Mid-semester feedback enhances student learning

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Abstract

Soliciting mid-semester student feedback encourages a more responsible attitude by the students as they reflect upon the course. Making use of a third party facilitator to obtain this feedback results in constructive suggestions by the students. Implementation of some of these suggestions, will often result in an improved learning environment. A junior-level fluid mechanics course was modified over a two-year period. These modifications together with the results of soliciting mid-semester feedback are described here.

Introduction

New assistant professors are usually enthusiastic about teaching their first undergraduate course. As we prepare a course we often reflect upon our own undergraduate years. Yet all too often our learning environment was a passive lecture format where the instructor spoke and the students listened. Guskin[1] points out that 'the primary learning environment for undergraduate students, the fairly passive lecture-discussion format where faculty talk and most students listen, is contrary to almost every principle of optimal settings for student learning'. The optimal environment for learning motivates students, encourages a high degree of interaction with students and provides students with specific goals, meaningful feedback and a sense of direct engagement[2]. As instructors, both new and experienced, we should make use of new pedagogical approaches in order to ensure that we provide a better learning environment for our students. However if these new approaches are not introduced carefully, the results could be disappointing.

This paper describes our efforts to use mid-semester student feedback when modifying an existing course. We have modified the course twice (over a two year period). In particular we focus on the importance of introducing students to new pedagogical ideas slowly, and soliciting their feedback in a formal setting. Our results should be of particular interest to assistant professors as they prepare to teach courses for the first time. Importantly, this process of soliciting feedback parallels common industry practice promoting the kinds of self-reflective and cooperative skills our graduates ought to possess.

Background

The undergraduate fluid mechanics course contained 31 and 32 registered students in 1998 and 1999 respectively. The majority of the students were chemical engineering majors. Prior to 1998 the course was more theoretical in its focus. Thus a major aim, was to ensure the course

included practical applications of theory and was related to the sequel unit operations laboratory course which followed the next semester. In particular, it was decided to:

- Include laboratory demonstrations thus linking the lecture course to the companion laboratory course.
- Include team based group assignments that would prepare the students for the laboratory course and their future professions.
- Solicit student feedback by conducting mid-semester course evaluations using an expert third party facilitator.

The sequel laboratory course contains three fluid mechanics experiments: pressure drop in pipes and fittings, fluid flow meters and rheology. Modified versions of these laboratory exercises were included as demonstrations. The demonstrations were scheduled so as to complement the theoretical development presented in class.

In the laboratory course students work in groups of 4-6. The group leader gives an oral presentation at the conclusion of the experiment. In addition, the group leader must submit a detailed experimental report while the other members of the group submit smaller less detailed reports. We decided therefore that the team based assignments should also be conducted in groups of 4–6 students. Three team based assignments were included in fall 1998: a poster presentation followed by questions, a 10 minute oral presentation followed by questions and a 1,500 word paper. For both the oral and poster presentations the students had to demonstrate the fact that they had worked in a team. We did not set any formal guidelines as to how this was to be achieved. Some groups chose to identify each part of the presentation with a group member. Others ensured that each group member answered at least one question about the presentation posed by the instructor.

Groups were assigned based on student scores for the first two individual homework assignments. We ensured that women and minority students were not outnumbered in any group[3-5]. A list of the group assignment topics is given in Table 1. These topics were chosen in order to allow students to pursue a particular aspect of the course in more detail. In addition, some topics were chosen which focussed on practical mechanical separations.

We decided to analyze both qualitative and quantitative measures in order to assess the effectiveness of these pedagogical changes. At Colorado State University (CSU) the Center for Teaching and Learning has developed a formal procedure for soliciting this information based on a mid-semester feedback session. This feedback session (conducted by Dr Timpson), consisted of two parts; a discussion with the students on the strengths and weaknesses of the course and a survey[6]. At the end of the semester the standard CSU course evaluation was administered. The instructor (Dr Wickramasinghe) was not present during either of the two feedback sessions.

In 1999 the fluid mechanics lecture course followed a similar format to 1998. The same laboratory demonstrations were included. Team based assignments were again part of the overall course assessment. However the following changes were made.

- Two (rather than three) team based assignments were included; an oral presentation and a poster presentation. A list of the group assignment topics is given in Table 2.
- The oral presentations were 20 minutes in length and were videotaped.

