White paper

Current trends in assessment in Europe

The way forward

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A Tradition of Innovation

Current trends in assessment in Europe – the way forward

Introduction

Recent years have seen an increased focus on assessment and feedback in many European countries. This trend is triggered by the development of teaching and learning activities that support student-centred learning and, closely linked to that, the general modernisation agenda within higher education in Europe as outlined, for instance, by the High Level Group on the Modernisation of Higher Education (2013). Final examinations at the end of the course module or academic term have been the order of the day, but new developments are primarily to be found in continuous or formative assessment activities throughout the academic term. Much inspiration in this field has come from the English-speaking parts of the world; however, new developments are spreading across Continental Europe as well.

This White Paper is the final outcome of a workshop within the auspices of the Coimbra Working Group on *Education Innovation*[1] held in Aarhus (Denmark) on 27 February 2017. The output from that workshop, consisting of participants' contributions in electronic and paper notes, combined with a selection of literature in this field and cases from Coimbra Group universities, has resulted in this White Paper (WP), adopted by the Working Group in April 2018.

In what follows, focus is on recent and potential new developments within continuous (and formative) assessment as opposed to traditional end-of-term examination or summative assessment.

Purpose

The purpose of the WP is, first, to briefly outline the link between assessment and learning and, second, to describe and discuss new opportunities and potential challenges linked to the use of formative and continuous assessment and, in this context, to suggest how and why such assessment should be used in higher education. This section is exemplified by cases from Coimbra Group universities that have already introduced continuous or formative assessment activities. Finally, this WP will briefly outline suggestions for further research, development and the sharing of good practice.

Terminology

The terminology used in the literature on assessment varies: one form of assessment may have different labels or terms; and one term may cover different forms of assessment in different contexts. In any case, the different forms of assessment may be said to occupy a position on a continuum from purely formative feedback with no grading to high-stakes end-of-term invigilated examinations. The following terminology is employed in this paper:

Assessment would refer to tasks undertaken by students as part of their course of study and judged by their lecturers or peers. Non-graded *formative assessment* may be distributed throughout the course and provide the opportunity for feedback, feed-up and feed-forward in order to support students' learning and adjust teaching and learning activities. *Continuous assessment* would be graded tasks or activities (written assignments, tests, short oral presentations or similar) distributed throughout the course module and providing the opportunity for feedback, etc. In other contexts, this kind of assessment is also referred to as coursework, curriculum integrated assessment, or embedded assessment.

[1] The authors would like to thank all colleagues in the WG for their contributions to the final version of this document, not least for the illustrative cases from their respective universities.

Examination (end-of-term assessment) is undertaken in formal and invigilated, time-constrained conditions, typically at the end of the module or academic term. Examination is thus a special form of *summative assessment*, that is, graded assessment that provides information about student performance. It may provide feedback to students in order for them to enhance their learning; however, feedback is often limited to a given grade.

Evaluation is the students' assessment of the teaching/supervision event, typically of a full course module.

Assessment and learning

Ideally, the intended learning outcomes and the design of a given module (course) should determine the choice of assessment format(s). Judging from the variety of both module design and learning outcomes that may be observed across the disciplines, one would expect to also find an enormous variety in assessment methods. However, the Coimbra WG workshop showed that this does not seem to be the case, an observation that is also confirmed in the literature. There is a remarkable homogeneity in terms of assessment methods actually employed in most European universities.

The standard assessment practice is still to have one high-stakes summative assessment activity (examination) at the end of a given module, often supplemented by non-graded student activities throughout the academic term followed by formative assessment. High-stakes end-of-term assessment is no doubt very helpful when one is comparing student performance and monitoring progress; however, its effect on student learning may be limited.

Changes in assessment practices may have several sources of inspiration, among them a desire for a more innovative approach to teaching and learning, the enhancement of student motivation, the demand for more feedback to the students, etc. Based on the innovation rationale, course directors, coordinators, and lecturers have begun to rethink their assessment practices with the positive expectation that students actually learn from being assessed. This approach involves lecturers exploring and understanding student progress in order to enhance their teaching practice; it is therefore also termed assessment *for* learning. It is strongly formative in nature and is used as the basis for providing feedback to students.

Assessment is thus expected to be a strong driver for student learning; many students seem to use a strategic approach and only put real effort into tasks that will count towards their grades. Taking advantage of this driver, educators have therefore also developed assessment *as* learning. Here all assessment activities are specifically designed with the purpose of developing students' ability to assess their own work. Examples of this practice are self- and peer-assessment activities, in which students' metacognitive awareness and independence are also enhanced.

With the concepts of assessment *for* and *as* learning gaining ground, the challenge for educators is to design assessment tasks that are meaningful for the students, promote deep learning and facilitate long-term retention of learning.

The following sections reflect some of the key themes in current discussions about assessment: Continuous and formative assessment versus final summative assessment; Assessment and study intensity, student behaviour, motivation and exam anxiety; Authentic assessment and generic skills; and Assessment and feedback. Each section will outline the pros and cons of the different assessment forms and offer one or two exemplary case(s) to illustrate the points made.

Continuous and formative assessment versus final summative assessment

As a group, students have different approaches to learning, and individual students' approaches may vary considerably depending on their motivation, time and capabilities for studying a given subject. Closely linked to that is the observation that students often focus on assessment requirements rather than learning in their studies, whereas universities and lecturers would tend to pay more attention to the students' learning as well as to using assessment to test students' academic achievements. In such a scenario, assessment has the double function of enhancing student learning and certifying achievement at one and the same time.

While many lecturers are working towards employing more feedback and assessment activities to support their students' learning, there also seems to be a certain amount of inertia preventing lecturers from trying out new assessment formats. There may be several reasons for that, one being that assessment counting towards the students' grades may ultimately impact on students' degrees and future careers and is therefore also considered high-risk by the lecturers; another reason would be that changing assessment procedures may be more time-consuming for the lecturers – at least in the first instantiations.

