AC 2009-1110: THE EFFECT OF REGULAR CLASS SURVEYS IN MECHANICAL ENGINEERING EDUCATION ON TEACHING QUALITY IMPROVEMENT AND STUDENTS' EVALUATIONS

Benxin Wu, Illinois Institute of Technology

Dr. Benxin Wu is an Assistant Professor in the Department of Mechanical, Materials and Aerospace Engineering at Illinois Institute of Technology (IIT). He joined IIT in August 2007 after he completed his Ph.D. degree from Purdue University.

The Effect of Regular Class Survey in Mechanical Engineering Education on Teaching Quality Improvement and Students' Evaluation

The Effect of Regular Class Survey in Mechanical Engineering Education on Teaching Quality Improvement and Students' Evaluation

Abstract

The author of this paper has been teaching classes in mechanical engineering at both undergraduate and graduate levels, including MMAE 546 Advanced Manufacturing Engineering (graduate level), and MMAE 201 Mechanics of Solids (undergraduate level). In these classes, the author organizes regular (typically monthly) class survey to get feedback from students in order to monitor the teaching equality and improve the teaching approaches. This paper will describe how the regular class survey is organized, and also share some useful findings about the effect of the regular class survey on student evaluation and teaching quality improvement.

Introduction

Since the author joined the Department of Mechanical, Materials and Aerospace Engineering (MMAE) at University A in Fall 2007, he has been teaching classes in mechanical engineering at both undergraduate and graduate levels, including MMAE 546 Advanced Manufacturing Engineering (graduate level) for Fall 2007 and Fall 2008, and MMAE 201 Mechanics of Solids (undergraduate level) for Spring 2008. MMAE 546 typical has an enrollment of around 20 to 25 students, while MMAE 201 has an enrollment of nearly 50 students.

During the first semester of his teaching at University A, the author does not organize regular class survey to get feedbacks from the students. Only one official on-line survey is organized by the university at the end of the semester, and it turns out the students feel that the author's teaching method has many problems, which the author has not realized until after the end of the class when he sees the survey results. The evaluation of the students on the author's teaching quality is shown in Fig. 1, and the average score (with 5 being the full grade) is only 3.54, much lower than the department's average, which is 4.25.

Previous studies [1-4] show that class evaluation/survey by students provides an effective way to get feedback for teaching quality improvement. The feedback from the students in the university-organized official on-line survey at the end of each semester is very useful for improving the author's teaching quality. However, it will be much better if feedback can also be collected within the semester, so that actions can be taken more quickly and effectively to correct the problems or mistakes in teaching approaches. Also, different students may have different learning styles [5-6]. Therefore, the most effective teaching method may depend on the students being taught. Regular class surveys may be an effective way to know the learning styles of the students and adjust the teaching method accordingly.

Motivated by the above, the author decides to start organizing regular (typically monthly) class surveys to get feedback from students within the semester from Spring 2008.
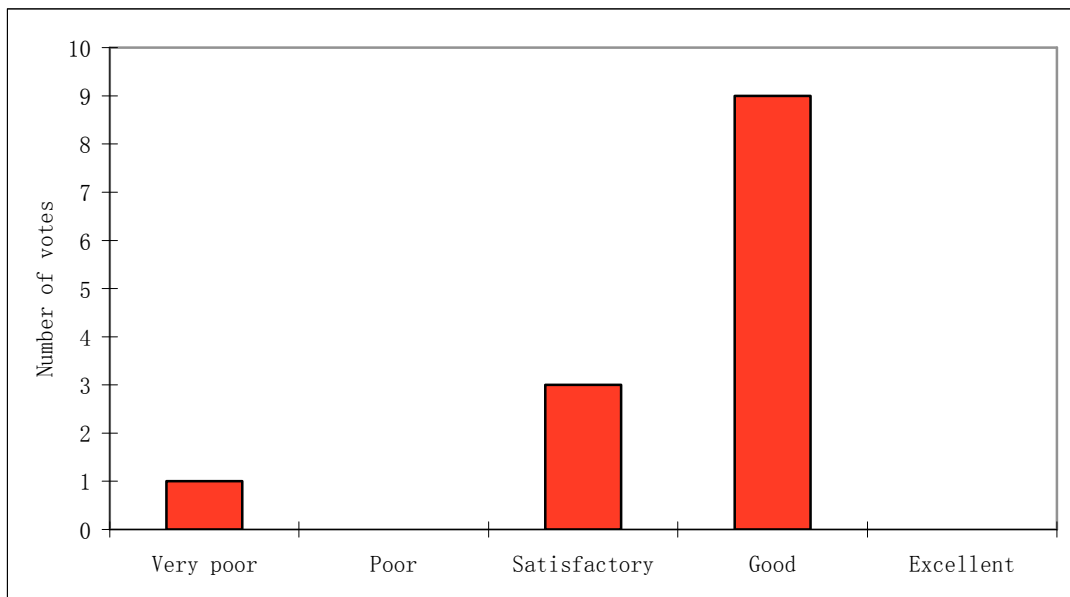

