

PERFORMANCE OF HISPANIC WOMEN IN A MASTER DEGREE PROGRAM – CURRENT AND FUTURE INITIATIVES TO IMPROVE PERFORMANCE

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Abstract *¾ The purpose of this article is to report the progress of Hispanic women in a master degree program related to engineering at the Polytechnic University of Puerto Rico (PUPR). According to the National Center for Education Statistics, women in the U.S. earned more than half of all associate, bachelors and masters degrees. Although this fact may seem promising, women still trail men in several fields. For instance, women prefer fields such as Education and English while men concentrate in Agriculture and Engineering. Nevertheless, women have made a substantial gain in male-dominated fields since the 70's. This tendency has been demonstrated to be similar for all ethnic groups. In 1998, the PUPR started the Master Programs in Manufacturing as part of the Industrial Engineering Program. Due to the high number of Hispanic women that requests admission to the program, an analysis of the women's performance as well as their needs to pursue the degree were conducted.*

Index Terms *¾ engineering master degrees, hispanic women, manufacturing engineering programs.*

INTRODUCTION

According to the National Center for Education Statistics [1], women earned more than half of all associate, bachelors and masters degrees. Although this fact may seem promising, women still trail men in several fields. Specifically in fields that have been traditionally considered male-dominated. For instance, women prefer fields such as Education, English and Performing Arts while men concentrate in the areas of Agriculture, Computer and Information Sciences and Engineering. Nevertheless, women have made a substantial gain in male-dominated fields since the 70's. This tendency has been demonstrated to be similar for all ethnic groups.

The purpose of this article is to report the progress of Hispanic women in a master degree program related to engineering at the Polytechnic University of Puerto Rico (PUPR).

PROGRAM OVERVIEW

In 1998, the PUPR started the Master Programs in Manufacturing as part of the Industrial Engineering Program. These programs seek to encourage in graduate

students an intensive desire for knowledge and the development of skills and mental attitudes applied to the manufacturing environment, prerequisites for the achievement of the pursued degree while being of great benefit to the Manufacturing Industry. The programs also offer an educational alternative in fields characterized by high technology, rapid change and strong relationship among disciplines as diverse as Engineering, Science and Business for the maximum development of engineers, scientists and business professionals intimately identified with the manufacturing activity.

The two degrees offered are: Manufacturing Engineering and Manufacturing Competitiveness. Each degree can be completed with a thesis or design project option, whichever the student selects. However, with the thesis option the student obtains a degree in Science (e.g., Master in Science in Manufacturing Engineering). Students with an engineering background can request admission to the first program while students with Engineering, Business Administration or Natural Sciences background could request admission to the second program. Students specialize in one of two areas depending on the degree pursued. For the Manufacturing Engineering degree the specializations available are Pharmaceutical Processes or Industrial Automation. For the Manufacturing Competitiveness degree the specializations available are Pharmaceutical Products or Medical Devices. Due to the high number of Hispanic women that request admission to the program, descriptive statistics were developed to show their performance in the field of engineering. This analysis was also performed to verify the student's performance as well as to identify special needs that they may have to pursue the degree.

PROGRAM STATISTICS

Two approaches were used to develop the program statistics. The first approach focused mainly in the whole group of students and the second approach used a gender perspective. Tables and charts are used to present the results for both methodologies.

General Statistics

As of the Spring 2002 trimester, there are a total of 347 students in the program. From this number, 197 students are studying during the trimester of Spring 2002. Student

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distribution by programs is almost equivalent. The Manufacturing Engineering has 54% of all the students while the Manufacturing Competitiveness program has 46%. Table I presents the most popular specializations in each program based on student preference. Specifically, these specializations are Pharmaceutical Processes and Medical Devices for the Manufacturing Engineering and Manufacturing Competitiveness programs, respectively.

TABLE I
STUDENT DISTRIBUTION BY PROGRAM - SPECIALIZATION

Program - Specialization	Number of Students	Percentage
Manufacturing Engineering - Pharmaceutical Processes	137	40%
Manufacturing Engineering.- Industrial Automation	22	6%
Manufacturing Competitiveness - Pharmaceutical Products	70	20%
Manufacturing Competitiveness – Medical Devices	118	34%
Total	347	100%

Gender Statistics

Currently, the gender distribution for both degrees (Engineering and Competitiveness) is almost equally divided, females 48% and males 52% (Figure 1). This fact makes the program unique since the educational tendency has demonstrated that women still trail men in some male-dominated fields like Engineering. In terms of the manufacturing degrees, more female students pursue the Competitiveness alternative in comparison to the Engineering option (60% vs. 35%). Figures 2 and 3 present the gender distribution for each program. The result that more female students pursue the Competitiveness alternative is probably due to the fact that currently women earned more degrees in areas such as Business Administration and Natural Sciences than in Engineering. Business Administration and Natural Sciences are examples of the bachelor degrees required to pursue the Manufacturing Competitiveness field. Thus, many more women are found in the Competitiveness program.

