

Importance of the Undergraduate Research Experience for Job Opportunities

**Professional Enrichment Center (CEP)
Research Academy for Faculty and
Postdoctoral Fellows**

University of Puerto Rico- Mayagüez Campus

Introduction

- As part of ongoing research studies at the University of Puerto Rico - Mayagüez, a study based research survey was conducted in order to assess the importance of research as an element of the students' experience.
- As immediate benefit, the companies responses' will help us identify the student profile that the companies seek when recruiting and to improve those potential areas in the student profile.
- This report presents a general idea of the preliminary data collected.

Introduction

- **General objectives:**

- Assess the importance of the research experience as an element of the students' profile.
- Explore the skills that the companies seek when they recruit students.
- Evaluate if research elements such as projects, publications, oral presentations, are of interest for the companies.
- Know the perspective that companies have about the potential benefits for their companies in recruiting students with research experience.
- Determine if the undergraduate research experience in or outside of Puerto Rico is important for the companies.
- Explore the disciplines that the companies believe UPRM should develop to benefit the students.
- Measure the satisfaction level of the academic and professional profile of the UPRM students.
- Propose comparisons between some variables of interest

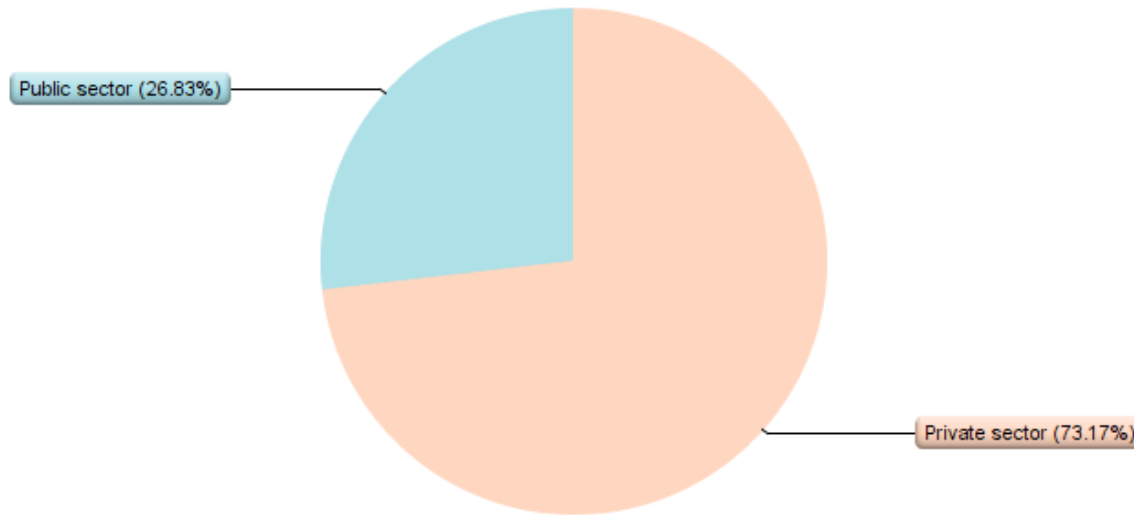
Introduction

We invited the companies who participated in Job Fairs to voluntarily take a survey about the importance of research as an element of the students' experience.

The Job Fairs considered for participation were:

- The 26th Annual Job Fair (on Friday, September 26, 2014) at the Rafael A. Mangual Coliseum organized by the Placement Office at UPRM, and the Job Fair 2014 event at the ADEM building (on Thursday, September 25, 2014).
 - The Spring Job Fair (on Friday, February 27, 2015) at the Rafael A. Mangual Coliseum organized by the Placement Office at UPRM.
- A total of 41 companies accepted to participate in the survey. Among the participants were companies in manufacturing, technology and software development, telecommunications, pharmaceutical, financial and accounting, security, logistics and transportation, to name a few.

2. Type of company:

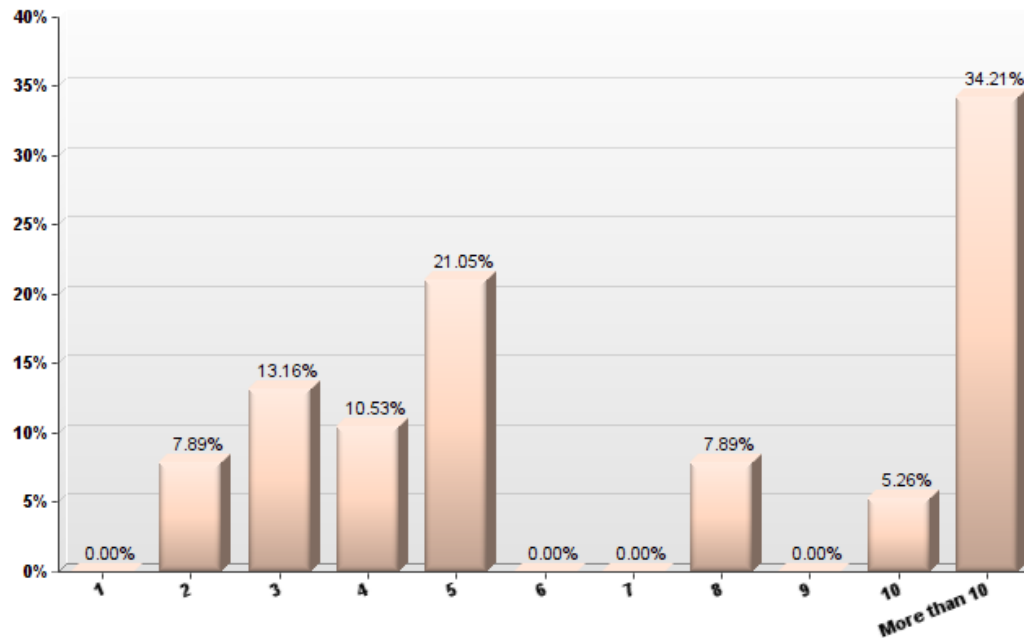


#	Answer	Response	%
1	Private sector	30	73.17%
2	Public sector	11	26.83%
	Total	41	100.00%

Table Q2-1. Summary of the type of company

Of all the companies who participated in this study, 73.17% correspond to the private sector and 26.83% represent companies of the public sector.

