

Report for the MOOC-course

Introduction to assessment and management of chemicals

Course description

In September 2022, the Department of Environmental Science at Stockholm University offered an introductory online course to the assessment of chemicals and strategies to reduce risk. The course consisted of six modules. The first module addressed if and why chemicals can be a threat to human health and the environment, and the following five described the key elements of risk assessment and management of chemicals: Hazard identification; Hazard characterization; Exposure assessment; Risk characterization; and Risk reduction. The course consisted of pre-recorded lectures, self-assessment exercises, interviews with experts, and quizzes. After completing the course and passing all the quizzes, the students received a certificate. The course was open to all, but the target audience was environmental scientists, decision-makers, policymakers, regulators, and medical professionals from all over the world.

Primary course literature:

- Swedish Chemicals Agency. 2020. Hazard and risk assessment of chemicals – an introduction. <https://www.kemi.se/en/publications/guidance-on-national-chemicals-control-for-other-countries/hazard-and-risk-assessment-of-chemicals---an-introduction>
- Swedish Chemicals Agency. 2020. Risk reduction of chemicals. <https://www.kemi.se/en/publications/guidance-on-national-chemicals-control-for-other-countries/risk-reduction-of-chemicals>

Website: <https://www.aces.su.se/education/mooc-assessment-and-management-of-chemicals/>.

The free version of the Canvas platform was used to communicate with the students.

Course coordinator: Marlene Ågerstrand, marlene.agerstrand@aces.su.se

Course developers: Lennart Dock and Marlene Ågerstrand. Special acknowledgement to Kersten Gutschmidt at the WHO for advice regarding the scope, content, and format of the course.

Lecturers at the course: Lennart Dock, Diana Kättström, Flora Borchert, Michael McLachlan, Lina Wendt-Rasch, and Marlene Ågerstrand.

Interviewed experts (in order of appearance during the course):

- Richard Brown from the WHO
- George Kass from the European Food Safety Authority
- Oliver Wootton from the United Nations Institute for Training and Research (UNITAR)
- Rachael Kupka from the Global Alliance on Health and Pollution (GAHP)
- Anna Beronius at the Karolinska Institutet, Sweden
- Daniel Borg at the Swedish Chemicals Agency (KEMI)
- Hans Peter Arp at the Norwegian Geotechnical Institute (NGI)
- Richard Gutierrez from the Secretariat of the Minamata Convention
- Godfrey Wilgod from the Hanns R Numan Stiftung in Tanzania
- Bethanie Carney Almroth from the University of Gothenburg, Sweden

- Maria Delvin at the Swedish Chemicals Agency (KEMI)
- Marian Asantewah Nkansah at the Kwame Nkrumah University of Science and Technology, Ghana.

Technical support: Paula Jokela, Ylva Brännström Almquist, Tecla Malmström at KTH Canvas Support, and Tomas Ärlemo.

