

# Collegial evaluation of writing as a learning activity in a bachelor programme

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**ABSTRACT:** Writing is an important academic skill and an essential element of any university degree. Employers and graduate advisors expect students with a bachelor's degree in biology to be able to communicate persuasively in writing with both scientists and the general public. But how can a collegium assess how aligned the teaching of a skill such as writing is within a programme? As group of teachers (the authors), we decided to produce an overview of how writing skills are trained during a 3-year university Bachelor Programme in Biology. We develop an inventory of how much writing students encounter in individual courses and how this comes together as a whole as they graduate, including how often and in what format writing assignments are given, including feedback and assessment. Our main emphasis has been on the first 2 years of the programme, common to all students, where we interviewed individual teachers to get the exact information, but we have also looked into the more diverse 3rd year. We found that (1) there is limited writing activity during the two first years, but more during year three; (2) almost all writing assessments in the first two years are in the form of laboratory or field reports; (3) there is a lack of individual-level feedback, particularly from faculty, on writing assignments (with some the notable exceptions). We also point at a few improvements to facilitate writing as an integrated activity in the program.

## 1 INTRODUCTION

University graduates write. [Ryssevik & al \(2011\)](#) interviewed a large number of employers of former students from the University of Bergen. The employers ranked written and oral communication skills as the 3<sup>rd</sup> most important qualification of candidates when recruiting new employees (Fig 6.3 in their report, see below). Surprisingly, theoretical knowledge was ranked 9<sup>th</sup> out of 11 options. Clearly, written communication skills are important for students regardless of the career to which they aspire.

Writing skills are important for written essay assignments, reporting research results or answering exam questions, but writing by university students is much more. *Writing is active learning*: it requires organization of knowledge, and results in an external product that is available for feedback, revision, and self-reflection (Bangert-Drowns et al. 2004). Feedback and reflection improves the written text, and writing with feedback becomes an iterative process that increases both learning and writing skills. This active process not only engenders deeper learning in the student, but it also teaches critical thinking. Quitadamo & Kurtz (2007) conclude that writing activities positively influence critical thinking, when comparing the effect of written assessments with quiz-based assessment in general biology laboratories. Writing can also produce innovation. As knowledge is subjected to a repeated process of feedback and reflection, new understanding and ideas can be constructed.

Writing is the primary way our students communicate science. We want our students to be able to write clearly, whether the audience is other biologists (including their teachers) or the public at large. Students should master not only the science about which they write and the proper way to structure formal and informal writing, but also fundamentals of good writing practice: *clear* writing arises from not only structure and content, but also the nuts and bolts of word selection, grammar, logic, and other dimensions of correct writing. No amount of critique of the scientific qualities of a text will improve writing skills; no matter how well they understand their subject, students cannot communicate science effectively if they do not master basic writing techniques as well. If we expect students to learn to write well, writing as a method for learning biology must be incorporated in our curriculum.

How do students learn to write well? To learn to write students have to write, and they need constructive feedback (Mynlieff et al. 2014). Students also learn from reviewing other students' texts, and from themselves giving feedback (Rienecker 2007, Reed et al. 2014). University libraries and other centres (e.g. [Skrivesenteret](#)) offer writing courses, provide writing assistance and can be an integrated part of any course.

In recent years, higher education has been shifting towards active learning methods coupled with fewer lectures and less emphasis on final written exams (see [Quality Reform](#) and [Qualification framework](#)). Efforts are made to activate students through placements in industry or through laboratory and field activities and by generating alternatives to traditional lectures along lines described in the [Carl Wieman Science Education Initiative](#) (CWSEI, see also Deslauriers & al. 2011). Clearly, written assignments with constructive feedback should be intrinsic to ambitions for modernizing university education: writing is both a skill and active learning (Bangert-Drowns et al. 2004), and educational programs should have an explicit strategy to develop writing and communication skills in students.

In summary, communicating science effectively in writing is a key transferable skill. Besides having a working understanding of their field of study, both faculty and future employers expect our graduates to be numerate and biologically literate. Writing forces reflection, and the learning benefits from the cognitive processes engendered by reflection have been well established by empirical research (Brown et al. 2014; see also Quitadamo and Kurtz 2007, Reed et al. 2014).

So, how much do our students write now, and in what forms? Are they getting the feedback and other training which is necessary for *improving* writing skills? How can we ensure proficiency in written communication at the end of three years of study at our institute? Are our published writing-related intended learning outcomes being achieved?

## 2 METHODS

Limited information on the amount, formats and practices of writing assignments during the bachelor's degree study at BIO is available from the official course [web sites](#). In order to get a more complete overview, we interviewed teachers of all mandatory courses taken during the Bachelor Programme in Biology (BPB). Transcripts of these interviews are available in [this document](#). In BPB there are twelve 10-ECTS courses in a fixed plan that all students follow. These include five in biology; the others are in mathematics, statistics, physics, chemistry and Ex. Phil. Students from several study programmes mix during this period, and 130–250 students enrol in introductory biology courses (100-level courses).