4. How many people do you contemplate recruiting at the Job Fair atUPRM?



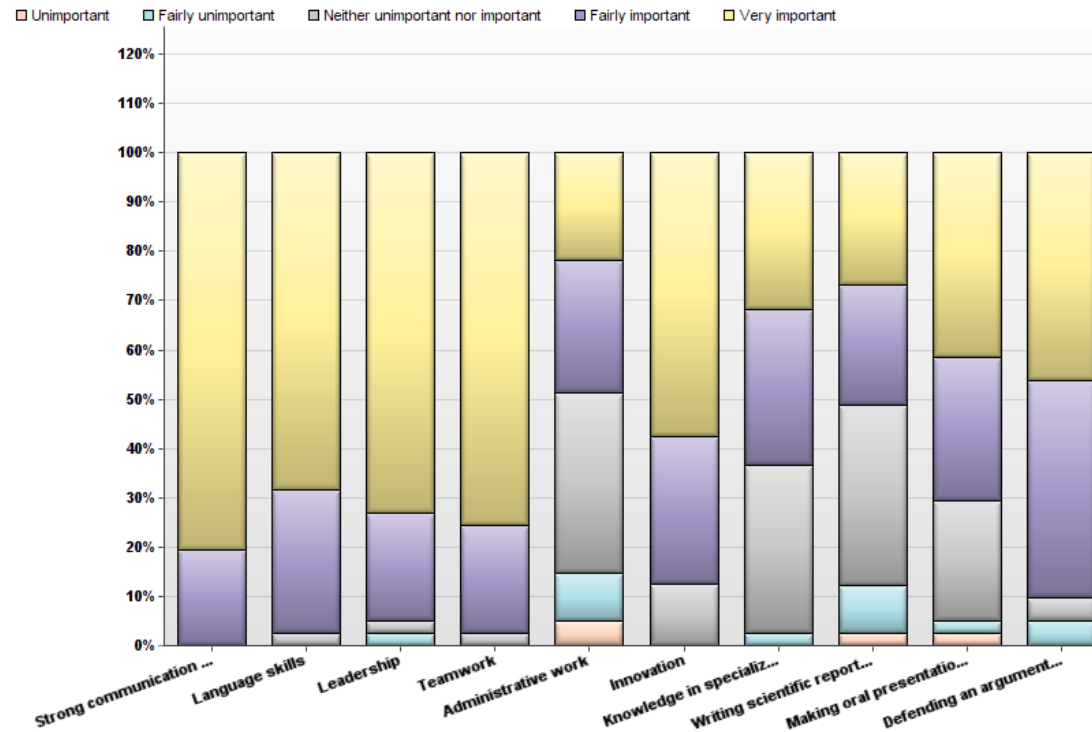
This study revealed that 34.21 % of the companies contemplated recruiting more than 10 students at the Job Fair at UPRM. To recruit 5 students was the objective of 21.05% of the companies.

4. How many people do you contemplate recruiting at the Job Fair at UPRM?

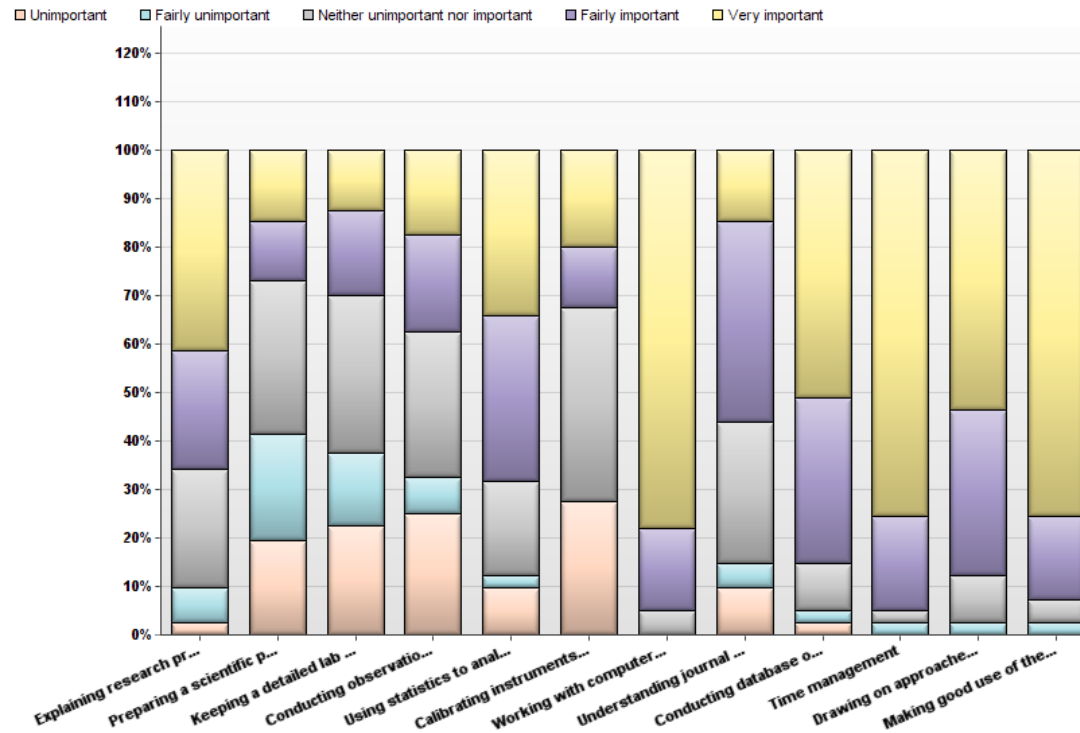
#	Answer	Response	%
1	1	0	0.00%
2	2	3	7.89%
3	3	5	13.16%
4	4	4	10.53%
5	5	8	21.05%
6	6	0	0.00%
7	7	0	0.00%
8	8	3	7.89%
9	9	0	0.00%
10	10	2	5.26%
11	More than 10	13	34.21%
	Total	38	100.00%

Table Q4-1. Summary of the number of students that the companies contemplated recruiting at the UPRM Job Fair.

5. Please use the scale to select the skills that your company seeks when recruiting students.



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Based on the mean, the skills that the companies seek when recruiting students, arranged in order from most important to least important are the following:

Rank	Skill	Total Responses	Mean
1	Strong communication skills	41	4.8
2	Teamwork	41	4.73
3	Working with computers	41	4.73
4	Time management	41	4.68
5	Language skills	41	4.66
6	Leadership	41	4.66
7	Making good use of the resources available	41	4.66
8	Innovation	40	4.45
9	Drawing on approaches from different fields to solve a problem	41	4.39
10	Defending an argument when asked questions	41	4.32
11	Conducting database or Internet searches	41	4.29
12	Making oral presentations	41	4.05
13	Explaining research projects to people outside the student's field	41	3.95
14	Knowledge in specialized software	41	3.93
15	Using statistics to analyze data	41	3.8
16	Writing scientific reports or papers	41	3.63
17	Administrative work	41	3.51
18	Understanding journal articles	41	3.46
19	Conducting observations in the lab or field	40	2.98
20	Calibrating instruments needed for measurement	40	2.98
21	Keeping a detailed lab notebook	40	2.83
22	Preparing a scientific poster	41	2.8