Formative and continuous assessments are ways of executing assessment *for* and *as* learning. While formative assessment (feedback) seems to be quite common, both as feedback from the lecturer and as peer feedback, continuous assessment still does not seem to be widely employed in, particularly, Continental Europe. Examples of student activities completed in the course of the academic term, and counting towards the final grade for the module, seem to be few and far between.

By being placed at key moments during the academic term, continuous assessment activities offer a clear indication to students that engagement throughout the term is vital for their successful completion of the module. Scoring or grading students' work during the academic term is thus a way to avoid long periods with no assessment activities followed by a single high-stakes opportunity to demonstrate learning at the very end of the module.

The balance between continuous and final (summative) assessment events obviously depends on the intended learning outcomes and the design of a given module's teaching and learning activities. Moreover, assessment methods and the number of assessment activities might differ across disciplines and levels of study. In some cases, continuous assessment seems to be employed more often in the early years of study, whereas summative assessments alone are more common in the final years of study.

In higher education institutions where it has been employed, continuous assessment is considered beneficial to students' learning and, in addition to that, it provides information to the lecturers on how their students are progressing in the course of the academic term. There are some tensions, however, that should also be considered. Examples of these are outlined below.

First of all, the distribution of assessment tasks for the individual students across the modules of a given academic term should be taken into consideration in the planning of the individual modules so that, for instance, the students do not have several graded assessments every week. In addition, the progression through the semester should influence the way the continuous assessment activities are organised so that they form a coherent whole and do not end up looking like a series of final examinations without the formative aspect for the students. This also hinges on the assessment methods, which will differ across the disciplines.

Unless continuous assessment is introduced by the decision-making bodies within a given higher education institution (HEI), lecturers may choose not to use it for a number of reasons: One might be that they are simply not aware of this possibility, and another that they find it too time consuming. While there is no denying that changes in the curriculum and teaching practices always require some extra time in the first instantiation, lecturers with experience in this field would typically indicate that, in a long-term perspective, continuous assessment is not more time-consuming than other forms of active teaching and learning activities. This is especially the case when lecturers have been able to take advantage of the relevant features of a learning management system or other educational technology solutions. However, irrespective of which assessment methods and media are employed, lecturers need to be properly equipped to take on this task, and it would be the responsibility of the individual HEIs to have in place adequate professional development opportunities for the lecturers in question.

Legal frameworks at national, regional or institutional levels may enable continuous assessment without any serious constraints. In other cases, the possibility of using continuous assessment is restricted. As for the latter, the national and institutional regulations in Denmark are a case in point. The most recent ministerial order on examinations in higher education (2016) allows the universities to establish internal rules for continuous assessment. But, for instance, in accordance with the ministerial order, students have the right to re-sit a final exam or other assessment if they do not pass it the first or second time (of altogether three tries), so university-internal regulations must take that into account in its guidelines for continuous assessment. Moreover, students have the right to complain to the university about their grades, and the logistics of these student rights must also be considered. In some other countries or HEIs similar restrictions apply; in others, there are no such regulations.

The potential benefits of formative and continuous assessment

In the next sections, the potential benefits of – and tensions caused by – formative and continuous assessment will be briefly outlined and illustrated with concrete examples from Coimbra universities.

Assessment and study intensity, student behaviour, motivation and exam anxiety

Continuous assessment has the potential to strengthen student motivation and engagement if and when students consider the assessment activities meaningful and purposeful (cases A & B). Motivation and engagement may thus be enhanced in authentic tasks that mirror students' future professional careers (see below), and in tasks that lead to formative feedback combined with a summative grade (e.g. a certain percentage of the final grade for the whole course). Such tasks help students see their own progression throughout the academic term, and it has even been suggested that it may strengthen student retention. On the other hand, too many assessment tasks may lead to anxiety or surface learning for some students.

High-stakes summative assessments at the end of an academic term only offer students one chance to demonstrate what they have learned in a given course and may therefore promote exam anxiety. Contrary to this, continuous assessment activities are considered relatively low-stake, and therefore less stress-provoking, because they only count with a certain percentage towards the final grade. For some students, however, a string of assessment events do seem to be more anxiety-provoking than one final examination.

A string of continuous assessment activities may be combined with an end-of-term assessment activity, and together these assessment activities result in a final grade. This is illustrated in case C.

Even though there are examples such as A-C, more systematic research is needed to ascertain whether such assessment methods do in fact have the intended positive effects among a wider circle of disciplines, lecturers, and students.

Authentic assessment and generic skills

As already mentioned, authentic settings and cases seem to be a motivating and engaging factor for many students. There are some disciplines where this authenticity is part of the tradition. In such settings, students are expected to apply their higher order knowledge in situations that mirror the tasks and conditions of their future professional lives; examples of this would be students of medicine diagnosing or treating patients; students of law identifying legal issues in cases (for instance, as reported in the media); or engineering students developing a tangible object (product). However, many disciplines would not have a tradition for such authentic tasks; authentic assessment is typically found in disciplines, such as the ones mentioned here, where there is a direct link between the programme of study and a given profession (doctors, lawyers, or engineers). Other examples would be internships as an assessed and credited part of the curriculum, business cases in programmes of economics and management, or laboratory work in science programmes.
Whether or not, in a given discipline, there is a tradition for activities that reflect or simulate real-world situations or cases, authentic assessment would often be limited to the final grade for a course. However, in the process of solving real-life problems, students would typically also develop competencies that are difficult to assess in traditional exam formats, for instance, teamwork or collaboration with peers, interpersonal skills, communication, or critical and creative thinking (cases D-F). These competencies might in fact be important generic skills or graduate attributes for the programme as a whole.

There are two major issues related to this: One is the question of how these competences are appropriately defined as learning outcomes in the context of a given course; the other is how these learning outcomes may be assessed in a transparent and meaningful way. One possible solution is to assess these competences in the course of the semester and provide feedback to students so that they in fact develop these competences in the course of the academic term. However, most generic skills or graduate attributes are learned slowly over time and, consequently, they should not be assessed in one course only. Therefore, another possible solution is to have individual (reflection) portfolios on this topic, developed throughout the programme and assessed in connection with (one of) the last module(s) of a given study programme.