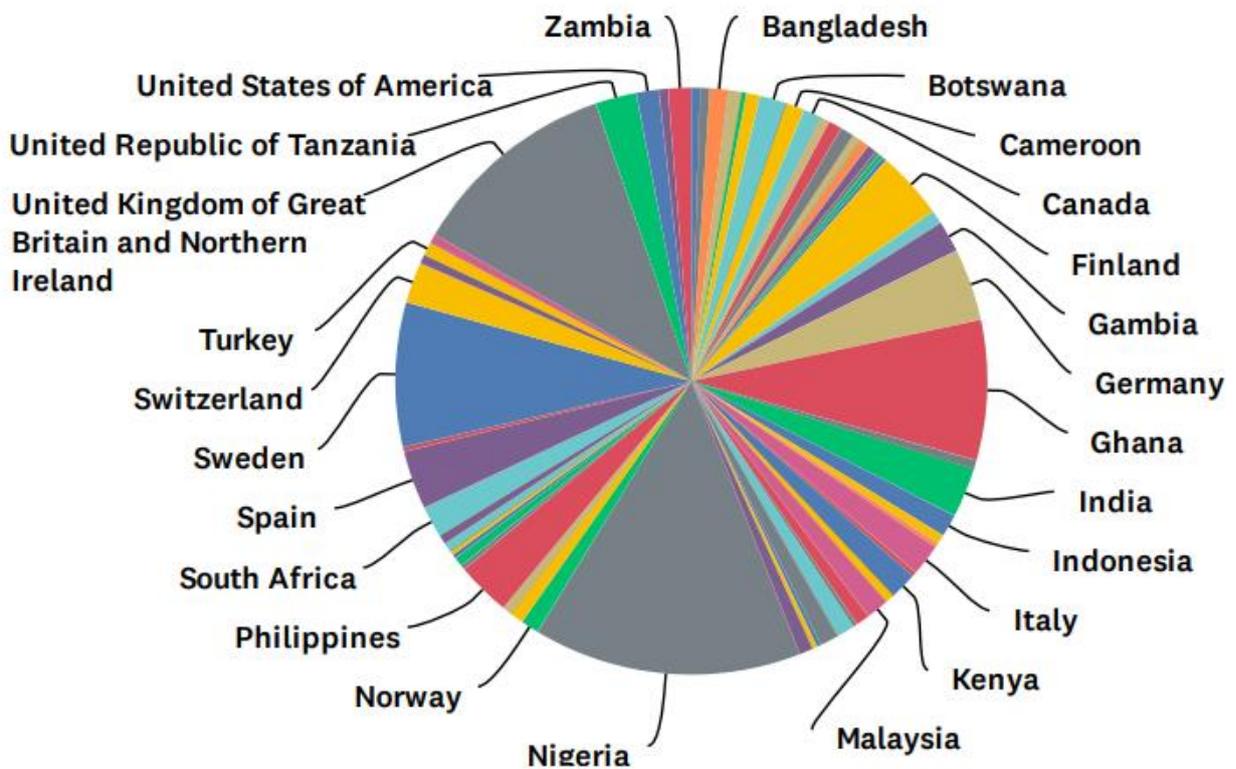
Funding: This course was developed with support from an education initiative from the president of Stockholm University, as well as additional support from the Department of Environmental Science at Stockholm University.

Students attending the course

The students were asked to answer the survey “Who are you?” and 404 students did so. This is what we learned about them from asking six questions.

Q1 In what country do you currently work/study?

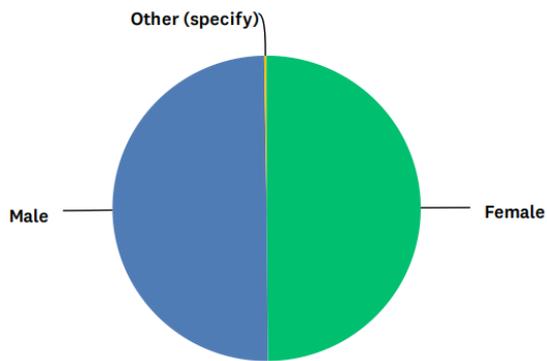
Answered: 402 Skipped: 2



In total, 60 countries from five continents were represented in the course: Africa (148 students), America (24 students), Asia (54 students), Australia/Oceania (2 students), and Europe (174 students).

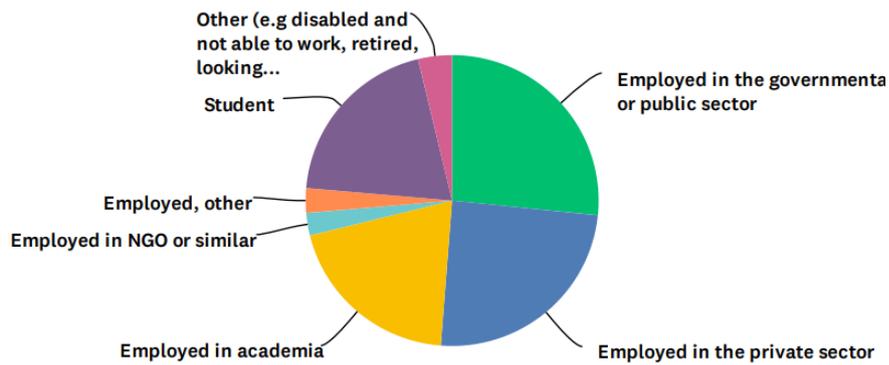
Q2 What is your gender?

