Me, myself and I - Teachers' self-motivation and sense of responsibility determine the use of active learning methods

K. Enberg, I.H. Steen, and S. Ellingsen, *Department of Biological Sciences, University of Bergen.*

ABSTRACT: Extended use of laboratory and field courses makes biology a discipline considering itself as a habitual practitioner of active learning strategies. We investigated how widely the faculty at the Department of Biological Sciences (BIO) at the University of Bergen (UiB) uses active learning methods. 36 members of the teaching staff answered our web-based questionnaire, and we carried out in-depth interviews of 7 faculty members. Our results show that almost all BIO-teachers use at least some active learning methods, and plan to use them in their teaching in the near future. The teachers use active learning methods mostly because they want their students to achieve deeper learning, but also because they want to develop themselves as teachers. This self-motivation is obvious, as over 90% of the teachers identified self-motivation as the strongest incentive, while colleagues, the department, and the university were less important. A vast majority of the teachers also think that it is their own responsibility to take in use active learning methods, while fewer faculty members assume institutional responsibility from BIO. The major bottlenecks identified were large class size and difficulties related to evaluating and grading student performance when using active learning methods. The teachers would use more active learning methods if the availability of active learning rooms was increased. Our in-depth interviews suggest that the most suitable time window for adopting more student-active learning methods is either when new courses are established, or when teachers are taking over courses new to them. We therefore suggest that if educational institutes wish to increase the proportion of active teaching methods, they should provide extra support in such transition periods.

1 INTRODUCTION

Gains from active learning methods in terms of student performance are well documented (Freeman et al. 2014). Active learning is a method in teaching were the student is directly involved in the learning process as opposed to passive listening, i.e traditional lectures (Bonwell and Eison, 1991). The intentions of adapting active learning strategies in science education is to improve the learning environment and to stimulate motivation, intellectual engagement and deeper learning among university students (e.g. Michael 2006; Connel GL et al. 2016; Freeman et al. 2014). To facilitate the adoption of active learning methods, many institutions invest in active learning rooms, classrooms designed for creating good learning environments and facilitating work in small groups, as opposed to the large auditoriums with fixed rows (Beichner 2014, Lee et al. 2018). Yet, some research suggest that the benefits of active learning methods are achievable even without such specifically designed rooms or without the use of expensive high-tech audio-visual systems (Roediger & Pyc 2012; Soneral & Wyse 2017).

In Norway, the dominating teaching strategy in higher education is still traditional lecturing. As many as 90% of students report that traditional lectures are used "to a large extent", while 75% of educators report that introduction of new content predominantly is done by plenary lectures at campus (Meld. St. 16 (2016–2017). We believe that what influences the implementation of active learning methods vary greatly among Universities in Norway. To our knowledge, this has not been systematically studied so far, and our survey among the faculty at BIO at UiB addresses this knowledge gap.

2 MATERIAL AND METHODS

2.1 The Department of Biological Sciences (BIO) at the University of Bergen (UiB)

BIO is the largest department at the UiB, with 218 annual full-time equivalents distributed as 153 scientific, 47 technical and 18 administrative. In January 2019, the number of post docs and PhD student were 23 and 43, respectively. The annual uptake of first-year bachelor students is approximately 200, and the number of students that complete their master degree is approximately 50 per year. Annually, over 100 courses are taught ranging from large classes (100+ students) at the bachelor level to small- to

medium-sized classes at MSc- and PhD-level. BIO is host for BioCEED (https://bioceed.w.uib.no), a Norwegian Research Council-funded Centre for Excellence in Education.

2.2 Online Survey

We designed an on-line questionnaire comprising 12 questions about the background, experience, and motivation for implementing active learning strategies in teaching activities. The survey was first sent to the teaching-leaders of the six different teaching-groups at BIO, and we asked the teaching-group leaders to also evaluate the questions. Based on this pre-evaluation, the survey was modified accordingly. The final survey (https://skjemaker.app.uib.no/view.php?id=6046955) was presented to BIO faculty at a faculty teaching retreat December 4th 2018.