Assessment and feedback

Whether or not feedback is linked to assessment, it is an important component of a student-centred approach to teaching and learning. Students have the opportunity to become acquainted with the goals and standards of a given discipline, for instance, in the form of rubrics or other forms of assessment criteria, and when they receive feedback, they have the opportunity to improve their work. However, students will need to learn how to use the feedback they receive and, if they are not allowed or required to submit a revised version of their work, they do not necessarily act on the advice given. It is therefore vital that lecturers organise the teaching and learning activities so that students act on the feedback they receive, and that they can see for themselves that they achieve better results when they do so. Again, depending on the discipline and the activity, the feedback criteria may reflect the demands of relevant professional practices (cases C, G-I).

Students seem to learn from engaging in both giving feedback to their peers and receiving feedback from their peers or lecturers: Working with criteria-based feedback and assessment helps them not only improve the quality of the work at hand, but also to develop as self-reflected learners (assessment *as* learning). They

have the opportunity to develop their self-efficacy as well as their capacity to take responsibility for their own learning, a generic skill that will also be needed in their professional lives after they graduate. An important part of this development is also to learn to cope with failure, that is, to learn from projects or other real-life situations that do not go well.

In conclusion, lecturers would be well advised to organise student assignments so that, when students engage in formative feedback and continuous assessment tasks in the course of the academic term, their efforts become more evenly distributed rather being crammed just before the final exams. Moreover, by engaging in such productive learning activities, student seem to have a much better chance of retaining what they learn and of applying it in a professional context after they graduate.

Finally, while these learning opportunities for students would seem to be a strong incentive for HEIs and lecturers to revise their courses to include more continuous assessment, there also seems to be a widespread concern that assessment events under less strictly controlled and invigilated conditions will lead to an increase in student cheating or plagiarism. This is of course an issue, but could be dealt with in different ways. Examples of this would be

- ✓ Assessment methods that are designed so that it is not possible for students to just copy text from already existing papers, for instance, by having students apply their new knowledge on concrete (live) cases or examples;
- ✓ Written assessments that are submitted electronically with robust student ID software and subjected to equally robust plagiarism-detecting software;
- ✓ Oral assessments with face-to-face interaction between the lecturers and their students;
- ✓ Group work;
- ✓ Task design where students resubmit a revised assignment after having received feedback from their lecturers or their peers.

Some of this is exemplified in cases G & J.

Assessment and learning analytics

Learning analytics (LA) – the collection, analysis and reporting of electronically available student data in learning management systems or other databases – is a relatively new concept that offers HEI decision makers, lecturers, and students information that may support the quality of teaching and learning.

Given the learning potential of continuous assessment and feedback outlined in the sections above, HEI decision makers and lecturers have been attracted by these recent opportunities to track students' study behaviour and achievements. In the specific context of assessment, LA data may predict better student performance or retention (a fall in drop-out rates) as a result of new interventions or teaching and learning activities in a given course, and it may enable lectures and other stakeholders to ascertain whether these predictions hold true. An example of that is found in case K.

Based on LA data demonstrating, for instance, degree attainment, progression results, module results, individual assessment results, rubric results, and specific strengths and weaknesses of an individual student's work, students at risk may be offered additional help, and students who are not engaged, may be stimulated with extra tasks that keep them motivated. Lecturers can understand students' learning processes better; they can reflect on their own teaching methods and performance, and they can gain more information about

social, cognitive and behavioural aspects of teaching and learning. The development of LA is still ongoing and, consequently, instructional designers and computer scientists must keep developing efficient data mining techniques as well as appropriate factors and settings for the measurement of variable types of learning effectiveness.

While the potential for utilising learning analytics in the context of assessment is obvious, there are also some issues that cannot be overlooked: First of all, the impact of learning analytics depends on the amount of data and the appropriateness of the data sources available. Their consolidation and evaluation is still a major challenge. Second, at this point in time, algorithms still need to be further developed to provide a precise prediction of the future performance of a given student. Third, informal learning activities are very difficult to measure, and self-evaluations are biased by nature. Fourth, since learning analytics is based on electronic data, it is not applicable to the vast majority of face-to-face learning sessions. Finally, and especially in Continental Europe, ethical and legal issues of collecting and processing student data are major barriers.

The way forward

In the above sections, the potential benefits of employing continuous and formative assessment have been outlined and exemplified by means of cases from Coimbra universities. Such types of assessment may contribute to the quality of teaching and learning in higher education. Based on this, the following conclusions may be drawn:

- ✓ Continuous and formative assessment seems to support student learning and motivation and reduce test anxiety for most students.
- ✓ Continuous and formative assessment seem to lead to better results than end-of-term summative assessment only; however, research is not as yet conclusive.
- ✓ The exploitation of the possibilities presented by digital and online learning resources as well as learning management systems and learning analytics seem to support some feedback and continuous assessment methods.

Given that this is still a developing field, collaboration, the sharing of successful practice in context and more research on the effects of continuous assessment and feedback is advisable. In addition, this whole area of teaching, learning and assessment would benefit from

- ✓ The development and sharing of discipline-specific resources in the field assessment and feedback.
- ✓ Collaboration on the development and exploitation of digital and online resources and of learning analytics.
- ✓ Collaboration on systematic research of the effects of new assessment methods.
- ✓ Professional development of HE lecturers to enable them to exploit the potentials of assessment and feedback and of appropriate digital and online resources.
- ✓ Clarification of national, regional or HEI-internal regulations that block the development of assessment methods.

Collaboration within and among the Coimbra universities would be a strong driver for the development in this field of higher education teaching, learning and assessment.

Cases

The cases A-K referred to in the text will be found on the following pages. Most cases illustrate more than the theme they are linked to in the text. The most important themes are indicated at the beginning of each case.

