

Gender and other Determinants of Undergraduate Student Satisfaction in STEM

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Abstract. In this research, the author is attempting to identify the factors that lead to student' satisfaction with a STEM (Science, Technology, Engineering, and Math) program in a public college. By building a model of these factors, the author was able to test the impact of various demographic variables on students' satisfaction. Of specific interest was the role of gender, as well as having English as a first language and how these two factors influenced student satisfaction. Contrary to the initial hypothesis, both variables were not found to have any influence, and as thus the determinants of satisfaction were the same for males and females, as well as for those who had English as a first language, and those who did not. On the other hand, students' perception of the effectiveness of the program, the skills acquired, satisfaction with teaching, and the availability of an internship, all contributed to students' overall satisfaction with the program. In addition, it was also found that as students mature (in terms of the number of credits they have), they tend to be more satisfied with the program. Similarly, Bachelor's students were more satisfied than Associate's students.

Keywords: STEM; Student Satisfaction; Gender; Internship

Introduction

Juillerat and Schreiner (1996) define student satisfaction as "a student's perception of an institution's effectiveness", and it is directly related to whether students' expectations have been met (Bowman and Smedley, 2012). Higher education institutions must achieve student satisfaction in order to gain competitive advantage, and with pressure on institutions to increase student enrolments and retention, the emphasis placed on a positive student experience has become much greater (Arambewela, 2010). In addition, studies have indicated that university satisfaction is positively associated with student retention, institutional reputation, and institutional vitality (Bryant 2006b; Miller 2003; Schreiner 2009).

It is now universally accepted that student satisfaction results from the total student experience and not just from quality in teaching and learning (Wilkins et al., 2012, and Wright & O'Neill, 2002). Elliott & Shin (2002) state that "the campus environment is a web of interconnected experiences that overlap and

influence students' overall satisfaction; thus what happens in the classroom is not independent of all other experiences relating to campus life". Accordingly, to study student satisfaction one needs to consider not only the teaching and classroom experience, but also other factors like the use of technology, resources available, etc.

Alves and Raposo (2009) explained that "in order to establish long-term relationships with their students, higher education institutions need above all to satisfy them". They then attempted to develop a satisfaction construct using seven variables: 1) program effectiveness; 2) quality of lecturers and teaching; 3) student learning; 4), assessment and feedback; 5) learning resources; 6) use of technology; and 7) facilities/quality of social life.

Douglas et Al. (2006) studied student satisfaction levels across a university's service offerings in the UK. The survey used was subdivided into the following categories: 1) lecture and tutorial facilities, 2) ancillary facilities, 3) the facilitating goods, 4) the explicit service and 5) the implicit service. To measure the students' satisfaction (and similar to my research), the authors asked students for their overall satisfaction rating and whether they would recommend the University to others or not. The results of that study showed that with regards to student satisfaction, many of the physical aspects of the University services are unimportant. Such a finding supports the findings of Schneider and Bowen (1995), Banwet and Datta (2003) and Hill et al. (2003) who found that the university's core service (lecture, class delivery, etc) is the most important aspect of a university's service offerings.

Wilkins et al. (2012) used seven dimensions (adapted from Alves & Raposo, 2009; Douglas et al., 2006; Miliszewska & Sztendur, 2010; Telford & Masson, 2005) to study student perceptions of their experience of study at an international branch campus 1) student learning; 2) quality of lecturers and teaching; 3) program effectiveness; 4), assessment and feedback; 5) learning resources; 6) use of technology; and 7) facilities/quality of social life.

In their examination of the extent to which university satisfaction varies as a function of students' religious affiliation, Bowman and Smedley (2012) reported that "group disparities in satisfaction are also observed for race/ethnicity, gender, parental education, and academic preparation". The students' race/ethnicity, gender, pre-university achievement, and parental education were all significantly related to university satisfaction. Black and lower-achieving students are less satisfied with university, whereas women and students with higher parental education are more satisfied. In the same paper, Bowman and Smedley (2012) pointed to a number of researches that studied the relationship between race and student satisfaction: Black and Asian students for example report lower overall satisfaction with their university experience than White and Latino students (Noel-Levitz 2009; Fischer 2007; National Survey of Student Engagement 2005). Black students also seem to be less satisfied than White, Asian, and Latino students with the structural diversity of their institution (Park 2009) as well as with their social interactions (Harper and Hurtado 2007). Black students also seem to be "less satisfied with the (un)equal treatment that they receive from students and faculty" (Suarez-Balcazar et al. 2003). Bowman and Smedley (2012) also report that according to Harper and Hurtado (2007), "Latino

and Native American students reported being thankful for the opportunity to attend the particular institution, and they expected less social support than did Black students”.