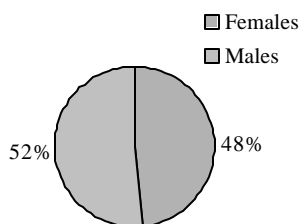


FIGURE 1
GENDER DISTRIBUTION FOR BOTH PROGRAMS

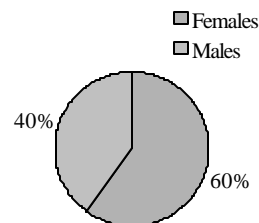


FIGURE 2
GENDER DISTRIBUTION FOR THE MANUFACTURING COMPETITIVENESS PROGRAM

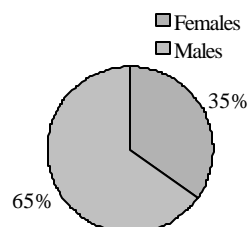


FIGURE 3
GENDER DISTRIBUTION FOR THE MANUFACTURING ENGINEERING PROGRAM

According to the results obtained by program, the analysis by specialization demonstrates that the Manufacturing Competitiveness specializations have the highest number of female students. Gender distribution results by specialization show that Medical Devices and Pharmaceutical Products options resulted in 63% and 56% female students, respectively. The Pharmaceutical Processes and Industrial Automation alternatives resulted in 38% and 14% female students, respectively. Gender distribution results by specialization are presented in Tables II and III for the Manufacturing Competitiveness and Manufacturing Engineering programs, respectively.

TABLE II
GENDER DISTRIBUTION FOR THE MANUFACTURING COMPETITIVENESS SPECIALIZATIONS

Specialization	Gender	Percentage
Medical Devices	Females	63%
	Males	37%
Pharmaceutical Products	Females	56%
	Males	44%

TABLE III
GENDER DISTRIBUTION FOR THE MANUFACTURING ENGINEERING SPECIALIZATIONS

Specialization	Gender	Percentage
Pharmaceutical Processes	Females	38%
	Males	62%
Industrial Automation	Females	14%
	Males	86%

STUDENT OVERVIEW

Our female students pursue their master's degree while working as full time employees in the manufacturing industries (e.g., Pfizer, Hewlett Packard). They are highly respected professionals as evidenced by the positions that they hold. Some of these positions are process engineers, financial analysts, quality engineers and validation laboratory supervisors among others. Research projects and theses prepared by our female students include topics such as: *Certification of Supplier for the Electronic Industry* and *Design of a Solution Transfer System*, to mention a few.

This group of Hispanic female students has shown to be successful in pursuing their master's degree. However, as many other professional women they also struggle when it is time to discriminate between professional or family time. In a recent PUPR survey, women responded that they feel more committed to their jobs than to their studies, due to the pressure of being recognized as good professionals in their fields. Another major concern for the female students is the need of having a person they can trust to take care of their children while they attend the university. These and other concerns expressed by our female students have encouraged the university administration to develop successful partnerships with industry, government and other universities to address the special needs that Hispanic female professionals have.

CURRENT PUPR INITIATIVE

In November 2001 (i.e., Winter 2001 trimester), the Institution started the Distance Education Courses at the Graduate School. The Distance Education Courses present an alternative to the students in terms of learning methodology. Through this modern methodology students do not have to attend the university to take their courses. Courses are available through the University's web page, allowing students to study the course's material at any personal computer that is available to them. The Distance Education Courses have allowed students to balance their working and family lives while pursuing their goal of obtaining their master degree. A survey given to the students to rate the Distance Education experience resulted in comments such as: *Thanks to the courses on-line now I have time for all my responsibilities: work, children and family.*

It is important to highlight that the first courses that were launched through this new methodology were the courses in the Master in Manufacturing Programs. For the Winter 2001 trimester, three Manufacturing courses were available through the Distance Education Program with a total number of 59 registered students. On the following trimester (Spring 2002), there were two on-line courses available for the Manufacturing Programs and the total number of registered students resulted in 77 (Figure 4). Thus, this initiative has been well received by our students

and based on the registration numbers, registration is expected to continue to grow rapidly as new courses are added to the program.

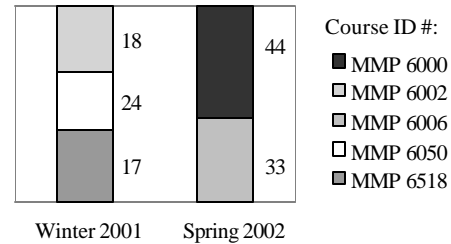


FIGURE 4
REGISTRATION NUMBERS FOR THE MASTER IN MANUFACTURING ON-LINE COURSES

FUTURE PUPR INITIATIVES

The efforts to help our students are now focusing on finding economic support to help these students through their school years. Then, we will encourage them to continue graduate work at the doctoral level and publish their thesis or design project work in journals or other publications recognized in the manufacturing environment (e.g., Pharmaceutical Technology). The first effort is guided by the development of successful partnerships with industry and government. The second focuses on promoting graduate work in other universities that have successful Manufacturing Programs, thereby enhancing the knowledge already acquired at our school.

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REFERENCES

- [1] U.S. Department of Labor, National Center for Education Statistics, "Entry and Persistence of Women and Minorities in College Science and Engineering Education", *National Center for Education Statistics – Research and Development Report*, NCES 2000-601, September 2000.