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Student Knowledge of and Attitude Toward WPI Course Evaluations

An Interactive Qualifying Project
Submitted to the Faculty of Worcester Polytechnic Institute
In Partial Fulfillment of the Requirement for the Degree of Bachelor of Science
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Executive Summary

Course evaluations are used by many higher education institutions across the nation as a way to collect student feedback on the quality of their instructors and facilities. Many institutions also utilize the data that is gathered from the evaluations as a factor in determining instructors' salaries, raises, promotions, teaching awards, and tenure. In addition, some instructors take advantage of student comments to self-evaluate and improve their teaching methods. Course evaluations provide a good source of communication among teachers, students, and administration. Students are allowed an outlet to express both to the instructor and the administration, their evaluation of the competency of instructors at their institution. It is important, however, that students are aware of the influence that their evaluations have, and for what purposes the evaluations are administered.

WPI distributes its own standard course evaluation form as a means of collecting student feedback (Figure 1). The form is divided into four parts.

Parts I and II are statements that students evaluate by circling one of five responses: strongly agree, agree, disagree, strongly disagree, or not applicable. The first part is labeled "your specific perceptions", and consists of 17 questions that inquire about the students' perception of the performance of the instructor. Statements that the students are asked to evaluate include that of communication, preparation, and organization skills of the instructor, as well as the motivational skills and amount of concern that the instructor has for the students.

The second part of the evaluation is titled "some general perceptions", and contains seven general statements about the evaluation of the textbooks used, and general lab and room conditions.

The third and fourth parts of the evaluation inquire more about the student. Part III of the evaluation is titled "background information" and asks for the student's class year (six choices), and major field (13 choices). Part IV is titled "written comments" and asks five short-answer questions about what the student liked/disliked about the course or lab, and how the instructor could improve the quality of teaching. There is also a question that allows students to provide suggestions on how to benefit from the course.

Instructors distribute the forms to their students at the end of each seven-week term. WPI uses the data collected from the course evaluations as a factor in determining tenure, raises and promotions, and teaching awards. The results of WPI's course evaluations reflect a 93% median teacher approval rating of strongly agree + agree responses on the evaluations.

Our project objective was to evaluate how informed WPI undergraduates were with respect to how WPI uses the course evaluation data. Our project hypotheses were:

- WPI students generally do not know what WPI uses course evaluation data for.

- Most WPI students do not take completing the course evaluations seriously.

- Knowledge of how course evaluation data is used increases with increasing time spent at WPI.

- WPI students need to be further educated about the use of course evaluation data.

- Students that feel that the professors take the completion of course evaluations seriously are also more likely to take completing the evaluations more seriously.

To test these hypotheses we conducted a web survey to which 626 students, out of a student body of 2,754, replied, for a 23% response rate. We collected the survey data

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using a Cgi interface to a Perl script running on the WPI UNIX system. Data was analyzed using correlation and comparison methods.

Our results reflected a need for WPI students to be educated about what course evaluation data is used for. Our results supported this finding, with evidence that knowledge of the use of course evaluations increased with time spent at WPI. Results also reflected that students who felt that the instructor took the completion of the course evaluations seriously were also more likely to take completing the evaluations seriously.

Students suggested that the best way to raise awareness about the use of course evaluation data was to inform students at freshman orientation, or to have instructors explain what course evaluations are used for before administering them. We suspected that students are misled by how the evaluations are referred to (course evaluations). We concluded that one way to improve awareness would be to change the way that the evaluations are referred to from course evaluations to instructor evaluations. This would imply what the evaluations are actually used for, instead of misleading students to believe that the evaluations are used for nothing more than to help the instructor improve her teaching methods.

We concluded that a need exists for WPI to take measures to increase awareness of how course evaluation data is used. This was apparent from the many incorrect responses that the students gave when asked on the survey how course evaluation data was used. A need for increasing awareness of course evaluation use was also apparent through personal campus interaction. We observed, based on these interactions, that students generally have an indifferent approach to completing the evaluations, and complete them quickly in order to be done with them. We also discovered from our results that as knowledge of course evaluation uses decreases, students' attitudes towards

the evaluations deteriorates. This suggests that if students are better educated as to the uses of course evaluation data, their attitude toward the evaluations will improve. If WPI is going to continue to use the course evaluation data as a factor in making important personnel decisions, action needs to be taken to inform students throughout their time at WPI about the importance of being present to complete evaluations, and of completing them honestly.

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Authorship Statement

Level of contribution:

       A-all

       B-most (half or more)

       C- some (less than half)

       D- little

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1.0 Introduction

Course evaluations are used at institutions of higher education across the nation as a means of encouraging a communicative environment between student and teacher. Course evaluations are also used as a means to improve the quality of such institutions and their instructors' teaching techniques. In addition, some colleges and universities use the data from course evaluations as one factor in determining a teacher's salary, promotion, and tenure (Scriven, 1995).

WPI garners student feedback by distributing its own standard course evaluation form (Figure 1). WPI course and lab instructors distribute the standard course evaluation forms to their students near the end of each seven-week term.

WPI utilizes data from course evaluations in many ways. WPI administration uses the course evaluation results as one factor in determining tenure, promotion, raises, and teaching awards. Some instructors use the students' comments on the course evaluations to improve the quality of the class and as a guide to improve their teaching techniques. Course evaluation data is also useful to current and prospective students; a compilation of each instructor's course evaluation results is made available on WPI's website for students who wish to research certain professors, or get tips on choosing classes.

We observed through internal campus and peer interaction that WPI undergraduates generally didn't know the purpose of course evaluations. We believed that, as a result of this, most WPI students didn't take completing the course evaluations seriously. Our project objective was to investigate the possibility of a deficiency in student knowledge pertaining to the use of course evaluation data. If we found that a deficiency did exist, then we would suggest techniques to improve awareness among

WPI students based on what undergraduates recommended as the most effective means. Other main objectives were to learn about the students' attitudes towards completing the course evaluations, and also to relate the level of student knowledge of the use of course evaluation data to the class year of the student.

Figure 1

WPI Worcester Polytechnic Institute

STUDENT EVALUATION OF COURSE/LAB OR CONFERENCE INSTRUCTOR

TRUCTOR'S NAME		TERM	DATE	COURSE NUMBER

By providing your perceptions of the effectiveness of your teacher on this evaluation form, you can help to improve the overall quality of teaching at WPI. Therefore, please take time to consider each reply thoughtfully. These evaluations are used by the teacher for self-improvement and by members of the administration and faculty committees as one important factor in determining salary, promotion and tenure.

Your response will remain anonymous. The evaluation form will be returned to your teacher after you have received a grade for the course.

Please circle the number to indicate your feeling of disagree/agree with each statement using the range from STRONGLY DISAGREE to STRONGLY AGREE. Circle NOT APPLICABLE if the particular statement does not apply to your instructor.

NA – NOT APPLICABLE
SD – STRONGLY DISAGREE   D – DISAGREE   A – AGREE   SA – STRONGLY AGREE

	RANGE OF AGREEMENT				
	NA	SD	D	A	SA
PART I – YOUR SPECIFIC PERCEPTIONS					
1. The instructor established clear objectives for the course.	0	1	2	3	4
2. The instructor organized the course well.	0	1	2	3	4
3. The instructor was well prepared to teach each class.	0	1	2	3	4
4. The instructor communicated well.	0	1	2	3	4
5. The instructor demonstrated a good understanding of the material being taught.	0	1	2	3	4
6. The instructor used the blackboard/visual aids in an effective manner.	0	1	2	3	4
7. The instructor used class time effectively.	0	1	2	3	4
8. The instructor assigned homework that aided my learning.	0	1	2	3	4
9. The instructor used evaluations that were good measures of the material covered.	0	1	2	3	4
10. The instructor provided adequate assistance outside the classroom.	0	1	2	3	4
11. The instructor stimulated my interest in the subject matter.	0	1	2	3	4
12. The instructor challenged me to extend my capabilities.	0	1	2	3	4
13. The instructor seemed really concerned about the students.	0	1	2	3	4
14. The instructor was well above average.	0	1	2	3	4
FOR LABORATORY COURSE					
15. The instructor showed me how to use laboratory equipment properly.	0	1	2	3	4
16. The instructor provided adequate time to complete experiments.	0	1	2	3	4
17. The instructor clearly defined the requirements for preparing lab reports.	0	1	2	3	4
PART II – SOME GENERAL PERCEPTIONS					
1. The textbook(s) helped me learn the subject matter.	0	1	2	3	4
2. The material to be learned in this course was difficult.	0	1	2	3	4
3. The room used for the course was acceptable.	0	1	2	3	4
4. The lab and/or computer equipment was in good operating condition.	0	1	2	3	4
5. I rate myself in general as an excellent student.	0	1	2	3	4
6. I had a good understanding of material that was prerequisite for the course/lab.	0	1	2	3	4
7. I learned a lot in this course.	0	1	2	3	4

PART III – BACKGROUND INFORMATION

1. My current student year classification is (circle one)

    1 – 1st Year   2 - 2nd Year   3 – 3rd Year   4 - 4th Year   5 - 5th Year   6 – Graduate Student

2. My major department is (circle one)

    01 – Chemical Engineering
    02 – Civil & Environmental Engineering
    03 – Electrical & Computer Engineering
    04 – Mechanical Engineering
    05 – Chemistry & Biochemistry

    06 – Computer Science
    07 – Biology & Biotechnology
    08 – Management
    09 – Mathematical Sciences
    10 – Physics
    11 – Interdisciplinary

    12 – Consortium
    13 – Other
    14 – Biomedical Engineering
    15 – Humanities & Arts
    16 – Social Science & Policy Studies

PART IV — WRITTEN COMMENTS

1. What did you particularly like about this course/lab?

2. What did you particularly dislike about this course/lab?

3. Can you suggest anything that the instructor can do to improve the quality of teaching?

4. What strategy would you advise a friend to use to benefit from this course?

5. Other Comments?

2.0 Literature review

2.1 What are course evaluations?

Course evaluations are an important source of information about an instructor from a student's point of view. They are a way of letting the students, faculty and administrators of the school assess their instructor's performance in a class. They can measure anything from the way the instructor tests the students to see what they have learned, to how much the instructor has stimulated the student's interest in the material taught. The evaluations give students a forum for thoughts and suggestions to improve the instructor's teaching. At the end of each term students are administered a survey that contains multiple choice questions and/or free response questions. At WPI the multiple-choice questions are used to produce a numerical summary for the instructor to improve on and for supervisors of the instructor to review. While such questions are easy to analyze, they limit the student responses to those specific questions asked.

