of a variety of technological teaching tools • Use of PowerPoint • Use of a variety of teaching strategies • Use of group presentations • Coordinating lab work with theoretical concepts covered in lecture • Organizing and preparing of class and lab activities • Use of individual lab projects • Providing timely feedback on class and lab projects
Dependent Variables Students' perception of their learning / success in terms of: 1. GPA 2. Self-reported technical competency (SRTC1) [Critical Thinking] 3. Self-reported technical competency (SRTC2) [Job Preparation] 4. Self-reported technical competency (SRTC3) [Construction of a Prototype]	Student learning / success measured is terms of: • GPA • Self-reported technical competency (SRTC) [in terms of analytical and critical thinking, knowledge of EET, and design and implementation of a system] • Given a technical challenge, a student can analyze a problem by thinking critically (SRTC1 [Critical Thinking]) • Student has confidence in his/her technical knowledge to be successful as an electronics engineering technology (EET) job (SRTC2) [Job Preparation] • Given a technical problem or specification for a system design, a student can propose a solution by designing the necessary sub-system/circuits and by constructing a prototype of the system (SRTC3) [Construction of a prototype]

II. Description of Sample and Sampling Design

Sampling

Considering the time and cost limitations, a convenience sampling approach was employed. Figure 1 illustrates the sampling scheme.

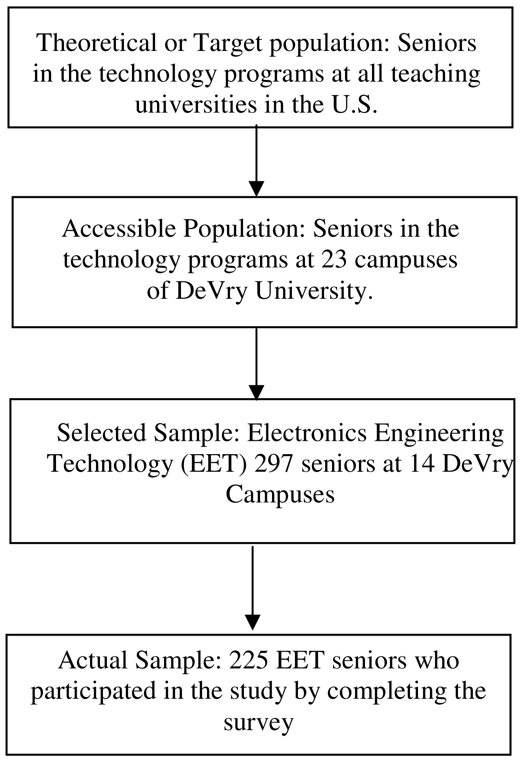

Figure 1. Sampling design for student survey.

Participants

The study investigated seniors, through a survey, in the B.S.E.E.T program for the Fall 2003 term at 13 DeVry University campuses spread all over the country. These campuses were chosen to incorporate diversity of study population and diversity of geographic locations. The sample size was 225 seniors, and the response rate was in the range of 29% - 100% for all 13 campuses. The survey sought descriptive information about the student perceptions about the importance of several faculty characteristics for their learning.

Instrument

The survey instrument (Appendix A) sought descriptive information about the students' perceptions of the importance of faculty teaching techniques for their learning/success expressed in terms of 3 areas of self-reported technical competency and

GPA. The instrument used twenty 7-point Likert scales to collect data about student perceptions of their faculty. The statistical software package, SPSS, was employed to analyze the data collected from the respondents of the survey.

III. SUMMARY OF RESULTS

Table II presents a summary of results for students' perceptions of the importance of faculty teaching techniques for their self-reported learning/success.

Table II

Summary of Results: Highest and Lowest Levels of Agreement for Students' Perceptions of the Importance of Faculty Teaching Techniques.

Sub-construct (Construct)	Agree	Mean	Standard Deviation
Highest Level of Agreement (≥ 90%)			
Coordinating lab with lecture	91.9%	6.10	1.16
Organization and preparation for class and lab activities	91.2%	5.99	1.15
Professors' lectures)	90%	5.90	1.12
Lowest level of Agreement (≤ 60)			
Use of group presentations	49.7%	4.39	1.55
Use of PowerPoint	32.1%	3.60	1.68

The lowest level of agreement (60 percent or less) is revealed by the faculty sub-constructs of use of group presentations, and use of PowerPoint. It is a very interesting to note that out of all sub-constructs, "how PowerPoint is used by the faculty", had the lowest level of agreement. This is especially surprising when one considers how often PowerPoint is used in academia for onsite and online (web based or web supported) classes whether for synchronous or asynchronous delivery modes.