In addition, biology students normally take a variety of 200-level elective courses during the third year. We relied mainly on publically available information for the 200-level courses, including evaluative course reports publically available from the [Studiekvalitetsbase](#), where teachers are obliged to submit a report at least every third year according to the [Quality Assurance regulations](#) at UiB. To ensure a complete overview of the writing activities in each course, we interviewed all teachers responsible for the mandatory 12 courses by email, over the telephone, or in person. However, some uncertainty about writing activity remains for 200-level courses, where we relied on web-based information only. The course descriptions do not always reflect all learning activities, as became clear when we read some course reports. Importantly, the amount and quality of feedback provided is difficult to assess without directly observing what goes on in the classroom or learning platforms. We did our study during 2016, referring to the situation at BIO in 2015.

## 3 RESULTS

### 3.1 Learning outcomes and writing

Intended learning outcomes (ILOs) for the BPB programme do not mention writing skills explicitly. Under general competencies the formulation '*the candidate can communicate scientifically in Norwegian and English*' must implicitly involve writing skills, but '*can communicate*' is vague. Another relevant ILO is '*can explain main theories, methods and research areas in biology*', which presumably includes explaining in writing. Effectively, there is little explicit emphasis on developing writing skills as a core competency for students completing a bachelor degree from BIO.

Eight courses explicitly mention writing skills in the learning outcomes, and typically this is formulated as '*being able to present research in writing*' or similar. The type of writing or levels of skills expected are vaguely described in the ILOs.

### 3.2 Writing in mandatory courses (first two years)

First, we present a general overview of the mandatory first two years, semester by semester. Then we summarize writing activities in the elective 200-level courses available to bachelor's degree students, which they normally use to fill up the 3rd year. All chemistry, statistics, physics, and math courses (five) involve assignments with feedback, but there is no focus on writing in these courses.

**1<sup>st</sup> semester:** First semester students attend BIO100 (Introduction to Evolution and Ecology) along with a first-year course in math and one in chemistry. BIO100 is one of few obligatory biology courses that provides feedback on language use and writing skills. Students get practice writing short answers and essays in class, as preparation and exercise for the final exam. The instructor also gives individual feedback to each student on the answers to the final written exam, commenting both on scientific content and writing style. Students write a graded report in a numerical lab (but get no feedback) and receive written feedback on language usage in a PowerPoint presentation. There is also an objective exam (multiple choice, definitions), but no feedback is given on this.

**2<sup>nd</sup> semester:** BIO101 (Organismal Biology 1) includes four lab reports where students learn about the proper structure of the report, including layout, tables, figures, and illustrations. The feedback includes the organization of the report, but not the writing skills. The grade is Pass/Fail on the report.

In the philosophy course, EXPHIL-MNSEM, students can choose between two variants of the course: a seminar model, or an exam model. In the seminar model, the students have a written assignment of  $2400 \pm 600$  words. They receive information on bibliography, layout, resources on internet, etc. Before final submission, they write a draft and get one-hour individual supervision on both scientific content and language. In the exam model, students have a mandatory written assignment of 600-800 words, graded Pass/Fail, no feedback, and a written exam. About 75% of the BPB students choose the seminar model.

**3<sup>rd</sup> semester:** BIO102 (Organismal biology 2) starts with a field course right before summer and one immediately after summer. After the field courses, students write a report in large groups (10 students per group). The students get some information and instructions on the formatting of the report. Students get feedback from assistants on both writing and content in the report.

**4<sup>th</sup> semester:** Both BIO103 (Cell Biology and Genetics) and BIO104 (Comparative Physiology) have three written lab reports which count for 10% of the final grade. BIO104 has three exams, all with some short- or essay-style written answers.

**Writing in 200-level courses (year 3):** BIO offer 34 200-level courses in total. All but four include some writing: 22 courses include a report that is graded or has to be approved, and 8 courses include written assignments or term papers. We have limited information about feedback in these courses; however, assignments are mainly used as summative assessment and graded or approved with little or no feedback on writing.

Some courses use writing extensively, e.g. BIO298 'Vocational Training in Biology' (*Yrkespraksis i biologi*). Here, the final report is a [blog](#) based on students' experiences during work placements. This represents a different writing experience than students are normally exposed to, in a format of increasing importance for science communication. BIO299 'Research Project in Biology' includes a comprehensive written report of a one-semester research project, graded Pass/Fail. Each project and its ensuing report develops as an interaction between a student and an individual advisor.

