

## 3-årig emneevaluering: GEOV243

Emne: GEOV243 Environmental Geochemistry

Semester og år for gjennomført emneevaluering: H2021

Navn på emneansvarlig(e): Eoghan P. Reeves

---

### Innhold:

1. Beskriv og begrunn pedagogiske valg i emnet, reflekter over studentens læring som følge av disse valgene.

*Several major pedagogic changes have been implemented in the course since it was taken over by E. Reeves in H2017. Firstly, the mappevurdering assessment was changed to include 4 large «take home» Problem Sets «that the students work on for several weeks at a time – 2 to 4 problems in each, each set forming a percentage of the final grade. Based on previous success of this approach when the instructor both took and co-taught this course at MIT, it was felt that for the students to really grasp the concepts of mathematical calculation involved in aqueous and environmental geochemistry, they need time to digest the lecture material, and problems to work on by themselves, to apply the many small tips and tricks needed – thus reaching the learning outcomes better. Instead of a «lab / øvelse» session, each week we therefore have «Tutorials» where I go through, on paper/document camera, how I would tackle similar problems to the Problem Sets. Initially, I was apprehensive about giving M.Sc.-Ph.D. level problems from MIT to 200 level course students here, but the students (despite a little grumbling on the workload) have taken well to the problem set approach, with many good feedback comments (see below). A pair of short «in class» problem sets (much simpler and shorter), are implemented at the end of the course, to force the students to work alone, but also under a strict time pressure, as if in the environmental consultancy sector. The take home assignments work very well when groups formed naturally and worked together in an equitable way i.e. brainstorming strategies to solve the problem, but finishing them alone. There have been some issues of weaker students simply 'following along' with their friends, or attempting to use older problem set solutions from previous years, but the students are firmly warned against this at the start of the semester, and incidences are very low.*

*In future, based on the instructors learning in the UPED680 Team Based Learning course, elements of TBL (but not the entire method) will be incorporated, whereby the students will be grouped into randomized groups of 2-3. Though students in H2021 complained when this was proposed to them as a potential future change, they agreed being forced to work in a diverse team was an important skill to build*

*Based on instructor training received in UPED620 (Basismodul i Pedagogikk), the existing model of mappevurdering was modified to be even less «summative» assessment with the problem sets (receiving grade feedback much later on in the course), but more «formative» (receiving feedback more continuously). To that end, I have put the teaching app Socrative into much use over the last years (starting 2018). Though my usage of it varies through the years, the students generally respond well to it, as long as it is not used too much. Examples of its use (similar to Kahoot quizzes, but with more educational features) include spot checks (in the moment) on concept comprehension, or group 'pub quiz' style team quizzes.*

*Since student assistant Thomas Viflot (PhD Candidate, GEO) has been helping with the course, we have added in lectures on geochemical modelling softwares (introductions to softwares, basic «how to» etc.) and we are also trying to develop a field site, Litlebø mine museum/acid-mine drainage site, as a natural example for fluid chemistry mixing problems. We collected samples in 2021 as part of GEOV109, and hope to implement the data in H2022 Problem Sets. Of critical importance here, is not the creation per se of another field trip/tour/excursion, but the creation of natural data, from a real system, to which the key concepts and learning outcomes can be moulded around. Since the students experience this site in GEOV109, it would be a great find if we can make Problem Set examples that fit our needs from it.*

Emneevalueringer skal også minst omfatte:

## **2. Oppfølging av tidligere evalueringer**

*Many of the students typically comment that they do not feel they have enough chemistry when they start GEOV243, despite the fact that the course involves more algebra than chemistry usually. In all cases though, this seems to be more a case of them forgetting basic chemistry concepts from VGS etc. and I encourage them to look back on this material as needed.*

*Students have also occasionally commented that the lectures are quite fast, or contain much material. In response to this (rather than dilute course content), I record the lectures, allowing the students to rewatch complex calculations again, in case they missed any key points. This was well received in the 2019 student evaluations and since then.*

*Students have also asked for more practice example calculations in the classes, and these are now being given (it was a lot already though). It is hoped that the TBL component next semester will aid in helping students who do not naturally form into groups get help, and formalize questions to the me better, and help with co-learning.*

*Students also wished to have the problem sets graded earlier. This takes time, and a course assistant is always needed, but as soon as problem set deadlines pass, the proper solution is given out, so students can see the correct calculation strategy, which helps to assess their own work before the grade.*

## **3. Studentevaluering og andre evalueringer som er relevante for emnet**

Selected examples from the H2021 student evaluations, on the benefits of the Problem Set style of learning, when combined with the Tutorials as primers:

*Q. Hvilke(n) undervisningsaktivitet(er) mener du har bidratt mest til læring i dette emnet? [Spesifiser og gi begrunnelse]:*

- Problem sets, fordi da fikk man samarbeide og diskutere med medstudenter. Da ble man også tvunget til å jobbe med oppgaver.
- the exercises - it was good to work through the PSets
- the help sessions & tutorials - good to do some problems together and see how to solve them, so we get at least an idea how to deal with the PSets at home
- The problem sets and tutorials, it helps to understand the material by working on problems and looking at examples of how to solve them compared to only learning the theoretical background.