Figure 1. The students' evaluation on the author's overall teaching quality for MMAE 546 in Fall 2007

Class Survey Organization

The class survey is totally anonymous and organized by the author roughly once a month in the classroom. Typically, a total of three surveys are performed each semester without counting the final university-organized official on-line survey at the end of each semester. The questions in

the surveys organized by the university and the author are very similar, which mainly include the following:

General Instructor Questions (please choose among: <u>strongly disagree, disagree, neutral, agree, strongly agree</u>; or among: <u>very poor, poor, satisfactory, good, excellent</u>).

1   *The instructor communicates clearly and understandably. ( )*

2   *The instructor effectively uses teaching aids and materials. ( )*

3   *The instructor is prepared for class. ( )*

4   *The instructor is reasonably available outside of class. ( )*

5   *The instructor makes students feel free to ask questions. ( )*

6   *The instructor treats students with respect. ( )*

7   *The instructor encourages class participation. ( )*

8   *The instructor provides constructive feedback on graded material. ( )*

9   *The instructor returns graded material promptly. ( )*

10   *The grading criteria were clearly explained and followed. ( )*

Instructor Rating

1   *Overall, how would you rate this instructor? ( )*

General Course Questions

1   *The course covered the announced objectives. ( )*

2   *The textbook and course materials are useful learning aids. ( )*

3   *The assignments and homework are useful learning aids. ( )*

4   *The examination questions related to the course material. ( )*

5   *Rate the level of intellectual challenge in the course. ( )*

Course Rating

1   *Overall, how would you rate this course?*

Comments and Suggestions for class/teaching improvement:

Results and Discussions

Spring 2008 is the first semester when the author starts organizing the regular class survey. The response from the students is not mandatory, but the typical response rate is more than 50%,

indicating that many students are willing to participate. From the first survey, lots of comments are left by the students, indicating some problems that exist in the author's teaching method. Some of the comments are:

- *"I would like real example problems done in class, like the homework problems".*
- *"Please give us the solution after submitting homework right away".*
- *"Explain new material better. Explain what's going on and relate it to real life stuff".*
- *"Provide more examples and sample questions"*
- *"The examples done in class would be more beneficial if they were not the problems which the students had already been assigned for homework."*
- *"Examples are essential"*
- *"During explanation on the board, it is better to write it clearly and step by step"*
- *"Do more examples when covering new material not just going over homework problems"*
- *"Do more examples"*
- *"Please use the white board instead of the projectors".*

It can be seen that lots of comments are given by the students, and some of them are very consistent among the students. For example, multiple comments suggest that more examples should be added to the class to explain the theory. After the first survey, relevant actions are taken to address the above suggestions from the students. For example, more examples are given in the class, and also the white board instead of the projector is used more. In the second survey, the students have left much fewer comments, and some of them are:

- *"Thanks for switching to the whiteboard. It helps a lot"*
- *"I am learning a lot better now that you are teaching on the board & giving more examples. Thanks!"*
- *"More participating part. Let students explore or present some part in the future class"*
- *"Please write slow and steady and we can understand".*

It can be seen that the students are satisfied with some of the actions taken, and feel the teaching quality is improving. However, they still point out some other problems. Hence, the author has

taken some further actions to address those problems. In the third survey, even fewer comments are received than the second survey, and some of them are:

- *"so far…..so good"*
- *"great job"*
- *"the teacher's English was hard to follow"*
- *"still hard to follow English"*

It can be seen that some students are still not satisfied with the author's English, and this is something that the author has always been trying to improve, and it is certainly not something that can be improved very quickly. Besides the English problem, most of the other problems mentioned by the students in the first two surveys disappear, indicating that the actions taken have effectively addressed those problems.

It can be seen that the organized regular class survey is an effective way to find out existing problems in teaching approaches, so that actions can be taken to address the problems to improve the teaching quality.

In Fig. 2, the students' evaluation is shown on the author's overall teaching quality from Fall 2007 to Fall 2008. It can be seen that improvement is steady and significant. The author's score increased from 3.54 in Fall 2007 to 4.77 in Fall 2008 (full grade is 5.0). It is believed that the author can not make such a big improvement without the regular class survey as a tool of finding and solving problems in teaching.