In 1998 none of the material presented in the team based assignments was directly examinable. By videotaping the students' presentations, we were able to make all the material presented examinable since now the students could review the videotapes at their leisure. In addition, when the students prepare their oral presentations for the laboratory course, they will be able to review their videotaped presentations and determine their weaknesses.

As in 1998, a mid-semester feedback session was conducted in addition to the standard CSU end of semester course evaluation. In the next section we discuss the quantitative and qualitative results we have collected over the past two years.

Results and Discussion

Tables 3-5 summarize the students' responses to the mid-semester and end of semester evaluations in 1998 and 1999 respectively. Table 3 shows that in 1998 the students' responses to all the questions were more positive in the end of semester evaluation compared to the mid-semester feedback session.

In the mid-semester feedback session conducted in 1998 (see Table 3), a number of issues were raised by the students during their discussion with Dr Timpson. In general, the students felt that insufficient time was available for working through sample problems in class. Consequently they suggested that an optional recitation session be included. In addition, the students were very sceptical about the value of team based assignments. Based on the students' input two optional recitation sessions were offered per week. About 90% of the students attended at least one of the recitation session each week. In addition, additional solved examples were handed out during class. These changes proved very popular alleviating student concerns and boosting morale.

Felder et al.[3-5] point out that students who are not accustomed to working in groups may not see the value of group assignments. We observed this reaction in our fluid mechanics class in 1998. Though Dr Wickramasinghe stressed the importance of teamwork in the workforce and in the next semester's laboratory course the students remained unconvinced that it was worth putting time and effort into group assignments. During the mid-semester feedback session Dr Timpson moderated a discussion on the importance of teamwork. As a consequence of this discussion, the students expressed a far more favourable attitude towards team based assignments at the end of the semester. Allowing the students to discuss the merits of group assignments in a formal setting seemed particularly helpful in clarifying the rationale for this assignment and addressing concerns with a neutral third party present.

Interestingly, though no changes were made to the workload, course objectives grading criteria, or course evaluation/examination criteria, the responses in all of these areas were more positive in the end of semester evaluation. In addition, the students felt that the assignments were more consistent with the objectives of the course, and that the course was more consistent with the syllabus at the end of the semester. These, more positive responses, could be due in part to the fact that unlike the mid-semester feedback session, at the end of the semester the students were able to reflect upon the whole course. Nevertheless, the students were most appreciative of the fact that we had held a mid-semester feedback session where they were able to provide input on

the course which could directly benefit them. Discussing concerns in a formal public session may also have promoted a more responsible attitude by students as they reflected on the course and the instructor's role to-date.

Though mid-semester feedback sessions are very helpful, an obvious drawback is that they do require valuable class time. In addition, we found that while the team based assignments were very beneficial, they also took up lecture time. Further 10 minute oral presentations were too short. As a consequence, in 1999 the oral presentations were increased to 20 minutes and videotaped. By making the material presented in the team based assignments examinable, we were able to offset the loss of class time due to the longer presentations by the fact that much of this material was now covered in the team based assignments. As an added benefit, the students now had an opportunity to teach themselves.

In 1999 we decided to drop the team based written report. Our aim for introducing team-based assignments was to encourage the students to work effectively in a team. Requiring the students to make both oral and poster presentations forced them to publicly demonstrate that it was a team effort. This was not possible with the written report.

Our results in 1999 (Tables 4 and 5) show similar trends to 1998. However there are some interesting exceptions. Since the optional recitation sessions were very popular in 1998, they were offered from the second week of classes in 1999. However, attendance was always poor as evidenced by the large number of students who were ambivalent about the value of the recitation sessions in the end of semester evaluation. In addition, the students were more positive during the mid-semester review about the value of the laboratory demonstrations than at the end of the semester. Further, the class as a whole remained undecided as to whether students should form their own groups or be assigned groups for team based assignments.

Mid semester evaluations are a valuable tool for soliciting student feedback. Further conducting these evaluations using a third party facilitator, expert in post-secondary instruction offers a number of benefits. During the discussion segment of the mid-semester evaluation conducted by Dr Timpson, the students often begin with negative comments about the course. While an inexperienced assistant professor may become nervous and anxious, an expert in post–secondary instruction is able to steer the conversation in order to solicit constructive and implementable suggestion from the students. Then, after the evaluation, the facilitator can discuss the students' comments with the instructor in order to develop implementable changes to the course.