Answered: 403 Skipped: 1



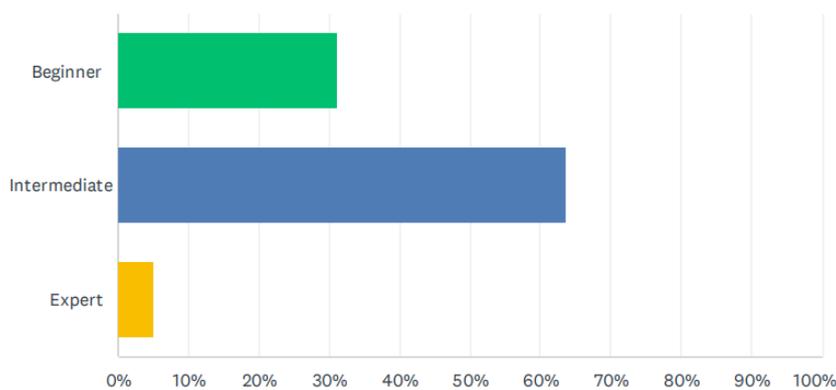
Q3 Besides taking this course, what do you do?

Answered: 402 Skipped: 2



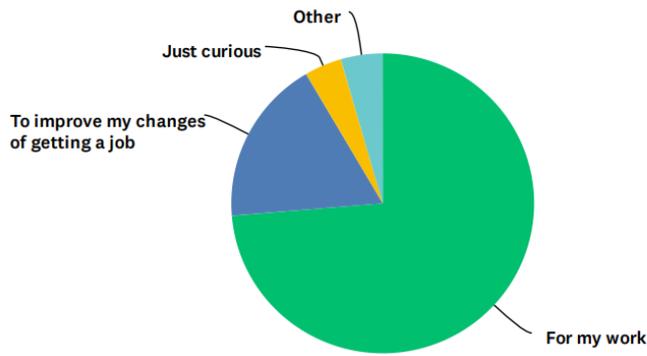
Q4 What is your current knowledge about the topic of the course?

Answered: 402 Skipped: 2



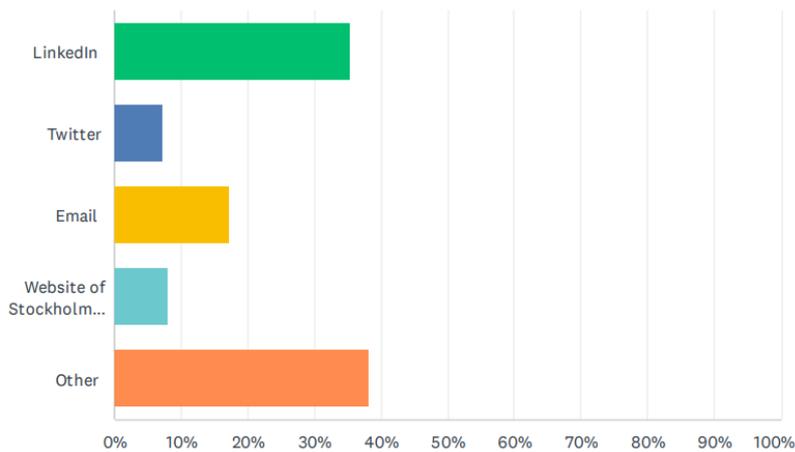
Q5 How will you use the knowledge gained in the course?

