Performance of Female Students in Engineering Statics at Texas A&M University at Qatar

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Dedicated to the memory of Troy Marschang, Texas A&M University, Class of '11Petroleum Engineering

Abstract: -The performance of female students in Engineering Statics is analyzed using data collected during the Fall semester 2008 at Texas A&M University at Qatar. It is shown that i) female students complete their assignment more regularly than male students, ii) male attendance is higher than female attendance and iii) gender is not a factor in the performance of students.

Key-Words: - Female Engineering Students, Engineering Statics, Qatar

1 Introduction

Texas A&M University at Qatar (TAMUQ) [1] is a branch of Texas A&M University (TAMU) (College Station, Texas) [2] established in 2003 in Doha (Qatar), under the auspices of her Highness Sheikha Mozza bin Nasser al-Misnid, as part of a broader effort to bring American higher level education to the Middle East. Currently, the school offers programs leading to Bachelor of Science (B.S.) degrees in four majors: Chemical (CHEN), Electrical (ELEN), Mechanical (MEEN) and Petroleum (PETE) Engineering. Texas A&M University at Qatar curricula are identical to those of Texas A&M University (College Station, Texas) which grants the degrees. Milestones for the campus include the graduation of its first class of (thirty two) engineers in May 2008 and the accreditation by the American Board for Engineering and Education (ABET), last October 2008 [3]. (The accreditation was retroactive to include the first graduating class). As of Fall 2008, the total enrollment was 362 students of which 227 (63%) were male and 135 were female (37%), an unusually high percentage of female students compared to 8%-12 % females in US engineering programs. (Consult the US Department of Education [4] for details).

This paper analyses the performance of female students in engineering Statics and Particle Dynamics at Texas A&M University at Qatar using data collected during the Fall semester 2008. Statics and Particle Dynamics is a 15 week-class that covers the applications of the fundamental principles of Newtonian mechanics to the statics of particles and rigid bodies such as trusses, frames and beams. The last third of the semester is devoted to the study of particles dynamics. Prerequisites (or corequisites) for the class include two semesters of Mathematics and two semesters of Physics. This is a required class in the curriculum of Mechanical and Petroleum engineering students usually taken in the first semester of the sophomore year. Other majors may take the class as an elective.

Student performance was evaluated using grades computed from two midterm-examinations, one final examination, homework return and class attendance.

2 Data Analysis

A total of 85 students, 61 males and 24 females,(72%-28% ratio) were enrolled in the class in the Fall 2008, a ratio close to the school enrollment per gender (Fig. 1). Four class levels were represented in the class, juniors being the largest group (48 students) followed by the seniors and freshmen (14 students in each class level, comprised of Petroleum and Electrical engineering major). The number of students per class level and gender in the class is shown in Table 1.

Table 2 summarizes the number of students per major and gender. It shows that Petroleum engineering students represented the largest group (29) followed by an approximately equal proportion of Electrical (20), Mechanical (19) and Chemical (17) engineering students consistent with school enrollment per major (Fig. 2).We note the zero number of female mechanical engineering students enrolled in the class. (In the Fall 2008, three female were enrolled in the mechanical engineering program.) Efforts are under way to recruit more females in the mechanical engineering program, a profession

generally perceived in the Middle-East as "hands-on" and "dirty". Reach-out activities have included visit to local girls-schools, science and engineering fairs. More discussions with local industries and education officials are planned.

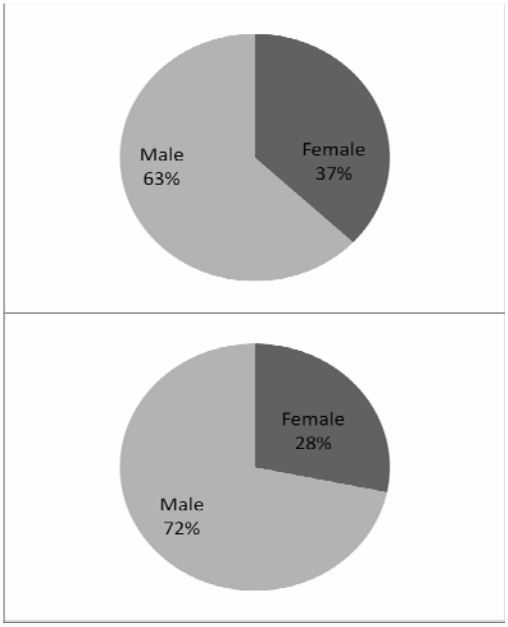

Fig. 1 School enrollment per gender (top) and enrollment in Engineering Statics per gender (bottom).

Table 1: Enrollment per class level and gender in Engineering Statics at TAMUQ (Fall 08).

Class level	Male	Female
Freshman	9	5
Sophomore	35	13
Junior	7	2
Senior	10	4

Fig. 3 shows the distribution of grades per exam and per gender, in the class. The grades were given according to the typical letter grade scale A: > 90%, B: 80%—90%, C: 70%-80%, D:60%-70% and F: <60%. Averages for the class exams were 78.6% (Exam I), 61.3% (Exam II) and 76% (Final Exam), so a combined average of 72.5% for the three exams. Twice as many males than females (16.4% vs. 8.3%) received an A in the first exam, a trend reversed in the final exam (16.67% A's for females vs. 11.48% A's for males). 42 % females received a C or higher grade in exam II compared to 23% for their male counterpart.

