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# Effects of mid-term student evaluations of teaching as measured by end-of-term evaluations

## *An empirical study of course evaluations*

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**Keywords:** End-of-term evaluations: Midterm evaluations: Student evaluation of teaching.

**Abstract:** Universities have varying policies on how and when to perform student evaluations of courses and teachers. More empirical evidence of the consequences of such policies on quality enhancement of teaching and learning is needed. A study (35 courses at the Technical University of Denmark) was performed to illustrate the effects caused by different handling of mid-term course evaluations on student's satisfaction as measured by end-of-term evaluations. Midterm and end-of-term course evaluations were carried out in all courses. Half of the courses were allowed access to the midterm results. The evaluations generally showed positive improvements over the semester for courses with access, and negative improvements for those without access. Improvements related to: Student learning, student satisfaction, teaching activities, and communication showed statistically significant average differences of 0.1-0.2 points between the two groups. These differences are relatively large compared to the standard deviation of the scores when student effect is removed (approximately 0.7). We conclude that university policies on course evaluations seem to have an impact on the development of the teaching and learning quality as perceived by the students and discuss the findings.

## 1 INTRODUCTION

For decades, educational researchers and university teachers have discussed the usefulness of, as well as the best practice for student evaluations of teaching (SET). To a large extent discussions have focused on summative purposes like the use of SETs for personnel decisions as recruitment and promotion (Oliver & Sautter 2005, McKeachie, 1997, Yao & Gardy, 2006). The focus in the present study is the formative aspect, i.e. the use of SETs to improve the quality of teaching and learning.

Much effort has been put into investigating if SETs give valid measurements of teaching effectiveness with students' learning outcome as the generally accepted – though complex to measure – core factor (see metastudies of Wachtel, 1998, and Clayson, 2009). Though SETs can be questioned to be the best method for measuring teaching effectiveness (Yao & Gardy, 2006), there is a general agreement that it is the most practical and to

some extent valid measure of teaching effectiveness (Wachtel, 1998). Additionally, SETs provide important evidence that can be used for formative purposes (Richardson, 2005).

Studies of the long-term effect of SETs tend to lead to the discouraging conclusion that no general improvement takes place over a period of 3-4 years or more (Kember et.al., 2002, Marsh & Hocevar, 1991). However, it is generally found that when the feedback from SETs is supported by other steps, such as consultations with colleagues or staff developers, or by a strategic and systematic approach to quality development at university level, improvements can be found according to the SET results (Penny & Coe, 2004, Edström, 2008).

Some attention has also been directed to the timing of the evaluations – midterm, end-of-term, before or after the exam (Wachtel, 1998). There is some evidence that evaluation results depend on whether they were gathered during the course term

or after course completion (Clayson, 2009, Richardson, 2005).

Keeping the formative aim in mind, it is of interest whether midterm evaluations can lead to improvement within the semester to meet the needs of the students in a specific class context (Cook-Sather, 2009). In a meta-analysis of a number of studies comparing midterm and end-of-term SET results, Cohen (1980) concluded that on average the mid-term evaluations had made a modest but significant contribution to the improvement of teaching. His analysis confirms findings from other studies that the positive effect is related to augmentations of the feedback from students – typically consultations with experts in teaching and learning (Richardson, 2005, Penny & Coe, 2004).

In Denmark as in other Nordic countries, the general use of course evaluations has a shorter history. SETs have primarily been introduced for formative purposes as well as an instrument for the institution to monitor and react on student satisfaction in general and on specific issues (e.g. teachers' English proficiency). As an effect of a requirement from 2003, all Danish universities make the outcome of course evaluations public (Andersen et.al., 2009). Thus, key results of the existing SET processes are also used to provide information to students prior to course selections.

At the Technical University of Denmark, average ratings of answers to closed questions related to the course in general are published on the university's web site. Ratings of questions related to individual teachers and answers to open questions are not published. The outcome is subject to review in the department study board that may initiate follow-up actions.

