

# **Assessing Academic-Support Services to Achieve Program Outcomes: A Case Study on “Library Hours” and “Study Spaces”**

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## **ABSTRACT**

The student constituency at Universidad del Turabo’s José Domingo Pérez School of Engineering was surveyed regarding usage of, and hours of operation of the library. The study was motivated by the exit survey of graduating students which shows a chronic lack of satisfaction regarding two issues: “library hours” and “spaces for individual and group study”. The results indicate that engineering students primarily use the library as a study space and secondarily as a source of bibliographical resources. Students who are unsatisfied with the “study spaces” available in the SOE tend to communicate their disapproval by also assigning a low satisfaction score to “library hours”, thus creating a confounding effect between the two issues. This is an important finding with respect to the budget since the lack of satisfaction of the students could be resolved more economically by properly outfitting a relatively small study room(s) rather than extending the hours of the more voluminous library. The libraries of four mainland universities are shown to have 24/7 study rooms that complement the library hours. Recommendations to solve the chronic lack of satisfaction are given, including the improvement of current “study spaces”, and a pilot study to investigate a two-hour extension (from 10:00 pm until 12:00 am) during weekdays.

**Keywords:** ABET, Outcomes, Turabo, Library Hours

## **1. INTRODUCTION**

This investigation was motivated by the results of the exit survey of graduating students, a semiannual outcomes assessment instrument that has been in place for several years at Universidad del Turabo’s José Domingo Pérez School of Engineering (SOE). Outcomes assessment at the SOE is driven by ABET EC 2000 requirements (ABET, 2007). The school offers three B.S. programs: Mechanical Engineering (ME), Electrical Engineering (EE), and Industrial and Management Engineering (IME). A fourth B.S. degree, Computer Engineering, started in August 2007 but it has not yet graduated its first class. Mechanical Engineering is the only ABET accredited program (since 2004) but strong efforts are being carried out to achieve ABET accreditation for the remaining programs as soon as possible.

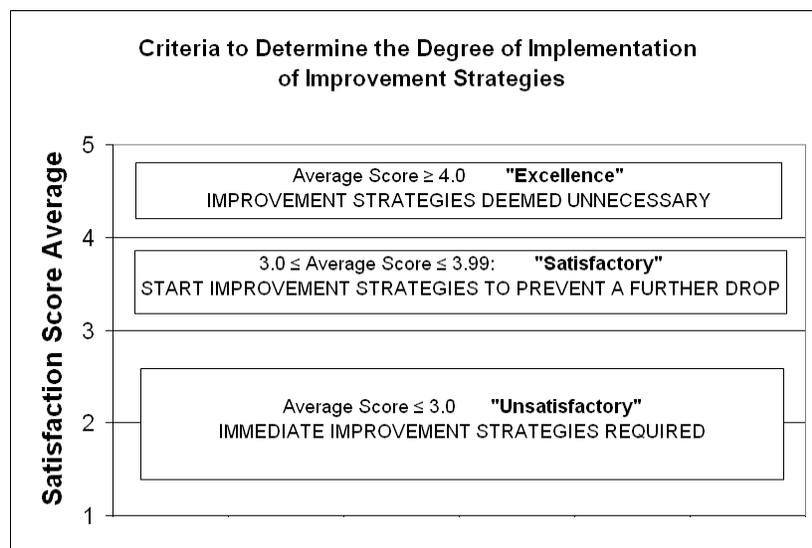
Part II of the exit survey of graduating students, “Instructional and Academic Support Services”, does not address the program outcomes directly (the first part of the survey does); however, it addresses some of the infrastructure

needs required to achieve the program outcomes. It is for this reason that part II of the exit survey is considered a very important component of the assessment program. Students express their degree of satisfaction based on a five-point Likert scale defined in Figure 1 (this scale is consistently used in all the outcomes assessment efforts in the SOE).