The authors wish to thank all the individual lecturers who have shared their assessment experiences in these cases.

Case A

Cognitive Psychology (Clinical psychology training in the 5th year)

The case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**

Why

This is an intensive course with little time for students to prepare for their traditional exams. The changes in assessment formats have been developed in order to

- ✓ Run in parallel with students' preparing for and participating in lectures.
- ✓ Incentivise deep learning rather than rote rehearsal.
- ✓ Reinforce learning.

In addition, students are to write a kind of exam essay answers that are different from what they have been used to; the lecturer offers detailed feedback, thereby also helping students improve their essay writing skills.

How

A traditional end of semester hand-written exam lasting several hours has been replaced by a series of short openly assessed essays written on PCs. Essay topics are set on general conceptual themes that attempt to integrate course material. They are ungraded, and students receive detailed feedback on each essay. Essays that are considered below a pass standard, have to be re-submitted after improvement. In addition, the obligatory essays are supplemented by a series of voluntary and obligatory online multiple-choice quizzes, which are being gradually expanded to cover more of the syllabus topics. These aim to motivate students to keep pace with the progression of topics being taught, and give them the opportunity for self-evaluation.

Outcomes for the students

Survey feedback from 2 consecutive classes of students in 2017 (approx. 100 respondents) conveys that the majority of students preferred this assessment method over the traditional methods they were used to. Many students made very positive written comments about the assessed essay format. Comments suggest that for many students the learning experience had been deeper, more useful, more inspiring and personally interesting, less stressful, etc. Aspects of the assessment that were rated as beneficial by most students were the distributed nature of the essays, the opportunity for revision, personal written feedback, and the open-resource nature of the tests. Students are more split on their views as to whether lack of grades is beneficial or not, and a minority of students may put less effort into the course due to the lack of grading.

The lecturer's experience

The lecturer's experience is in line with feedback from students. The assessment method is new and at first challenging for students, and it can create short term stress for some, but the overall outcome is very positive for the majority of students. Spending time at the start of the course to explain the format and rationale for the assessment system is important. The procedure is under ongoing development.

Student evaluations are published online at
https://kvalitetsbasen.app.uib.no/rapport.php?rapport_id=6582.

Case B

Key questions in research and society: The Refugee Crisis. What do we know and what should we do? (Bachelor)

This case especially illustrates the following:

- ✓ **Continuous and formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**
- ✓ **Feedback**

Why

This is an interdisciplinary course. In the past, guest lecturers have given their account of the issue from their disciplinary perspective. The focus has been on providing excellent teaching with skillful communicators and subject-matter experts. In the changed format, the idea is

- ✓ to strengthen the interdisciplinarity of the course by not just exposing the students to different viewpoints;
- ✓ to intentionally lead students to integrate those viewpoints into new, more sophisticated viewpoints;
- ✓ to give them a stronger sense of what a university education should be like beyond the current mono-disciplinary view that most students experience.

How

In the autumn of 2017, a limited experiment was introduced with reflection notes as a means to facilitate better student learning through writing, thinking, and reflecting on their own learning processes, as well as to provide regular feedback (continuous assessment). This is a dramatic shift from previously when there was only one final exam (with a limited learning effect).

From the spring of 2018, a new process has been developed, including the structuring of the course into different thematic modules with concomitant teaching and learning materials and activities. Now students write a reflection paper after having completed the reading assignments and participated in the lectures and discussion of each module. They then receive feedback by means of a rubric and comments from a teaching assistant. This new assessment for learning process has been implemented as an integral part of the course design and now forms the basis for the final exam, which consists of a synthesis of the reflection notes into a coherent essay.

Outcomes for the students

In order to know whether the new approach actually works as intended, the coordinator will investigate the student answers (quiz, reflection notes, quick response, and exam answers), conduct observations in the classroom meetings, and study the course evaluations to learn more about the activities that stimulate most learning. Secondly, s/he will develop the theoretical and practical dimensions of the course subject matter (such as a conceptual development and interdisciplinarity) and, finally, s/he will explore further the relevance of this learning design for other disciplines.

The lecturer's experience

This fully implemented redesign has only been run once, but the initial results are overwhelmingly positive. The early results of the course evaluation have also been extremely positive. The lecturers are therefore strongly committed to this redesign effort and hope to keep improving the model each semester across all of their interdisciplinary topic areas.

Case C

Relativity and Astrophysics (Bachelor, 1st semester)

The case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**
- ✓ **Feedback**

Why

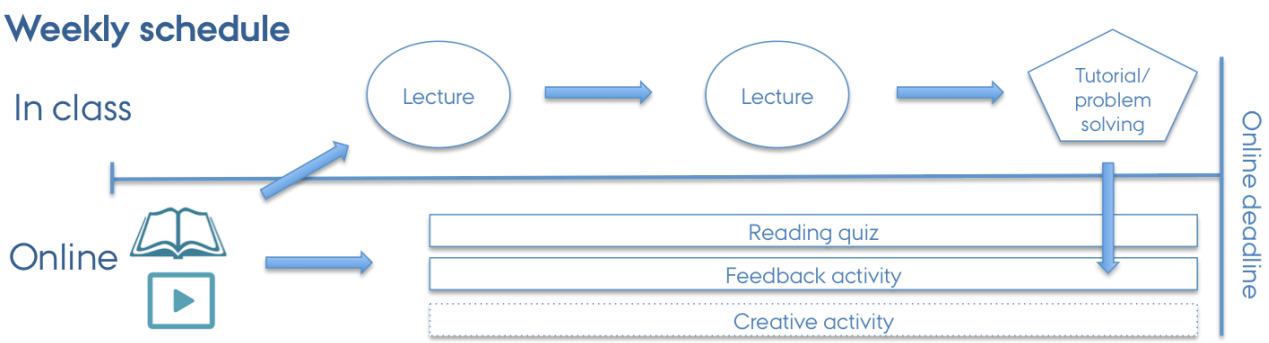
In the first semester of the physics programme, students not only have to learn physics, but also learn how to study at university. Moreover, since this exam is their first oral exam at university level, many students are anxious before the final exam.