5. Please use the scale to select the skills that your company seeks when recruiting students.

#	Question	Unimportant	Fairly unimportant	Neither unimportant nor important	Fairly important	Very important	Total Responses	Mean
1	Strong communication skills	0.00%	0.00%	0.00%	19.51%	80.49%	41	4.80
2	Language skills	0.00%	0.00%	2.44%	29.27%	68.29%	41	4.66
3	Leadership	0.00%	2.44%	2.44%	21.95%	73.17%	41	4.66
4	Teamwork	0.00%	0.00%	2.44%	21.95%	75.61%	41	4.73
5	Administrative work	4.88%	9.76%	36.59%	26.83%	21.95%	41	3.51
6	Innovation	0.00%	0.00%	12.50%	30.00%	57.50%	40	4.45
7	Knowledge in specialized software	0.00%	2.44%	34.15%	31.71%	31.71%	41	3.93
8	Writing scientific reports or papers	2.44%	9.76%	36.59%	24.39%	26.83%	41	3.63
9	Making oral presentations	2.44%	2.44%	24.39%	29.27%	41.46%	41	4.05
10	Defending an argument when asked questions	0.00%	4.88%	4.88%	43.90%	46.34%	41	4.32
11	Explaining research projects to people outside the student's field	2.44%	7.32%	24.39%	24.39%	41.46%	41	3.95

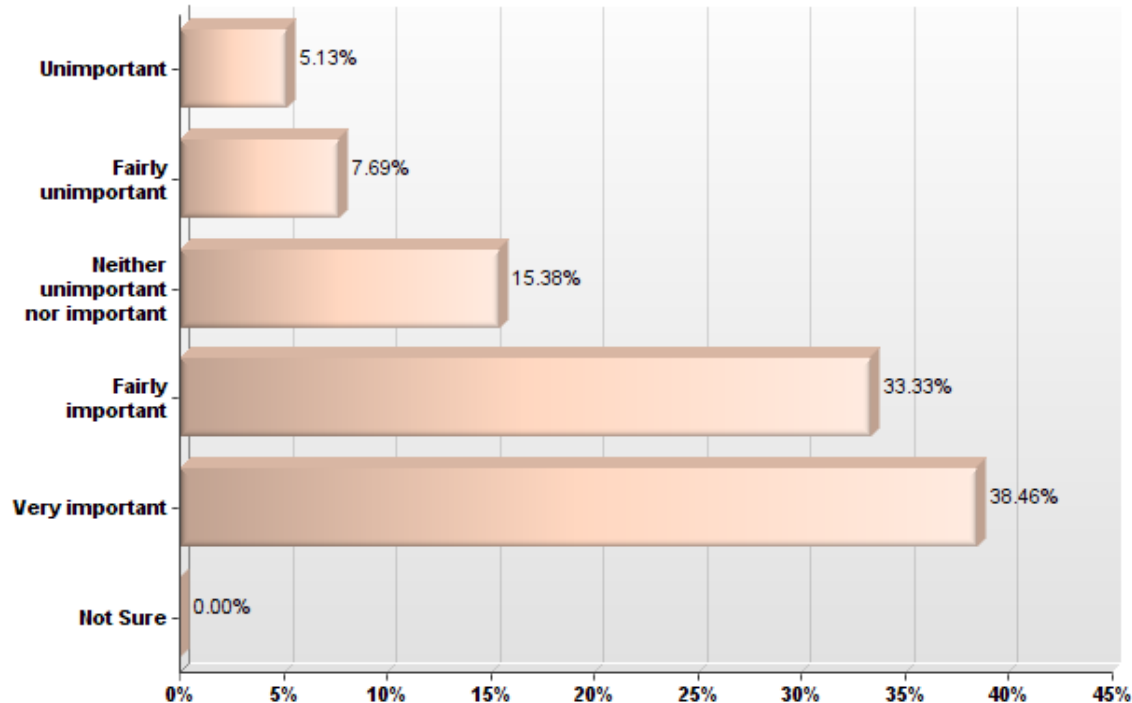
Table Q5-1. Summary of the skills that the companies seeks when recruiting students.

5. Please use the scale to select the skills that your company seeks when recruiting students.

#	Question	Unimportant	Fairly unimportant	Neither unimportant nor important	Fairly important	Very important	Total Responses	Mean
12	Preparing a scientific poster	19.51%	21.95%	31.71%	12.20%	14.63%	41	2.80
13	Keeping a detailed lab notebook	22.50%	15.00%	32.50%	17.50%	12.50%	40	2.83
14	Conducting observations in the lab or field	25.00%	7.50%	30.00%	20.00%	17.50%	40	2.98
15	Using statistics to analyze data	9.76%	2.44%	19.51%	34.15%	34.15%	41	3.80
16	Calibrating instruments needed for measurement	27.50%	0.00%	40.00%	12.50%	20.00%	40	2.98
17	Working with computers	0.00%	0.00%	4.88%	17.07%	78.05%	41	4.73
18	Understanding journal articles	9.76%	4.88%	29.27%	41.46%	14.63%	41	3.46
19	Conducting database or Internet searches	2.44%	2.44%	9.76%	34.15%	51.22%	41	4.29
20	Time management	0.00%	2.44%	2.44%	19.51%	75.61%	41	4.68
21	Drawing on approaches from different fields to solve a problem	0.00%	2.44%	9.76%	34.15%	53.66%	41	4.39
22	Making good use of the resources available	0.00%	2.44%	4.88%	17.07%	75.61%	41	4.66

Table Q5-1. Summary of the skills that the companies seeks when recruiting students. (continuation).

6. How important is it for a student to have research experience when recruiting for your company?



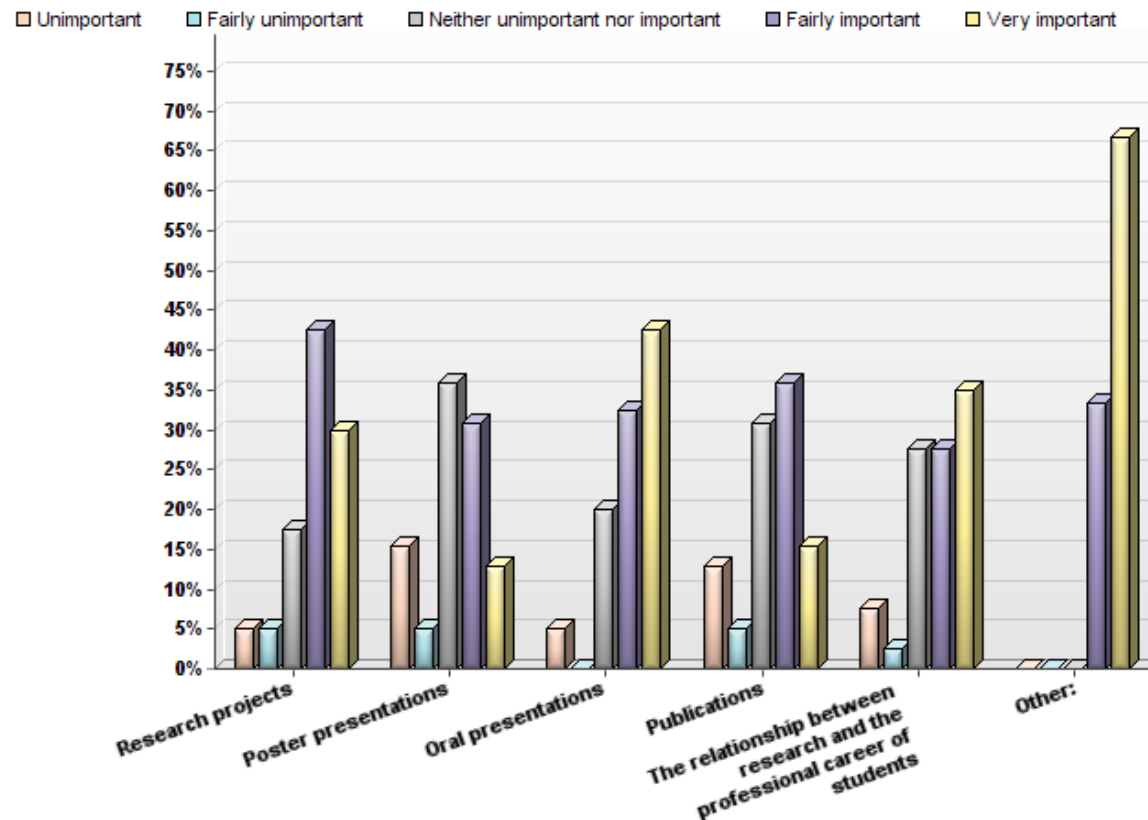
With 71.79%, most of the companies stated that it is important for a student to have research experience when the student is recruited for their company.