Writing can be found in 200-level courses in all sub-disciplines of the biology bachelor's degree. In all aquaculture- or nutrition-related courses, students are required to hand in assignments, term papers, essays, or reports, which all count towards the final grade. Feedback is given both on contents and style of writing. Students specializing in marine biology are required to write essays and seminar reports. Fish health students also have some writing in addition to the aquaculture/nutrition courses discussed above. Students in fisheries biology and management are required to hand in a report from a scientific cruise. Students in biodiversity, evolution and ecology see writing in several courses, including essay style, short assignments, reviews, reflections and lab reports. Students in microbiology

are required to hand in an essay based on practical (lab) work and a short series of lectures. One course specifies in its ILO “training in written presentation of research results”. Further, microbiology students are required to “present microbial experiments in writing and orally”. Students in developmental biology and physiology are required to hand in essays and lab journals which count towards the final grade. Students in environmental toxicology are required to write a project report and a midterm test which constitutes 3 ECTS of the total work load.

#### 4 DISCUSSION

Our survey revealed that students do not write much in their first two years (EXPHIL-MNSEM being an exception). More advanced and smaller courses incorporate writing in many forms. In addition to traditional multi-hour final exams, graded assignments include shorter or longer essays, reports, term papers, take-home exams, and even blogs. Most written assignments are summative rather than formative, and there is relative little actual training in writing skills. Generally, our survey shows clearly that few of our courses give any feedback on these writing activities to students, and if they do, it is usually only regarding scientific content. All writing promotes learning, but we need a coordinated strategy to ensure our graduates possess some minimum level of writing ability.

Writing in university science programs is often "sink or swim", rather than being an expressed learning outcome, and our institute is no exception. We found little or no mention of writing skills in the intended learning outcomes for degree program or in those for individual courses.

We think our graduates can be expected to be proficient in three forms of writing: essays and blogs; writing laboratory and field notes; and reports and exams. They should be able to adapt their writing style to the given format and its audience, and they should be able to write clearly and directly. Writing effectively requires mastery of fundamental writing skills as well as more discipline-specific knowledge about writing. In addition, we should aim to help students develop a reflective, self-critical attitude towards writing (Brown & al. 2014), a way of ‘standing back’ and reading one’s own writing as the audience will read it. Based on the results of this survey and on our own experiences, we suggest below an institute-wide strategy for strengthening fundamental writing skills.

##### 4.1 General plan to increase quality and quantity of writing

First and foremost, we recommend that transferrable writing skills should be a part of the programme learning outcomes and learning outcomes for specific courses, where appropriate. Currently, bioCEED is planning a web platform (bioWRITE) to collect advice and resources, and to organize and align writing activities. We believe this is an excellent idea and encourage faculties to add their courses and ideas in here. In addition, we suggest assigning different 2<sup>nd</sup> and 3<sup>rd</sup> year courses responsibility for improving certain basic writing skills. These skills might be divided between the two years as follows:

*2nd year:* IMRAD<sup>1</sup>, general system (each part); what constitutes plagiarism; writing in a scientific voice, for reports and essays; active vs passive writing.

*3rd year:* IMRAD, more on form of introduction, on form of discussion, separating results from discussion, flow; citation practice and formatting references; writing better sentences; writing better paragraphs; improving word choice, writing for general public.

Other suggestions to improve student writing includes:

- Identify specific courses in which students can learn certain forms of writing (e.g. essays, reports, blogging), and see that these courses fulfil program learning outcomes.
- Identify specific courses in which students can learn chosen aspects of good writing, using bioWRITE as a platform.
- Acquire resources for effective teaching of writing, including resources relevant for developing the quality of writing assignments.
- Train instructors to provide feedback on writing and how to help develop specific student writing skills (see Linton et al. 2014).

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<sup>1</sup> An acronym for the norm for organizing a scientific paper: Introduction, Methods, Results and Discussion.

- Select, modify, or develop a short guide to good writing practices to help with giving feedback and integrate it into bioWRITE.
- UiB has an excellent learning platform (Canvas) where submitting, uploading, commenting, and peer-review is easy to do, but teachers still need instruction to make full use of the functionality.
- Suggest that more courses use portfolio assessment (see Dysthe and Engelsen 2003), and integrate writing with assessment into the assignments.
- Ensure assessment is criteria-based. The criteria must be known to and discussed with the students in advance.

Finally, we would point out that not all writing needs to be formally (or even informally) assessed, and that writing can be a useful exercise whether or not there is constructive feedback. Elbow (1994) points out that educators use student writing in two ways, for two very different purposes: for assessment, so-called *high-stakes writing*; and as a learning activity, *low-stakes writing*. We are all familiar with high-stakes writing: essays, written exams, take-home exams, textual term projects. These are graded, and tell us something about how much students have learned. High-stakes writing is usually turned in at or near the end of the course, and usually does not involve feedback other than a grade. Low-stakes writing is generally ungraded or counts little, as the activity is not meant to be summative, but rather to engage students in the material at hand. Elbow (op. cit.) lists examples such as journal writing, “think pieces, and small written exercises during class. We suggest urging our colleagues to incorporate more low-stakes writing in our courses.

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