The open-ended free response questions allow students to make specific comments on the course or professor. Although the responses to these questions can be helpful to a professor, they are difficult to analyze in a quantitative manner. Responses to such questions from a large number of students are not useful to universities when determining the merit of their faculty members. The student may make detailed responses that only apply to the one instructor, or about the course that only the instructor would understand. At WPI, responses to open-ended questions are left for the instructor they are written about to review. A mix of both of these types of questions gives good feedback to the instructor.

2.2 Administration of the evaluation

The administration of the form is important to the results of the evaluation. Conventional wisdom includes not having students sign their rating forms, and having the instructor leave the room when the form is filled out. One student should then turn in the evaluations to the administrators who will use the forms to evaluate the instructor. It is interesting to note that, in theory, WPI abides by all of these recommendations save one. Cashin (1990) recommends that evaluations be filled out a few weeks before the end of the term, so that students will not be distracted by finals and other term closing issues. This will give a more accurate description of the course. The fact that WPI does not adhere to this recommendation is especially noteworthy given the fact that it deals directly with student motivation. On the other hand, WPI has seven-week terms so distributing the evaluation a few weeks before the end may not give the student enough time to effectively evaluate the instructor.

2.3 Use of the results

Student evaluation data can be used in three legitimate ways, evaluation, improvement, and advising (Cashin, 1990). The first of these, evaluation, refers to ways in which the data can serve as a basis for personnel decisions, tenure, promotion, etc. Institutions need some way of judging the merit of the members of their faculty, and the course evaluation plays a necessary role in this process.

The data can also help instructors improve their ability to teach students. It is up to the instructor to heed the students' suggestions for changes, and for the administration, if applicable, to make sure the instructor makes these changes. As for the interpretation of the results, the instructor should not interpret them alone. Each institution must create a relative standard of interpretation of the results in order for an instructor to effectively act

upon them (Aubrecht, 1981). There cannot be one set of numbers or interpretations to compare the instructor's results to for all schools. Each school must create their own standard, which can be used to compare instructors. Also by having the same evaluation for all instructors in one school, each instructor can be compared to each other and measured relatively. Sometimes an instructor may not know what to do with the results of an evaluation. Low ratings may discourage an instructor and cause him/her to lose interest in the quality of their teaching. If an evaluation does not provide new results and the instructor has not improved upon the old ones, the instructor may not bother to change according to the new results. The numerical results of the evaluation should be reviewed by a committee overseeing the instructor to make sure that any important changes that need to be made are made by the instructor (McKeachie, 1986).

Finally, students can use the course evaluation data when making decisions about what classes to take. WPI has such a system on the web, although it is questionable how many students take advantage of it. This gives students the ability to research the evaluation history of courses and/or professors that they might have in the future, and is a valuable use of evaluation data. To have students see a professor's course evaluation history may help them in choosing a class, although this still is under some debate (McKeachie, 1986). Evaluations may not take into account certain indefinite characteristics of an instructor that would be important to a student in choosing a class, for example the professor's attitude or teaching style. Students who had access to the data from a professor's course evaluation history were most likely to pick an instructor who got the best ratings. Other research showed that students were more likely to base their decisions of which courses to take on discussion with other students rather than the course evaluation data (McKeachie, 1986).

The purpose of the evaluation process is to improve the instructor's ability to teach effectively, along with determining their salary, tenure and promotions. Thus when a student fills out an evaluation form, he is hopefully doing his part to improve the quality of learning for future students. How this improves the instructor after the evaluation is administered depends on the interpretation of the results. Faculty committees and administrators who review the instructor can interpret statistical results. Responses to open-ended questions, due to their length, are best sent to the instructor to read and take action on. Some schools may consider these answers confidential and only the instructor whom they describe may see them.

2.4 Possible sources of bias

Student evaluations would work effectively, if the results of the evaluation accurately reflected the performance of the professor. However, a major problem in student evaluations is getting an accurate answer from the student (McKeachie, 1986). There are various factors that can bias student responses when filling out evaluation forms.

The overall workload of a class has been shown to affect student ratings, although the correlation was shown to be positive, i.e., a high workload is correlated with high ratings. Non-anonymous ratings can cause students to inflate their ratings for fear of possible retaliation by the instructor. Instructors of higher-level courses usually receive somewhat higher reviews. Student motivation, that is, the student's overall enthusiasm for and enjoyment of the class, can bias the evaluation results as well, although the instructor can affect the students' enthusiasm for the class. These are just some of the biases that must be accounted for. If the biases are not accounted in the design of the evaluation, or

in the interpretation of the results, then the results can prove less helpful or even meaningless to improvement of an instructor (Cashin, 1995).

Students may use evaluations as a form of revenge on an instructor. They may have disliked a class initially or have gotten a bad grade and thus decided to take out their anger on the instructor. They might rate the instructor poorly on purpose, or enter the evaluation with a very biased state of mind and thus subconsciously give the instructor lower ratings than deserved. In fact, a student may just end up using the evaluations as a scapegoat for their responsibilities (Cholakian, 1994).

In order to evaluate all instructors fairly, all biases must be identified and the results of the evaluation modified to reflect these biases. With all the biases in each instructor's evaluation removed or compensated for, all of the evaluation results will be on the same relative scale. Instructors could be compared on a sound basis, and an instructor's progress could be easily marked from term to term. Finding and compensating for all biases, though, is difficult or nearly impossible.

Still, evaluations have been proven to be effective in judging an instructor's performance. For reliability, 10 or more students need to evaluate each course. Evaluations of the same instructor from different students correlate very well. Evaluations of different professors from different students do not correlate very well, showing that each individual professor gets a consistent review from all students (Cashin, 1995). By combining reviews from many students, some biases may be averaged out by the many different opinions of the students. Opinions from sources other than the students, combined with the students' opinions, will also help in creating a more reliable review of the instructor (McKinney, 1997).

2.5 Student motivation as a bias

One important bias which can affect evaluation results is student motivation. Motivation in this sense is understood to mean overall willingness of the student to fill out the form in a serious and thoughtful manner. There is a strong correlation between the level of enthusiasm shown by a student about a certain course and the evaluation ratings given to that course (Cashin, 1995). That is to say, students who show little interest in the course they are taking tend to give low ratings to the professor of that course. This was in fact one of the strongest correlations found between various variables and student ratings.

We believe that the same sort of bias can occur if the student does not take any interest in filling out the evaluation form. If a student does not believe the evaluation is worth his/her time or effort, the student may not take the time to accurately describe his/her opinions of the instructor. This would cause the evaluation results to be of little or no value. A student who simply gave one answer throughout the entire evaluation form, i.e., circling all responses in one column, regardless of the question being asked, would be a good example of this.

3.0   Hypotheses and Objectives

3.1   Hypotheses

The project hypotheses that we tested through the distribution of our survey were:

- WPI students generally do not know what WPI uses course evaluation data for.

- Most WPI students do not take completing the course evaluations seriously.

- There is a small increase of knowledge of how course evaluation data is used with increasing time spent at WPI.

- WPI students need to be further educated about the use of course evaluation data.

- Students that feel that the professors take the completion of course evaluations seriously are also more likely to take completing the evaluations more seriously.

3.2 Objectives

We postulated, based on our personal campus interaction, that students are generally uninformed about the purpose of the evaluations. We also believed that they believe the course evaluations to be more an evaluation of the course (to which the title 'course evaluation' misleadingly alludes), than of the professor (for which they are intended). This fact, we believed, was responsible for the students' hypothesized lack of sense of responsibility to complete the evaluations honestly and objectively.

Therefore, our IQP project was designed to determine the student knowledge of the purpose of student evaluation forms at WPI, and the impact that student attitude toward and awareness of the evaluation and its purpose has on their effectiveness. We

attempted to identify relationships among the level of knowledge that the average WPI student had about the purpose of the evaluation (i.e. what WPI uses them for), and the year and major of the student. We also wanted to determine if and why some students don't take the responsibility of completing the valuations seriously with thought and consideration.