Table III presents a summary of strongest relationships (r ≥. 30) between students' perceptions of the importance of faculty teaching techniques, and students' perceptions of learning/success expressed in terms of their self-reported technical competency (SRTC). The first dependent variable, critical thinking (STRC1) has two relationships of $r \geq .30$ with the independent variables: use of individual lab project of the summated faculty teaching techniques. The second dependent variable, job preparation (SRTC2), also has one relationship of $r \geq .30$ with the independent variable: summated faculty teaching techniques. The third dependent variable, construction of a prototype (SRTC3) has three relationships of $r \geq .30$ with the independent variables: use of individual lab projects, timely feedback on class and lab projects, summated faculty teaching techniques. And, the fourth dependent variable summated self reported technical competency (SRTC), which is the sum of critical thinking, job preparation and construction of a prototype, has two relationships of $r \geq .30$ with the independent variables.

Table III

Summary of Results: Pearson Correlation Coefficients for the Relationship Between Students' Perceptions of the Importance of Faculty Teaching Techniques and Students' Perceptions of Learning/Success Expressed in Terms of Their Self-reported Technical Competency (N = 225)

Faculty Sub-Construct (Construct)	Self-reported technical competency (SRTC1) [Critical Thinking]	Self-reported technical competency (SRTC2) [Job Preparation]	Self-reported technical competency (SRTC3) [Construction of a Prototype]	Summated SRTC
Statistically Most Significant Relationships ($r \geq .30$)				
Use of individual lab projects)	0.30	-	0.34	0.35
Timely Feedback on class and lab projects	-	-	0.32	-
Summated FTT	0.30	0.32	0.37	0.38

Note: For all listed correlations $p < 0.001$ and the effect size is medium.
SRTC1: Given a technical challenge, a student can analyze a problem by thinking critically.
SRTC2: Student has confidence in his/her technical knowledge to be successful at an electronics engineering technology (EET) job.
SRTC3: Given a technical problem or specification for a system design, a student can propose a solution by designing the necessary sub-system/circuits and by constructing a prototype of the system.

Table IV lists the Pearson correlation coefficients for the highest relationships between the students' perceptions of the importance of the faculty teaching techniques, and students' perception of learning/success expressed in terms of GPA.

Table IV

Summary of Results: Pearson Correlation Coefficients for the Relationship Between Students' Perceptions of the Importance of Faculty Teaching techniques, and Students' Perceptions of Learning/Success Expressed in Terms of Their Self-reported GPA (N = 225)

Faculty Sub-Construct (Construct)	GPA
Significant Relationships	
Use of group presentations	-0.17

Note: Correlation is statistically significant at $p < .01$, and the effect size is small-to-medium

For the relationship between faculty use of group presentations and student learning/success in terms of GPA the Pearson correlation coefficient's direction is negative, which suggests an inverse relationship. The EET seniors who considered faculty use of group presentations as an important factor for their learning/success had lower GPAs and vice versa. In summary, based on the data, it can be concluded that, the student self-reported GPA was not a strong predictor of student success, as it failed to show any associations with self-reported student learning/success that had even a medium effect size.

IV. Discussion of the Findings

Research Question : Ares there associations between students' perceptions of the importance of the faculty teaching techniques (FTT) [in terms of lectures, use of a variety of technological teaching tools, use of PowerPoint, use of a variety of teaching strategies, coordinating lab work with lecture, organization and preparation of class/lab activities, use of group presentations, use of individual lab projects, and providing timely feedback on class/lab projects] and student's self-reported success/learning (expressed in terms of self-reported technical competency, and GPA), as perceived by seniors in the EET program?
The Pearson correlational coefficients for the relationship between faculty teaching techniques and students' perceptions of learning/success expressed in terms of their self-reported technical competency revealed small to medium effect sizes. The following relationships between the FTT sub-constructs and students' self-reported technical competency reveal significant associations of $r \geq .30$, which are medium sized effects according to Cohen [1].

1. Use of lab projects and summated FTT are related to self-reported technical competency (SRTC1 [Critical thinking]).
2. Summated FTT is related to self-reported technical competency (SRTC2 [Job preparation]).

3. Use of individual lab projects and timely feedback on lab and class projects, and summated FTT are related to self-reported technical competency (SRTC3 [Construction of a prototype]).
4. Use of individual lab projects and summated FTT are related to summated self-reported technical competency (SRTC).

The results suggest that students perceive that the use of individual lab projects, has a significant impact on student learning/success. Designing and implementing a lab project is an example of active learning. This finding supports one of Chickering and Gamson's [2] principles of effective undergraduate learning, which states, "Effective teaching uses active learning techniques." A lab project is an example of active learning, brain-compatible or constructivist learning, thus involving an application of different levels of Bloom's taxonomy [3].

The results also indicate that students perceive that professors' timely feedback on lab and class projects is important for their learning/success. This finding supports the results of Guskey's [4] study that providing feedback to students about their learning promotes learning.