6. How important is it for a student to have research experience when recruiting for your company?

#	Answer	Response	%
1	Unimportant	2	5.13%
2	Fairly unimportant	3	7.69%
3	Neither unimportant nor important	6	15.38%
4	Fairly important	13	33.33%
5	Very important	15	38.46%
6	Not Sure	0	0.00%
	Total	39	100.00%

Table Q6-1. Percentage of each response to “the importance that the student has research experience when recruited by the companies”.

7. Please use the scale to select the items that would be of interest to your company if/when recruiting students with research experience.



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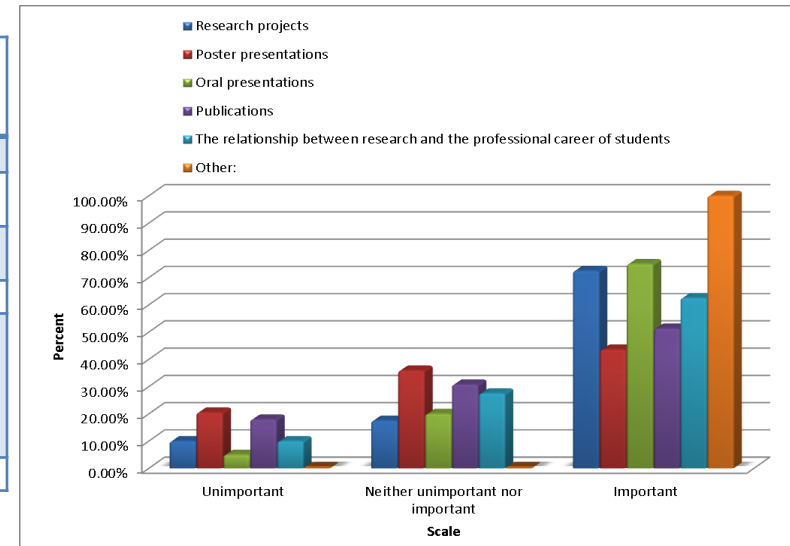
#	Question	Unimportant	Fairly unimportant	Neither unimportant nor important	Fairly important	Very important	Total Responses	Mean
1	Research projects	5.00%	5.00%	17.50%	42.50%	30.00%	40	3.88
2	Poster presentations	15.38%	5.13%	35.90%	30.77%	12.82%	39	3.21
3	Oral presentations	5.00%	0.00%	20.00%	32.50%	42.50%	40	4.08
4	Publications	12.82%	5.13%	30.77%	35.90%	15.38%	39	3.36
5	The relationship between research and the professional career of students	7.50%	2.50%	27.50%	27.50%	35.00%	40	3.80
6	Other:	0.00%	0.00%	0.00%	33.33%	66.67%	3	4.67

Table Q7-1. Percentage of each response to “the items that would be of interest to the companies if/when recruiting students with research experience”.

7. Please use the scale to select the items that would be of interest to your company if/when recruiting students with research experience.

#	Question	Unimportant	Neither unimportant nor important	Important	Total Responses	Mean
1	Research projects	10.00%	17.50%	72.50%	40	3.88
2	Poster presentations	20.51%	35.90%	43.59%	39	3.21
3	Oral presentations	5.00%	20.00%	75.00%	40	4.08
4	Publications	17.95%	30.77%	51.28%	39	3.36
5	The relationship between research and the professional career of students	10.00%	27.50%	62.50%	40	3.8
6	Other:	0.00%	0.00%	100.00%	3	4.67

Table Q7-2. Regrouping table Q7-1.

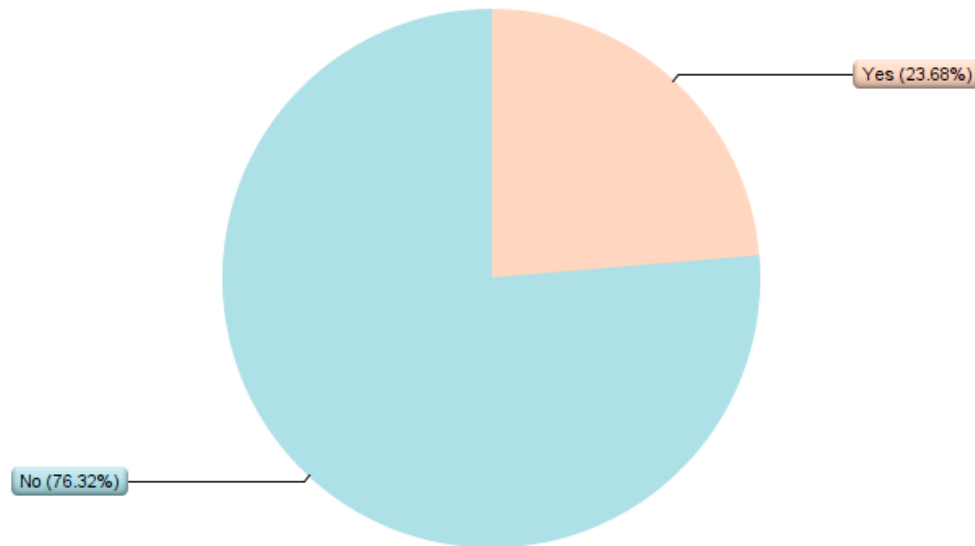


Regrouped items:

The rank of the items (to see Table Q7-2), only considering the five options fixed for this question, was as following: in first place, oral presentations (75.00%); second place, research projects (72.50%); third place, the relationship between research and the professional career of students (62.50%); fourth place, publications (51.28%); fifth place, poster presentations (43.59%).