Answered: 403 Skipped: 1



Q6 How did you learn about the course?

Answered: 404 Skipped: 0



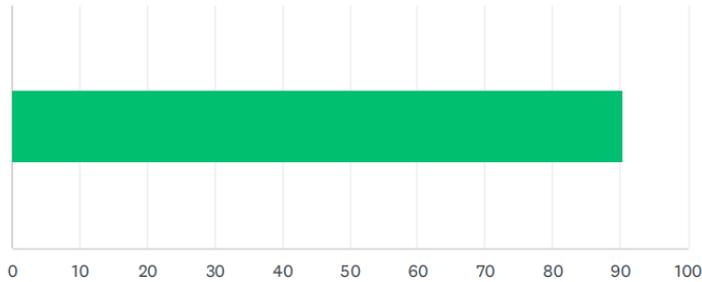
In total, 1273 email addresses were registered at the course, corresponding to a slightly smaller number of students due to several students registering twice using different email addresses. Between 348 and 713 students attended each module, the number decreasing as the course progressed. 288 students chose to complete the quizzes and provided their full names, thereby qualifying for the certificate.

Course evaluation

The course evaluation was answered by 252 students. First, they were asked to indicate agreement to four statements on a scale from 1 to 100, and then answer two open questions. This is how they replied.

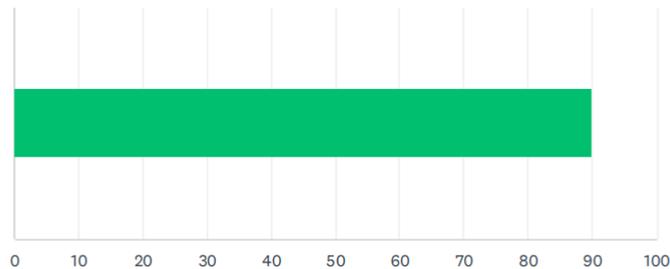
Q1 Overall, I am satisfied with the course.

Answered: 252 Skipped: 0



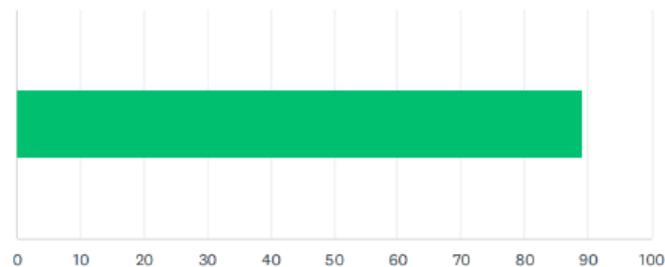
Q2 The content of the course was relevant to me for achieving the intended learning outcomes.

Answered: 252 Skipped: 0



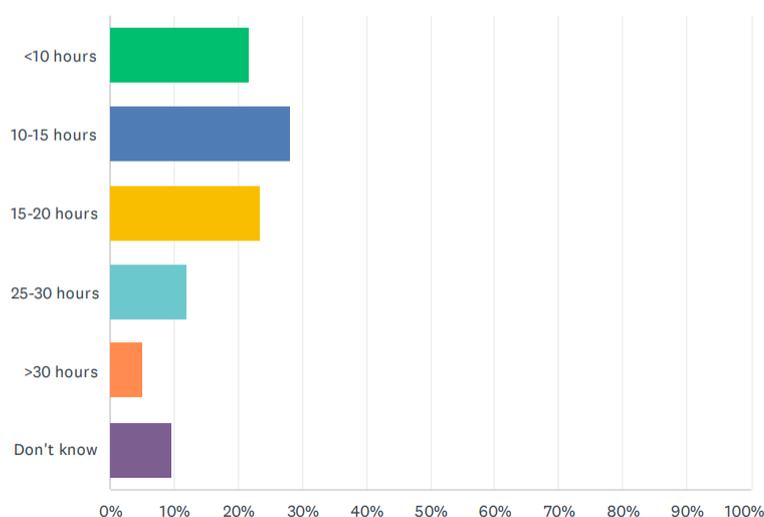
Q3 The teaching gave me good conditions to achieve the intended learning outcomes.