2.3 Interviews

We asked the teaching-group leaders to suggest two interview candidates from their respective groups: one with interest and/or experience and one with less interest and/or experience in applying active learning methods. Seven candidates were invited for a 30-minute long personal in-depth interview, and each interview was both directly transcribed and audio-recorded. The questions used as starting points for the interviews were: 1, Can you describe how you plan and choose the methods for your teaching?; 2, Can you please define the term "Active learning"?; 3, Do you think teaching being performed in the field or lab courses automatically can be defined as "Active learning"?; 4, Have you used/visited the "active learning" room at UiB? What is your impression about that room?; 5, Do you have good and/or bad experiences during teaching (using active learning methods) you would like to share?

3 RESULTS

3.1 The respondents

BIO teaching staff reported teaching on average 16.4 credits per year (SD 7 credits). For 52% of the respondents, over half of their teaching consists of lecturing, while for 13% all of their teaching is lectures. Teaching on the field is not necessarily as common as often assumed: 36% of the respondents never teach in the field, and only 16% of the teachers have more than 25% of their teaching in the field. Likewise, 44% of the respondents do not teach in the laboratory, and about 11% of the teacher have majority (>50%) of their teaching activities in the laboratory. Consequently, class room was the most

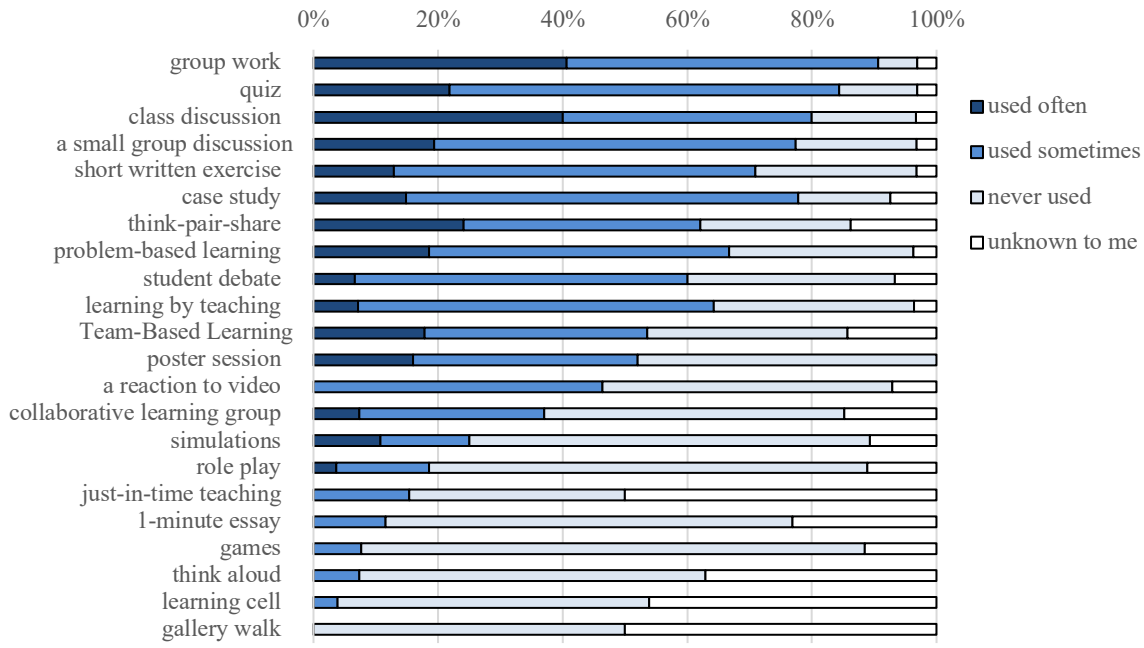

Fig. 3.1. How often do the respondents use the listed active learning methods?

common teaching location: 16% of the respondents have all their teaching in a class room, while 35% have the majority (>50%) of their teaching activities in a class room. Only 8% of the respondents have no teaching in a classroom. The active learning room is not yet much used (it only became available during late 2018 fall semester): 52% of the respondents have no teaching in the active learning room, while only 14% have the majority (>50%) of their teaching activities in the active learning room.