It is important to highlight that the participants added three items to the list (Other): work, operations (business), and sense of urgency expressing such items as very important.

8. If a student with research experience is recruited by your company, is it possible for the student to receive additional incentive?



#	Answer	Response	%
1	Yes	9	23.68%
2	No	29	76.32%
	Total	38	100.00%

Table Q8-1. Percentage of each response to the possibility that the student with research experience receives an incentive.

About 23.68% of the participants who responded this question indicated that if a student with research experience is recruited by their companies, possibly that student would receive an additional incentive. These incentives include a bonus, recruitment and master's degree payment, better salary, travel expenses paid and tuition reimbursement, and promotions. In addition, one company indicated that it can be worked out but based on a specific example.

9. Does your company have a research collaboration program with UPRM?

About 16.22% of the participants expressed that they have a research collaboration program with UPRM. The other remaining 83.78% do not have such collaboration.

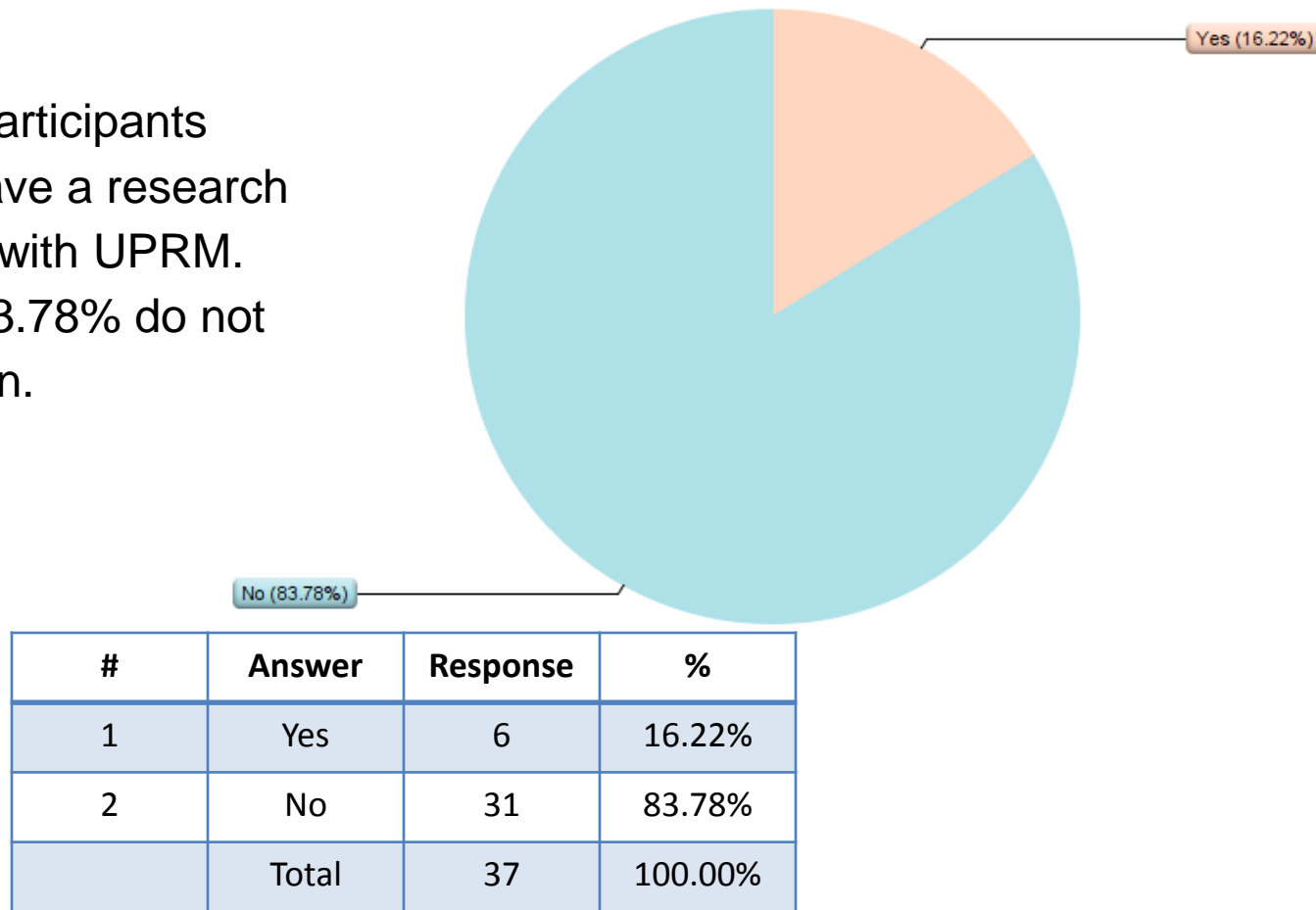
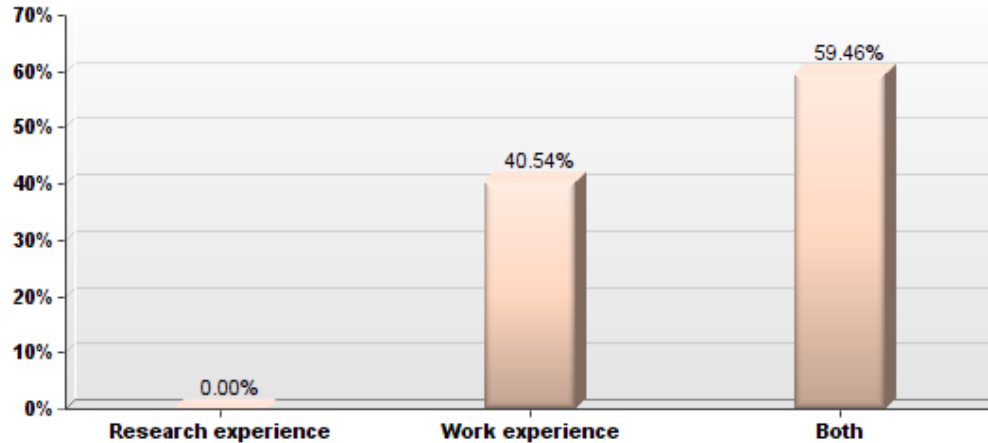


Table Q9-1. Percentage of each response to “the collaboration program with UPRM”.

10. In your opinion, what would be the potential benefits for your company if it recruits a student with research experience?

Text Response
➤ Quality and diversity.
➤ Ability to solve a problem that requires teamwork & investigation.
➤ Applied knowledge and/or depends on the specific research (e. s vision).
➤ It depend the type of research.
➤ Good defending an argument, oral communication skills.
➤ Knowledge of investigation.
➤ Quality of work, student has more time to focus learning on a new topic rather than learning how to do research.
➤ Our job requires candidate to conduct research or technical area. Having a research experience would greatly allow candidates to do our job.
➤ Reduces the learning curve. Ready to execute.
➤ Does analysis well.
➤ We are a research company, so having research experience ensures they will have the skills necessary to succeed.
➤ Adds value to the operations or related topics.
➤ Efficiency.
➤ Vary.
➤ Not sure.
➤ The opportunity to apply the knowledge acquired from classes in a practical environment, which enhances comprehension of technical topics and skills.
➤ Scientific research opportunities.
➤ Some experience is always a benefit, since they already know the importance of being committed.