Kuo et al (2013) studied student satisfaction in online learning and showed that the following factors were good predictors of student satisfaction: 1) learner-instructor interaction, 2) learner-content interaction, and 3) Internet self-efficacy. On the other hand, interactions among students and self-regulated learning did not contribute to student satisfaction. They also found that gender, class level, and time spent online per week seemed to have influence on learner-learner interaction, Internet self-efficacy, and self-regulation.

In a cross-sectional study of undergraduate students across two north-west university business schools in the UK, Douglas et al. (2015) identified the following variables as determinates of quality in education: motivation, reward, social inclusion, usefulness, value for money and fellow student behavior. Selim and Masud (2014) on the other hand conducted a quantitative survey on students’ perception of a higher educational institute in Malaysia, and concluded that to achieve higher satisfaction, graduate schools need to provide up-to-date equipment and physical facilities, as well as focus on responsiveness of academic staff.

Hypothesis and Research Model

Borrowing variables from the literature, the author built the following model (diagram 1) that describes the determinants of student satisfaction. Accordingly, the author hypothesizes that the following factors will have a positive direct effect on student satisfaction: 1) perceived program effectiveness, 2) the skills acquired, 3) satisfaction with teaching, 4) satisfaction with courses material, 5) quality of assessment and feedback, 6) participation in internships, 7) participation in research projects, 8) availability and utilization of technology resources, 9) availability of and utilization of all other resources, 10) Program/number of credits, 11) Gender, and 12) English as a first language.

Data

To collect the data, a survey was emailed to 1244 students (361 Associate’s degree students, and 883 Bachelor’s degree students) in an information systems program in a public college. The survey consisted of 29 questions that were designed to address the following areas:

1. Perceived program effectiveness
2. Overall satisfaction with the programs in terms of the likelihood of re-choosing the programs, and/or recommending it to a friend.
3. Satisfaction with and use of technology resources
4. Satisfaction with and use of all other resources (library, tutoring, counseling, etc.)
5. Satisfaction with faculty and course material
6. Assessment and feedback
7. Participation in internship and research
8. Student learning (skills acquired)
9. Demographics, including gender, English as a first language, program, and the number of credits.

By the end of the 10 days, 593 students (47.7%) took the survey. Because the survey responses were anonymous, it is fair to say that the responses reflect the students' true feelings and perceptions.