The main purposes of the continuous assessment are to:

- ✓ Strengthen the learning of physics by motivating students to work continuously during the course and not just before the exam.
- ✓ Take some pressure off the final oral exam with graded feedback activities in the course of the semester.
- ✓ Offer students the possibility of resubmitting their assignments.
- ✓ Test and practice student creativity in addition to the traditional technical skills.

How

Most assessment activities followed a weekly schedule as outlined below. In this way, students gradually accumulated points contributing to their grade. The assessment activities during the course contributed 50 per cent, the final exam the other 50 per cent of the final grade:



Reading and online homework

Each week the students read the set literature and watched technical videos, after which they could self-assess their understanding through graded reading quizzes. Each attempt would automatically provide feedback on wrong answers and students could then re-take the quiz as many times as needed.

Assessment criteria

Assessment criteria were developed in collaboration with students through an activity, where students ranked four students' answers to an assignment from a previous year. Students ranked the activities according to their own list of assessment criteria. All criteria were then harvested by the lecturer and merged into a list of criteria used to assess subsequent assignments in the course.

Feedback activities
Students received individual feedback on assignments from teaching assistants and were then allowed to resubmit the following week, taking the feedback into account. Only the submission with the highest score contributed to the grade.

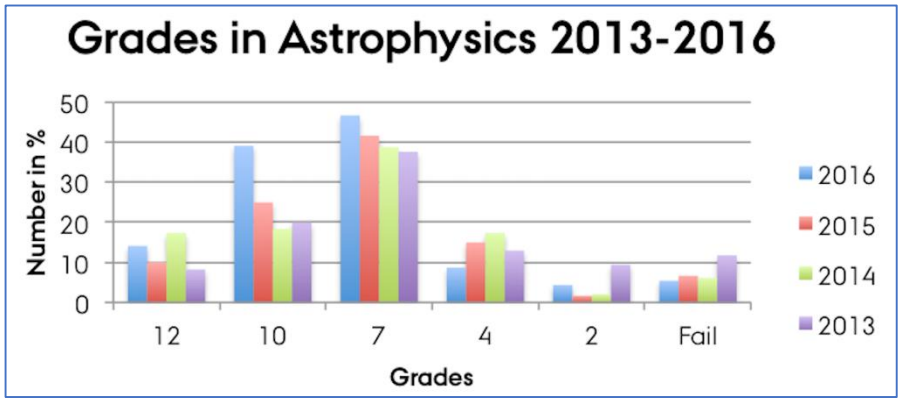
Creative activities
In the middle and towards the end of the course, two projects replaced all other teaching activities. Here students communicated technical topics from the curriculum with free reins in terms of communication format. Assessment criteria were clear from the beginning of these projects and included creativity and multimodality. Both were practised during the course in smaller graded activities.

Outcomes for the students
The continuous assessment has been a great succes in motivating students to work continuously and the vast majority of students prefer the combination of continuous assessment and a final exam over a single final exam. Their work resulted in fewer students failing the course and many students expressing a great satisfaction with the learning activities in the course. Especially activities with feedback and a possibility for resubmission have received very positive evaluations.

At the final exam, only very few students seemed very nervous and many appreciated the decreased emphasis on the final oral exam.

The lecturer's experience
The continuous assessment has enabled the lecturer to monitor student learning and progress during the course, and s/he has thus been able to make small adjustments throughout the course.

Student grades
These bars show grades before (2013) and after (2014-) continuous assessment was introduced into the course. In the Danish grading scheme, 12 is the highest grade and 2 the lowest.



Case D

Introduction to Programming (Bachelor)

This case especially illustrates the following:

- ✓ **Continuous and formative assessment for learning**
- ✓ **Authentic assessment**
- ✓ **Learning Analytics**

Why

Authentic assessment in programming requires students to write their own programs on a computer; assessment only by written exam is particularly inauthentic. There is a challenge to validity though, as coursework programming exercises are particularly prone to plagiarism. In the approach described here, lecturers provided students with individualized programming assignments, generated as "variations on a theme", so that students could not copy another student's work directly. And, by having unique pieces of work to complete, students were discouraged from "outsourcing" their coursework because the coursework specification could be traced back to the student.

How

The lecturers have tried a variety of approaches and compared their effectiveness at making different students submit noticeably different code. Over a period of time, with different programming classes following similar material, the following factors have been varied:

- ✓ Whether or not the problem specifications have been randomized per student.
- ✓ Whether or not the students have had a time-constrained element. Where the assessment is time-constrained the sessions are spread out over a week because of lab availability.
- ✓ How convergent/divergent the assessment problems have been.
- ✓ How closely specified the format of the solutions have been. In particular, in Java programming, a required interface can be specified that includes the names and parameters of all the functions to be implemented.

To compare how similar the submissions were for each assignment configuration, the lecturers examined the output of a code-similarity tool (JPlag), usually used for plagiarism detection, as a specific form of learning analytics. In most cases students were also given a subset of the automated tests to be applied, enabling them to get their own formative feedback as they developed their work.

Outcomes for the students

Our results show that randomization of the problems did not have a significant impact on the average similarity of the work submitted. The variation that had the largest impact was the convergent/divergent nature of the assessment. Neither precise specification of formats nor time constraints had a large impact on average submission similarity.

Authenticity was enhanced, as students worked in a much more realistic environment than a standard written exam. Comments from individual students indicate that they felt that time-constrained "live programming" exams were a good way of assessing their ability to program: presumably, the balance of authenticity and validity was about right.