11. When your company recruits students, what is more important?



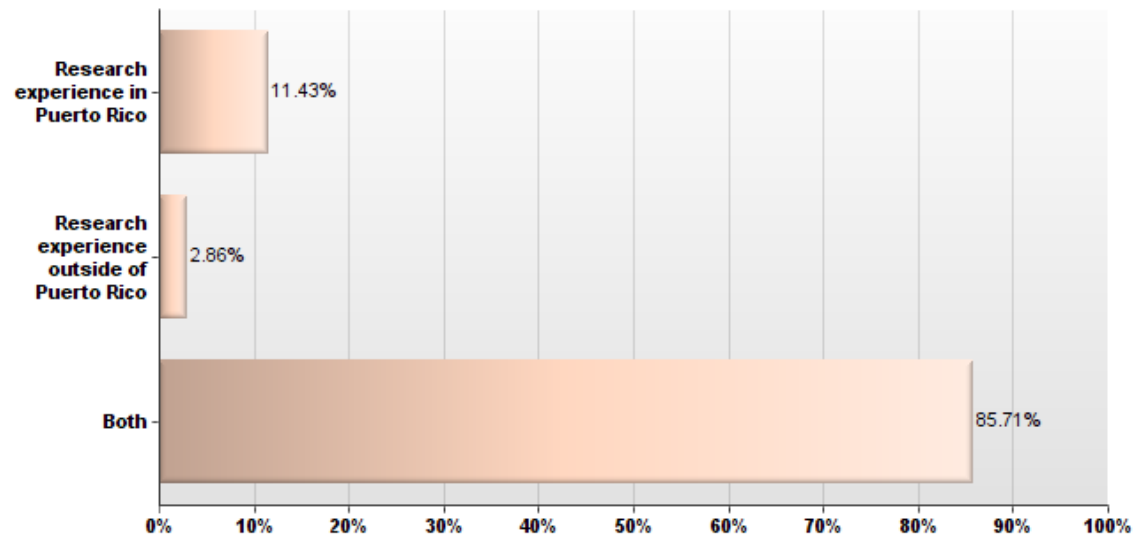
About 59.46% of the companies who responded this question coincided that the most important elements are both research and work experience.

#	Answer	Response	%
1	Research experience	0	0.00%
2	Work experience	15	40.54%
3	Both	22	59.46%
	Total	37	100.00%

Table Q11-1. Percentage of each response to “the importance of the research or work experience when the companies recruit students”.

12. When your company recruits students, what is more important about the kind research experience the student may possess?

About 85.71% of those who responded this question indicated that both research experience in and outside of Puerto Rico are very important.

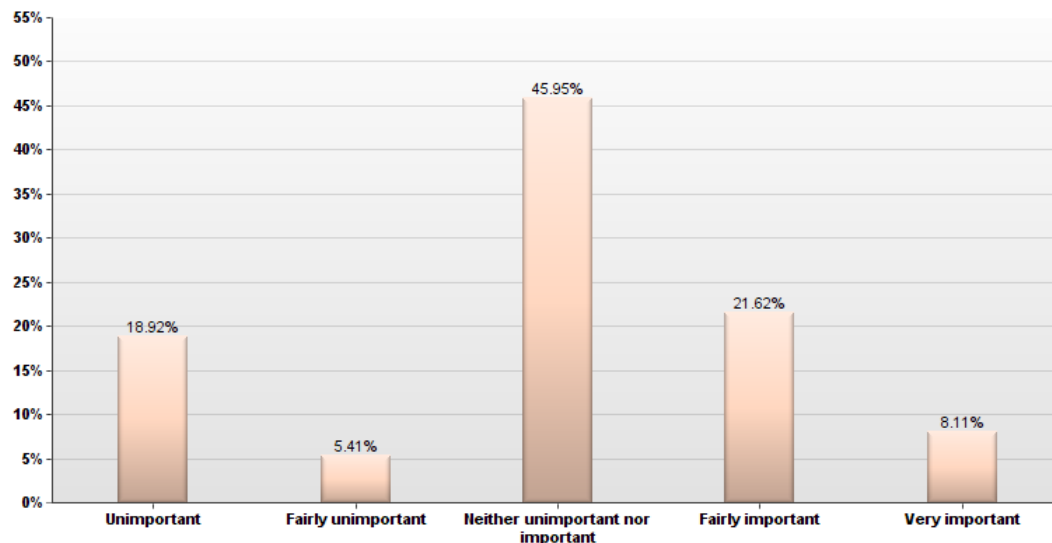


#	Answer	Response	%
1	Research experience in Puerto Rico	4	11.43%
2	Research experience outside of Puerto Rico	1	2.86%
3	Both	30	85.71%
Total		35	100.00%

Table Q12-1. Percentage of each response to “the importance that the student may possess research experience in or outside of Puerto Rico”.

13. When your company recruits students, how important is it for the student to already have a publication in a peer-reviewed journal?

About 45.95% of respondents assumed neutral stance with respect to the importance for the student to already have a publication in a peer-reviewed journal. The respondents indicated that this issue is neither unimportant nor important.