In Fig. 3, the students' response (in the author-organized last class survey in Fall 2008) to the question "*The in-class student surveys have helped improving the teaching quality of the class*" is shown. It can be seen that most of the students agree or strongly agree that the surveys do provide a big help.
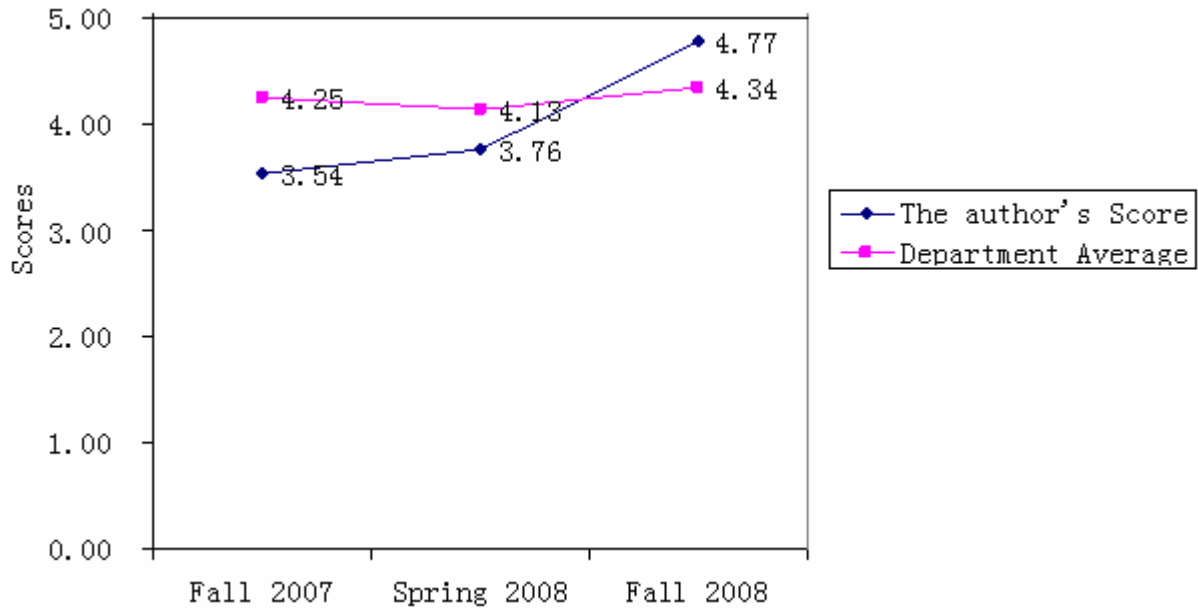
Figure 2. Students' evaluation on the author's teaching quality from Fall 2007 to Fall 2008; full grade is 5.0 (from the university-organized official on-line survey at the end of each semester).
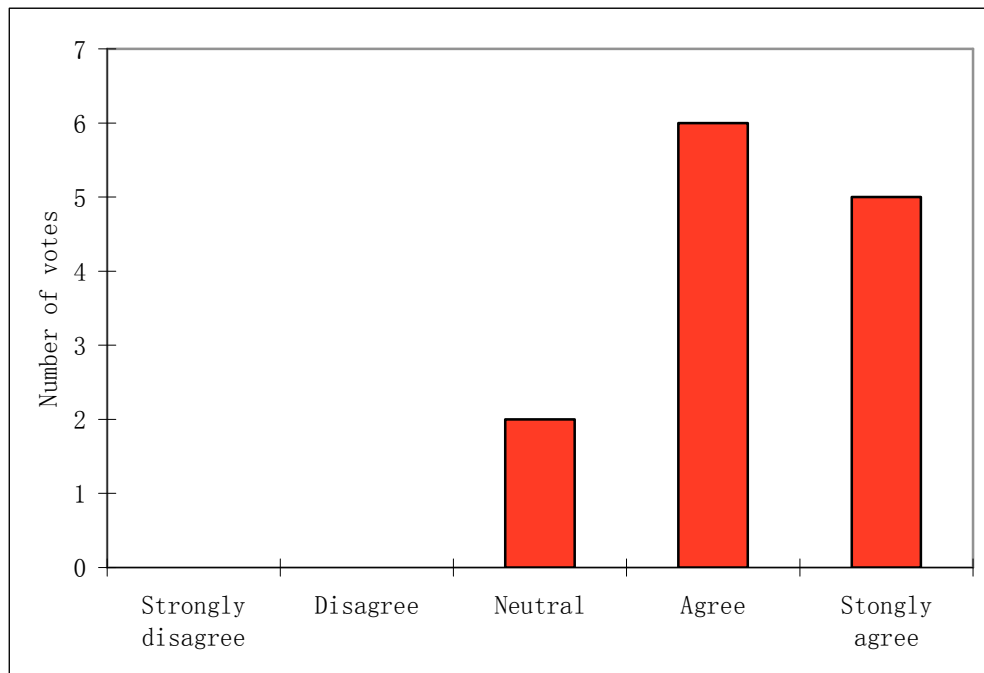

Figure 3. The students' response in the author-organized last class survey in Fall 2008 to the question "*The in-class student surveys have helped improving the teaching quality of the class*".