It was surprising to note that the fourth predictor of student learning/success, GPA was not a viable predictor of student learning/success. For GPA, the correlation coefficient values are very small for all sub-constructs, except for use of a variety of technological tools and use of group presentations, where the magnitude of the effect size is small and the direction is negative (an inverse relationship). Thus, students perceive that there exists an inverse relationship between faculty's use of a variety of technological tools, and use of group presentations, and, students' learning/success expressed in terms of their GPA. Students in the technology domain rely mainly on professors' lectures and labs as the main modes of learning and any attempt by professors to use computer simulations, internet and videos may be perceived by some students as waste of time rather than learning.

V. Recommendations/Implications for Practice

The exponential rate of technological advances is forcing a paradigm shift in education. Teaching in today's world requires new approaches to instruction. The profound and pervasive changes occurring in education are placing new demands on educators. Educators are expected to be technically current and to learn the mechanics of teaching/learning in order to become effective teachers. These new challenges are forcing teachers to become life-long learners.

The study revealed that majority of EET senior (90% or more) perceive that the most important factors that contributed to their learning and success are: coordinating lab with the lecture, organization and reparation of class and lab activities, and professors' lectures.

In the domains of engineering technology, to narrow the gap between the state-of-curricula and state-of- technology in the industry, faculty are required to revise curricula frequently and maintain their technical currency. To improve student learning/success they are also required to learn the pedagogy. This endeavor is very challenging, and requires institutional vision, planning, and allocation of appropriate resources. The following recommendations need to be implemented at the personal, program/departmental, and institutional levels to improve student learning/success by enhancing faculty technical currency and pedagogy.

1. At the personal level: Faculty members should do a yearly self-inventory of their teaching techniques and should identify areas of improvement and pursue professional development activities to enhance their pedagogical skills, and the do a self assessment of their teaching techniques.

2. At the program/department level: Administrators/chairpersons need to realize the importance of pedagogy. Moreover, they should provide training opportunities for faculty to enhance their teaching techniques in order to improve student learning/ success.

3. *At the Institutional/Organizational level:* Because of the applications orientation of engineering technology programs, faculty teaching techniques are essential to make student learning more relevant. Therefore, there is a need to formulate/revise institutional polices to encourage faculty to enhance their teaching techniques.

REFERENCES

[1] Cohen, J. (1988). Statistical power and analysis for the behavioral sciences (2^{nd} edition). Hillsdale, NJ: Lawrence Erlbaum Associates.

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[3] Bloom, Benjamin. (Ed.). (1956). *Taxonomy of educational objectives: The classification of educational goals.* New York: McKay.

[4] Guskey, T. (1988). *Improving student learning in college classrooms*. Springfield, IL: Charles Thomas Publisher.

Appendix A

Student Survey

Consider your **technical professors'** influence on your learning and success. Your input is needed regarding various aspects of these **professors' teaching techniques**, and how these factors influenced **your learning** and **success**. Please indicate the extent to which you agree or disagree with the following statements (Questions 1-13) about your professors' influence on your learning and success using the following rating scale.

1 = This was not at all important for my learning/success, I strongly disagree (SD)
2 = I disagree with this statement (D)
3 = I moderately disagree with this statement (MD)
4 = I neither agree nor disagree with this statement (N)
5 = I moderately agree with this statement (MA)
6 = I agree with this statement (A)
7 = This was very important for my learning/success, I strongly agree (SA)

Please circle the appropriate number.

	SD	D	MD	N	MA	A	SA
1. My learning/success is due to my professors' lectures.	1	2	3	4	5	6	7
2. My learning/success is due to my professors' use of a variety of technological teaching tools (e.g. computer simulation, internet, and videos).	1	2	3	4	5	6	7
3. My learning/success is due to my professors' use of powerpoint to deliver lectures.	1	2	3	4	5	6	7
4. My learning/success is due to my professors' use of a variety of teaching strategies (e.g. individual work, discussions as well as lecture).	1	2	3	4	5	6	7
5. My learning/success is due to my professors' use of group presentations.	1	2	3	4	5	6	7
6. My learning/success is due to my professors' coordinating lab work (experiments and projects) with theoretical concepts covered in lecture.	1	2	3	4	5	6	7
7. My learning/success is due to my professors' organization and preparation of class and lab activities.	1	2	3	4	5	6	7
8. My learning/success is due to my professors' use of individual lab projects.	1	2	3	4	5	6	7
9. My learning/success is due my professors' timely feedback on class and lab projects.	1	2	3	4	5	6	7
Students self-perception of competency	SD	D	MD	N	MA	A	SA
10. Given a technical challenge, I can analyze a problem by thinking critically.	1	2	3	4	5	6	7
11. I have confidence in my knowledge of electronics engineering technology (EET).	1	2	3	4	5	6	7
12. Given a technical problem or specifications for a system design, I can propose a solution by designing the necessary sub-system/circuits and by constructing a prototype of the system.	1	2	3	4	5	6	7
13. What is your GPA? My GPA = ___________ out of 4.00							