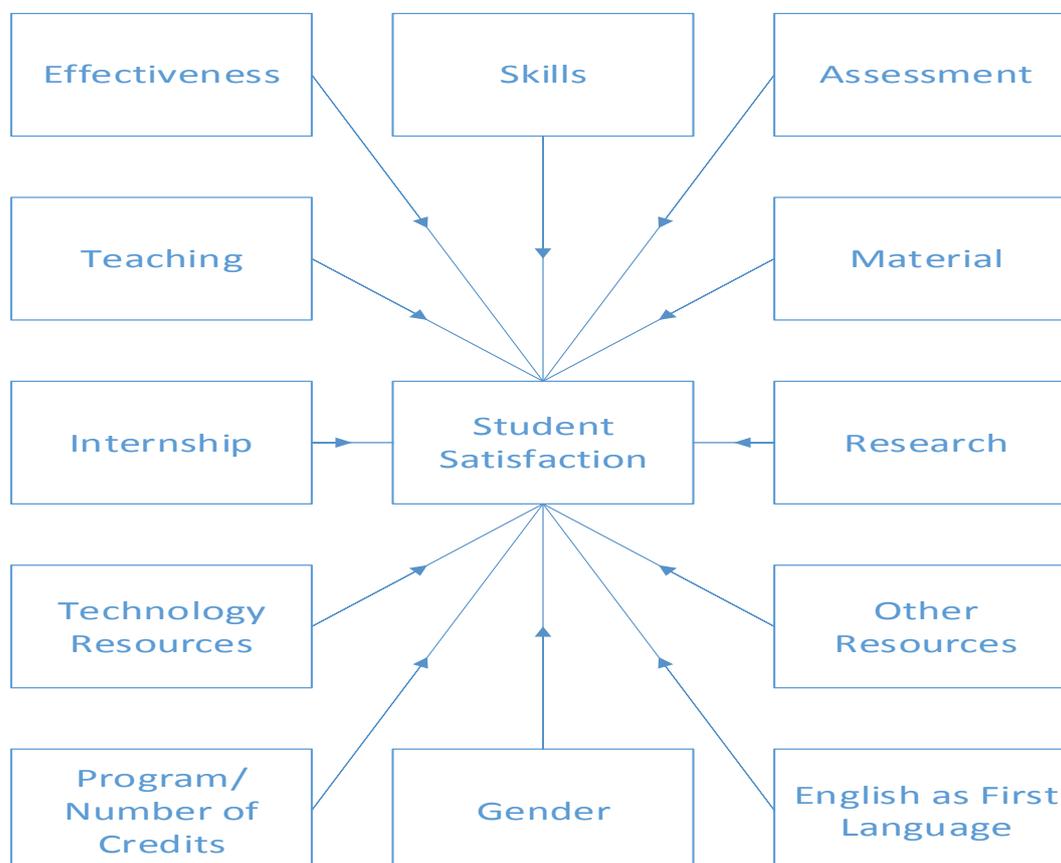


Diagram 1. Research Model

The Survey

Student Satisfaction:

Two items were used to assess overall student satisfaction:

- I would recommend my major to others
- If you could start college over, would you choose to pursue degree in this department?

Program Effectiveness

Program effectiveness can be assessed on both a 'use' basis: relevance to actual work, and 'exchange' basis: the ability to use the end qualification to gain a better job, higher pay, further education etc (Wilkins et al., 2012). Two items were used to assess overall program effectiveness:

- My current program has prepared me for my career and/or advanced studies
- I feel confident that I will be able to find employment in my chosen field

Student Learning

Student learning is measured by the skills acquired by students during their tenure in the program. Nine items (as shown in following table) were used to assess the skills acquired by the students in Information Systems:

- My program has helped me develop skills in Desktop Maintenance and Support
- My program has helped me develop skills in Communications Skills
- My program has helped me develop skills in Web Technologies
- My program has helped me develop skills in Introduction to Computer Systems
- My program has helped me develop skills in Information Security
- My program has helped me develop skills in Networking
- My program has helped me develop skills in Database Systems
- My program has helped me develop skills in Programming
- My program has helped me develop skills in Problem Solving

These items were added and then an average was calculated that represents an overall Skills factor for each student.

Assessment and Feedback

Two items were used to assess the quality of assessment and feedback:

- Frequency of feedback from faculty about your course performance
- Quality of feedback from faculty about your course performance

Satisfaction with teaching:

One item was used to assess the students' satisfaction with the quality of teaching:

- I am satisfied with how the instructors teach the classes

Satisfaction with material:

One item was used to assess the students' satisfaction with the quality of material used in the program:

- I am satisfied with the courses material

Demographics

Three items were used to measure demographics:

- Is English your first language?
- What is your gender?
- What is your program?

Internships and Research

One item was used for Internships and another for Research:

- I have taken/will participate in the internship program provided by the department
- I have taken/will participate in the research activities or opportunities provided by the department

Technology Resources

Three items were used to assess the use of technology resources:

- The computers are available for my use.
- You have utilized the following resources: Department Computer Lab
- You have utilized the following resources: Equipment in the Classrooms

These items were added to create a Technology Resources factor for each student.

Other Resources

4 items were used to assess the frequency of use of the following resources offered by the college.

- Tutoring Service
- Library
- Department advisor
- Counseling center

These items were then added to create a measure of resources_other.