4.0   Methods

Our method for determining the level of student knowledge pertaining to the use of course evaluation data was to construct a survey for WPI students that would be available via the Internet. We pre-tested the survey (Figure 2) by administering it to a small survey pool. Based on the pre-test results and student feedback, we amended the survey (Figure 3). We then administered the improved survey, collected, and analyzed the data. After the data was analyzed, we suggested ways of better educating the students to improve evaluation results based on what methods the students recommended as most effective

4.1   Creating survey questions

We drafted a survey (Figure 2) to effectively determine the overall knowledge and general attitude of the students. We needed to develop survey items that would produce conclusive results in relation to our objectives. Questions 1 and 3 (Figure 1) were formulated to determine the extent of student knowledge pertaining to the uses of evaluation results. To conclude if general knowledge of course evaluation use differed with year and major, we asked for the students' year and major, and related that information to the responses to questions 1, 2, and 3 (Figure 2).   Questions 6 and 7 (Figure 3) were designed to determine why some students don't complete course evaluations with thought and truth. Question 5 (Figure 2) was asked to find what method, from the students' perspective, was the best way to inform WPI students about the uses of course evaluations.

4.2   Developing questions to test for credible data

Certain questions on the survey were designed to determine if the students were generally truthful on the course evaluations. We wanted to produce results that could be

Figure 2: Pilot Survey

Pilot Survey

This survey was made to determine the effectiveness of the course evaluation forms (the blue forms you fill out at the end of the term in each class).
You can circle more than one answer for specified questions. A yes and no answer will be considered undecided.

What is your Major _____ Year _____ and Gender? _____

1.) Before this survey, did you know what the course evaluations are used for?   Yes   No

2.) Has anyone ever explained to you what the course evaluations are used for?   Yes   No

3.) What are the course evaluations used for? (more than one possible answer)
        a.) overall evaluation of the course
        b.) a guide for teachers to improve their teaching
        c.) data for determining tenure and promotion
        d.) data for determining raises
        e.) data for determining teaching awards

4.) Do you think that teachers take the course evaluations seriously?   Yes   No

5.) What do you think would be the most effective way to educate students as to what the evaluations are used for? (more than one possible answer)
        a.) in freshman orientation
        b.) have teachers read a short paragraph prior to distributing them
        c.) have a student mass email prior to normal evaluation time
        d.) have a letter put in students' mail boxes prior to evaluation time
        e.) other _____

6) Do you complete the evaluations with careful thought and truthfulness?
                                                              Always/Usually/Sometimes/Never
7.) If sometimes or never, what are some of the reasons? (more than one possible answer)
        a.) administered too late in the term
        b.) not given enough time to complete
        c.) don't think they are used for anything
        d.) just don't care
        e.) other _____

8.) If there is a class or professor that you don't like, are you generally present to
      complete the evaluation?   Yes   No

9.) In your opinion, how many teachers that you've had deserve low ratings?   _____

10.) Roughly, how many teacher have you given an overall low rating(strongly disagree/disagree)? _____

11.) Roughly, how many teachers have you rated at WPI?   _____

12.) How many of the first 14 questions that refer to the teachers, do you consider a low rating if you answer with strongly disagree/disagree?   _____

13.) Do you know that you can look at course evaluation data on the web?   Yes   No

Figure 3

Student Questionnaire

This survey was made to determine the effectiveness of the course evaluation forms (the blue forms you fill out at the end of the term in each class).

What is your major _____, year _____ and email _____

Male ○

Female ○

1. Do you know what the course evaluations are used for? Yes ○ No ○

2. Has anyone ever explained to you what the course evaluations are used for? Yes ○ No ○

3. What are the course evaluations used for? (You can check more than one entry)

      A ☐ Overall evaluation of the course

      B ☐ A guide for teachers to improve their teaching

      C ☐ Data for determining tenure and promotion

      D ☐ Data for determining raises

      E ☐ Data for determining teaching awards

4. Do you think that teachers take the course evaluations seriously? Yes ○ No ○

5. What do you think would be the most effective way to educate students as to what the evaluations are used for?

      A ☐ In freshman orientation

      B ☐ Have teachers read a short paragraph prior to distributing them

      C ☐ Have a student mass email prior to normal evaluation time

      D ☐ Have a letter put in students' mail boxes prior to evaluation time

6. Do you complete the evaluations with careful thought and truthfulness?

      A ○ Always

      B ○ Usually

C ◯ Sometimes

D ◯ Never

7. If sometimes or never, what are some of the reasons?

A ⌐ They are administered too late in the term.

B ⌐ You're not given enough time to complete the form.

C ⌐ You don't think they are used for anything.

D ⌐ You just don't care.

8. If there is a class or professor that you don't like, are you generally present to complete the evaluation?
Yes ◯ No ◯

9. In your personal opinion, how many teachers have you had, that deserved an overall low evaluation?
⌐⌐

10. Roughly, how many overall low ratings have you given to teachers? ⌐⌐

11. Of the first 14 questions on the evaluation form, (those having to do with the performance of the instructor), what minimum number of "strongly disagree"/"disagree" responses would you consider an overall low rating. ⌐⌐

12. Roughly, how many teachers have you rated at WPI? ⌐⌐

| Submit Query | Reset |

compared to WPI's. Specifically, we were interested in the strongly agree + agree percentages that WPI compiles from their course evaluations which are administered quarterly.

We wanted questions that would produce percentages comparable to WPI's 93% approval rating. To accomplish this we formulated questions that asked students how many strongly agree + agree and strongly disagree + disagree ratings they'd given to professors during their time at WPI. The problem we expected with asking these questions was that we were asking students to recall too much information, which could increase the margin of error. Attempting to escape this problem, we considered asking for a percentage of low ratings given over the students' time at WPI, but we felt this still asked for too much information to remember. To avoid these problems, we developed four questions that would give us enough information to manipulate into a percentage of high ratings (strongly agree + agree) given. These questions are 9, 10, 11, 12 on the final survey (see Figure 3).

4.3 Pilot survey selection and administration

We developed a paper pilot survey that consisted of questions very similar to the ones that we wanted to put on the web. We decided to distribute a pilot survey to garner student feedback on any difficulties (i.e. trouble understanding questions) that they encountered while taking the survey. We administered the pilot survey to 20 students. We carefully chose the 20 students to consist of 16 men and 4 women to approximate WPI's gender ratio of 78% men and 22% women.

Results of the pilot survey showed that many of the students had difficulty understanding the wording of question 12, which read "How many of the first 14 questions that refer to the teachers do you consider a low rating if you answer with

strongly disagree/disagree?"(Figure 2). To make the question more intelligible, we reworded it so that it read (renumbered as question 11), "Of the first 14 questions on the evaluation form, (those having to do with the performance of the instructor), what minimum number of "strongly disagree"/"disagree" responses would you consider an overall low rating?"(Figure 3). We also encountered a problem with the wording "before this survey" which is the first clause in question 1 (Figure 2),"Before this survey, did you know what the course evaluations are used for?" The students didn't understand what "before this survey" denoted, so we removed the clause completely, so question 1 (Figure 3) plainly asked, "Do you know what the course evaluations are used for?"

4.4   Administering the survey

We had debated whether to do a traditional paper survey administered through the campus mail or a web survey. We chose the web survey because of the attractive possibility of easier data collection and analysis. To achieve a high accuracy rate, we needed responses close to percentages of actual numbers of majors to class ratios from WPI (see 5.2 Results and Discussion: Demographics) to correctly represent the student population. However, we had no way of ensuring a specific demographic return.

We put the final survey (Figure 3) on the web using simple HTML. It was then necessary to obtain CCC permission before sending an email to all WPI undergraduates. We received permission and sent an email to undergraduates@wpi.edu directing all undergraduates to the website, and requesting that they take the survey. As an incentive to take the survey, we offered entry into a drawing for a $20 gift certificate to Best Buy. Four days later we sent out another email stating that the survey and contest would be closed the following day at midnight. We ended up with 626 responses out of a student body of 2,754, for a response rate of 23%.

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4.5   Data collection

Data was collected by means of Cgi interface to a Perl script running on the WPI UNIX system. The Perl script parsed the data from each response to the survey and stored all of the responses in a file. When the survey was completed the data file was run through another script, which put the file into an Excel readable format. Excel was then used as the main tool for statistical analysis of the data.

4.6   Data analysis

Two main methods, comparisons and correlations, were used for analyzing the data received from the web survey and for answering the data analysis questions (in **bold**).

4.6.1   How do the demographics of our survey respondents compare to those of WPI?

The male and female responses from our survey were compared to WPI's numbers for male and female enrollment to obtain a gender demographic comparison. The same method was used to obtain major and year demographic comparison.

4.6.2   How does knowledge of the use of the course evaluations change with class year?

One of our main objectives in analyzing the data was to draw conclusions about overall student knowledge of the course evaluations and to relate knowledge to class year. We accomplished this by scoring the overall response as well as the individual answers on question 3 (Figure 3), and then comparing those responses to question 3 to the students' class year. We also were interested in determining whether students who responded that they knew what the course evaluations were used for, actually did. We determined, through a correlation of overall response to question 3 and student year, if

there was a relationship between students' class year and whether they knew how course evaluation data was used.

4.6.3 Does class year affect whether students believe that instructors take the completion of course evaluations seriously?

Correlation methods were used with the results from question 4 (Figure 3) to determine if students felt that the professors take the completion of the course evaluations seriously, and if the response to this question changed with the class year of the student.

4.6.4 Is there a relationship between student knowledge of the course evaluations and whether students feel that the instructors take the completion of the course evaluations seriously?

A correlation was calculated to determine if student knowledge of the course evaluation affected whether the student felt that the professor takes the completion of the course evaluations seriously.