It is essential that the instructor discuss the results of the mid-semester evaluation with the class as soon as possible. Students will become very cynical of the entire process if they feel their comments and feedback lead to no changes. During this discussion, which can be quite short (15 minutes), the instructor should discuss the changes he or she proposes as a result of the students' feedback. We have found that the students are very receptive to these changes and often make more suggestions. In the two years that we have conducted mid-semester evaluations, a number of students have personally thanked the instructor (Dr Wickramasinge) for providing the opportunity for a formal mid-semester evaluation and then, for discussing the results and consequent course modifications with the students.

Certainly there are other means to solicit this type of student feedback. Input can be sought from one's peers who teach different courses to the same group of students. In addition student volunteers could be solicited to collect information anonymously. While both methods will provide valuable information they do contain serious flaws. Students will make judgements and have biases about their instructors. Thus information provided by the students to another faculty member who teaches them will be coloured by these biases. Making use of student volunteers runs the risk that the students will seek and obtain more information from their friends. Thus the feedback will be less representative than that obtained from a formal mid-semester evaluation as we have conducted.

Another means of obtaining student feedback is for the instructor to schedule individual meetings with each student. This will help develop a personal contact with each student especially in large classes. However, students will provide relevant information only if they are asked appropriate questions. An inexperienced instructor may have difficulty in asking appropriate questions and thus obtaining useful information. Further an expert in post-secondary education is often better able to analyze the students input and convert it into implementable changes.

When we compare the results of the mid-semester and end of semester evaluations for 1998 and 1999 we see that the improvement in the responses is less positive in 1999. This is not surprising. As an inexperienced assistant professor gains experience he or she will be able to adjust his or her teaching style based on student cues. Thus, after the first year or two, the improvement in student responses is likely to be less.

Our results show us that teaching is a dynamic process. As a group, each class is different thus the instructor must be willing to adjust the approaches used during the semester. The mid-semester feedback session promotes the kinds of open communication so essential for a more dynamic and responsive approach to instruction to succeed.

Conclusions

- Novel pedagogical approaches should be introduced carefully otherwise the results can be disappointing.
- Students appreciate the opportunity to provide input especially when this input will directly benefit them. However it is best that this input be solicited in a formal setting in the middle of the course after the students have some understanding of the course material. Using a third party facilitator, expert in post-secondary instruction, encourages students to be open, thoughtful and responsible with their feedback.
- When introducing non-traditional teaching methods such as group assignments it is necessary to reiterate the importance of these assignments throughout the course. If an immediate benefit (such as performance in a subsequent laboratory course) can be shown the students will be more receptive .
- Teaching is a dynamic process. Highly successful teaching methods in a given year may be less successful the next year. We must be prepared to make changes during the semester to our teaching style. The students will appreciate the fact that their concerns

were heard, their ideas considered and some changes made. The overall result is an improved learning environment.

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WILLIAM TIMPSON

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	Assignment 1 (poster presentation)	Assignment 2 (paper)	Assignment 3 (oral presentation)
Group 1	Viscoelastic fluids	Tube flow of viscoelastic fluids	Weirs as flow measurement devices
Group 2	Time dependent fluids	Tube flow of viscous non-Newtonian fluids	Pressure drop in tangential flow filtration
Group 3	Viscosity of blood	Pressure drop in pipes and fittings for viscous non-Newtonian fluids in laminar flow	Flow in packed columns
Group 4	Models for high viscosity Newtonian fluids	Pressure drop in pipes and fittings for viscous non-Newtonian fluids in turbulent flow	Pressure drop in dead end filtration
Group 5	Viscosity measurement devices (Newtonian fluids)	Flow meters based on variable area (Newtonian fluids)	Fluidized beds
Group 6	Viscosity measurement devices (viscous fluids)	Flow meters based on changes in kinetic energy (not variable area meters for Newtonian fluids)	Sedimentation
Group 7	Viscosity measurement devices (viscoelastic fluids)	Pressure drop in pipes and fittings for Newtonian fluids in laminar flow	Cyclone separations

Table 1 Group assignments in 1998.