The lecturer's experience

In some ways, the fact that using randomization does not necessarily have a large impact on the similarity of submissions is disappointing, considering the extra complication it entails. However, it does provide very good mitigation against "outsourcing" of assignment work. To be able to detect plagiarism in students' work reliably, the work itself has to be set so that it would not be reasonable for two students to submit very similar pieces of work by chance. This means that divergence of assessment is required. The possibility of setting substantially divergent assessment increases as the students' levels of knowledge and sophistication increase, so an emerging practice is to have a piece of time-constrained randomized assessment earlier in the course, with the final submission a more substantial piece of work with a higher level of divergence.
https://dl.acm.org/citation.cfm?id=2999560

Case E

Professional development and leadership in diagnostic radiography (Bachelor)

This case especially illustrated the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**
- ✓ **Authentic assessment**
- ✓ **Assessment of transversal & generic skills (graduate attributes)**

Why

The diversity and development of health care services require that graduates are equipped with an understanding of continuing professional development, leadership, and education.

Graduates from this programme may be called upon to develop and manage services from an early stage in their career. This assessment is designed to enable students

- ✓ To develop a critical understanding of teaching & learning in a professional context;
- ✓ To reflect on and articulate graduate attributes relating to continuous learning so they will be able to identify and address future learning gaps, and
- ✓ To navigate the complex situations that will face them in their early careers.

How

During their professional placement period, students are asked to take a photograph of an image that they believe represents teaching and/or professional learning/continuous development in professional practice. Students are encouraged to be creative and to view professional practice/continuous learning from a perspective different to their own.

They also create a 10-minute presentation around this photograph, which addresses the following reflection points:

- ✓ Why did you choose this image? What do you see in it?
- ✓ How does this image represent teaching and/or professional learning/continuous development?
- ✓ Using the photograph as a catalyst, reflect on your experience of this module. How has it informed your beliefs and practices about continuous learning and how has it influenced your future role as someone who is going to 'teach' in professional practice.

Students present their work to the class and a panel of assessors, who mark their work according to a set of criteria which is circulated and discussed with students at the beginning of the assessment process (i.e. when they first receive their assignment). This presentation is worth 60 marks and forms 60% of the module's mark.

Outcomes for the students

Students comment very positively on this assessment. They have noted in module feedback that it is a relevant and helpful assessment as it helps them to apply their learning in practice, and because it gives them an understanding of the importance of lifelong learning. They enjoy being creative. The fact that they have to present their photograph and reflect on it with their peers encourages them to articulate the graduate attributes.

The lecturer's experience

The lecturers have run this assessment for the last three years. It combines assessment for, of and as learning and encourages critical reflection on students' own learning where learning is seen as a process of change and development rather than just knowledge.

The assessment does need to be scaffolded, and the lecturers always spend some class time discussing the expectations of the assessment. The teaching team present students with detailed grading criteria and discuss the assessment rubrics with them so that students and assessors have a shared understanding of the levels of reflection required. It is important in an assessment of this nature that students understand the differences between descriptive reflection and critical reflection. The module also includes a session on reflection/reflective practice where students analyse appropriate frameworks and models of reflection.

Case F

Ecology (Bachelor)

The case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Authentic assessment**
- ✓ **Feedback**

Why

The teaching, learning and assessment formats have been changed for the following reasons:

- ✓ Students deserve individual feedback, and the lecturer also enjoys this dialogue with the students.
- ✓ Working in teams is a rewarding form of learning and inherently training for work, inside or outside of academia.
- ✓ Training in using computers to solve problems is an important generic competence.
- ✓ Writing an individual term paper (with peer review) combines writing, critical thinking, and disciplinary knowledge.
- ✓ An oral exam stimulates group discussions, and it makes in-class discussions very relevant to the final assessment.

How

The course is organized as follows:

Group discussions: All classes are organized as Team-based Learning (TBL), with if-at cards, individual response systems and short tutorials. The students rate each other's performance, for all group activities, at the end of the course.

Group projects: The groups get three spreadsheet assignments to solve during the term.

Term paper: Each student chooses a relevant topic for a term paper – in an online dialogue with the lecturer. The student uploads the paper to a Learning Management System; it is then passed on to two other students for peer review. Both the paper and the review receives feedback and a grade.

Oral exam: 30 minutes per student, with 30-minute preparation (with the questions).

Outcomes for the students

Student learning outcomes comprise the following:

- ✓ Factual knowledge of the topic, and the ability to present and discuss the content with peers.
- ✓ Critical thinking and writing skills.
- ✓ The ability to use spreadsheets to solve relevant problems.
- ✓ Experience with working in teams.

The lecturer's experience

The course is a hybrid TBL model, with about 50% team/individual activity and assessment. The design tends to activate the students, and the lecturers as well, which is an effective and rewarding learning experience for all. The lecturer's role is primarily that of a coach, a facilitator, a referee and a manager – with a new setting and atmosphere in class, both for the lecturer and for the students.

Course outlines may be found here:

2017: https://drive.google.com/open?id=0BztDyZzAhZ0rUzdHRU5oZkVYMjQ

2018: https://drive.google.com/open?id=1GqF8S3US9d_AjExmwkUKiK_8jovNYcbp

Case G

Technology and Learning Environments

This case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity student behaviour, motivation, etc.**
- ✓ **Authentic assessment**
- ✓ **Assessment of transversal & generic skills**
- ✓ **Feedback**

Why

In the first semester of the Educational Technologies course, an experimental laboratory with Wikipedia was launched. The activity involved the students in a process of collaborative construction of online knowledge, with the aim of developing their digital skills and, at the same time, to experiment with alternative forms of formative assessment that would be active, situated, authentic, and collaborative.

The main purposes of the activities were:

- ✓ To verify whether, with the support of Wikipedia, the learning environment would stimulate the development of Digital Competences as outlined in the European DigComp 2.1 recommendation set.
- ✓ To investigate whether the interactions of external actors with students could act as forms of participatory and formative assessment.

How

The students worked in groups of 3-4, creating new Wikipedia articles or modifying existing ones on topics of education, pedagogy and local cultural heritage. They received continuous feedback through comments from an assistant (online tutor) and an expert Wikipedian. Finally, the students monitored the articles for two months to see if other contributors to the online encyclopedia changed them and why, engaging in discussions with them when they had to justify their changes.
Wikipedia activities made up 50 % of the final grade, while other online activities accounted for the remaining 50 %.