3.2 Active learning methods in use at BIO

More than 90 % of the respondents use group work sometimes or often in their teaching, making this the most popular active learning methods used at BIO (*Fig. 3.1.)*. Quiz (84% used sometimes or often) and class discussion (80% used sometimes or often) were also common methods. However, there are many active learning methods either not used or not familiar to the teaching staff at BIO. 91% of the respondents are planning to use active learning methods within the next 12 months, reflecting a general positive attitude towards these learning methods.

3.3 Motivation

Almost all respondents use active learning methods at least partly because they help students to achieve deeper learning (*Fig. 3.3.1.*). The teachers are motivated to use active learning methods also because they make students engage more, and because research shows that they lead to better learning. Only a minority was using active learning methods to improve their CV or their students' grades.

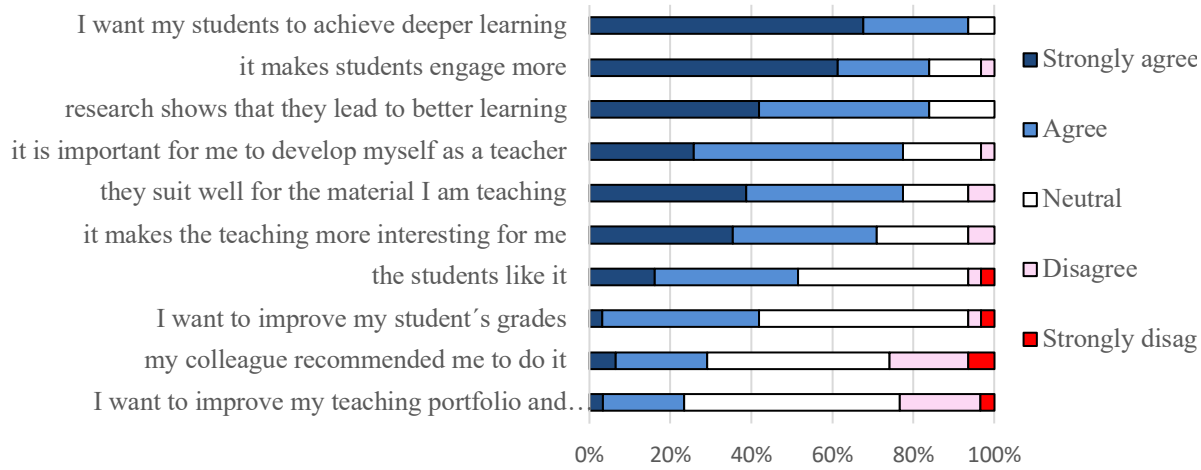

Fig. 3.3.1. Why are BIO-teachers using active learning methods?

The most important motivational factor for using active learning methods was self-motivation (*Fig. 3.3.2)*. Colleagues and BioCEED were also motivating for two thirds of the respondents. However, very few experienced that the UiB or the Faculty of Mathematics and Natural Sciences had motivated them to use active learning methods. Interestingly, the research group was found to be more important motivational factor that teaching-group, even though the latter is the organisational unit responsible for teaching.

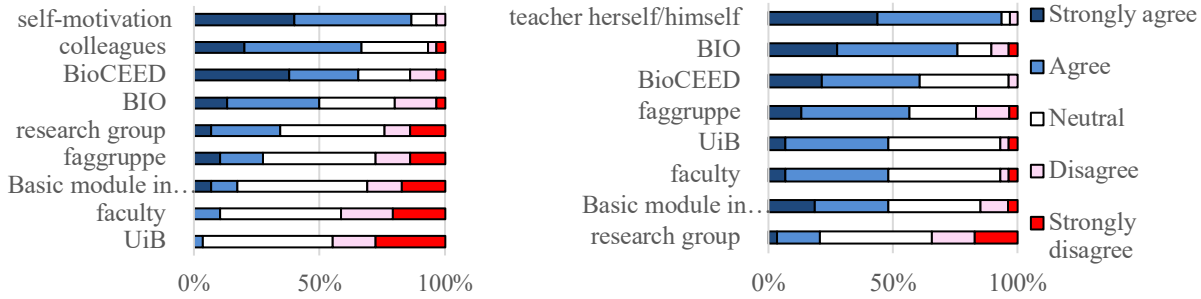

Fig. 3.3.2. Left: If the teacher has used active learning methods, who or what motivated her/him to do it?; Right: Who has the responsibility for active learning being taken in use at BIO?