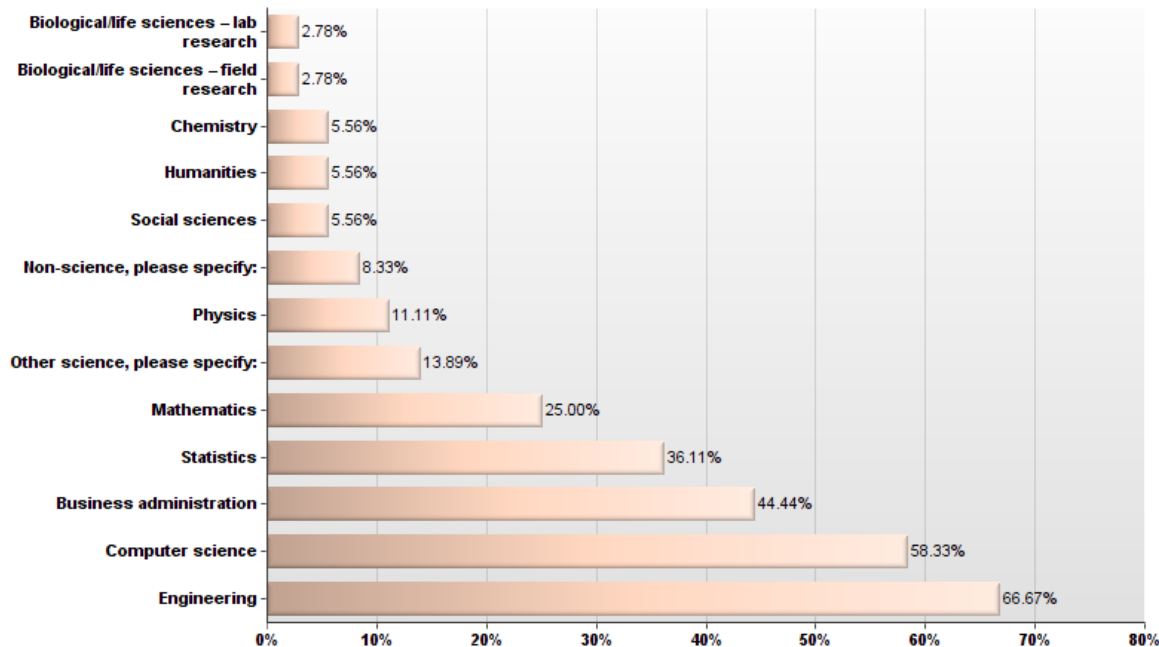


13. When your company recruits students, how important is it for the student to already have a publication in a peer-reviewed journal?

#	Answer	Response	%
1	Unimportant	7	18.92%
2	Fairly unimportant	2	5.41%
3	Neither unimportant nor important	17	45.95%
4	Fairly important	8	21.62%
5	Very important	3	8.11%
	Total	37	100.00%

Table Q13-1. Percentage of each response to “the importance that the student already has a publication in a peer-reviewed journal”.

14. What discipline (or research area) do you believe UPRM should develop in order to benefit students who will eventually work for your company?



In respect to the discipline or research area that the companies believe UPRM should develop in order to benefit students if eventually they work for their company, the participants coincided that engineering (66.67%) and computer sciences (58.33%) are the most important of all disciplines that they can select.

14. What discipline (or research area) do you believe UPRM should develop in order to benefit students who will eventually work for your company?

#	Answer	Response	%
1	Biological/life sciences – lab research	1	2.78%
2	Biological/life sciences – field research	1	2.78%
3	Mathematics	9	25.00%
4	Physics	4	11.11%
5	Chemistry	2	5.56%
6	Engineering	24	66.67%
7	Computer science	21	58.33%
8	Statistics	13	36.11%
9	Social sciences	2	5.56%
10	Humanities	2	5.56%
11	Business administration	16	44.44%
12	Other science, please specify:	5	13.89%
13	Non-science, please specify:	3	8.33%

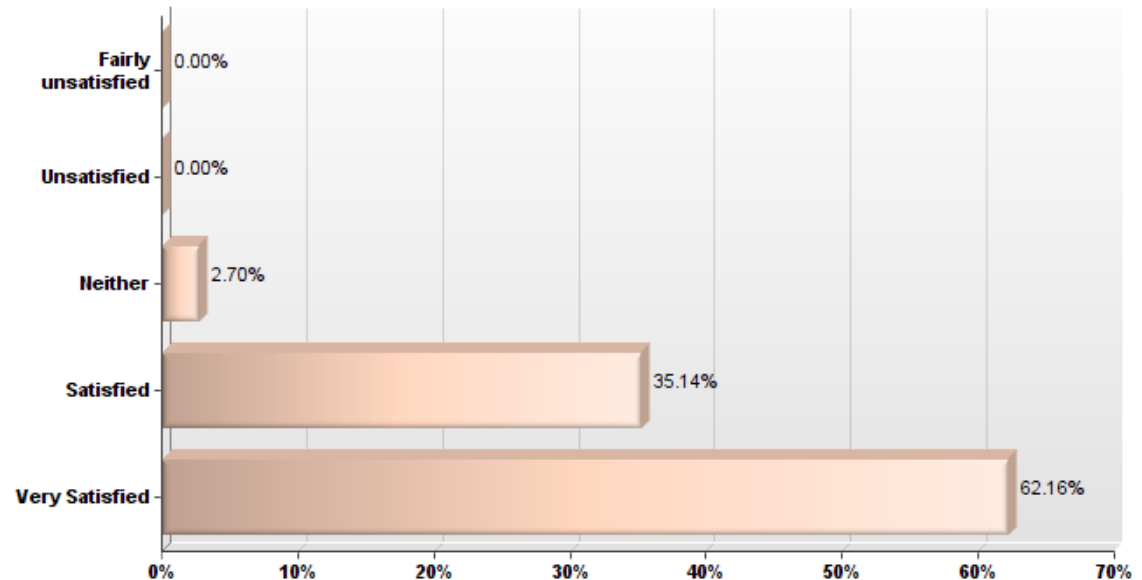
Table Q14-1. Percentage of each response to “discipline (or research area) that the companies believe UPRM should develop in order to benefit students who will eventually work for their companies”.

14. What discipline (or research area) do you believe UPRM should develop in order to benefit students who will eventually work for your company?

The respondents mentioned as other sciences that should be considered as potential opportunities of development. These **other sciences** included: engineering systems, accounting and finance, mobile, cloud computing, big data, cyber-security, software, and agronomy. In addition, the development of more software skills, and knowledge of Excel and English skills were included in the list of **non-sciences**.

15. How satisfied are you with the academic and professional profile of the UPRM students?

Finally, it is important to underlay that the companies expressed satisfaction with the academic and professional profile of the UPRM students with a 97.30% (35.14% + 62.16%) of the companies. However, they expressed as a recommendation the improvement of English skills and to continue encouraging the research given that they considered it important.



#	Answer	Response	%
1	Unsatisfied	0	0.00%
2	Fairly unsatisfied	0	0.00%
3	Neither	1	2.70%
4	Satisfied	13	35.14%
5	Very Satisfied	23	62.16%
Total		37	100.00%

Table Q15-1. Percentage of each response to “the satisfaction for the companies about the academic and professional profile of the UPRM students”.

Cross Tabulation tables

- Type of company (question two, Q2) and the number of people that the companies contemplate recruiting in the Job Fair at UPRM (Q4).

		How many people do you contemplate recruiting at the Job Fair at UPRM?												
		1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	More than 10 (11)	Mean	Total
Type of company:	Private sector (1)	0 0.00%	3 10.71%	4 14.29%	4 14.29%	7 25.00%	0 0.00%	0 0.00%	1 3.57%	0 0.00%	0 0.00%	9 32.14%	6.29	28 100.00%
	Public sector (2)	0 0.00%	0 0.00%	1 10.00%	0 0.00%	1 10.00%	0 0.00%	0 0.00%	2 20.00%	0 0.00%	2 20.00%	4 40.00%	8.80	10 100.00%
	Total	0 0.00%	3 7.89%	5 13.16%	4 10.53%	8 21.05%	0 0.00%	0 0.00%	3 7.89%	0 0.00%	2 5.26%	13 34.21%	-	38 100.00%

Cross Tabulation tables

- Type of company (Q2) and the importance of the work or research experience when the companies recruit students (Q11).

