

Bidragsformat: Diskusjon/Presentasjon

Formative Course Evaluation Through Continuous Student Feedback

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ABSTRACT

Most student evaluations in university STEM education are currently done at the end of the semester and therefore are summative. We developed and tested a new student evaluation method. This method can be done at regular intervals throughout the semester. Moreover, it is formative, as it is possible for the teacher to adjust the teaching methods based on the survey and discuss the results with the students. It consists of a simple survey with two questions. The first question is related to the learning outcomes. The second question typically is related to student preparation or involvement in the course. The survey has been conducted at natural science courses of the University of Bergen. Results on the use of the survey for three courses are presented. The consensus among both students and teaching staff is that this method is a valuable tool to improve teaching. The development and implementation of the project is a student initiative.

Key words:

Formative course evaluation, quality of education, student involvement

Introduction and background

The quality of university STEM (Science, Technology, Engineering and Mathematics) education has been a topic of research and policy discussion for many years (e.g. Fox and Hackerman (2003), Singer et al. (2012), Kober (2014), Melding for Stortinget (2017)). It is seen as central to student success. Moreover, as a result of globalization of higher education, university management has become increasingly concerned with student satisfaction (Thanassoulis et al., 2017).

The discussion about student evaluation of teaching (SET) is not new. Its history can be traced back to the 1920s and from the 1970s onwards there has been a steady increase in SET research (Benton & Cashin, 2014). This increased interest is likely due to the ever-changing nature of higher education, prompting institutions to seek effective methods of collecting feedback on teaching practices, with student evaluations of teaching (SETs) emerging as one of the most common and influential practices (Chen & Hoshower, 2010; Spooren et al., 2013).

Although SETs were originally indented for formative purposes (Spooren et al., 2013), they have nowadays primarily taken the form of summative end-of-semester surveys. These surveys allow students to rate various aspects of teaching, ranging from clarity of communication and course organization to perceived fairness of grading and overall level of engagement (Feldman, 1976; Marsh, 1987). While summative SETs can provide a final snapshot of students' overall experience or satisfaction in a course, they have also faced intense scrutiny and criticism. A significant body of research has been conducted investigating the validity of SETs (for review see Spooren et al., 2013; Quansah et al., 2024). Among other things, they have been used in administrative decisions regarding tenure, promotion, or overall faculty performance (Boring et al., 2016; Chen & Hoshower, 2003). Consequently, teaching staff often experience anxiety and tension related to summative evaluation (Yao & Grady, 2006). Additional criticism emphasizes that insights from such evaluation arrive too late to benefit the current students (Chen & Hoshower, 2003), making them an ineffective method for improving pedagogical practices.

In contrast, formative evaluations of teaching enable students to provide feedback during the course. This makes it possible for teachers to make course improvements that benefit both current and future students (Peterson, 2016). However, despite the growing recognition of the importance of formative feedback for *student learning* (e.g. low-stakes quizzes or draft assignments), formative *student evaluation of teaching* remains much less common and has not achieved nearly the same level of institutional visibility as its summative counterpart (Gravestock & Gregor-Greenleaf, 2008). A related issue is that hardly any research on formative evaluation of a course by student has been conducted even though such evaluations potentially are very useful when used for improvement of teaching, course content, and format (Chen & Hoshower, 2010). Some even argue that formative use of evaluation should be the ultimate purpose, especially when teaching

staff have not yet received enough (or any) pedagogical training, for example at the beginning of their careers (Yao & Grady, 2006).

In this paper, we investigate the usefulness of continuous formative evaluation of teaching and teachers' experiences with using it. We do this by focusing on the following research questions:

1. What were the results of the student evaluations throughout the duration of the course?
2. How did teaching staff experience the use of this form of formative student evaluation in their course?

In the next section the formative student evaluation method is described. After this the practical implementation and results of the use of this method are presented.

Description of the formative evaluation method

The survey used in the formative student evaluation method is very short. We call this the 'airport model' as a similar survey is often used after one has gone through security at airports. This model has also been implemented in various companies over the past few years, especially retail stores. The smiley emojis are easy to spot and only require a few seconds to select. Therefore, it provides a quick and intuitive way to gauge students' learning outcomes, while keeping the effort minimal.

The different smiley emojis represent four distinct levels of satisfaction. The levels are **very high**, **high**, **low** and **very low** (or, depending on the wording of the question: **very good**, **good**, **adequate** and **not adequate**). The use of the four options is deliberate as it eliminates the neutral middle ground and so encourages students to take a clear stance.

An important goal of this format is to provide quick and efficient feedback. However, students can elaborate on their answers as they also have the option to leave written comments. In the implementation that we use the form consists of two main questions:

1. "How was your learning outcome from these classes/this class?"
2. "How well have you prepared for the class?"