4.6.5 If a student does not like the instructor of a course, does that affect whether students are present to complete the evaluations, and whether they complete them with careful thought and truthfulness?

Correlations were used to relate questions 6, 8, and 9 (Figure 3) to draw conclusions about how carefully students complete the course evaluations, as well as whether they are generally present to complete the evaluations. We also related the responses to these questions to whether the student felt that the professor took the completion of the course evaluations seriously (question 4, Figure 3). We were also interested in correlating the student year to how many teachers the students felt deserved a low rating, and to how many of those teachers they had actually given a low rating.

4.6.6 How do our survey determinations of instructor approval rating percentages compare to WPI's approval rating percentages?

We were very interested in comparing what the students feel is a low rating, to what WPI designates as a low rating. To accomplish this, we manipulated our data to compare our data to WPI's. First we took the number of teachers to whom the student reported having given a low rating and multiplied it by the number of low ratings out of the 14 questions that each student considered to be a bad rating, to give a total number of low ratings given. Next, we took the total number of teachers that the student had rated and multiplied it by 14 to give a total number of rated questions. Then to determine the percentage of low ratings (strongly disagree + agree), we took the total number of low ratings reported and divided it by the total number of rated questions. Finally, a number for the percentage of high ratings (strongly agree + agree) given was determined by simply subtracting the percentage of low ratings (strongly disagree + agree) from 100.

4.6.7 What is the best way for students to be educated about the purpose of course evaluations?

Our final objective in analyzing the data was to recommend the most effective means of educating students about the purpose of the course evaluations. We did this by analyzing what the students recommended on the survey (question 5, Figure 3) as the most effective means of educating WPI students about the purpose of course evaluations.

4.6.8 Statistical analysis

Statistical significance testing was used in the data analysis whenever appropriate. Specifically, the statistical significance test used was the hypothesis test for proportions in the binomial model. This model assumes that the data is from a large binomial population, which is where the only two values for any datum are yes or no. For

example, a respondent to our survey had to check either yes or no for question 1. There was no middle ground. Questions 1, 2, 4, and 8 (Figure 3) of our survey fit the binomial model perfectly. The statistical analysis was performed using the program Excel in addition to a calculator.

Correlation coefficients were found using Excel. Correlation coefficients are the measure of the linear association between two sets of data, the closer to 1 or –1 the more linear the relationship is. The positive and negative values indicates whether the relationship has a positive or negative linear slope.

5.0 Results

5.1 Demographics

Here we compared the demographics of our respondents to those of WPI undergraduates, to determine whether or not there is any statistically significant variation between the two populations based on gender or major.

5.1.1 Gender

Table 1. Gender Demographics of WPI and Survey Respondents

	WPI	Survey	p-value
Male	2087 (78%)	458 (73%)	0.004
Female	584 (22%)	167 (27%)	0.004
Total	2671	625	

We can see from this data that the proportion of females responding to our survey was five percent higher than what we would expect based upon the WPI statistics. A statistical test of the difference of the population proportions gave a p-value of 0.004, which shows strong evidence that this difference was significant. So, based on gender our response is not a perfect representative sample of WPI undergraduates.

5.1.2 Major

Table 2. Major Demographics of WPI and Survey Respondents

Major	WPI	Survey	p-value
ME	544 (20%)	109 (17%)	0.0495
EE/ECE	444 (17%)	106 (17%)	0.4207
CS	466 (17%)	120 (19%)	0.1515
BIO	296 (11%)	74 (12%)	0.2946
CE	192 (7%)	37 (6%)	0.1314

Table 2 shows the proportions of the top five majors at WPI and among the respondents to our survey. For the most part the two sets of proportions compare very favorably. The only major differences between WPI and the survey respondent populations are the 3% deficit of ME majors, and the 2% excess of CS majors responding to the survey. The slightly larger proportion of CS majors responding than would be expected might be explained by the fact that the survey was administered on the web, so computer savvy individuals could have been more likely to fill it out. The only statistically significant difference in population proportion is that of ME majors. A p-value of 0.0495 shows reasonably strong evidence that the population proportion of ME majors at WPI is greater than that of our survey respondents.

### 5.2 WPI Students' Knowledge of WPI's Course Evaluation Form

The results in Table 3 show students' understanding of the uses of evaluation data. The question on the survey, " What are the course evaluations used for?" gave a choice of 5 correct answers, of which the respondents could choose any number.

Table 3. Percentage (number) of correct identifications of uses of WPI course evaluations

Class Year (a)	Course	Teaching	Tenure	Raises & Promotion	Teaching Awards	Ave Score
00	87% (114)	95% (125)	48% (63)	20% (27)	24% (32)	55.1%
01	85% (138)	95% (155)	45% (73)	21% (34)	17% (27)	52.4%
02	83% (143)	98% (168)	28% (48)	10% (17)	23% (39)	48.3%
03	81% (130)	97% (155)	19% (30)	9% (15)	26% (41)	46.4%
Totals (b)	84% (525)	96% (603)	34% (214)	15% (93)	22% (139)	50.3%

(a) year of graduation
(b) percentage (number) of respondents who selected each answer

Figure 4. Percentage of correct identifications for overall evaluation of the course
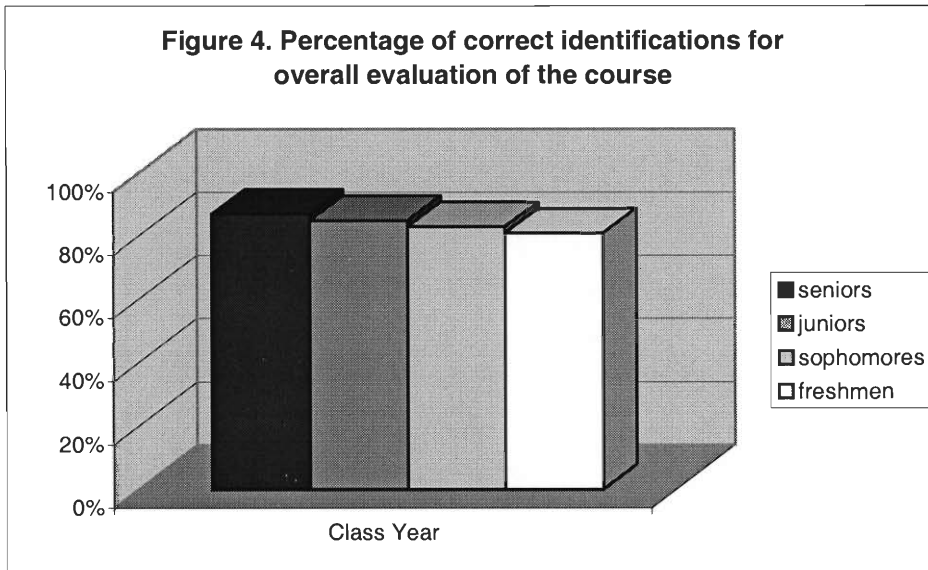
The first answer, "Overall evaluation of the course", was the second most common answer. On this question the seniors had the most correct responses. The correct responses progressively declined going from seniors (87%) to freshmen (81%). Figure 3 shows the direct effect of class year on knowledge.
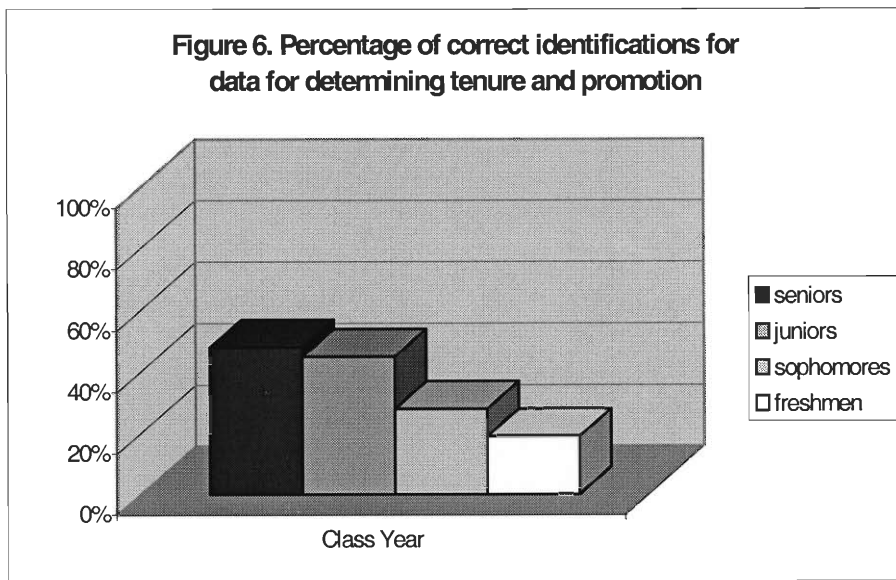
A significance test of pairs of population proportions showed no significant difference between responses of seniors to juniors, juniors to sophomores, and

sophomores to freshmen. However seniors to freshmen showed reasonably strong

evidence of significant difference with a p value of 0.0401.