As an extensive amount of time and effort is spent on the evaluation processes described, it is of vital interest to examine whether the processes could be improved to generate more quality enhancement. Therefore, the present study provides a basis to consider whether mid-term course evaluations can be used as a supplement to (or partial substitution of) end-of-term evaluations to create an immediate effect on quality of teaching and learning in the ongoing course.

In the study, the student evaluations are treated as a source of information on the teaching and learning process, as perceived by the students, which can be used as a basis for improvements. An experimental setup is designed to address the

question: What is the effect of mid-term course evaluations on student's satisfaction with the course as measured by end-of-term evaluations?

The study addresses how general university policies can influence the quality of courses by deciding when to perform student evaluations. Therefore, the course teachers were not obliged to take specific actions based on the midterm evaluations.

The paper is organized as follows. The experimental design is explained in Section 1. Section 2 gives the methods of analysis, and Section 3 the results. Section 4 discusses the findings, and we conclude in Section 5.

## 2 EXPERIMENTAL DESIGN

Since 2001 standard student evaluations at the Technical University of Denmark are performed using an online questionnaire posted on "CampusNet" (the university intra-net) as an end-of-term evaluation in the last week of the semester (before the exams and the grades are given). The semesters last thirteen weeks. On one form the student is asked questions related to the course in general (Form A) and on another form questions related to the individual teacher (Form B). The questions can be seen in

Table 1. The students rate the questions on a 5 point Likert scale (Likert, 1932) from 5 to 1, where 5 corresponds to the student "strongly agreeing" with the statement and 1 corresponds to the student "strongly disagreeing" with the statement. For questions A.1.6 and A.1.7, a 5 corresponds to "too high" and 1 to "too low". In a sense for these two questions a 3 corresponds to satisfactory and anything else (higher or lower) corresponds to less satisfactory. Therefore the two variables corresponding to A.1.6 and A.1.7 were transformed, namely:  $5 - \text{abs}(2x - 6)$ . Then a value of 5 means "satisfactory" and anything less means "less satisfactory". Furthermore, the evaluations contain three open standard questions "What went well – and why?", "What did not go so well – and why?", and "What changes would you suggest for the next time the course is offered?" Response rates are typically not quite satisfactory (a weighted average of 50%). However, they correspond to the typical response rates for standard course evaluations. The results are anonymous when presented to teachers while they in this study were linked to encrypted

keys in order to connect a student's ratings from midterm to end-of-term.

Table 1: The evaluation questions.

Id no.	Question	Short version of question (for reference)
A.1.1	I think I am learning a lot in this course	Learning a lot
A.1.2	I think the teaching method encourages my active participation	TM activates
A.1.3	I think the teaching material is good	Material
A.1.4	I think that throughout the course, the teacher has clearly communicated to me where I stand academically	Feedback
A.1.5	I think the teacher creates good continuity between the different teaching activities	TAs continuity
A.1.6	5 points is equivalent to 9 hours per week. I think my performance during the course is	Work load
A.1.7	I think the course description's prerequisites are	Prerequisites
A.1.8	In general, I think this is a good course	General
B.1.1	I think that the teacher gives me a good grasp of the academic content of the course	Good grasp
B.1.2	I think the teacher is good at communicating the subject	Communication
B.1.3	I think the teacher motivates us to actively follow the class	Motivate activity
B.2.1	I think that I generally understand what I am to do in our practical assignments/lab courses/group computation/group work/project work	Instructions
B.2.2	I think the teacher is good at helping me understand the academic content	Understanding
B.2.3	I think the teacher gives me useful feedback on my work	Feedback
B.3.1	I think the teacher's communication skills in English are good	English/English skills

A study was conducted during the fall semester of 2010 and included 35 courses. An extra midterm evaluation was setup for all courses in the 6th week of the semester. The midterm evaluations were identical to the end-of-term evaluations. The end-of-term evaluations were conducted as usual in the 13th

week of the semester. The criteria for choosing courses were that:

1. The expected number of students for the course should be more than 50

2. There should be only one main teacher in the course

3. The course should not be subject to other teaching and learning interventions (which often imply additional evaluations)

The courses were randomly split into two groups: one half where the teacher had access to the results of the midterm evaluations (both ratings and qualitative answers to open questions) and another half where that was not the case (the control group). The courses were split such that equal proportions of courses within each Department were assigned to the two groups. The distribution of responses in the two groups is given in

Table 2. Furthermore the number of students responding at the midterm and final evaluations and the number of students who replied both evaluations are listed. For each question the number of observations can vary slightly caused by students who neglected to respond to one or more questions in a questionnaire.