Since some courses require little to no student preparation, the second question can be modified if so desired. In some classes, where active participation is essential, it has been changed to "How well have you worked during the class/these classes?" Generally, the second question is meant to give the students an opportunity to reflect on their own part in learning. This is done because the learning outcomes depend not only on the teaching but also on the student's own participation, engagement and preparation.

Once the responses are submitted, a python script automatically generates a summary form with a pie chart and listed comments underneath. The continuous

feedback is implemented through a QR-code. At the end of the class, the lecturer displays the QR-code on a screen. The students can then scan the code and complete the form just before leaving the class, as it does not take much time to fill out. To prevent evaluation fatigue among students, the process is designed to be efficient and effective. As an alternative, the lecturer can upload the QR-code to an accessible platform. However, experience has shown that students tend to forget to complete the form later. It should hereby be emphasized that these surveys, as they are formative, are meant to be done regularly (for example every week or every class).

This continuous feedback system is not intended as an evaluation of the lecturer. Moreover, to ensure constructive feedback, a course representative (a student taking the class) reviews the responses and filters out inappropriate remarks. For example, comments like “The lecturer has an annoying voice” are irrelevant and unhelpful, whereas “The lecturer speaks too fast” is valuable as it affects learning outcomes.

The feedback system aims to provide lecturers with valuable insight into their students’ learning. For example, concepts that may seem obvious to an experienced academic might be challenging for students to grasp and apply. The form allows the students to express their learning progress and difficulties and gives the lecturer the opportunity to adjust the level of teaching, if necessary. The form is positive for both parties, as it holds the students responsible for their own learning and helps the lecturer to track the students’ development. If so desired, the teacher can implement changes in the teaching and/or discuss the survey results with the students, thus closing the feedback.

The survey is designed to be low effort for all the parties involved, and to not be time-consuming. The course representative simply scans the responses for inappropriate comments, before sending them to the lecturer to read through the responses. The most time-consuming aspect may be to adjust the course based on the students’ input. However, if many of the students struggle with a certain concept, then the lecturer can proactively address this in class, ultimately improving learning outcomes.

Practical Implementation and Results

Currently, the survey project has been implemented in 23 courses at the department of Geosciences of the University of Bergen (Norway). The courses range from large introductory bachelor level courses, with over 100 students, to smaller master level courses with fewer than twenty students. Despite the differences in course size and level, the format and questions used are the same.

The results presented here are preliminary. They focus on the students’ learning outcome throughout the semester and the lecturers’ experiences with the implementation of the survey. We present here the results for three courses, which were given in the same semester to the same student group of 54 students. To quantify the student experienced learning outcome we have created a point system, assigning the numbers 1-4 to the emojis, where 1 is “Very low” and 4 is “Very high”. By summing the

points and dividing by the answering rate, one gets an average score and thus a general overview of the experienced learning outcome.

The results are summarized in table 1. This table shows that the survey was conducted respectively five, four and eight times in courses 1, 2 and 3. The learning outcomes as experienced by the students varied between 2.6 and 3.7, suggesting that the students were reasonably happy about the learning outcomes. Overall, the highest learning outcomes were for Course 2. This course is based on traditional lectures, whereas the other two courses used active learning. Because of holidays, fieldwork and change of lecturers, the surveys were not conducted every week.

Teaching week	Course 1	Course 2	Course 3
1	-	-	2.61
2	2.60	-	3.20
3	2.58	-	2.67
4	2.26	3.42	3.10
5	-	3.36	-
6	-	3.00	-
7	-	3.67	-
8	-	-	2.95
9	-	-	-
10	-	-	2.53
11	2.65	-	2.67
12	3.31	-	3.25

Table 1. Results of the use of the formative student evaluation. This table shows the learning outcomes, as experienced by the students, for three courses. The courses were given in the same semester to the same group of students. The results of this table are discussed in the text.

The experience of the lecturers with the survey varied. Course 3 had reflection notes after each module. Here there were discrepancies between the comments from the survey and the reflection notes were noted. In particular, the comments from the survey were more negative. Because of this the lecturer found the comments less useful and focused more on the reflection notes. The lecturer in Course 1 did not think the format suited the specific course. This course is based on active learning with modules, and the lecturer considered it more useful with feedback after each module instead of weekly. This lecturer also stated that the survey is a positive way to get feedback from all students, as many students may be reluctant to contact the lecturers directly. The lecturers of Course 2, which got the highest overall score, were positive about the project and did not experience any challenges. The lecturers of all courses unanimously agreed that the survey was easy to use and required little extra work. They all plan to continue with the survey and want to implement it in other courses. The teachers also preferred this formative student evaluation method over the more traditional summative evaluation method held at the end of the semester.