It has been found that getting intra-semester feedback from students can demonstrate concerns for students and hence enhance the students' evaluation on the class[1]. In this study, it is believed that, besides the demonstration of concerns, the actual teaching quality improvement should also be a very important reason for the evaluation improvement. This can be seen from the comments left by the students given earlier in this paper, which show that the students feel more and more comfortable with the author's teaching method as the semester goes on, due to the class modification by the author based on the students' feedback.

Finally, in Fig. 4 the comparison is shown between the students' evaluation on the author's teaching quality in the university-organized class survey and the author-organized last class survey for each semester. It can be seen that they are very close, indicating that the author has organized the survey in a way that can collect information at least as trustable as those collected by the on-line official survey administered by the university.
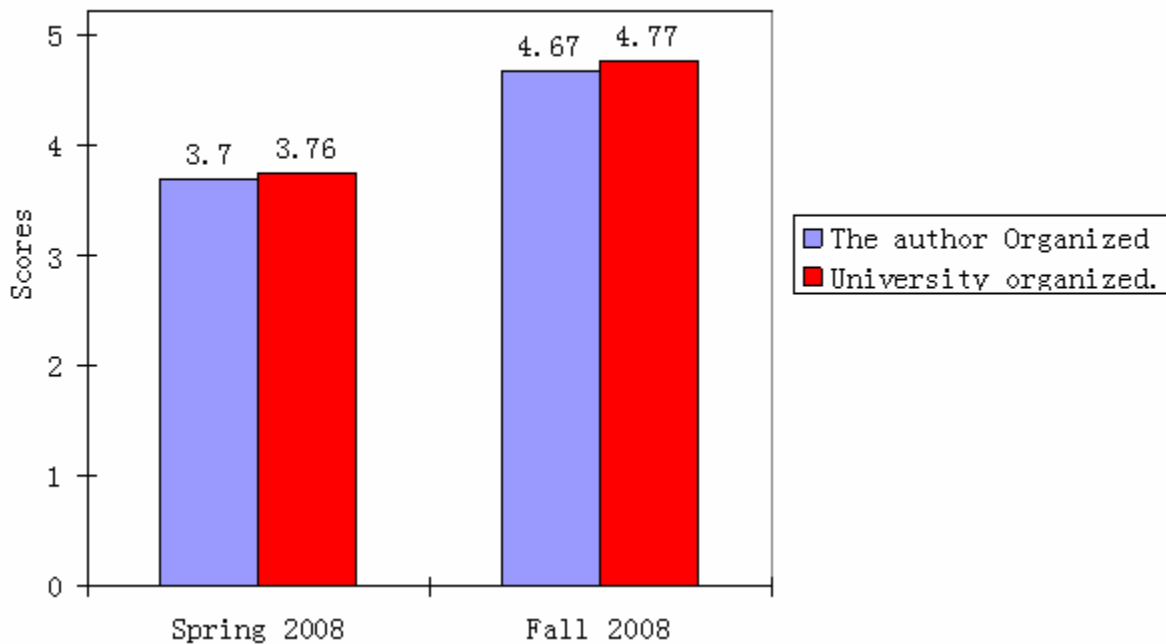

Figure 4. The comparison between the students' evaluation on the author's teaching quality given in the university-organized class survey and the author-organized last class survey (full grade is 5.0).

Conclusion

Regular class surveys have been organized during the author's teaching at University A, and it has been determined that this is a very effective approach to get feedback from the students, and identify and solve the existing problems in teaching methods very quickly. With the help of this approach, the teaching performance of the author has been improving significantly. This technique will be continued in the future by the author to further improve the teaching quality, and will also be recommended to the department in a faculty meeting.

References:

[1] Visco, Jr., (2004), "Improving student evaluations by demonstrating concern for students", *ASEE Annual Conference Proceedings*, 6931-6938.

[2] Rockland, R.H., (2002), "Effective teaching training for new faculty through analysis of a student evaluation form", *ASEE Annual Conference Proceedings*, 4823-4827.

[3] Hill, W., (2006), "Student evaluation of teaching – Myths and realities", ASEE Annual Conference Proceedings.

[4] Kockelman, K.M., (2001), "Student grades and course evaluations in engineering: What makes a difference", *ASEE Annual Conference Proceedings*, 9085-9110.

[5]Felder, R.M., and Silverman, L.K., (1988), "Learning and teaching styles in engineering education", *Engineering Education*, 78(7), 674-681.

[6] Lawrence, G., (1982), *People Types and Tiger Stripes: A Practical Guide to Learning Styles*, 2nd edit., Center for Applications of Psychological Type, Gainesville, Fla.