The majority of the courses were introductory (at Bachelor level), but also a few Master's courses were included. The courses were taken from six different Departments: Chemistry, Mechanics, Electronics, Mathematics, Physics, and Informatics.

Table 2: The two groups in the experiment.

Access to midterm evaluations	Number of courses	No. of matched responses	Percentage of responses
Yes	17	687	53
No	18	602	46.7

No further instructions were made to the teachers on how to utilize the evaluations in their teachings.

### 3 METHOD

It has been disputed whether, and to what extent, SET ratings are influenced by extraneous factors (Marsh, 1987, Cohen, 1981). In the present study it is taken into consideration that student evaluations may be biased, e.g. by different individual reactions to the level of grading or varying prior subject interest (Wachtel, 1998, Richardson, 2005), or as a result of systematic factors related to the course such

as class size or elective vs. compulsory (McKeachie, 1997, Wachtel, 1998, Alamoni, 1999). In order to test the differences between midterm and final evaluations as well as differences between with/without access to midterm evaluations while removing factors like students' expected grade (Wachtel 1998 , Clayson 2009) or high/low rated courses, we performed two kinds of tests.

a) Paired t-tests where a student from midterm to the final evaluation is a paired observation and we test the null-hypothesis that there is no difference between midterm and final evaluations (Johnson et al., 2011).

b) t-tests for the null-hypothesis that there is no difference between having access to the midterm evaluations and not (Johnson et al., 2011).

These tests were based on differences in evaluations for the same student in the same course from midterm to end-of-term evaluation in order to remove course, teacher, and individual factors. In Table 2 the number of students who answered both midterm and final evaluations are referred to as the number of matches.

## 4 RESULTS

Pairwise t-tests were conducted for the null-hypothesis that the mean of the midterm evaluations were equal to the mean of the end-of-term evaluations for each question related to either the course or the course teacher. The results are summarized in Table 3 and

Table 4 for the courses where the teacher had access to the midterm evaluation results and those who had not, respectively.

Table 3: Summary of pairwise t-tests between midterm and end-of-term course and teacher evaluations. For courses without access to the evaluations

Final-midterm	Mean difference (std)	p-value	p-value < 0.05
A.1.1 (Learning a lot)	-0.056 (0.96)	0.17	No
A.1.2 (TM activates)	-0.053 (0.98)	0.21	No
A.1.3 (Material)	-0.065 (1.0)	0.13	No
A.1.4 (Feedback)	0.081 (1.1)	0.085	No
A.1.5 (TAs continuity)	-0.075 (1.0)	0.095	No
A.1.6 (Work load)	-0.040 (0.15)	0.53	No
A.1.7	-0.049 (1.2)	0.32	No

(Prerequisites)			
<b>A.1.8 (General)</b>	<b>-0.12 (0.97)</b>	<b>0.0038</b>	<b>Yes</b>
B.1.1 (Good grasp)	-0.044 (0.86)	0.23	No
B.1.2 (Communication)	-0.066 (0.84)	0.068	No
B.1.3 (Motivate activity)	-0.035 (0.90)	0.36	No
B.2.1 (Instructions)	-0.048 (0.99)	0.33	No
B.2.2 (Understanding)	-0.012 (0.85)	0.78	No
B.2.3 (Feedback)	-0.015 (0.97)	0.76	No
B.3.1 (English)	-0.046 (0.79)	0.54	No

Table 4: Summary of pairwise t-tests between midterm and end-of-term course and teacher evaluations. For courses with access to the evaluations.