Figure 5. Percentage of correct identification for a guide for teachers to improve their teaching
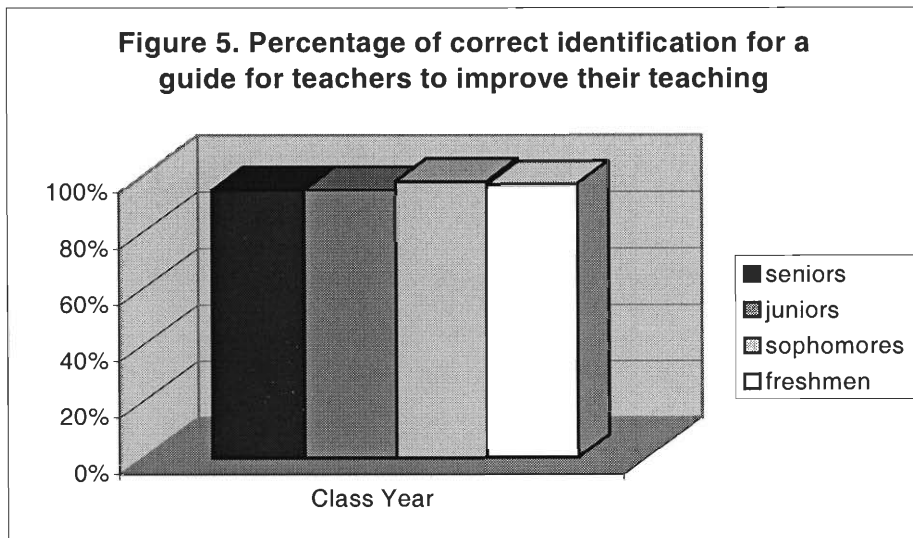
The second answer, "A guide for teachers to improve their teaching", was the

most common answer getting up to 98% of correct responses. On this question freshmen

and sophomores had 97% and 98% correct responses respectively. Seniors and juniors

both scored 95% showing that on this question underclassmen were more inclined to

believe that teachers use the evaluations to better their teaching and upperclassmen were

a little more skeptical (Figure 5).

There was no significance between seniors and juniors. There was borderline

significance of the difference between juniors and sophomores (p=0.0655). There was a

strong significance of the difference between sophomores and freshmen (p=0.0135), as

well as between seniors and sophomores (p=0.0344). There was a very strong

significance between seniors to freshmen (p=0.002).

Figure 6. Percentage of correct identifications for data for determining tenure and promotion
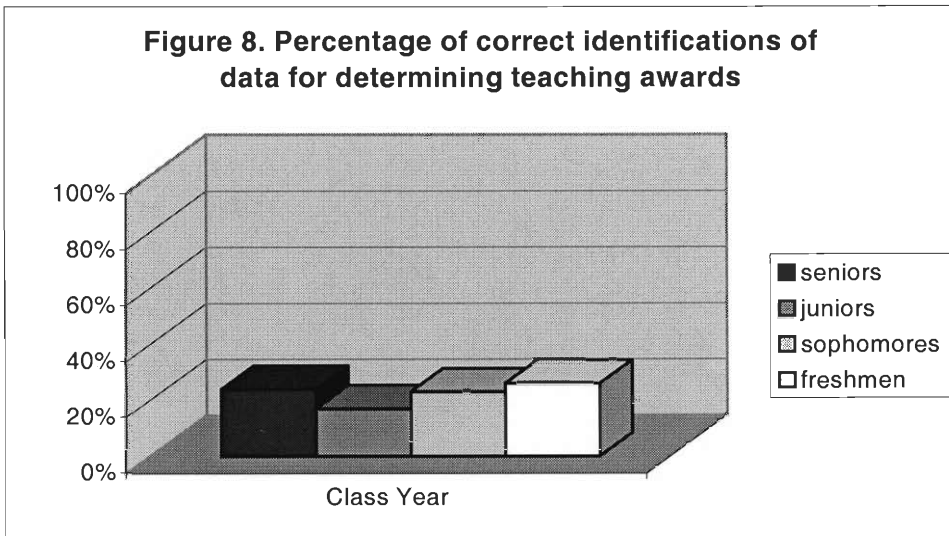
The third answer, "Data for determining tenure and promotion", had the biggest variation in correct responses between class years. Again seniors had the most correct responses at 48%. Correct responses declined with class year, with juniors at 45%, sophomores at 28%, and freshmen at 19%. Figure 6 shows the difference in the knowledge of upperclassmen compared to underclassmen.

There was no significant difference between seniors and juniors. There was a very strong significance between juniors and sophomores (p=0.0006). There was a strong significance between sophomores and freshmen (p=0.0158). . There was a very strong significance between seniors and freshmen (p=0).

Figure 7. Percentage of correct identifications for data for determining raises
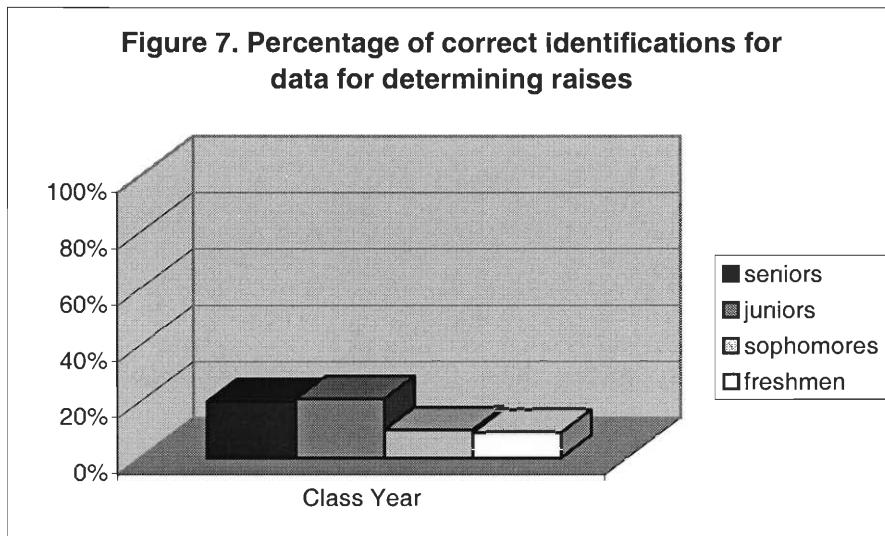

The fourth correct answer, "Data for determining raises", was the least known use of evaluation data. Seniors and juniors were close with correct responses of 20% and 21% respectively. Sophomores and freshmen were also close with correct responses of 10% and 9% respectively. Figure 7 shows the difference in the knowledge of upperclassmen and underclassmen; in this case, twice as many upperclassmen as underclassmen answered the question correctly.

There was no significant difference between seniors and juniors or sophomores and freshmen. There was a very strong significance between juniors and sophomores (p=0.0026), seniors and sophomores (p=.0049), juniors and freshmen (p=0.0013), and seniors and freshmen (p=.0026).

Figure 8. Percentage of correct identifications of data for determining teaching awards

The fifth answer, "Data for determining teaching awards", was the only answer that was not affected by class year. The correct responses for class year were as the following; seniors 24%, juniors 17%, sophomores 23%, and freshmen 26%.

There was no significant difference between sophomores and freshmen. There was a reasonably strong significance of the difference between seniors and juniors (p=0.0526). There was borderline significant difference between juniors and sophomores (p=0.0808). There was a reasonably strong significant difference between juniors and freshmen (p=0.0344).

Figure 9. Overall knowledge of students with respect to year
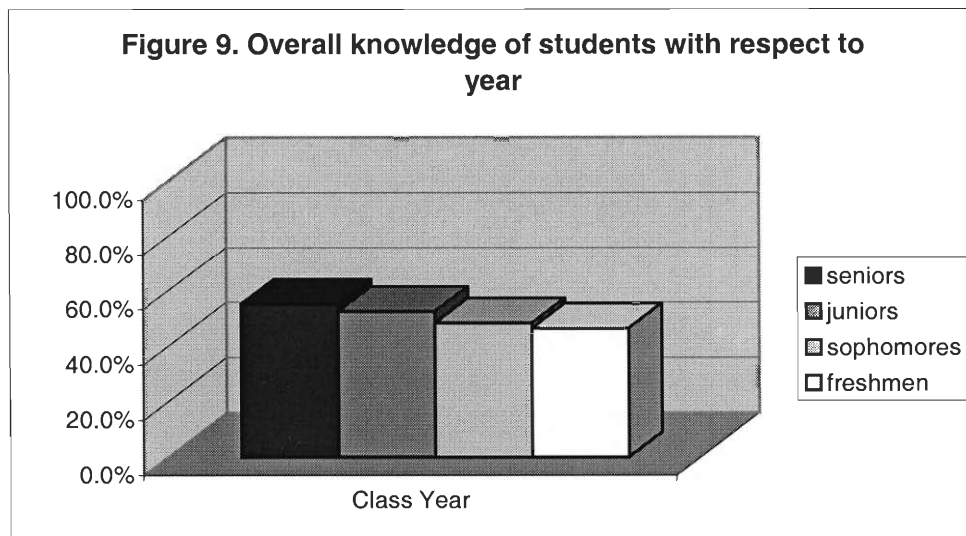
The overall performance of students on this question about what course evaluation data is used for was poor, with an average score of 50.3%. Figure 9 shows that the overall knowledge of students increases as class year increases. The overall scores of students with respect to year were seniors 55.1%, juniors 52.4%, sophomores 48.3%, and freshmen 46.4%. The scores were determined by percentage of the five answers that were correctly identified. The differences in scores among class years were small. The overall score on question three (figure 2) was only 50.3% with the most deviation between class years of only 4.8 percentage points higher (55.1%), so although the scores increased with class year, the differences in overall score were so small that no conclusion could really be drawn relating year and knowledge. Significance testing showed that there was no significant difference between any pair of class years. An overall percentage of only 50.3% correct on question 3 showed that there was definitely a deficit in knowledge pertaining to course evaluation use regardless of class year.