		When your company recruits students, what is more important?			
		Research experience (1)	Work experience (2)	Both (3)	Total
Type of company:	Private sector (1)	0 0.00%	13 48.15%	14 51.85%	27 100.00%
	Public sector (2)	0 0.00%	2 20.00%	8 80.00%	10 100.00%
	Total	0 0.00%	15 40.54%	22 59.46%	37 100.00%

Cross Tabulation tables

- The importance of the work or research experience (Q11) and the kind of research experience the student may possess (Q12) when the companies recruit students.

		When your company recruits students, what is more important about the kind of research experience...			
		Research experience in Puerto Rico (1)	Research experience outside of Puerto Rico (2)	Both (3)	Total
When your company recruits students, what is more important?	Research experience (1)	0 0.00%	0 0.00%	0 0.00%	0 100.00%
	Work experience (2)	2 15.38%	1 7.69%	10 76.92%	13 100.00%
	Both (3)	2 9.52%	0 0.00%	19 90.48%	21 100.00%
	Total	4 11.76%	1 2.94%	29 85.29%	34 100.00%

Cross Tabulation tables

- Type of company (Q2) and the importance of the kind of research experience the student may possess (Q12) when the companies recruit students.

		When your company recruits students, what is more important about the kind of research experience...			
		Research experience in Puerto Rico (1)	Research experience outside of Puerto Rico (2)	Both (3)	Total
Type of company:	Private sector (1)	3 11.11%	1 3.70%	23 85.19%	27 100.00%
	Public sector (2)	1 12.50%	0 0.00%	7 87.50%	8 100.00%
	Total	4 11.43%	1 2.86%	30 85.71%	35 100.00%

Cross Tabulation tables

- Type of company (Q2) and the discipline (or research area) which the companies believe UPRM should develop in order to benefit students who will eventually work for the company (Q14).

		Type of company:		
		Private sector (1)	Public sector (2)	Total
Discipline (or research area)	Biological/life sciences – lab research (1)	1 3.70%	0 0.00%	1 2.78%
	Biological/life sciences – field research (2)	1 3.70%	0 0.00%	1 2.78%
	Mathematics (3)	4 14.81%	5 55.56%	9 25.00%
	Physics (4)	3 11.11%	1 11.11%	4 11.11%
	Chemistry (5)	1 3.70%	1 11.11%	2 5.56%
	Engineering (6)	18 66.67%	6 66.67%	24 66.67%
	Computer science (7)	14 51.85%	7 77.78%	21 58.33%
	Statistics (8)	9 33.33%	4 44.44%	13 36.11%
	Social sciences (9)	1 3.70%	1 11.11%	2 5.56%
	Humanities (10)	1 3.70%	1 11.11%	2 5.56%
	Business administration (11)	12 44.44%	4 44.44%	16 44.44%
	Other science, please specify: (12)	3 11.11%	2 22.22%	5 13.89%
	Non-science, please specify: (13)	3 11.11%	0 0.00%	3 8.33%
	Total	27 100.00%	9 100.00%	36 100.00%

Cross Tabulation tables

- Type of company (Q2) and the importance that the student have research experience when recruiting for the company (Q6).

		How important is it for a student to have research experience when recruiting for your company?					
		Unimportant	Fairly unimportant	Neither unimportant nor important	Fairly important	Very important	Not Sure
Type of company:	Private sector	2 7.14%	2 7.14%	5 17.86%	8 28.57%	11 39.29%	0 0.00%
	Public sector	0 0.00%	1 9.09%	1 9.09%	5 45.45%	4 36.36%	0 0.00%
	Total	2 5.13%	3 7.69%	6 15.38%	13 33.33%	15 38.46%	0 0.00%

Comparing opinions

- To compare opinions about some relevant issues of the survey, the responses of two companies (A and B) which participated in both Job Fairs, in September 2014 and February 2015, are here presented. It is possible to extend the comparisons to other questions, but it will depend on the relevance or pertinence for the study.

How many people do you contemplate recruiting at the Job Fair at UPRM?:

Company	Job Fair – September 2014	Job Fair – February 2015
A	8	More than 10
B	Not answered	More than 10

Comparing opinions

The companies seek very *important skills* when recruiting students:

Company A

Job Fair – September 2014	Job Fair – February 2015
Strong communication skills	Strong communication skills
Language skills	Language skills
Leadership	Leadership
Teamwork	Teamwork
Administrative work	Administrative work
Innovation	Innovation
Making oral presentations	Making oral presentations
Defending an argument when asked questions	Defending an argument when asked questions
Explaining research projects to people outside the student's field	Explaining research projects to people outside the student's field
Using statistics to analyze data	Using statistics to analyze data
Calibrating instruments needed for measurement	Working with computers
Working with computers	Understanding journal articles
Understanding journal articles	Conducting database or Internet searches
Conducting database or Internet searches	Time management
Time management	Drawing on approaches from different fields to solve a problem
Making good use of the resources available	Making good use of the resources available

Company B

Job Fair – September 2014	Job Fair – February 2015
Leadership	Strong communication skills
Teamwork	Language skills
Administrative work	Leadership
Using statistics to analyze data	Teamwork
Calibrating instruments needed for measurement	Administrative work
Working with computers	Innovation
Using statistics to analyze data	Knowledge in specialized software
Calibrating instruments needed for measurement	Writing scientific reports or papers
Working with computers	Making oral presentations
Conducting database or Internet searches	Working with computers
Time management	Time management
Drawing on approaches from different fields to solve a problem	Drawing on approaches from different fields to solve a problem
Making good use of the resources available	Making good use of the resources available

Comparing opinions

Disciplines (or research areas) that the companies believe UPRM should develop in order to benefit students who will eventually work for their companies:

Company	Job Fair – September 2014	Job Fair – February 2015
A	Statistics Excel (non-science)	Chemistry Engineering Computer science Statistics Business administration
B	Engineering	Biological/life sciences – lab research Chemistry Engineering Computer science

The satisfaction for the companies about the academic and professional profile of the UPRM students:

Company	Job Fair – September 2014	Job Fair – February 2015
A	Very satisfied	Very satisfied
B	Very satisfied	Very satisfied

Conclusions and recommendations

Conclusions

- ❑ In an explorative way, the survey provided a preliminary idea about the importance of undergraduate research experience for job opportunities. Certainly, for future improvements, the survey must be applied to a significant sample of companies who participate in the Job Fairs. The survey must undergo a statistical validation process and revision; procedures to determine if the survey measure (or assessment) is effective for the objectives for which it was created and then to propose it as a solid study.
- ❑ The present report gives us an idea of the relevance of the student's skills, the disciplines, and other important information that eventually will be necessary areas to develop in the students, allowing them to find better job opportunities offered by the companies.

Recommendations

- ❑ It is possible to enhance the survey by first analyzing if all questions will provide the adequate metrics to measure what we want to, or if the questions give relevant and important information, and then to add or delete questions.
- ❑ Incorporate methods for handling missing data.
- ❑ A short survey can motivate the participation of more companies who are available during short time intervals at the Job Fair.

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