Final-midterm	Mean difference (std)	p-value	p-value < 0.05
<b>A.1.1 (Learning a lot)</b>	<b>0.089 (0.77)</b>	<b>0.0040</b>	<b>Yes</b>
A.1.2 (TM activates)	0.048 (0.93)	0.20	No
A.1.3 (Material)	0.019 (0.88)	0.59	No
<b>A.1.4 (Feedback)</b>	<b>0.18 (1.0)</b>	<b>&lt;0.0001</b>	<b>Yes</b>
A.1.5 (TAs continuity)	0.039 (0.92)	0.29	No
A.1.6 (Work load)	0.058 (1.4)	0.30	No
A.1.7 (Prerequisites)	0.053 (0.93)	0.16	No
A.1.8 (General)	0.039 (0.85)	0.26	No
B.1.1 (Good grasp)	0.020 (0.78)	0.50	No
B.1.2 (Communication)	0.039 (0.74)	0.15	No
B.1.3 (Motivate activity)	0.016 (0.89)	0.64	No
B.2.1 (Instructions)	-0.038 (0.94)	0.36	No
B.2.2 (Understanding)	0 (0.89)	1.0	No
B.2.3 (Feedback)	0.059 (1.0)	0.20	No
B.3.1 (English)	-0.071 (0.73)	0.13	No

For the courses without access to the midterm evaluations the general trend is that the evaluations are better at midterm than at end-of-term. This is seen as the mean value of the midterm evaluations subtracted from the final evaluations are negative for most questions. In contradiction, the courses with access to the midterm evaluations have a trend towards better evaluations at the end-of-term, i.e. the means of the differences are positive. The question related to the general satisfaction of the course

(A.1.8) got significantly lower evaluations at end-of-term when the teacher did not have access to the midterm evaluations ( $p = 0.0038$ ). The question related to the academic feedback throughout the course (A.1.4) got significantly higher scores at the end-of-term when the teacher had access to the midterm evaluations ( $p < 0.0001$ ). The question related to whether the student felt he/she learned a lot (A.1.1) got significantly higher evaluations at end-of-term when the teacher had access to the midterm evaluations ( $p = 0.0040$ ). The increase or decrease in student evaluations were of average values in the range  $[-0.12, 0.18]$ , and significant changes were of average absolute values  $[0.089; 0.18]$ , (A.1.1 with access being the lowest and A.1.4 with access being the highest). The size of the (dis)improvement should be compared with the standard deviations of the differences divided by the squareroot of two (approximately 0.7), which is the standard deviation of the scores where the student effect has been removed.

For the last analysis the midterm evaluations were subtracted from the end-of-term evaluations for each student and each course. The two groups with/without access to midterm evaluations were then compared based on these differences using a two sample t-test for differences between means; the results are summarized in Table 5.

Table 5: Summary of t-tests of the null-hypothesis that there is no difference in the evaluation differences from midterm to end-of-term between courses with and without access to the midterm evaluations. A folded F-test was used to test if the variances of the two groups were equal. If so, a pooled t-test was used, otherwise the Satterthwaite's test was used to check for equal means.

With-without access	Mean difference	p-value	Significant (p-value < 0.05)
<b>A.1.1 (Learning a lot)</b>	<b>0.15</b>	<b>0.0045</b>	<b>Yes</b>
A.1.2 (TM activates)	0.10	0.071	No
A.1.3 (Material)	0.084	0.13	No
A.1.4 (Feedback)	0.099	0.11	No
<b>A.1.5 (TAs continuity)</b>	<b>0.11</b>	<b>0.05</b>	<b>Yes</b>
A.1.6 (Work load)	0.098	0.24	No
A.1.7 (Prerequisites)	-0.0037	0.95	No
<b>A.1.8 (General)</b>	<b>0.16</b>	<b>0.0032</b>	<b>Yes</b>
B.1.1 (Good grasp)	0.064	0.18	No
<b>B.1.2 (Communication)</b>	<b>0.11</b>	<b>0.021</b>	<b>Yes</b>
B.1.3 (Motivate activity)	0.051	0.32	No
B.2.1 (Instructions)	0.0095	0.88	No
B.2.2 (Understanding)	0.012	0.84	No
B.2.3 (Feedback)	0.073	0.27	No