3.4 Responsibility

If active learning methods are preferable for achieving deeper learning, who has the responsibility for them to being taken in use? A vast majority (94%) of the respondents agrees that it is the teacher herself/himself that has this responsibility (*Fig. 3.3.2.*). However, it is also seen as departmental responsibility: 74% of the respondents agree that BIO has this responsibility. As could be expected, only about 20% of the respondents think that the research group is responsible.

A majority (83%) of the respondents had learned about active learning methods themselves, 44% at a BioCEED teaching course, and 35% in a specialized university pedagogics course (figure not shown).

3.5 Bottlenecks and solutions

A small majority (52%) replied that the large number of students in their class is a bottleneck for their use of active learning methods (*Fig. 3.5.1)*. Evaluating and grading is also seen as difficult when using active learning methods by 45% of the respondents. Only 35% of the respondents experience the traditional lecture room setup as a limiting factor, although 26% agree that too few active learning rooms is limiting their use of active learning methods. 45% of the respondents experience too little support from the administration in issues related to active learning. Against our expectations, only 13% of the respondents feel that it takes too much time to plan active learning activities, but 23% agree that using active learning methods limits the amount of material they can cover in their course.

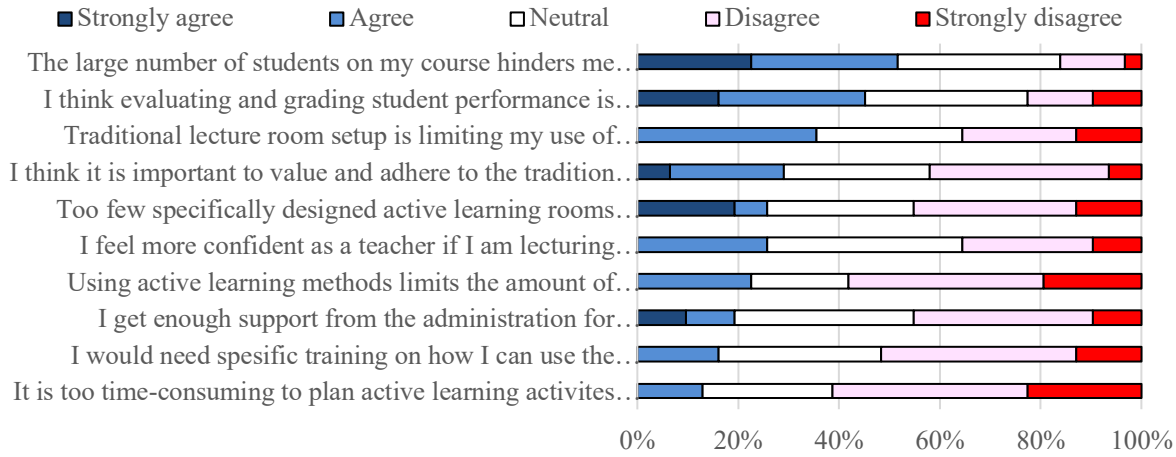

Fig. 3.5.1. Bottlenecks for using more active learning methods.

If the number of active learning rooms was increased, the majority (51%) of the respondents would use more active learning methods (*Fig. 3.5.2*). Getting an introduction to the technology related to the use active learning rooms would also help (41% respondents agree). However, only 30% of the respondents agree that more pedagogical training would increase their use of active learning methods.