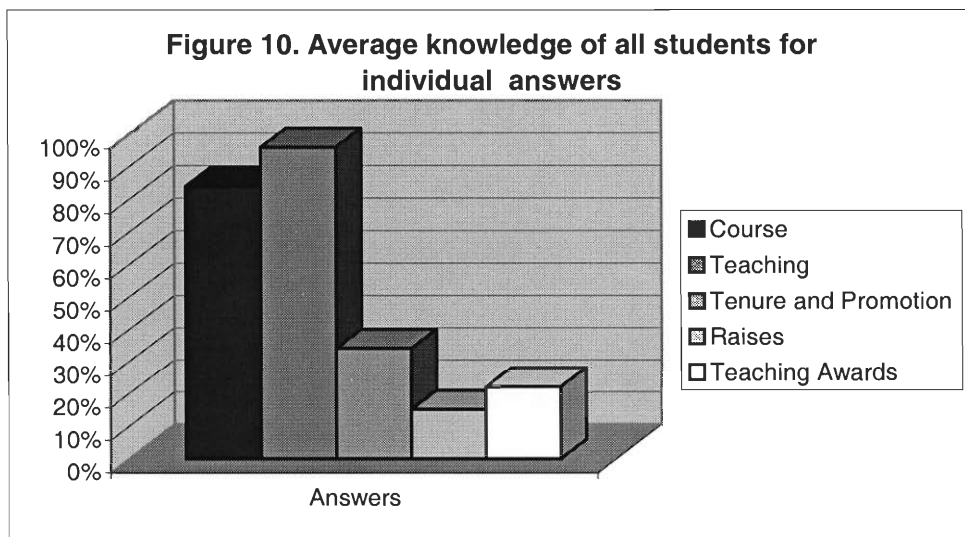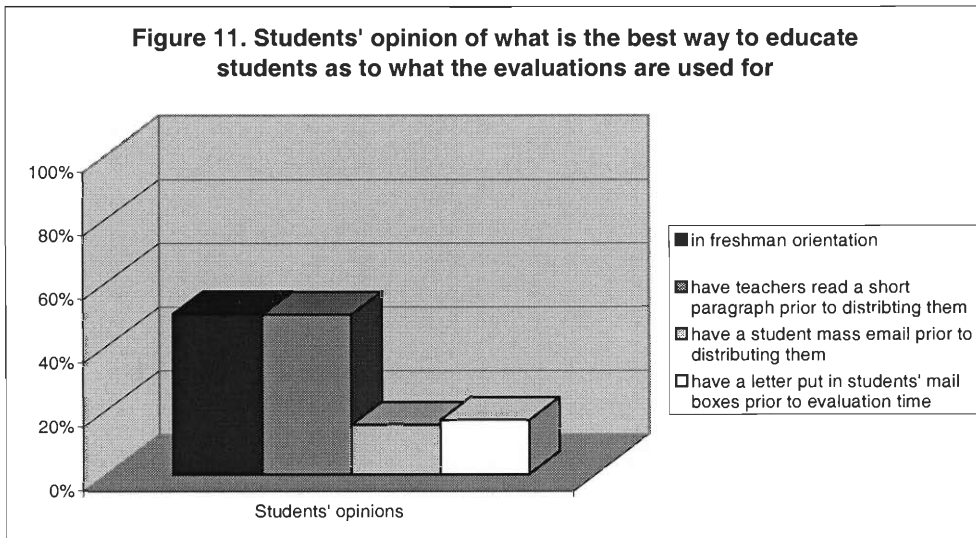Figure 10. Average knowledge of all students for individual answers

Figure 10 shows the average percentage of students polled that selected each response correctly. Generally students know that the evaluations were used for overall course evaluation (Course) and for a guide to help teachers improve their teaching (Teaching). Generally students are uneducated about the fact that evaluations are used for determining tenure and promotion (Tenure and Promotion), raises (Raises), and teaching awards (Teaching Awards). Students are least familiar with the fact that evaluations are used for determining raises, with an average percentage of correct responses of 15%, compared with their best score of 95% for "Teaching". Figure 10 shows that students are generally uneducated about the uses of evaluation data, being strongly familiar with only 2 out of 5 uses of course evaluation data.

5.2.1 Students' opinion on the best way to educate students about the uses of course evaluation data
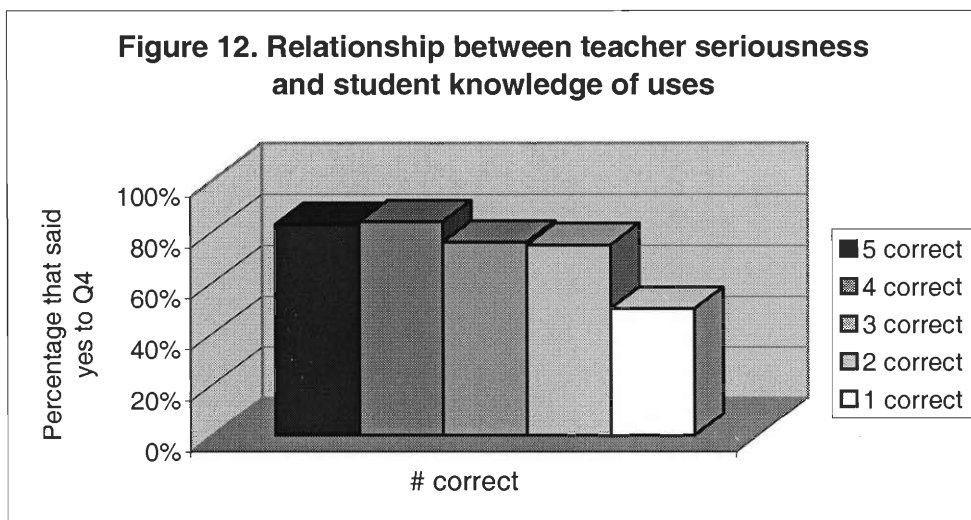
Results of question 5 on the survey, asking what students feel would be the most effective way to educate students as to what the evaluations are used for, are shown in Figure 11. Students feel that the best way to educate students about the uses of course evaluation data would be to have teachers read a short paragraph prior to distributing the course evaluation and also in freshman orientation. Both answers received about half of the students' responses.

Figure 11. Students' opinion of what is the best way to educate students as to what the evaluations are used for

Legend:
- in freshman orientation
- have teachers read a short paragraph prior to distribting them
- have a student mass email prior to distributing them
- have a letter put in students' mail boxes prior to evaluation time

Students' opinions

5.3 Student attitudes

5.3.1 Teacher seriousness vs. student knowledge

Figure 12 compares student knowledge of the use of the evaluations (Question 3) with their opinion of whether or not teachers take the evaluation seriously (Question 4). This was to determine if the amount of knowledge a student has on the evaluation relates to how seriously they believe the teacher takes it.

Figure 12. Relationship between teacher seriousness and student knowledge of uses

Percentage that said yes to Q4

Legend:
- 5 correct
- 4 correct
- 3 correct
- 2 correct
- 1 correct

correct

Perceptions of teacher seriousness (Question 4) was found to correlate very well with student knowledge (Question 3), having a correlation coefficient of 0.8668. The less

knowledge the student has of the evaluation's use, the less likely it is that they believe

that the teacher takes the evaluation seriously (Figure 12). If a student does not have

enough knowledge of an evaluation's use, they will not know how important the

evaluation is. The student may not believe that the teacher will take the evaluation results

seriously if the student doesn't believe the evaluation is important.

5.3.2 Student year vs. teacher seriousness

Question 4 asked students if they believed that professors took the course evaluations

seriously. We compared the response to question 4 with student year to determine if there

was any correlation between the two. The correlation coefficient was found to be 0.5576

indicating a moderate correlation between student year and percent who believe teachers

take the evaluation data seriously.

Figure 13. Student year vs. percent who believe teachers take the evaluation seriosly
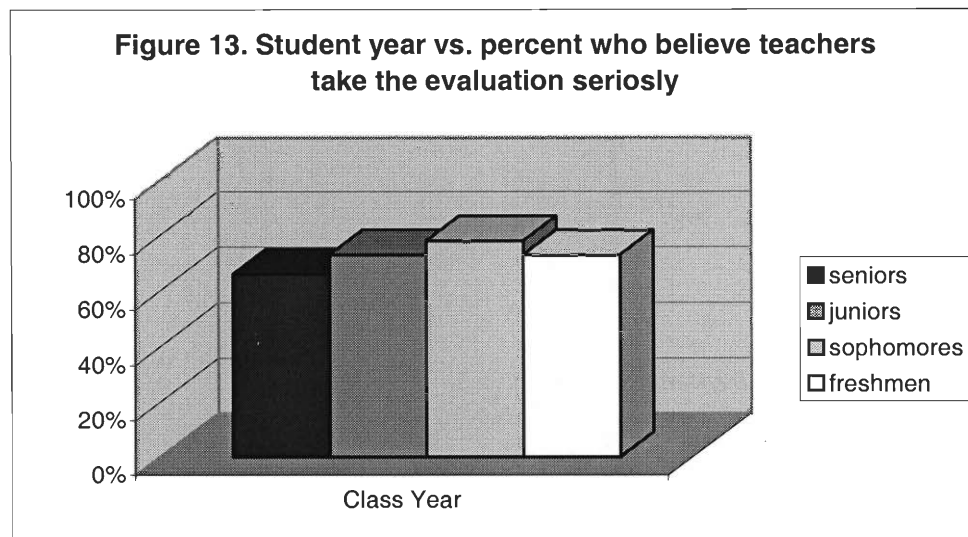
The relationship between class year and seriousness suggests that the longer a

student is at WPI, the less likely he/she will believe that teachers takes the evaluations

seriously. It is possible that students may initially believe that evaluations are very

important since they are something most students have never done before college. As a

student progresses through WPI the evaluations may become routine, without any

acknowledgement that teachers use the data and the student will decrease how serious they believe teachers take the evaluations.