B.3.1 (English skills)	-0.025	0.77	No
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The general trend is that the courses where the teacher had access to the midterm evaluation results get a larger improvement in evaluations at the end-of-term than those where the teachers did not have that access (the differences are positive). The only exceptions to this trend are found in two questions regarding factors that cannot be changed during the course (course description of prerequisites (A.1.7) and teacher's English skills (B.3.1)). However, these are not significant. The questions related to the student statements about learning a lot, the continuity of the teaching activities, the general satisfaction with the course, and the teacher's ability to communicate the subject (A.1.1, A.1.5, A.1.8, and B.1.2) had significantly higher increases from midterm to end-of-term when the teachers had access to the midterm evaluations, compared to the courses where the teachers did not have access. Note that the significant differences in means for the questions are of sizes in the range  $[0.11, 0.16]$ .

According to subsequent interviews (made by phone), the percentage of the courses with access to the midterm evaluations where the teachers say they shared midterm evaluations with students was 53%, and the percentage of courses where the teachers say they made changes according to the midterm evaluations was 53%. The percentage of the courses with access to the midterm evaluations where the teachers say they either shared the evaluations, made changes in the course, or both was 71%.

## 5 DISCUSSION

The results illustrate that students are generally more satisfied with their courses and teachers at end-of-term when midterm evaluations are performed during the course and teachers are informed about the results of the evaluations.

According to the evaluations, students perceive that courses improve when midterm evaluations are performed and the evaluations and the teachers are informed. Though the teachers were not instructed how to react on the results from the mid-term evaluation, it turned out that almost  $\frac{3}{4}$  of the teachers followed up on the evaluations by sharing the results with their students and/or making changes in the course for the remaining part of the semester. The fact that  $\frac{1}{4}$  of the teachers acted like the group who were not allowed access to the midterm results could cause the effects to be even smaller than if all

teachers acted. The effects are relatively large when compared to the standard deviation of the scores where the student effect has been removed: approximately 0.7.

We expect that the actions upon the midterm evaluations of the  $\frac{3}{4}$  in many cases have included elaborated student feedback to the teacher, a dialogue about possible improvements, and various interventions in the ongoing teaching and learning activities, which can explain the increased satisfaction as expressed in the end-of-term evaluation. For this to happen, the teachers should both be motivated and able to make relevant adjustments (Yao & Gardy, 2006). The ability to make relevant adjustments will usually increase as a result of participation in teacher training programs that will also encourage teachers to involve both students and peers in teaching development activities. However, less than half of the teachers responsible for the courses in this study have participated in formal University teacher training programs. The proportion of the teachers who have participated in training programs is the same for both groups of courses (35 % and 38 %, respectively). Therefore, the observed effect of the mid-term evaluation does not seem to be directly dependent of whether the teacher has participated in formal teacher training.

For future work it would be of interest to directly measure the placebo effect of conducting midterm evaluations as opposed to also measuring the effect of real improvement.

From the student comments in the evaluation forms we noticed that there in some courses was a development pointed out. As an example one student writes at midterm that: "A has a bad attitude; Talking down to you when assisting in group work". At end-of-term the student writes: "In the beginning of the course A's attitude was bad – but here in the end I can't put a finger on it". Such a development was found in courses with access to the midterm evaluations and where the instructor said he/she made changes according to the evaluations. This illustrates the usefulness of midterm evaluations when addressing students evaluations within a semester.

In most of the courses the major points of praise and criticism made by the students are reflected both at midterm and end-of-term. Examples are: That the course book is poor, the teaching assistants don't speak Danish, the lecturer is good etc. Thus such points which are easily changed from semester to semester rather than within a semester are raised both from midterm and end-of-term evaluations.