<b>1</b> VERY POOR (Disagree Strongly)	<b>2</b> POOR (Disagree)	<b>3</b> GOOD (Acceptable)	<b>4</b> VERY GOOD (Agree)	<b>5</b> EXCELLENT (Strongly Agree)
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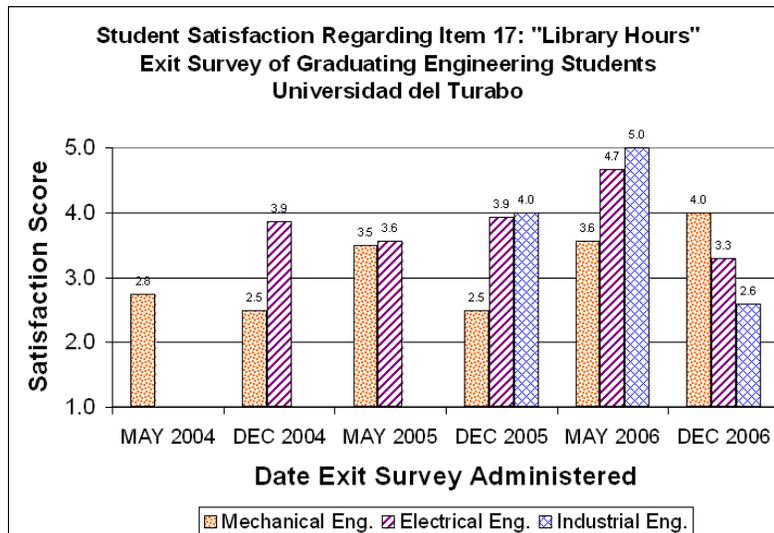
**Figure 1: Definition of the Five-Point Likert scale**

The average score is calculated for each item in the exit survey. Average scores between 4.0/5.0 and 5.0/5.0 are considered “excellent” and improvement strategies are deemed unnecessary. The school strives to maintain all scores above 4.0/5.0. Scores between 3.0/5.0 and 3.99/5.0 are considered “satisfactory”; however, improvement strategies are started to prevent a further drop in the scores. If the average score were to fall below 3.0/5.0 the result is considered “unsatisfactory”, priority status is assigned to the item, and improvement strategies are started immediately. These criteria are summarized in Figure 2.

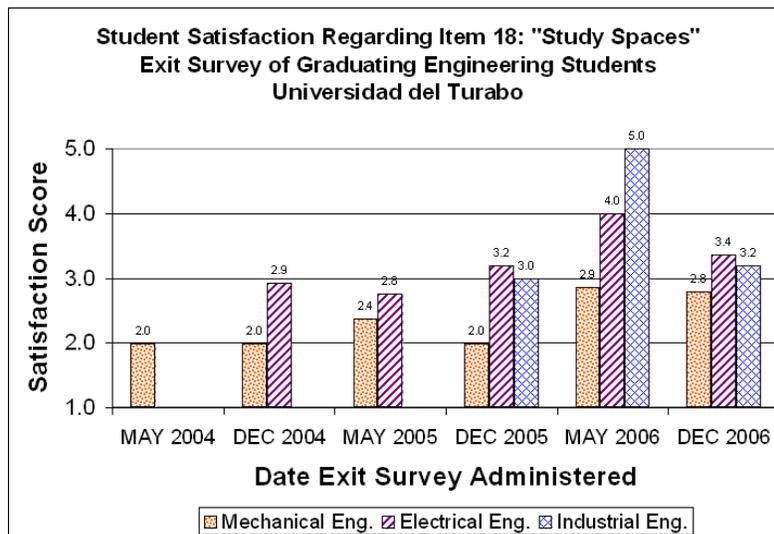


**Figure 2: Degree of Implementation of Improvement Strategies**

Graduating students generally express a high degree of satisfaction in the exit survey. In cases where satisfaction is low and there is a need to start improvement strategies, the issues are usually resolved after a few iterations (one iteration per semester). However, there are two notable exceptions, both in part II of the exit survey, in which issues have not yet been resolved. The two items are: item 17: “Library hours” (results shown in Figure 3); and item 18: “Spaces for individual and group study” (results shown in Figure 4). Note that data is available for the IME program only since December 2005 while for the EE program data it is available only since December 2004. Nevertheless, Figures 3 and 4 show that these two items regularly receive “unsatisfactory” reviews, that is, scores below the 3.0/5.0 threshold. This chronic lack of satisfaction clearly shows that our improvement strategies to date have been inadequate to resolve these two issues.