	Assignment 1 (oral presentation)	Assignment 2 (poster presentation)
Group 1	Sedimentation and centrifugation	Pressure drop in pipes and fittings for non-Newtonian fluids in laminar flow
Group 2	Time dependant fluids	Weirs as flow measurement devices
Group 3	Blood rheology	Pressure drop in pipes and fittings for non-Newtonian fluids in turbulent flow
Group 4	Viscosity measurement devices	Flow meters based on variable area (Newtonian fluids)
Group 5	Viscoelastic fluids	Pressure drop in pipes and fittings for Newtonian fluids in laminar flow
Group 6	Fluidization	Pressure drop in pipes and fittings for Newtonian fluids in turbulent flow

Table 2 Group assignments in 1999.

Question	SA		A		N		D		SD	
	MS	ES	MS	ES	MS	ES	MS	ES	MS	ES
Workload is consistent with the requirements provided at the beginning of the course.	5	8	19	18	2	2	3	3	1	0
The objectives of the course are clearly stated.	3	3	12	22	10	5	3	1	2	0
Course assignments are consistent with the objectives of the course.	4	3	14	20	5	4	5	4	2	0
Evaluations reflect the material presented and/or assigned in the course.	3	3	12	20	8	4	5	4	2	0
Grading criteria are clearly stated at the beginning of the course and are followed consistently by the instructor.	7	9	16	17	6	4	0	1	1	0
The course was consistent with the syllabus.	7	8	18	19	3	3	1	1	1	0
I learnt a lot in this course.	3	3	9	15	8	5	5	4	5	4
Group assignment interesting/educational.	4		12		7		5		2	
Laboratory demonstrations are helpful.	4		9		14		1		2	
Homework assignments reinforce key ideas.	1		9		6		8		5	
I learnt more in the second half of the semester (after the mid-semester evaluation) than in the first half.		8		12		7		4		0
Recitation sessions are helpful and should be included next year.		18		7		6		0		0
When I consider the entire course I feel the group assignments were educational/interesting and should be part of next year's class.		7		13		4		4		3
When I consider the entire course I feel the laboratory demonstrations were helpful and should be part of next year's class.		4		16		7		2		2

Table 3 1998 results of mid-semester and end of semester student evaluations. SA, A, N, D, SD, MS, and ES stand for: strongly agree, agree, neutral or undecided, disagree, strongly disagree, mid semester and end of semester respectively. Though 31 students were registered in the class, the total responses to each question are often less since not all students responded to every question. Questions, which have blanks for the number of responses, either mid semester or end of semester, were not asked during the respective survey.

Question	SA	A	N	D	SD
Workload is consistent with the requirements provided at the beginning of the course.	4	16	5	3	0
The objectives of the course are clearly stated.	1	13	6	7	1
Course assignments are consistent with the objectives of the course.	1	8	9	8	2
Evaluations reflect the material presented and/or assigned in the course.	4	10	6	7	1
Grading criteria are clearly stated at the beginning of the course and are followed consistently by the instructor.	6	13	6	2	1
The course was consistent with the syllabus.	5	14	7	0	0
I learnt a lot in this course.	3	10	3	9	3
Group assignment interesting/educational.	2	16	8	0	0
Laboratory demonstrations are helpful.	3	17	7	1	0
Homework assignments reinforce key ideas.	4	20	4	0	1
Videotaped presentations were a good idea.	2	12	11	1	1

Table 4 1999 results for the mid-semester student evaluation. SA, A, N, D and SD, stand for: strongly agree, agree, neutral or undecided, disagree and strongly disagree respectively. Though 32 students were registered in the class, the total responses to each question are often less since not all students responded to every question.

Question	SA	A	N	D	SD
Course objectives were clearly stated.	4	17	3	2	0
The grading system was clearly explained.	6	14	3	3	0
The course was intellectually challenging.	12	13	1	0	0
The assignments increased my understanding of the subject.	2	18	5	1	0
Recitation sessions are helpful and should be included next year.	2	8	12	3	0
Videotaping the oral presentations was a good idea.	6	13	3	2	2
I would prefer to form my own group for group assignments.	3	6	6	6	5
When I consider the entire course I feel the group assignments were educational/interesting and should be part of next year's class.	6	9	8	2	1
When I consider the entire course I feel the laboratory demonstrations were helpful and should be part of next year's class.	3	9	12	2	0

Table 5 1999 results for the end of semester student evaluation. SA, A, N, D and SD, stand for: strongly agree, agree, neutral or undecided, disagree and strongly disagree respectively. Though 32 students were registered in the class, the total responses to each question are often less since not all students responded to every question.