Discussion

In this study, we describe a survey that is used in formative student evaluation of university courses. The survey is brief, easy to implement and use and is meant to improve education. Results of the use of the survey in three different parallel courses were presented. The students experienced learning outcomes were reasonably high. The traditional lecture course had higher experienced learning outcomes than the active learning courses. This is not uncommon in university education (Deslauriers et al., 2019). Students' expectations of a teacher-led structure (Wright, 2011) combined with their comfort with traditional, teacher-centered learning (Bishop, Caston, & King, 2014) lead to an initial resistance to active engagement in the learning process, even though this preference does not necessarily contribute to their learning process (Weimer, 2002). The teaching staff were positive about the use of the survey in their classes and preferred this type of student evaluation above end of the semester evaluation, which confirms findings by Yao & Grady (2006).

Conclusion

We present a new method for improving university STEM education using formative student evaluations. This method is easy to implement, and the data can be analyzed efficiently. Moreover, the results can be discussed during the course with the students. We present a summary of the survey results for three STEM courses. It is found that the two active learning courses have slightly lower experienced learning outcomes than the course based on traditional lectures. Teachers were positive about this formative student evaluation method. These results thus suggest that this formative student evaluation makes a positive contribution to improving learning in higher education.

References

- Benton, S. L., & Cashin, W. E. (2014). *Student ratings of instruction in college and university courses*. In M. Paulsen (Ed.), *Higher education: Handbook of theory and research* (Vol. 29, pp. 279-326). Springer. https://doi.org/10.1007/978-94-017-8005-6_7
- Bishop, C. F., Caston, M. I., King, C. A., (2014). Learner-centered environments: Creating effective strategies based on student attitudes and faculty reflection. *Journal of the Scholarship of Teaching and Learning*, 14(3), 46-63.
- Boring, A., Ottoboni, K., & Stark, P. B. (2016). Student evaluations of teaching (mostly) do not measure teaching effectiveness. *Science Open Research*, 0(0), 1–11. <https://doi.org/10.14293/S2199-1006.1.SOR-EDU.AETBZC.v1>
- Chen, Y., & Hoshower, L. B. (2003). Student evaluation of teaching effectiveness: An assessment of student perception and motivation. *Assessment & Evaluation in Higher Education*, 28(1), 71–88. <https://doi.org/10.1080/02602930301683>
- Deslauriers, L., L. S. McMarty, K. Miller, K. Callaghan, G. Kestin (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom, Proceedings of the Natural Academy of Sciences, 116, 19251-19257.
- Feldman, K. A. (1976). Grades and college students' evaluations of their courses and teachers. *Research in Higher Education*, 4(1), 69–111. <https://doi.org/10.1007/BF00991462>
- Fox, M. A. and N. Hackerman (editors) (2003). *Evaluating and Improving Undergraduate Teaching in Science, Technology, Engineering and Mathematics*, National Academies Press, Washington, D.C.
- Gravestock, P., & Gregor-Greenleaf, E. (2008). *Student course evaluations: Research, models and trends*. Higher Education Quality Council of Ontario.
- Kober, N. (2014). *Reaching Students - What Research Says About Effective Instruction in Undergraduate Science and Engineering*, National Academies Press, Washington, D. C.
- Marsh, H. W. (1987). Students' evaluations of university teaching: Research findings, methodological issues and directions for future research. *International Journal of Educational Research*, 11, 253–388. [https://doi.org/10.1016/0883-0355\(87\)90001-2](https://doi.org/10.1016/0883-0355(87)90001-2)
- Meld. St. 16 (2016-2017), 2016. Kultur for Kvalitet i Høyere Utdanning, Kunnskapsdepartementet. (A Culture for Quality in Higher Education, Ministry of Higher Education; in Norwegian).
- Peterson, J. L. (2016). Formative evaluations in online classes. *The Journal of Educators Online*, 13(1).
- Singer, S. R., Nielsen, N. R., Schweingruber, H. A. (editors), 2012. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*, National Academies Press, Washington, D.C.
- Spooren, P., Brockx, B., & Mortelmans, D. (2013). On the validity of student evaluation of teaching: The state of the art. *Review of Educational Research*, 83(4), 598–642. <https://doi.org/10.3102/0034654313496870>
- Thanassoulis, E., Dey, P. K., Petridis, K., Goniadis, I., & Georgiou, A. C. (2017). Evaluating higher education teaching performance using combined analytic hierarchy process and data envelopment analysis. *Journal of the Operational Research Society*, 68(4), 431–445. <https://doi.org/10.1057/s41274-016-0165-4>
- Weimer, M. (2002). *Learner-Centered Teaching: Five Key Changes to Practice*. San Francisco: Jossey-Bass.
- Wright, G., B. (2011). Student-Centered Learning in Higher Education. *International Journal of Teaching and Learning in Higher Education*, 23(3), 92-97.
- Yao, Y., & Grady, M. L. (2005). How do faculty make formative use of student evaluation feedback?: A multiple case study. *Journal of Personnel Evaluation in Education*, 18(2), 107–126. <https://doi.org/10.1007/s11092-006-9000-9>