**Figure 3: Historical Exit Survey Results for Item 17: "Library Hours"**



**Figure 4: Historical Exit Survey Results for Item 18: "Study Spaces"**

## 2. GOALS, OBJECTIVES AND HYPOTHESIS

The main goal of this investigation is to learn more from our student constituency regarding the issues of "library hours" and "study space", and to recommend additional improvement strategies that could solve these chronic concerns.

The specific objectives of the study are:

1. To determine how students make use of the library. The four main options are: to withdraw resources such as books, to use the PC's connected to the internet, to study individually, and to study in groups.
2. To determine the percentage of students that desires an extension of library hours.
3. To give students the opportunity to suggest potential extensions of library hours.
4. To determine if students are aware that, although not air conditioned, the SOE computer center and classrooms are available for study after 10:00 pm if they obtain a use permit.

5. To determine if there is a confounding effect between the issues of “library hours” and “study spaces”; that is, to determine if students that are not satisfied with their “study spaces” (external to the library) tend to communicate their disapproval by also assigning a low satisfaction score to “library hours”. This is an important budgetary issue. If a confounding effect is established, the lack of satisfaction of the students could be resolved more economically by properly outfitting a relatively small study room rather than extending the hours of the more voluminous library.

The hypothesis of the study is based on the 5th objective: “Given an adequate study room (external to the library) to study after 10:00 pm, the majority of engineering students will indicate that the current library hours are satisfactory”.

### 3. METHODOLOGY

A survey was prepared based on the objectives of the study. It was administered from 2:00 pm – 4:50 pm on two subsequent days; Tuesday, May 8, 2007 and Wednesday, May 9, 2007. The 2:00 – 4:50 pm time slot was selected since classes at the SOE are offered mainly in the afternoon and evening (after 5:00 pm) so this time slot assured that a majority of students would be available for the survey. Also, since courses are offered twice per week, either on a Monday/Wednesday or Tuesday/Thursday modality, two subsequent days were selected to assure a greater sample of students. One table and three chairs were placed in the School of Engineering lobby. Students filled out the survey anonymously and placed it in an urn after completing it. The first author was present during the administration of the survey. The results were tabulated and processed in an Excel spreadsheet.

The survey consisted of six questions. In the first question, the students identified their major field of study. The second question queried for the reasons the student visits the library. Four options were given and students were allowed to select all the options that applied. The four options were, 1. to use a bibliographical resource such as a book, journal, video, etc.; 2. to use one of the 70 available computers with internet access; 3. to use it as a space for individual study; 4. to use one of the several isolated rooms in which group study is permitted. The third question asked if library hours should be extended. The current library hours of operation (M-F 7:00 am – 10:00 pm; Sat. 7:30 am – 6:00 pm); Sun. 10:00 am – 4:00 pm) were listed at the top of the page to serve as a reminder to the students. The fourth question gave students the opportunity to suggest alternative extensions of library hours. Three extension examples were given to stimulate a response: “Monday-Friday until 12:00 am”; 24 hours during the first three days of final exams; Saturdays until 10:00 pm”. The fifth question asked if students were aware that they could use the SOE computer center or any of its classrooms as a study space after 10:00 pm if they filled out a use permit. The question included the caveat that the central air-conditioning (A/C) system was turned off at 10:00 pm (rooms depend only on natural ventilation after 10:00 pm). The sixth and final question asked if students, given a study space after 10:00 pm at the SOE, would still find necessary an extension in the library hours of operation. Students were invited to write their comments. The final question was designed to determine the presence of the confounding effect. This was accomplished by quantifying the number of students who changed their minds from the first time they were asked if library hours should be extended (question 3) to the second time they were asked (question 6). By the second time they are asked the students have become aware that alternative “study spaces” are available.