Data Analysis

The author then ran the following regression using EViews, and the results are shown under model 1 in table 1:

$$\text{Satisfaction} = \beta_0 + \beta_1 * \text{Satisfied_Teaching} + \beta_2 * \text{Satisfied_Material} + \beta_3 * \text{Skills} + \beta_4 * \text{Effectiveness} + \beta_5 * \text{Assessment} + \beta_6 * \text{Internship} + \beta_7 * \text{Research} + \beta_8 * \text{Resources_Technology} + \beta_9 * \text{Resources_Other} + \beta_{10} * \text{Gender} + \beta_{11} * \text{English} + \beta_{12} * \text{Program} + \varepsilon$$

By replacing the Program variable, with the number of credits, the author ran the following regression equation using eViews, and the results are shown under Model II in table 1.

Table 1. Regression Results

Variable	Model I		Model II	
	Coefficient	Probability	Coefficient	Probability
SATISFIED_TEACHING	0.23	0.0023	0.23	0.0022
SATISFIED_MATERIAL	-0.04	0.6361	-0.05	0.534
SKILLS	0.37	0.0035	0.38	0.003
EFFECTIVENESS	0.16	0	0.16	0
ASSESSMENT	-0.01	0.6925	-0.01	0.7213
INTERNSHIP	0.26	0.0006	0.24	0.0015
RESEARCH	0.04	0.5266	0.05	0.4792
RESOURCES_TECHNOLOGY	0.14	0.0836	0.14	0.0783
RESOURCES_OTHER	-0.07	0.3456	-0.07	0.3635
ENGLISH	0.00	0.9925	0.00	0.9879
GENDER	0.10	0.4394	0.10	0.4564
PROGRAM	0.20	0.054	-	-
Credits	-	-	0.08	0.0315
ε	0.17	0.6204	0.19	0.5737

The results imply that the following equation holds for model 1:

$$\text{Satisfaction} = .23 * \text{Satisfied_Teaching} + .375 * \text{Skills} + .161 * \text{Effectiveness} + .258 * \text{Internship} + .204 * \text{Program}$$

And for model II, the following equation holds:

$$\text{Satisfaction} = .231 * \text{Satisfied_Teaching} + .38 * \text{Skills} + .164 * \text{Effectiveness} + .238 * \text{Internship} + .078 * \text{Credits}$$

Both results show that the more mature the student is (in the Bachelor's versus the Associate's program, or having acquired more credits), the more satisfied he/she is. In addition, both results also show that students' satisfaction with the program is positively affected by their perception of the quality of teaching, the skills they acquire, their perception of the effectiveness of the program, and the availability of an internship program.

Discussion

The results confirm previous findings (Douglas et al., 2006; Schneider and Bowen, 1995; Banwet and Datta, 2003; Hill et al., 2003) that many of the physical aspects of the University services have no direct impact on student satisfaction and that the most important aspects of a university's service offerings are associated with the core service, i.e. the lecture, including the attainment of knowledge, class notes and materials and classroom delivery. This research though was not able to find relationship between overall student satisfaction and satisfaction with class material.

Career focus

The findings suggest that students' satisfaction with the program is highly influenced by career-related considerations. Students were satisfied when they perceived that they gained specific skills that will help them find suitable jobs. The perception of the effectiveness of the program, in terms of preparing students for their careers, and helping them find employment was a strong predictor of student satisfaction. The availability of internships also influenced student satisfaction because students perceived them to have a positive impact on their career prospects. The same can not be said though about engaging in research which students did not seem to perceive as improving their career prospects.

The effect of demographics on student satisfaction:

One of the key findings of this research was that gender does not play a role in the determination of student satisfaction. These findings confirm the findings of Kuo, et al. (2013) with regards to finding no relationship between gender and overall satisfaction. The findings on the other hand contradict those of Bowman and Smedley (2012) who found that women and students with higher parental education are more satisfied with their universities. The same was true with having English as a first language as this research found no differences in the determinants of satisfaction based on the student's native language. Although one would expect that non-native English speakers would find it more difficult to succeed in college and accordingly would be overall less satisfied with their experience, the findings did not seem to support this hypothesis.

The more mature the student, the more satisfied he/she is: An interesting finding of this research is that bachelor students seem to be more satisfied than associate students. Also the more credits a student has, the more satisfied he/she is. At the beginning of their studies, students might not be able to understand how the knowledge and skills they acquired will help them in their careers. What this finding implies is that as students take more courses, they develop a better understanding of the field and gain appreciation for their education.

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