5.3.3 Evaluation validity vs. student year

Question 6 asked students how often they completed the course evaluations with thought and truthfulness. If a student does not put in any thought or answer the evaluations with truthfulness, then this decreases the validity of the student's evaluation. For question 6, 29% of the students said 'always', 56% said 'usually', 15% said 'sometimes' and less than 1% said 'never'.
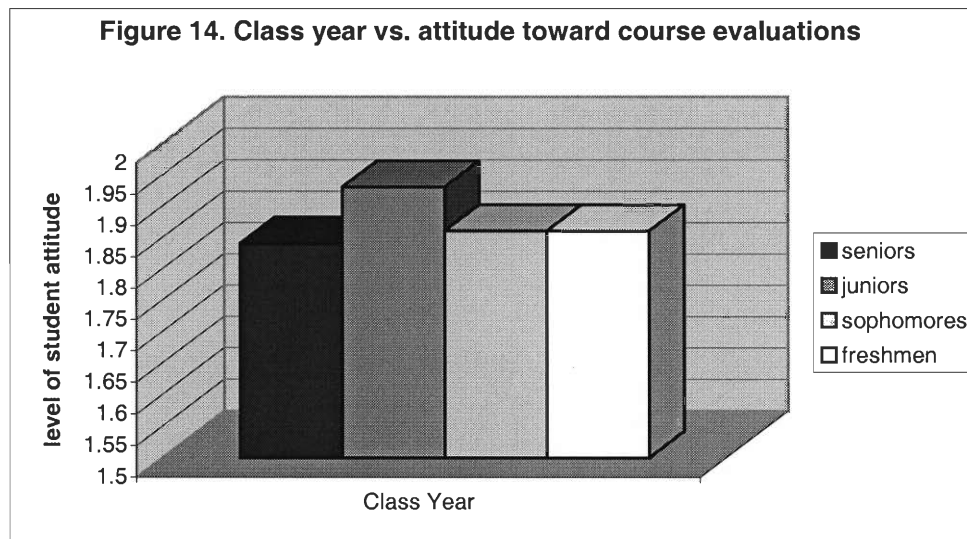
**Figure 14. Class year vs. attitude toward course evaluations**

The numbering for the level of student attitude goes from 1 to 4 where 1 is 'always', 2 is 'usually', and so on. The lower the number, the better the student's attitude.

Although students' knowledge (Figure 9) and students' belief (Figure 13) of how seriously the teacher took the evaluations correlated well to the students' class year, students' personal attitudes did not correlate (correlation coefficient of −0.0327) with class year (Figure 14). It appears that the students' attitude may be unrelated to their knowledge and their belief about how seriously teachers take the evaluations.

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5.3.4 Teachers rated vs. expected teachers rated

Question 12 asked the students approximately how many teachers they have rated. Figure 15 shows how many teachers the students say they have rated and the expected number of teachers the students should have rated at the time of the survey (Feb 2000). The expected total is based on 3 classes per term. The expected total does not deduct evaluations not given because of project work and does not account for extra classes due to overloading, etc.

**Figure 15. Teachers rated vs expected teachers rated**
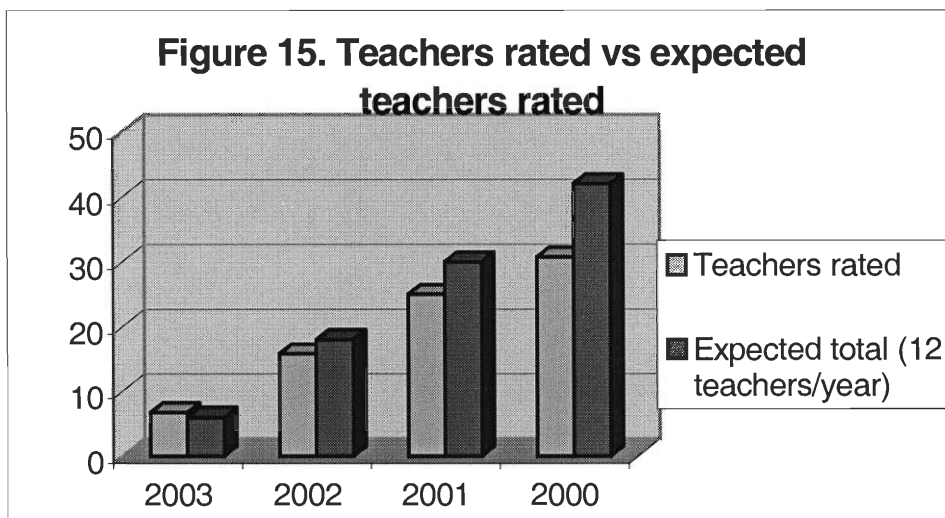
The number of teachers the student should have rated falls short of the expected total by more each year. These self reported values from the student suggest that each year the student is at WPI, they evaluate fewer teachers. Freshmen evaluate teachers the most, most likely because evaluating is something new to freshmen. The students may lose interest in evaluating the teachers, or may find the evaluations too routine or boring.

5.3.5 Student presence to give evaluations vs. student year

Question 8 asked the students if they are generally present to complete evaluations for professors that they do not like. The thought behind this question was that some students might skip classes with professors they don't like, and would therefore not

complete their course evaluation form. This would decrease the number of below average course evaluations a teacher received and would result in the teacher getting a higher than deserved rating.

Figure 16. Percentage of students present to complete course evaluations vs. class year
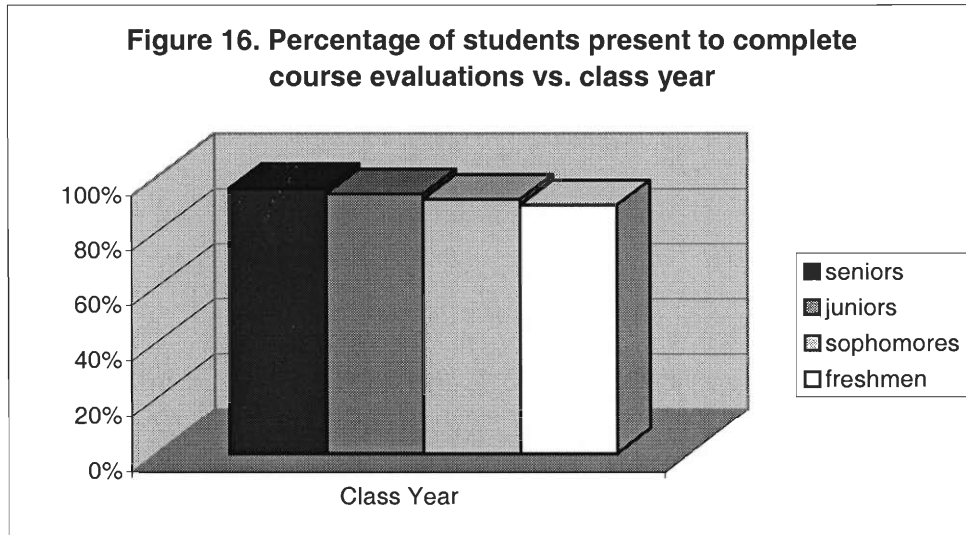
Each year exactly 2% more students say that they are present to give an evaluation of a professor they believe deserves a low rating, for a perfect correlation of 1. Students may become more aware of the evaluation's use the longer they are at WPI, as seen from the previous results. When they learn more about the evaluation's use and its importance they may be more likely to show up and give an evaluation to an instructor.

5.3.6 Teachers that deserved low ratings and received low ratings vs. student year

Here we compare the average number of teachers to whom students in each class report that they have given bad ratings, and the average number of teachers they have had that deserved low ratings. It is important to remember that the number of teachers deserving a low rating is the students' opinion.

Figure 17. The average number of low ratings given vs. average number deserved
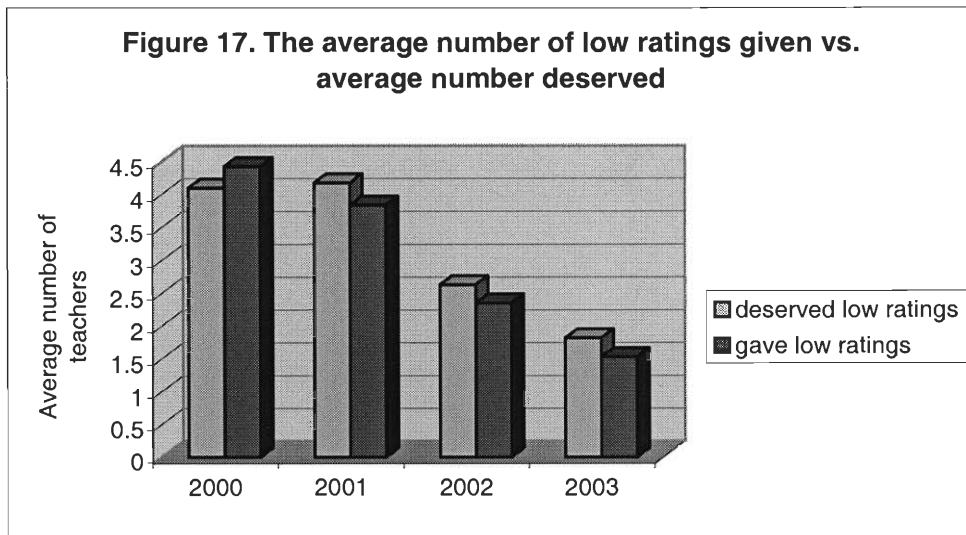
The number of teachers that deserved low ratings was slightly higher than the number of low ratings the students have given out, except for the class of 2000 where the reverse was true. In each case the difference between the number of low ratings given and low ratings deserved was very close to (±0.3). It also correlated extremely well having a correlation coefficient of 0.9775.