Answered: 252 Skipped: 0



Q4 On average, I have spent approximately the following number of hours on the course.

Answered: 252 Skipped: 0



Q5 What was the best about the course?

Answered: 207 Skipped: 45

We received written replies from 207 students, which cannot easily be summarized. Below is a selection of the replies, aimed at covering their breadth.

- The best about the course is the advocacy for a sustainable community.
- An eye-opener for me because the course was not only about chemical assessment but also putting chemical usage in a bigger picture. Thank you, I have learnt a lot.
- Great content, blended nature of the course including quizzes and practical exercises + video lectures from people working within the chemical universe.
- It's so flexible. I love it.
- It was concise, clear and easy to understand.
- The course was well-blended with scientific knowledge and policies.
- Information was pitched at a good level, the presenters were clear and easy to understand. The material was also well designed and flowed well to cover all the topics in a sensible order.
- The material resources and expert interviews were very relevant to the course.
- Giving an overarching view of the whole process. A brilliant course for new starters in Chemicals regulation (and as a refresher!).
- Clear and precise explanations of Risk Assessment calculations and Exposure rates.
- The good explanation of the topics and the several real cases.
- Probably the expert interviews. I found them very informative and eye-opening. I liked the practice quizzes too.
- There are many resources and supplementary reading materials provided.
- The lectures helped lay the foundations but the interviews helped put it into context.
- Information about further training.

- Application to real issues.
- Helping me understand key issues such as barriers to the circular economy and e-waste.
- The different material provided (e.g., lectures, interviews, reading material).
- It was free. And yet the quality was excellent, with suitable resources and references for further study.
- Overall they talked so everyone understand.
- It covered a wide range of information regarding the risk assessment of chemicals, there was interesting information even for people who are not new in this field and it was great to hear stories from experts.
- Awareness of the mercury problem.
- I loved the pedagogy behind the course development. I am aware of many of the concepts presented but it was really rewarding to get a refreshment. The presentations are well prepared. The idea of interviews is interesting and adds insight into global knowledge with practical cases. The practical quizzes are really interesting and stimulate the understanding of the concepts and indicators.
- I liked the lectures very much. They were very well structured.
- I was able to get a clear perspective on the global importance of Chemical Management and how it reduces significantly all risks relative to health and safety.
- The quiz made me study each topic hard.
- The variety of speakers and the very clear lectures. The topics were interesting and the volume of material was incredibly wide. It was good to get the recommended reading lists.
- Increased my awareness about the risks of chemicals.
- Practical approach coupled with quizzes to keep us up on our toes.
- I appreciated the structured presentations and the good lecturers. It is exactly this combination of basic knowledge and examples that is very catchy. I think it is good that the presentations were published so that they can be recapitulated later. I also appreciated the many references. Some of them refer to very voluminous works, but for people who have to develop regulations in their countries, they are very valuable. I found the interviews particularly motivating and inspiring - a perfect opportunity to learn about new perspectives and challenges. I was very impressed by how many different people participated in the interviews. The quizzes were very positive - I especially appreciated the concrete application of the calculations! For most of the participants, the fact that the course was free was certainly relevant. Thank you for a great course! I am sure it will make an impact in the future.
- The expert interviews and suggested extra reading were a nice addition, and great that the reference material was also available!
- Lectures and interviews from a range of scientists including many from the Global South are very varied and diverse.
- The simple breakdown of GHS & links to additional information.
- Possibility to repeat the quiz when we fail, and also providing explanations to the quizzes.
- I learnt useful notions in toxicology that I wasn't used to and now I know how to use formulas to calculate different risk assessment values, and finally, this course showed me the need for establishing a globally more efficient risk management system to deal with chemicals in products and in recycled items to protect our biota.
- The non-toxic circular economy is the best topic for me.