### 4. RESULTS

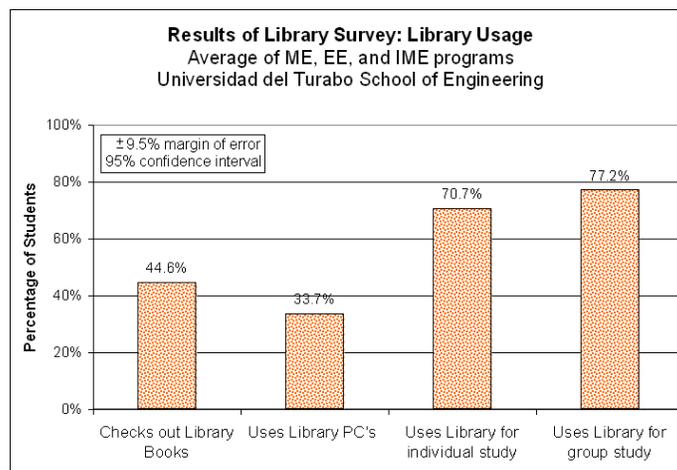
A total of 92 surveys were answered out of a population of 650 engineering students. The distribution by program was as follows; 46 ME students (18.4% of the 250 ME students), 31 EE students (12.4% of the 250 EE students) and 15 IME students (10% of the 150 IME students). On average, 14.2% of the total engineering student population was surveyed. The margin of error is  $\pm 9.5\%$  based on the population of 650 students, the sample size of 92 students, a confidence interval of 95%, and assuming the opinion was evenly split, i.e., using a 50% probability in the calculation, which is the most conservative scenario.

The results of the library survey are tabulated in Tables 1 and 2. The weighted averages, which take into account the sample size in each program (and are shown in the last row of Tables 1 and 2), are graphed in Figures 5 and 6.

Figure 7 shows the prevailing student suggestions on extending the library hours of operation. The vertical axis in Figure 7 corresponds to the percentage of students who favored a particular suggestion. Students were allowed to suggest as many alternatives to extend library hours as they wished.

**Table 1: Library Survey: Percentage of Students Regarding Library Usage**

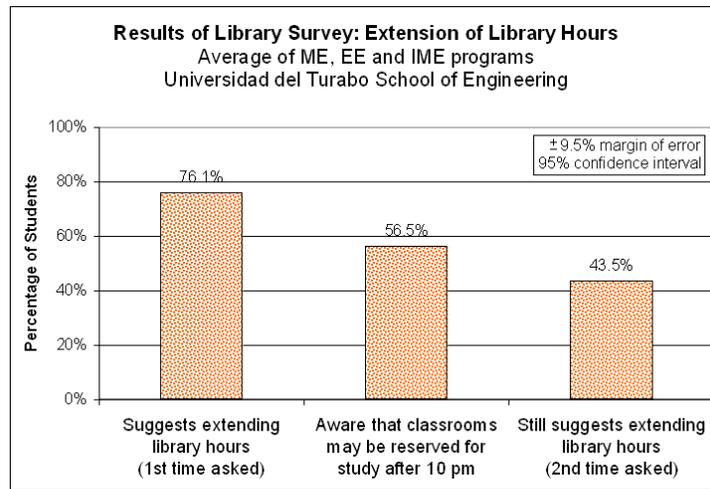
	Uses books	Uses PC's	Uses spaces for individual study	Uses spaces for group study
ME	54.3%	30.4%	69.6%	76.1%
EE	25.8%	32.3%	71.0%	80.6%
IME	53.3%	46.7%	73.3%	73.3%
Wt. AVG.	44.6%	33.7%	70.7%	77.2%



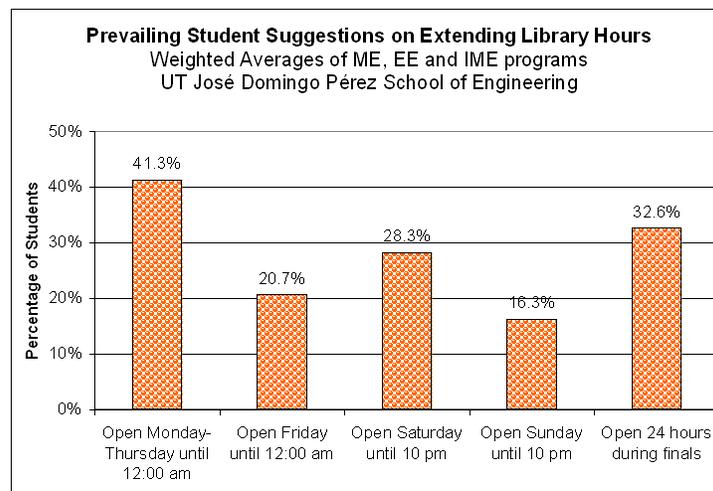
**Figure 5: Weighted Average Results: Library Usage**