Outcomes for students

Students experienced participatory and formative assessment from external actors (single experts or institutions) and not only a traditional formative and summative one from tutors and the professor responsible for the course.
The students' motivation to learn has grown considerably, because, from a social point of view, they knew that their encyclopedia entry could potentially be seen by thousands of people.

The lecturer's experience

The overall outcome is positive although it has not been easy to manage the non-formal and informal feedback activities together with the formal ones within the university, but it was very stimulating. The editing of Wikipedia articles increases the impact of students' work compared to the traditional assignments that are usually limited to their classroom/professor audience. The continuous editing process, by students themselves and other external contributors, helped them to accept revisions and criticism in order to create better content, as well as to realize the importance of collaborative work.

Case H

German as a foreign language (All levels; B2.2. in the Common European Framework of Reference)

This case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**
- ✓ **Feedback**

Why

The lecturer wanted to give students (international students who learn German as a foreign language, mostly groups of 24) the opportunity to improve their academic writing skills and to clearly see their own improvements when writing in German. S/he also wanted them to confront themselves with their writing abilities and make them aware of their individual strengths and weaknesses when it comes to academic writing in German. Besides, by adopting this approach to language learning assessment, students should become aware of the different stages within the writing process (e.g. drafting, revising), not relying on any shortcuts in the process.

How

In the course of a semester, students had to hand in four writing assignments, differing in type of text, i.e. narrative, descriptive, appellative and argumentative. The lecturer corrected these texts and returned them within a week, provided with detailed written feedback on a detailed evaluation grid. Students then had to rewrite incorrect sentences in order to confront themselves with and reflect on their personal errors in writing.

One week later, they had to hand in their original text again, now with their own corrections (based on the lecturer's feedback). Only then, the writing assignment was completed.

Another week later, students were handed back both versions of their text, once the lecturer had checked whether all mistakes were appropriately corrected. The feedback was not always actual corrections; sometimes it was only indications that within a word or a sentence there was a mistake, but one that was so obvious (at the level of B2.2) that students should be able to know how to correct it. It should be noted that students were not asked to rewrite their whole text. Still, some of them chose to do so for the sake of a better feeling of coherence.

Outcomes for the students

The students develop a much greater awareness of individual strengths and weaknesses in German academic writing (their foreign language). They learn how important the different phases of the writing process are and that revision, reflection and correction are crucial parts of the writing process. Besides, they benefit a lot from the fact that every single student receives explicit feedback on four rather long writing assignments during a semester. This kind of assessment definitely enhances study intensity and changes student behavior in terms of sense of responsibility and student engagement.

The lecturer's experience

This correction, evaluation and reflection procedure takes a lot of time and effort on both sides, for the students and for the lecturer. The drafting of the first text version and the finalization of the second one are stages students have to accomplish on their own. The student outcomes and their positive feedback on this rather demanding kind of formative assessment shows that it is worth all the effort and time.

Sometimes students entered into a sort of written dialogue with the lecturer by asking questions about the corrections (in written form directly in their texts). The lecturer responded to these questions, also in writing, explaining a certain language phenomenon or giving a reason for a specific correction. Obviously, this kind of assessment is not possible with too large groups of students.

Case I

The Diversity of Life: Cell Biology, Prokaryotes and Evolution (Bachelor, 1st semester)

This case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment of transversal & generic skills**
- ✓ **Feedback**

Why

Skills in academic writing should be practiced and supported by thorough feedback. In this first semester course in biology, the students improve their writing skills as a result of the process described in this case. The main purposes for the continuous assessment of writing skills are

- ✓ For students to practice and improve their academic writing skills through an iterative process.
- ✓ To provide several opportunities for students to receive, give and apply their feedback.

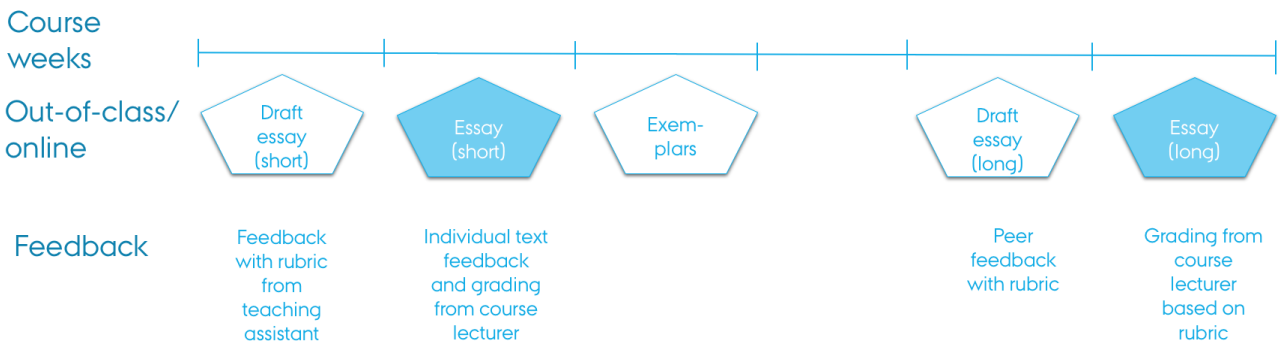
How

The students practice their writing skills during the last six weeks of this course when writing three assignments about evolution.

In the first (formative) assignment, students write a draft essay of a scientific paper assigned to them. Students receive feedback from a teaching assistant based on a rubric with assessment criteria. This rubric is available to the students already when they write their draft.

In the second (summative) assignment, students identify a scientific paper illustrating the presence of evolution and write an argument for evolution using Toulmin's argumentation model. The students receive detailed individual text feedback based on the rubric. The best essays are made available by the course lecturer as examples (also called exemplars).