A total of eleven homework assignments were given during the course of the semester. Table 3 summarized the number of students per gender who completed the assignments. It shows that about half of the female students (45.83%) turned in all their assignments compared to 31% male students and that about 56 % of the male students missed one to three assignments.

Table 2: Enrollment per major and gender in Engineering Statics at TAMUQ (Fall 08)

Major	Male	Female
ELEN	13	7
PETE	20	9
MEEN	19	0
CHEN	9	8

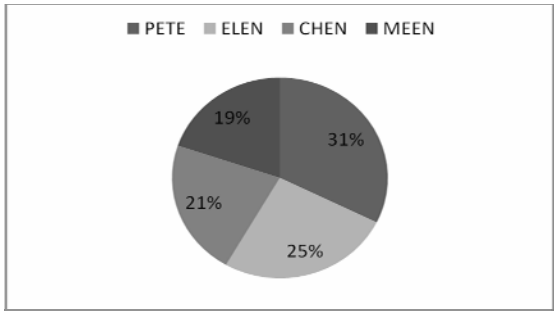

Fig. 2 School Enrollment per major

Class attendance was monitored 27 times during the semester and accounted for part of 5% of the final grade which also included class participation and class binder. This was introduced as an incentive to maintaining professional habits as well as learning time management, as students routinely missed classes to prepare for other assignments or exams. The data is summarized in Table 4. It shows that the same percentage of male and female (about 25 % of the students), missed more than half the time and that about 60% of females compared to 36 % male, missed 30% of the time. Male students attending more than 21 lectures was twice as much as their female counterpart (30% vs. 15%).

The final class grade was based on 25% Exam I, 25% Exam II, 25 % Final exam, 10% Homework, 10% (six) quizzes and 5% attendance, participation and class binder. The student who received the highest mark in the class (91%) received an A as a final grade and the grade scale adopted for the class was A: > 80%, B: 70%—80%, C: 60%-70%, D:50%-60% and F: <50%.
Figure 4 shows the final class grade per gender. Male and female received about the same % of A (21%), a slightly higher number of male than female students received a B (38 % male-34 % female) and 10% more female than male students received a C (41.8% vs. 32.8%). The bulk of male students received a B while the bulk of female students received a C. Approximately

5 % of male and female students received a D but no female received an F.

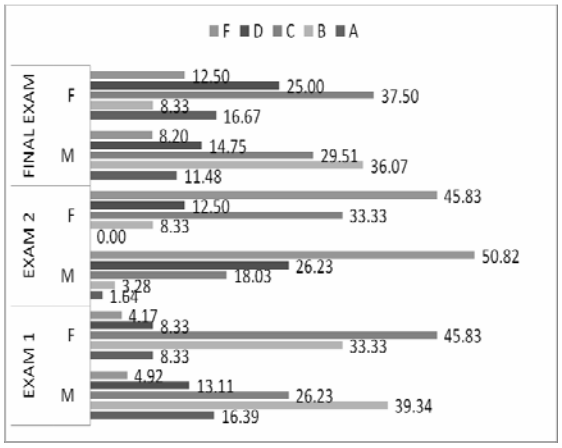

Fig. 3 Distribution of grades per exam and per gender (in %).

Table 3: Homework completion per gender in Engineering Statics at TAMUQ (Fall 08).

# of HW	Male (%)	Female (%)
< 5	3.28	0.00
5 to 7	9.84	16.67
8 to 10	55.74	37.50
11	31.15	45.83

Table 4: Class attendance per gender in Engineering Statics at TAMUQ (Fall 08).

# Classes Attended	Male (%)	Female (%)
<5	1.64	0
6 to 10	8.20	0
11 to 15	26.23	25.00
16 to 20	36.07	58.33
21 to 25	26.23	12.50
> 25	1.64	4.17

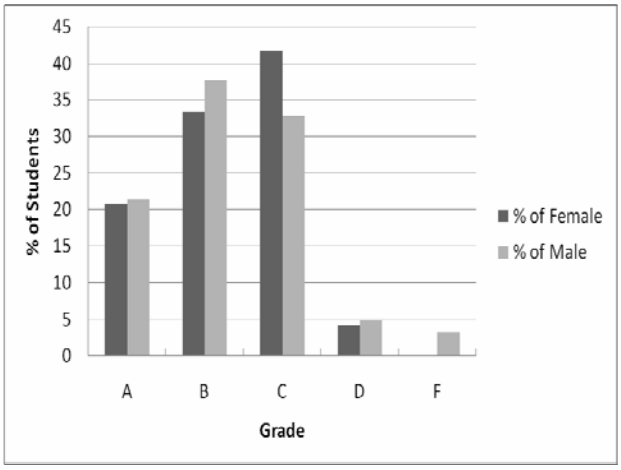

Fig. 4 TAMUQ Engineering Statics (Fall 08) final class grade per gender.

3 Conclusions

Analysis of data collected during the Fall 2008 in Engineering Statics course at Texas A&M University at Qatar showed that i) female students completed their assignment more regularly than male students, ii) male attendance was higher than female attendance and iii) gender was not a factor in the performance of students.

References:

[1] http://www.qatar.tamu.edu/
[2] http://www.tamu.edu/
[3] http://www.abet.org/
[4] http://www.ed.gov/index.jhtml