**Table 2: Library Survey: Percentage of Students Regarding Library Hours**

	Extend library hours (1 <sup>st</sup> time asked)	Aware that classrooms may be used for study after 10 pm	Extend library hours (2 <sup>nd</sup> time asked)
ME	76.1%	60.9%	41.3%
EE	74.2%	51.6%	41.9%
IME	80.0%	53.3%	53.3%
Wt. AVG.	76.1%	56.5%	43.5%



**Figure 6: Weighted Average Results: Extension of Library Hours**



**Figure 7: Prevailing Student Suggestions on Extending Library Hours**

## 5. DISCUSSION OF RESULTS

In terms of library usage (Table 1 and Figure 5), the weighted average results show that more than 70% of the students use the library as a “study space” for either individual or group study or both. Only 44.6% use it to check out a bibliographical resource and even less (33.7%) use the PC’s with internet connections. The fact that the library is used primarily as a “study space” is an early indication of the existence of a confounding effect. It is confirmed when the answers to the remaining questions, given in Table 2 and Figure 6, are analyzed. The first time students were asked, 76.1% of the sample indicate that library hours should be extended. However, the second time they were asked (after being told of the availability of “study spaces” in the SOE), only 43.5% of the sample still believed the hours should be extended. This is due to the fact that only 56.5% of the students were aware that classrooms, as well as the computer center, could be reserved for study after 10:00 pm. The downturn from 76.1% (first time asked) to 43.5% (second time they are asked) clearly establishes the confounding effect. However, of the 32.6% difference in these results, almost half (40%) of those who changed their mind commented that they would only accept the “study space” external to the library if an independent A/C system is installed, and if wireless internet service is available (the library has both). So, although the confounding effect has been established, it is only conditionally. For this reason, the hypothesis of the study, i.e., “Given an adequate study space (external to the library), the majority of engineering students will feel satisfied with current library

hours”, is validated but contingent upon equipping the “study space” with A/C and wireless internet service. When the  $\pm 9.5\%$  margin of error is taken into account, the upper range of the interval becomes  $43.5\% + 9.5\% = 53\%$ , which barely exceeds the  $49.9\%$  limit that validates the hypothesis. It can be shown that the sample would have to increase to 170 students (current sample is 92 students) to achieve a  $\pm 6.5\%$  margin of error that sustains the hypothesis, assuming the current values remain unchanged. The authors, however, believe that the present results are adequate to fulfill the objectives of the study so that no further testing is required.

Even though the hypothesis has been validated, it must still be noted that 43.5% of the total sample still feel that the library hours should be extended. No reasons were given by the students except for three students (3.3%) who commented that library resources, especially books, would not be available in a “study space” external to the library.

Figure 7 shows the prevailing student suggestions regarding extensions in hours. The most frequent suggestion (41.3%) was to increase the hours of operation by two hours (from 10:00 pm until 12:00 am) on Monday through Thursday. The second most frequent suggestion (32.6%) was to open the library 24 during finals week. Interest in extending the hours on Fridays and Sundays is not very strong. On Saturdays there is a stronger interest, although it is below 30%.

The closing times of several university libraries in Puerto Rico and the United States were obtained through an internet search to acquire a sense for the reasonableness of the student’s suggestions. The results of the search are shown in Table 3.