The exemplars and the students' own essays are used as source material for a longer (summative) assignment where students must present a nuanced argument for the presence of evolution. The students write a draft essay and give/receive peer feedback on the draft essay based on the rubric already used for the first assignment. The content of the peer feedback is incorporated in the final version of the essay. This essay is graded by the course lecturer, using the rubric. Students do not receive feedback on the final essay. Each of the two summative assignments constitute 25% of the final grade.



Outcomes for students

The students receive different forms of feedback and are given the opportunity to use the feedback in the final version of their essays. The quality of their academic writing skills improves as a result of this process.

The lecturer's experience

It is important to explain each step in the process carefully to the students as the learning outcomes might be unclear for them at the beginning, e.g. the benefits of the self-assessment and reflections embedded in the peer assessment activity.

Developing assessment criteria and providing individual feedback is time consuming. It is therefore important to include students and teaching assistants as feedback providers.

Case J

Eukaryotes: Fungi, algae and land plants (Bachelor, 1st semester)

This case especially illustrates the following:

- ✓ **Authentic assessment**

Why

Practical skills obtained during laboratory exercises are often not assessed in the final examination. The practical skills are here hands-on methods used when handling biological material, and these reflect an authentic work situation for a biologist.

The main purposes for assessing practical skills are to:

- ✓ Motivate students to focus on practical skills trained during laboratory exercises.
- ✓ Assess learning outcomes for practical skills.

How

Students perform practical skills during laboratory exercises related to the theory covered during lectures. In this course, the practical skills comprise the identification of species and structures of living plant material using the correct terminology as well as the mastering of microscopy techniques.

The students were assessed as follows:
Continuous assessment (1): Assessment of practical lab skills - 25 % of final grade.
Continuous assessment (2): Multiple choice - 25 % of final grade.
Final end-of-semester assessment: Multiple choice - 50 % of final grade.

The practical assessment was organised in the laboratory during the last laboratory exercise covering the topic about algae which was the topic during the first 6 weeks of the course. The practical assessment was divided into 4 stations where the student had 4 minutes to complete a practical or theoretical task. The overall tasks at each station was the same but the specific species or microscopic slide varied between students.

Outcomes for students

Students were engaged in the laboratory exercises as the skills practiced here were assessed during the practical assessment.

In the course evaluations the students highlighted the alignment between lectures and laboratory exercises. Some students needed more time or a smaller task at each station.

The lecturer's experience

This was the first time that this part of the course was assessed with a practical task assessment. The overall impression is that the organisation and the content of the assessment was appropriate, and that the practical assessment motivated the students to focus on practical skills in the laboratory. The tasks at each station might be simplified or downsized to allow students sufficient time to both read and solve the task.

Case K

Introduction to molecular biology (Bachelor, 1st semester)

The case especially illustrates the following:

- ✓ **Continuous or formative assessment for learning**
- ✓ **Assessment as learning to enhance study intensity, student behaviour, motivation, etc.**
- ✓ **Learning analytics**

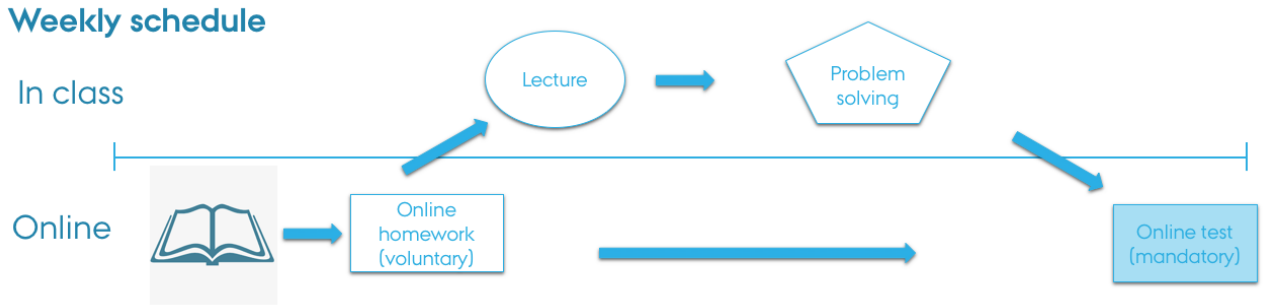
Why

In the first semester of the bachelor programme in Molecular biology, students enter the university with different levels within biology or molecular biology and with no prior knowledge of how to study at university. The main purposes of this section of the course are to:

- ✓ Bring students to the same level of knowledge of molecular biology by practicing new concepts and terms.
- ✓ Scaffolding students' work with the course material and encouraging good study behaviour.
- ✓ Retention of students through formative feedback and dialogue based on learning analytics.

How

Students worked with the course content in various ways.



Reading and online homework

Each week the students read the set literature, after which they could self-assess their understanding of the course content (online homework). The online homework questions were selected by the lecturer from a repository of questions developed by the publisher of the textbook. Students received formative feedback through the automated correction of their homework.

Lecture

In the regular lecture the lecturer included topics that turned out to be difficult for the student, based on the results of the online homework.

Problem solving

Students solved unseen problems (also called theoretical exercises) during a two hours in-class teaching supervised by a teaching assistant and a lecturer.

Online test

Each week was concluded with a randomized online quiz similar to the weekly online homework. This weekly test was corrected automatically and the scores from each of the seven online tests were summarized in a final course grade.

Outcomes for students

The online self-assessment before lectures resulted in well-prepared students, which increased the dialogue during lectures. In addition, the students were very engaged in the class sessions where they solved and discussed unseen problems.

The continuous assessment enabled lecturers to recognise potential drop-outs during the course. Students failing the online tests were contacted by the course lecturer. If these students had not completed the voluntary online homework, they were advised to do so in subsequent weeks. The dialogue with failing students also spotted students with disabilities and early intervention could be put in place.
In general, students were not stressed by the weekly homework and tests.

The lecturer's experience

The learning material provided by the publisher was easy to use and was suitable for assessing student learning.

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References

This White Paper has been developed based on experiences gathered at Coimbra Group member universities as well as a selection of relevant key literature.

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These references are not intended as an exhaustive list of relevant literature.