5.4 Relationship between attitude and students' knowledge of the uses of course evaluation data

Figure18 shows the relationship between (question 6) attitude of students toward the course evaluations and (question 3) students' knowledge of the uses of course evaluation data. This was to determine if there was any correlation between the two. It correlated extremely well having a correlation coefficient of 0.9342.
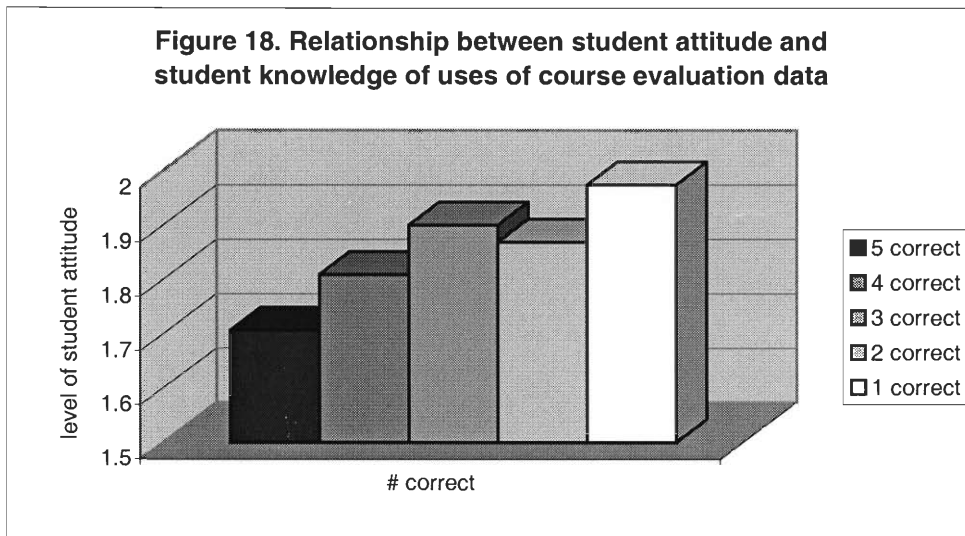
Figure 18. Relationship between student attitude and student knowledge of uses of course evaluation data

The numbering for the level of student attitude goes from 1 to 4 where 1 is 'always', 2 is 'usually', and so on. The lower the number, the better the student's attitude.

Figure 18 shows that the better the students' knowledge of the uses of course evaluation data, the better their attitude toward the course evaluations will be. This indicates that if students are better educated as to the uses of course evaluation data their attitude toward the evaluations will improve.

5.5 Comparing our calculated approval rating to median WPI approval rating

5.5.1 Percentage of strongly agree + agree

Our data showed a calculated percentage (section 4.4.6) of strongly agree + agree (92%) on the course evaluation form, very close to WPI's 93% strongly agree + agree. Numerically we could conclude from this that our data was comparable to WPI's. However, we assumed in our data analysis that the student had answered 0/14 strongly disagree plus disagree on all other teachers besides the ones that were rated low, making this a highest rating scenario. This could be true, but is most likely not true for every realistic scenario.

In light of this problem we calculated the worst case scenario. This was determined by taking the students' opinion of the number of strongly disagree + disagree that constituted a poor teacher, which the average number of strongly disagree + disagree among students was 5.52, and subtracting one. We then gave every other teacher that number. If a student felt that 5/14 strongly disagree + disagree constituted a poor teacher, then all the poor teachers he said he had were given 5 strongly disagree + disagree, and all the other teachers were given 4 strongly disagree + disagree to keep them just below being considered poor. This gave us a worst case scenario of 68% strongly agree + agree, considerably lower than WPI's median of 92%.

Another problem with our analysis is the fact that we assumed that students who had poor teachers, only gave the poor teacher their opinion of the number of strongly disagree + disagree that constituted a poor teacher, and no more. These two opposing problems would probably cancel each other out to some extent but it is worth pointing out.

5.5.2 Overall percentage of good teachers that students have had at WPI

The overall percentage of good teachers that students have had was determined by taking the total number of teachers reported to have been rated by the students (Question 12) and subtracting the total number of low rated teachers (Question 10) to get a total number of high rated teachers (presumably good teachers). The total number of good teachers was then divided by the total number of teachers reported to have been rated to get a percentage of good teachers students have had through their career at WPI, which comes out to be 82% (percent of good teachers that students have had at WPI).

This result is 10% lower than our calculated best case strongly agree plus agree calculation from the previous section and 11% lower than the WPI's median of 93%

strongly agree plus agree. This discrepancy prompted us to question WPI's current

methods for determining what constitutes a "good" teacher.

6.0   Conclusions

Our major results are as follows:

- WPI students generally do not know what WPI uses course evaluation data for.

- WPI students take completing the course evaluations more seriously when they feel that the professor also takes the completion of the evaluations seriously.

- There is a small increase of knowledge of how course evaluation data is used with increasing time spent at WPI.

- WPI students need to be further educated about the use of course evaluation data.

- As knowledge of course evaluation uses decreases, students' attitude toward the evaluation deteriorates.

- Students who that feel that the professors take the completion of course evaluations seriously are also more likely to take completing the evaluations more seriously.

- The two best ways that students suggested to further educate undergraduates about the purpose of course evaluations were to explain the purpose of the evaluations during freshman orientation, or to have the professor explain the purpose of the evaluations before distributing the forms.

- WPI needs to reexamine its current system of determining what constitutes a poor rating

Our results showed that an overwhelming number of students believed the course evaluation to be a guide for teachers to improve teaching (96%) and an overall evaluation of the course (84%). We postulated that students could have guessed it was used for evaluation of the course because of the constant references to "course evaluations". Students may also have inferred that the course evaluations were used for teaching improvement because of the section on the back of the form (figure 1) reserved for student comments on improving teaching. Decreasing percentages of students knew that it was used for determining tenure (34%), teaching awards (22%), and promotion and raises (15%). These alarmingly low percentages suggested that students needed to be further educated about the purpose of the course evaluations. The students suggested that the best way to raise awareness would be to either explain the purpose of the course evaluations during freshmen orientation or to have instructors read a short paragraph pertaining to the use of the course evaluation data before distributing them. The effectiveness of these methods could be measured by repeating our experiment after a trial period of implementing the suggested changes.

Another way to raise awareness of the course evaluation use would be to change how they are referred to. Students may be misled by the term "course evaluation", as it alludes to the course being evaluated as opposed to the professor. If administration and instructors want students to know that the evaluations are used for more than to evaluate the course, they should refer to them as "instructor evaluations" or "course and instructor evaluations".

Another conclusion drawn from our results was that students who felt that the instructor took the completion of the course evaluation seriously were more likely to take completing the evaluations seriously themselves. We felt that if instructors showed more

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interest by emphasizing the importance of the evaluations, perhaps by allotting more time for the students to complete them, then students would take completing the evaluations more seriously.

Yet another conclusion drawn from our results was that the better the students' knowledge of the uses of course evaluation data the better their attitude toward the course evaluations will be. This leads to the conclusion that if students are better educated as to the uses of course evaluation data, the more likely they are to take the evaluation seriously, and the more likely the data collected from WPI's course evaluations will be relevant.

We found that students considered that 82% of their teachers through their careers at WPI have been good teachers. This percentage is considerable lower than WPI's median teacher approval rating of 93%. This shows that there is something wrong with WPI's current method for determining teacher approval ratings. A suggestion to remedying this problem would be to consider each course evaluation as a vote instead of taking all the course evaluations and compiling them to determine the teacher approval rating. This would make the student's individual opinion a factor (i.e. if a student considers 5 strongly disagree + disagree as a poor teacher and gives that teacher 5 SD + D that would mean we gave the teacher 9 strongly agree + agree for a approval rating of 64.3% instead of in the student's opinion a 0% approval rating). This method would decrease the approval rating for poor teachers and increase it for good teachers. We conclude that if this method was done than the median approval rating would be close to our calculated 82% good teachers.

Problems that we encountered during the completion of our project occurred while putting the survey on the web. After the email was sent to the undergraduates to

take the survey, it was discovered that there was a problem with question 7 (figure 3) when taking the web survey. It required an answer in order to complete question 8, although the student should not have been forced to choose an answer. This was discovered very early and corrected, and considered when collecting the data.

There exists a persistent need for WPI to educate its students about how WPI uses the data from course evaluations. Students need to know how important their responses on the evaluations are, and that it is important to the instructors that the course evaluations are completed. Actions need to be taken to educate WPI students throughout their college career to make the course evaluations a more true reflection of the competency of WPI's instructors, as well as an influential factor in making important decisions.

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