**Table 3: Library Closing Times of Several Universities**

University, Location	Monday-Thursday	Friday	Saturday	Sunday
Turabo, PR	10:00 PM	10:00 PM	6:00 PM	4:00 PM
UPR-RUM, PR (Regular)	10:00 PM	4:30 PM	5:00 PM	12:00 AM
UPR-RUM, PR (Finals week)	12:00 AM	9:00 PM	5:00 PM	CLOSED
Politecnica, PR	12:00 AM	4:00 PM	4:00 PM	5:00 PM
Interamericana, PR	10:00 PM	6:00 PM	5:00 PM	5:00 PM
Caribbean, PR	10:30 PM	10:30 PM	5:00 PM	4:00 PM
Stanford, CA (Engineering)	10:00 PM	6:00 PM	5:00 PM	10:00 PM
Stanford, CA (Meyer Study Room)	24 hr	24 hr	24 hr	24 hr
MIT, MA (Reg.)	12:00 AM	10:00 PM	10:00 PM	12:00 AM
MIT, MA (Finals week)	24 hr	24 hr	24 hr	24 hr
MIT, MA (Hayden Study Rooms)	24 hr	24 hr	24 hr	24 hr
Cornell, NY	2:00 AM	6:00 PM	6:00 PM	2:00 AM
Union College, NY	1:00 AM	11:00 PM	10:00 PM	1:00 AM

From Table 3, a comparison of the Monday-Thursday period for universities in Puerto Rico shows that UPR-RUM, Interamericana, and Turabo have equal closing times of 10:00 pm. Politécnica (12:00 am) and Caribbean (10:30 pm) are the only ones with longer operating hours. During finals week, however, UPR-Mayaguez extends their hours until 12:00 am. At UPR-RUM, however, each engineering department operates a 24/7 study room with A/C (personal knowledge of the first author whose alma mater is UPR-RUM). For universities in the USA, Stanford has a 10:00 pm closing time like Turabo; however, they have “study spaces” available that are open 24/7 all year round. MIT opens the library regularly until 12:00 am, extends it to 24/7 during finals, and has 24/7 study rooms all year round. Cornell regularly operates the library until 2:00 am. It has 24/7 study rooms (departmental lounges) available in each engineering department. Union College in Schenectady, NY (a small university) opens its library until 1:00 am. Like Cornell, Union College operates 24/7 study rooms in areas external to the library.

## 6. CONCLUSIONS

1. Engineering students primarily use the library as a study space (over 70% of the sample), and secondarily as a source of bibliographical resources (45% of the sample).

2. Students who are unsatisfied with the “study spaces” available in the SOE tend to communicate their disapproval by also assigning a low satisfaction score to “library hours”, thus creating a confounding effect between the two issues. This is an important finding with respect to the budget since the lack of satisfaction of the students could be resolved more economically by properly outfitting a relatively small study room(s) rather than extending the hours of the more voluminous library. The four mainland universities researched in this study have 24/7 study rooms available to their students that complement the library hours of operation.
3. The most frequent suggestion by students on extending the library hours was to increase them by two hours (from 10:00 pm until 12:00 am) on Monday through Thursday which would place it at the same level as Universidad Politécnica in San Juan, PR and MIT. The second most frequent suggestion was to open the library 24 during finals week. This last suggestion would most probably be unnecessary if a properly outfitted 24/7 study room is made available to students.

## 7. RECOMMENDATIONS

The following recommendations are based on the results of this study.

1. Install an independent A/C unit in the engineering study room (SNL 246) and allow students to use it 24/7 all year round.
2. Install an independent A/C unit in the SNL 243 engineering classroom and allow students to use it after 10:00 pm all year round. Continue requiring students to fill out the use permit to access it.
3. Provide wireless internet access to the School of Engineering.
4. Install an independent A/C unit in the “open lab” area of the computer center (SNL 146A) which provides access to 12 computers with internet access. Allow 24/7 usage of this space but continue requiring students to fill out the use permit to access it.
5. Conduct a pilot study to extend library hours during the semester until 12:00 am on Tuesdays and Wednesdays. Usage of the library during the extended hours should be quantified to determine the effectiveness of this strategy.
6. Conduct a pilot study to extend library hours until 12:00 am during finals week. Since peak usage appears to be at the beginning of finals week, consider instead extending the hours three days before finals start, and the first three days of finals. Usage of the library during the extended hours should be quantified to determine the effectiveness of this strategy.
7. During the planning stages of new physical spaces in the university (PREC, civil engineering wing, student union, for example) consider including one study-room with an independent A/C unit in each new wing which will be available to students on a 24/7 basis. At the very least, consider usage of spaces as study rooms after 10:00 pm.
8. Continue monitoring the exit survey of graduating students and write a follow up paper with results once the recommendations are implemented and positive results are registered in the exit survey.

## REFERENCES

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