Various studies show that mid-term evaluations may change the attitudes of students towards the teaching and learning process, and their communication with the teacher, especially if the students are involved actively in the process e.g. as consultants for the teachers (Cook-Sather, 2009, Fisher & Miller, 2008, Aultman, 2006, Keutzer, 1993) – and it may even affect the students' subsequent study approaches and achievements (Greenwald & Gilmore, 1997, Richardson 2005). Such effects may also contribute to the improved end-of-term rating in the cases where teachers with access to the mid-term evaluation results share them with their students.

There is evidence that SETs in general do not lead to improved teaching as perceived by the students (Marsh, 2007) and one specific study quoted by Wachtel (1998) of faculty reactions to mandatory SETs indicate that only a minority of the teachers report making changes based on the evaluation results.

However, the present study indicates that mid-term evaluations (as opposed to end-of-term evaluations) may provide a valuable basis for adjustments of the teaching and learning in the course being evaluated.

As the course teachers were not obliged to take specific actions based on the mid-term evaluations, the study gives a good illustration of how the university policies can influence the courses by deciding when to perform student evaluations.

It seems to be preferable to conduct midterm evaluations if one is concerned with an improvement of the courses over a semester (as measured by student evaluations).

One may argue that both a midterm and an end-of-term evaluation should be conducted. However, it is a general experience that response rates decrease when students are asked to fill in questionnaires more frequently. If this is a concern, it could - based on the results of this study - be suggested to use a midterm evaluation to facilitate improved courses and student satisfaction.

On the other hand, it is widely appreciated that the assessment of students' learning outcome should be aligned with the intended learning outcomes and teaching activities (TLAs) of a course in order to obtain constructive alignment (Biggs and Tang, 2007). Therefore, to obtain student feedback on the entire teaching and learning process, including the alignment of assessment with objectives and TLAs, an end-of-term student evaluation should be performed after the final exams where all assessment tasks have been conducted (Edström, 2008). In this

case, teachers can make interventions according to the feedback only for next semester's course. This approach does not facilitate an improvement in courses according to the specific students taking the course a given semester.

Based on the results of the present study it could be suggested to introduce a general midterm evaluation as a standard questionnaire that focuses on the formative aspect, i.e. with a limited number of questions concerning issues related to the teaching and learning process that can be changed during the semester. It should conform to the existing practice of end-of-term evaluations by including open questions and making it possible for the teacher to add questions – e.g. inviting the students to note questions about the course content that can immediately be addressed in the teaching. This can serve as a catalyst for improved communication between students and teacher (Aultman, 2006).

As a consequence, the standard end-of-term questionnaire could be reduced and focus on general questions (like A.1.4, A.1.8. and B.1.1, see Table 1) and matters that are left out in the mid-term evaluation (e.g. teachers proficiency in English, B.3.1). Besides, it could be considered to encourage the teachers to use different kinds of consultations by faculty developers and/or peers to interpret the student feedback (ratings and comments) and discuss relevant measures to take (Penny & Coe, 2004).

The present study considered improvements over one semester as measured by end-of-term student evaluations as opposed to long-term improvements as well as studies including interviews with instructors and students. These limitations were discussed in more detail in the introduction of this paper.

## 6 CONCLUSIONS

An empirical study conducting midterm as well as end-of-term student evaluations in 35 courses at the Technical University of Denmark was carried out in the fall of 2010. In half of the courses the teachers were allowed access to the midterm evaluations, and the other half (the control group) was not. The general trend observed was that courses where teachers had access to the midterm evaluations got improved evaluations at end-of-term compared to the midterm evaluations, whereas the control group decreased in ratings. In particular, questions related to the student feeling that he/she learned a lot, a

general satisfaction with the course, a good continuity of the teaching activities, and the teacher being good at communicating the subject show statistically significant differences in changes of evaluations from midterm to end-of-semester between the two groups. The changes are of a size 0.1-0.2 which is relatively large compared to the standard deviation of the scores where the student effect is removed of approximately 0.7.

If university leaders are to choose university- or department-wise evaluation strategies, it is worth considering midterm evaluations to facilitate improvements of ongoing courses as measured by student ratings.

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