Q6 What improvements would you suggest?

Answered: 177 Skipped: 75

We received written replies from 177 students, which cannot easily be summarized. Below is a selection of the replies, aimed at covering their breadth. The most frequent replies concerned the insufficient audio at some lectures/interviews, or different versions of “no improvements are needed”.

- Give me more time to complete the course in my own time.
- Kindly make the lecture videos downloadable so that one can access them at any particular point in time even without internet requirements, especially in our land where the internet is still a very big challenge so downloading in advance can help to plan well what time to study what topic.
- Quizzes were straightforward, would be more effective to ask questions that test the application of learning rather than what could be a memory test from lectures.
- While it is good to have a global overview, the EU-related contents could be further emphasized.
- Consider including a case study for each module.
- The next course should be more interactive.
- A second course that delves into more detail ;)
- The class should be held on zoom to see the lecturers.
- Include strategies developed by developing countries.
- The pictures in the lecture slides were unfortunately not visible on my cell phone screen.
- Captions should be added to the video.
- I liked it a lot, particularly when we had to use more real-life materials - such as answering questions based on a specific paper/using the EU database, etc. so more questions based on these sorts of real-life materials would be great. I could have done it with a transcript of the main lecture videos. The delivery of these was not always the most upbeat, whereas the interviews always were very engaging. It would have been good to have an even more/harder assessment perhaps, just to 'bed' down the knowledge some more. Being new to the topic I did find that it was based on the Swedish chemical agency's expertise which would have been nice to acknowledge how they might differ from other regulators e.g. the UK/US who might take fewer protective approaches as a regulator.
- Create a forum for collaboration.
- Please kindly put other Environmental and risk management courses online too.
- Length of lecture video. It could be split into a maximum of 14 minutes for each video.
- Links to external websites like the one in the quiz for module 5 do not always work, for example when I took the quiz the EFSA website was down. Having it available as a pdf or extract would be preferred.
- More lessons.
- More information/guidance on the use of CLP to assess and classify wastes according to the chemicals identified within them.
- Have it in different languages.
- The course could be more challenging!
- I would suggest organising online live sessions where students and participants can interact, to make sure everyone is on the same page.
- More explanation in calculations.

- The calculation exercises for the practice quiz on risk characterization were a bit tricky - feels like some more examples on how to solve the exercises would have been nice since not all of the calculations were intuitive based on just the lecture.
- I do enjoy the lectures more when a video is included of the presenter.
- Transcript of the lectures in pdf.

Reflections from the course developers

The course has attracted a substantial number of students from, in total, 60 countries. In addition, there have been many requests for when the course will be held again, both from students that already registered but did not finalise the course and from students that are not yet registered. We conclude that there is an interest and a need for knowledge about the assessment and management of chemicals and that we were able to provide an introduction to this topic to students worldwide. We hope that our encouragement and suggestions to continue learning within this field even after the course is finalised have resulted in students finding other courses of relevance.

The course has been well received among students. The course evaluation is positive and encouraging. Our idea was to mix a variety of formats for teaching (i.e. pre-recorded lectures, self-assessment exercises, interviews with experts, and quizzes) and thereby counteract some of the limitations of online courses. Further, we have aimed for providing easy access to, in many cases, complex knowledge by using inclusive language and giving hands-on examples. The expert interviews were meant to provide the students with a connection to current work on the assessment and management of chemicals.

We received many useful suggestions for how to improve the course further. We aim to implement some of them, while still keeping to the same format and similar workload for the teachers. The course will be offered again in April 2023. The following improvements will be prioritized:

- Improve the audio at some of the lectures and interviews.
- Improve the instructions for the calculations during lectures, exercises and quizzes.
- Add the possibility to interact with some of the lecturers.
- Provide opportunities, and encourage the students, to interact with each other during the course.
- Potentially add more case studies and practical exercises.