




---

## Chemical Society Annual Report to the EuChemS Division of Chemical Education for 2021-2022<sup>1</sup>

### 1. Abstract

Even though we still have very little man- and women-power in chemistry education in Austria, we are quite successful in initiating and organising events and continuing development programmes for Chemistry Teachers. We are active in publishing papers in German and English for teachers and scholars as well as participating in national and international conferences.

Due to the pandemic situation, some scheduled workshops could not take place in schools. The PlusLucis teacher education week in February 2022 was changed to an online mode at short notice. Additionally, we organised online teacher education workshops to give chemistry teachers the opportunity to share experiences and expertise with online teaching tools.

### 2. National educational policy

The development of new national curricula for all subjects in primary and lower secondary schools is now completed and will be implemented starting in September 2023. Anja Lembens was commissioned by the Austrian Federal Ministry of Education, Science and Research to build and lead the group for the chemistry syllabus. Aim of the new curriculum is to focus more on competencies to deal with and value knowledge than on learning and reproducing content knowledge. We decided to use the didactic model of 'basic concepts' for structuring content knowledge, competencies and skills. All textbooks will be revised and adapted to the new objectives.

### 3. Events in chemical education

Many planned events were cancelled due to the Coronavirus-Pandemia, but some could be held in person and/or online mode. For example:

- University course "FLEX-based learning"  
For teachers who teach biology, chemistry, computer science, mathematics, or physics in lower and upper secondary schools and who want to teach creative problem solving to their students using new teaching techniques.
  - Didactic concepts for the diagnosis and promotion of creative problem-solving skills
  - Concrete teaching techniques and experiments for science teaching
  - Techniques for strengthening team processes and self-efficacy

---

<sup>1</sup> June 2021 - May 2022, all levels of chemistry education: primary, secondary schools, universities, LLL, general and vocational education.

- University course "Innovative problem solving – School as a think tank of creative solutions" For Teachers, of STEM subjects at secondary level I and II, who are interested in creative techniques in order to develop innovative ideas professionally. For Teachers who face STEM challenges in school and who are committed to the Sustainable Development Goals.
  - Creativity techniques such as morphological box, stimulus word association, bisociation, etc.
  - Creative project management such as design thinking, dragon dreaming, etc.
- Kinderuni (University for Children – Science and chemistry workshops for children (age 7-12))
- Farbe, Frühjahr, Fluoreszenz – Chemie und Physik rund um farbige Ostereier und den Frühling (Colour, Spring, Fluorescence – Chemistry and physics around coloured Easter eggs and springtime – Workshop open to the public)
- SpottingScience – Eine Portion Naturwissenschaften für das Wochenende. Pop-Up-Store (SpottingScience – A dose of natural science for the weekend. Pop-up store – Workshop open to the public)
- Carbonfootbricks – Mit Bausteinen den ökologischen Fußabdruck bauen und nachhaltige Entscheidungen treffen –Tag der Naturwissenschaften (Carbonfootbricks – Building the ecological footprint with building blocks and making sustainable choices – Science Day)
- Chemietage (Chemistry days –a conference for teachers and teacher educators from Austria, Italy, Switzerland, Germany and the Netherlands)

#### 4. Activities of the National Chemical Society

?

#### 5. Publications

Since several years, we publish a journal for chemistry and physics teachers with four issues per year (PlusLucis). The working group of the Austrian Educational Competence Centre Chemistry at the University of Vienna contributes to every issue (four per year) of the chemistry teacher journal *Chemie & Schule*.

In the following publications from the University of Vienna, the Tyrolean College of Teacher Education in Innsbruck, the Upper-Austrian College of Teacher Education in Linz, the University of Salzburg and the College of Teacher Education Salzburg as well as the University of Graz are listed alphabetically.

1. Aschauer, W., Haim, K., & Weber, C. (2021). A Contribution to Scientific Creativity: A Validation Study Measuring Divergent Problem Solving Ability. *Creativity Research Journal*, 1-18.
2. Eghtessad, A. & Goreth, S. (2022). Erstellung von Videovignetten zu Schülervorstellungen. [Development of video vignettes to address students' beliefs] In: Habig, S. & van Vorst, H. (Eds.). *Unsicherheit als Element von naturwissenschaftsbezogenen Bildungsprozessen. Gesellschaft für die Didaktik der Chemie und Physik. Jahrestagung 2021.* <https://gdcp-ev.de/tagungsbaende/tagungsband-2022-band-42/>.
3. Fleischer, T. & Huwer, J. (2022): 33 Ideen Digitale Medien Chemie – Step-by-step erklärt, einfach umgesetzt - das kann jeder! [33 Ideas Digital Media Chemistry - Step-by-step explained, easily implemented - anyone can do it!]. Augsburg: Auer Verlag.