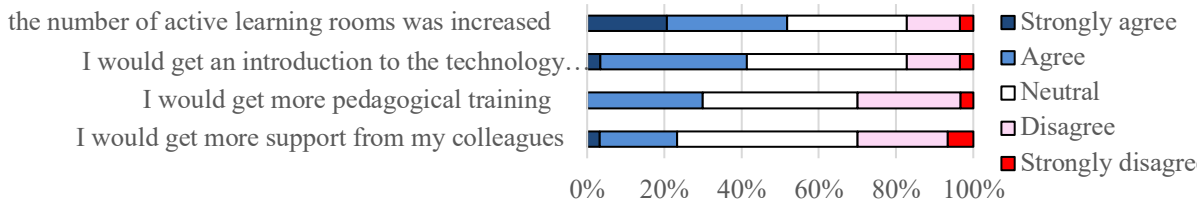

Fig. 3.5.2. The BIO-teachers would use active learning methods if…

3.6 In-depth interviews

The interviews revealed that all candidates had used or planned to use some sort of active learning tools in their teaching. Most frequently used (n = 6) were quizzes as part of student assessments and/or as feedback to the teacher. One faculty member had developed teaching consisting of mainly active learning strategies over a long period. Two faculty members had transformed courses from being totally lecture-based to include mostly active learning methods when being given the responsibility for a new course. A third faculty, teaching introductory course, had also introduced group work in a class of 160 students. However, notably, all but one (which taught only practical and laboratory work) used some sort of lecturing in their teaching. Two of the interviewees emphasized the value of lecturing as a good or excellent teaching and learning method, depending on the lectures being well structured or that the lecturer had a talent for inspiring students.

Among the interviewed faculty, there was an awareness of that both field courses and laboratory courses not necessarily can be defined as active learning methods, but that it is dependent on how such exercises are assembled. In general, the interviewed faculty members were not able to very clearly define what active learning is, but rather expressed what it is not or what are passive learning methods. All but one faculty member were clear on that standard lecture-based teaching was a passive learning method, and they did not want to base all their teaching solely on lecturing.

Five of the interviewees knew the active learning room at UiB. One expressed that it was not of interest to use this room for teaching, since standard classroom fulfilled the needs for the teaching given. For a second, the room was known, but not relevant to use in teaching, since the teaching consisting only of practical work. The remaining faculty expressed a high interest for using the room.

4 DISCUSSION

Traditional lecturing is still the most common teaching approach also at BIO. However, there is a clear awareness of the value of implementing active learning strategies, and a majority of the educators demonstrate a motivation and trust in "active learning" to achieve student engagement and deeper learning. However, the knowledge of different tools and the degree of implementation varied among the faculty. Simple methods like "group work" and "quiz" were widely used, whereas less knowledge and utilization was reported for more advanced methods.

An increased focus on the use of active learning strategies has been introduced at BIO through BioCEED. Still, when asked about the motivations to introduce new teaching strategies, self-motivation was given as the most important factor among BIO educators. The influence from BIO, the Faculty and central University was considered less important. Self-motivation obviously should be seen as a valuable asset at any work-place, and evidently plays a large role in how faculty at BIO plan their teaching.

Active learning rooms with optimized technical solutions are introduced in many universities to support the implementation of active learning methods. UiB has one such room, where all 6 groups have their own table with internet connection and electrical power outlets, large screen and a white board. Taken the limited access to active learning rooms, and the small size of the existing room, many educators at BIO had not (yet) used the room in their courses. However, a large proportion of the faculty expressed the lack of such rooms as one important bottleneck limiting their use of active learning methods, and would use more active learning methods if the availability of such rooms was improved. Educational institutions should invest in active learning rooms if they have ambitions to increase the utilizations of active learning methods.

Given the faculty's apparent willingness to implement new teaching strategies, a high gain could be hypothesized if the different bottlenecks are overcome. Based on our in-depth interviews, we suggest that the timing of introducing new teaching methods is of great importance. The points in time when new courses are established, or when a new person takes over an existing course, stand out as excellent opportunities to introduce changes to the way courses are taught. The educational institutions should take advantage of these windows of opportunities to stimulate for the implementation of active learning through administrational and collegial support.

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