- While during solving the problem Sets you had to Deal with the topic, repeated the Material discussed in class and read in some books by yourself. So it required own work which i think is really important for studying.
- "Tutorial"-ene, da de gir oss mogleighet til å gå igjennom stoff vi kanskje ikkje har skjønt eller glemt oppi alt.
- Problem sets! Disse har stått for stort sett hele læringsutbyttet i faget, i og med at kjemi er "mengdetrening". Forelesninger og tutorials har også vært til god hjelp, men oppgaveløsning er viktig etter gjennomførte forelesninger/tutorials.

*I also received in 2019, the following kind feedback message (email) from the Geovitenskaplig Fagutvalg:*

Hi

In March the institutt for geoscience conducted a survey on students welfare, socially and in courses. Your course GEOV243 come out especially good from this survey. The students emphasize that you have a great ability to lecture, even tho the material is difficult. On behalf of the student union we would like to extend a thank you for your good work teaching this course. Continue the good work!

Best regards

Oda R. Haga, Nestleder Geovitenskaplig fagutvalg

#### **4. Erfaringer fra andre som bidrar i undervisningen på emnet, både studenter og ansatte**

*Student assistent Thomas Viflot has found, like myself, that when students form into natural groups (e.g. friends etc.) they learn better and perform better on the Problem Sets. This, combined with the socialization benefits of pushing teamwork activities («soft skills») needed in the modern workplace, we have decided that from H2022, we will put the students into randomized groups, e.g. one bachelor student, one master student, one Erasmus etc. This will have the benefit of forcing the students who do not socialize well, and sometimes struggle with the material (without asking for help) to engage more.*

#### **5. Strykprosenten på emnet**

Rapport i Tableau: [https://rapport-dv.uhad.no/#/views/SVP3Emnegjennomfring\\_1/Emnegjennomfringslister?:iid=2](https://rapport-dv.uhad.no/#/views/SVP3Emnegjennomfring_1/Emnegjennomfringslister?:iid=2)

*Only one student (H2021) has failed the course since H2017. Typically, on the order of 10-20 students register for the course, with approximately 1/3 of these switching or dropping in the first week. Occasionally some students drop later in the course, usually commenting to me that they have too high a coursework load, not because they dislike the material.*

#### **6. Eventuell fagfelleevaluering**

*It is very unclear to me, how this course would function with the «2 sensor» approach currently being considered. I am concerned any potential external sensor might balk at the prospect of having to grade 4 problem sets from each of 15 students. I fail to see how this will be practical, if it were applied to GEOV243.*

**7. Vurdering av samsvar mellom emnets læringsutbyttebeskrivelse og undervisnings-, lærings- og vurderingsformer**

*I think in general, the course is now as reasonably well aligned as is possibly can be, with the learning outcomes. In general, the above feedback on the overall approach (Tutorials and Problem sets) is very encouraging as to the development of quantitative skills, and a broad introduction to quantifying environmental geochemistry systems. We will see now how further improvements to this – adapting TBL to the problems sets, and incorporating local pollution site data will further optimize this approach.*

**8. Vurdering av om framdrift og opplegg for emnet er i samsvar med de fastsatte målene for emne og program**

*The goals for further course development noted above are very much in line with the learning outcomes, so I do not see any lack of alignment with the directions this course will to in the next years.*

**9. I de tilfellene det er tilknyttet praksis eller arbeidsrelevans i emnet, skal det evalueres om ordningen fungerer tilfredsstillende.**

*While this course is not intended specifically to train students to be environmental consultants, wherever possible I do incorporate considerations that many are taking the course, with this career choice in mind. In some cases students have commented that the course is not quite a preparation for that industrial sector, but it was not intended as such – many research-bound students need the course also. In that sense I have tried to keep the course as focused on properly understanding, at a sufficiently deep enough level to be built upon later, the basic principles of aqueous environmental geochemistry. An added benefit of the course seems to be that the students leave with much better quantitative skills than they started with.*