

Building environmental metrology skills

The growing use of distance learning via the internet is opening up access to a diverse range of subjects to millions of students across the globe. Given metrology's crucial role underpinning many areas of trade, industry and scientific research, modules dedicated to measurement science are an effective way of improving skills to support data quality, effective process control and experimental rigour.

Europe's National Measurement Institutes working together

The European Metrology Research Programme (EMRP) brings together National Measurement Institutes in 23 countries to address key measurement challenges at a European level. It supports collaborative research to ensure that measurement science meets the future needs of industry and wider society.

Challenge

Science and engineering students and many industrial process and quality control professionals require a grounding in best measurement practices and the calculation of measurement uncertainties, in order to produce accurate, comparable data to inform decision making. This knowledge often forms part of university syllabuses but a wider appreciation across academia and industry supports greater confidence in data.

Chemists in particular often face challenging uncertainty analyses during routine procedures to test, for example, air and water quality due to the complex composition of real-world samples. Easily accessible and freely available courses disseminating best practice in measurement and uncertainty analyses in chemical analysis will help improve the skills of chemists in industry and public sector agencies as well as tomorrow's research scientists.

Solution

The Winkler titration method is used to determine the concentration of dissolved oxygen in water samples in water quality studies. It is a complicated method requiring complex uncertainty calculations if it is to be used effectively. The EMRP project *Metrology for ocean salinity and acidity* investigated the uncertainties associated with the Winkler titration method and generated a best practice method for its use. While the project was focused on assessing ocean parameters predominantly for climate change research the method for oxygen concentration has wide applicability in water quality assessments more broadly.

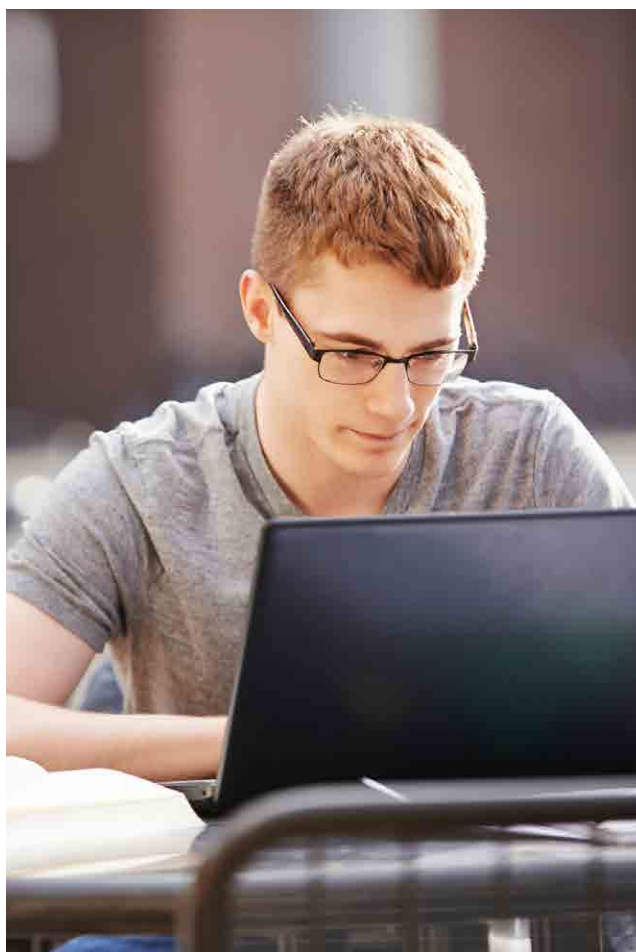
Impact

The best practice uncertainty evaluation method provided a key component of a new online course *Estimation of Measurement Uncertainty in Chemical Analysis* developed by project partner, the University of Tartu in Estonia. The course, delivered as a MOOC (Massive Open Online Course), is widely available and has not only been taken by 700 students so far but is also being used by SP, the Technical Research Institute of Sweden, to train environmental testing laboratories working towards Nordtest accreditation. Nordtest is the Nordic area conformity assessment body whose role is to harmonise compliance with standards and remove barriers to trade across the Nordic countries, which includes the accreditation of measurement and testing and conformity assessment laboratories in support of its mission: 'approved once - accepted everywhere'.

Therefore the project's outputs are not only contributing to important climate change research but are supporting the development of skills for practical and effective environmental monitoring.

Ocean metrology

The EMRP project *Metrology for ocean salinity and acidity* developed measurement methods, standards and tools to improve the measured ocean data used for climate monitoring and modelling. Focussing on both thermodynamic quantities – salinity, density, speed of sound and temperature – and chemical quantities – pH, oxygen content and composition – the project's outputs enable the traceable calibration of sensor networks and satellite systems. This will allow scientists to reliably identify small changes in long-term oceanographic data series.



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EMRP

European Metrology Research Programme
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