4. Fleischer, T. & Nerdel, C. (2021). Selbsterstellte Lernvideos für den Chemieunterricht – Der Zusammenhang von Stoff- und Teilchenebene [Self-created learning videos for chemistry lessons – The connection between substance and particle level]. In J. Meßinger-Koppelt & J. Maxton-Küchenmeister (Hrsg.), *Naturwissenschaften Digital – Toolbox für den Unterricht* (Bd. 1, Erweiterte & aktualisierte Auflage, p. 74-77). Hamburg: Joachim Herz Stiftung Verlag.
5. Fleischer, T., Tatzgern, M., Deibl, I. & Zumbach, J. (2021). Virtual Reality Chemielabor für Labor- und Gerätekunde [Virtual Reality Chemistry Lab for Laboratory and Equipment Science]. In S. Habig (Hrsg.), *Naturwissenschaftlicher Unterricht und Lehrerbildung im Umbruch?* (p. 741-744). Essen: Universität Duisburg-Essen 2021 (Gesellschaft für Didaktik der Chemie und Physik; 41).
6. Goreth, S. & Eghtessad, A. (2022). Das Projekt „Videovignetten in Naturwissenschaft, Technik und Textil“ (VidNuT) zur standortübergreifenden Entwicklung hochschulischer Lehrveranstaltungskonzepte. [The project "Video vignettes in science, technology and textiles" (VidNuT) for the cross-location development of university course concepts] In E. Eichelberger, V. Huber Nievergelt & A. Käser (Hrsg.), *Forschend lernen und lehren im TTG.* (p 179 - 189). Hep.
7. Guggi, J. J. & Spitzer, P. (2021): Nachhaltigkeit berechnen – Die CO<sub>2</sub>-Bilanz von PET- und Glasflaschen im einfachen Modell mit Lego®-Steinen ermitteln und vergleichen. [Calculate sustainability – Determine and compare the CO<sub>2</sub> balance of PET and glass bottles in a simple model with Lego® bricks] *Plus Lucis*, 3/2021, 30-32.
8. Haim, K. & Aschauer, W. (2022). Fostering Scientific Creativity in the Classroom: The Concept of Flex-Based Learning. *International Journal of Learning, Teaching and Educational Research*, 21(3).
9. Hofer, E., Koliander, B. & Puddu, S., (2021). Teachers' beliefs about and dispositions towards Inquiry-based Science Education, *PROJECT-BASED EDUCATION AND OTHER ACTIVATING STRATEGIES IN SCIENCE EDUCATION XVIII: Conference proceedings*. 5th-6th November 2020, Prague. Rusek, M., Tóthová, M. & Vojíř, K. (Eds.). Prague: Charles University, Volume XVIII. p. 16-25.
10. Hofer, E., Puddu, S., Abels, S. & Lembens, A. (2021). Was steckt hinter der mysteriösen Flasche? – Ein Mystery als Stimulus für Fragen beim Forschenden Lernen. [What is behind the mysterious bottle? – A mystery as a stimulus for questions in inquiry learning] In: *Naturwissenschaften im Unterricht Physik 182*. 42-46
11. Krebs, R. (2021). Content-Language-Integrated-Learning (CLIL) im Chemieunterricht. [Content-Language-Integrated-Learning (CLIL) in Chemistry lessons] In: *Chemie & Schule*. 36, 4, p. 10-12
12. Krebs, R. & Lembens, A. (2021). Developing Key Ideas to Teach 'Acids' & 'Bases' in Upper Secondary Schools. In: Rusek, M., Tóthová, M. & Vojíř, K. (Eds.). *Project-based Education and other activating strategies in science education XVIII. Conference Proceedings*, Prague. 132-139
13. Krebs, R. & Lembens, A. (2022). „Säuren & Basen“ in der SEK II – von Key Ideas zur Lerngelegenheit. [Acids & Bases" in SEK II – from Key Ideas to Learning Opportunities] In: Habig, S. & van Vorst, H. (Eds.). *Unsicherheit als Element von naturwissenschafts-bezogenen Bildungsprozessen*. Gesellschaft für die Didaktik der

Chemie und Physik. Jahrestagung 2021. <https://gdcp-ev.de/tagungsbaende/tagungsband-2022-band-42/>

14. Lembens, A., Heinzle, G., Tepla, A., Maulide, N., Preinfalk, A., Kaiser, D. & Spitzer, P. (2022). SpottingScience – a digital learning environment to introduce Green Chemistry to secondary students and the public. In: Chemistry Teacher International. De Gruyter. 1-12. DOI: <https://doi.org/10.1515/cti-2021-0025>
15. Lembens, A. & Krebs, R. & Taglieber, J. (2022). sensiMINT – Sprachsensibler Chemie- und Biologieunterricht. [sensiMINT – Language-sensitive chemistry and biology teaching] In: Habig, S. & van Vorst, H. (Eds.). Unsicherheit als Element von naturwissenschafts-bezogenen Bildungsprozessen. Gesellschaft für die Didaktik der Chemie und Physik. Jahrestagung 2021. <https://gdcp-ev.de/tagungsbaende/tagungsband-2022-band-42/>
16. Lembens, A. & Meier, M. & Lumesberger-Loisl, F. (2022). Geschlechter(un)gerechte Darstellungen in österreichischen Chemieschulbüchern? [Gender (in)equitable representations in Austrian chemistry textbooks?] In: Habig, S. & van Vorst, H. (Eds.). Unsicherheit als Element von naturwissenschafts-bezogenen Bildungsprozessen. Gesellschaft für die Didaktik der Chemie und Physik. Jahrestagung 2021. <https://gdcp-ev.de/tagungsbaende/tagungsband-2022-band-42/>
17. Lembens, A. & Nosko, C. (2021). Erfahrungen und Erkenntnisse zu chemischen Aspekten des Alltags ermöglichen. Entwicklung und Evaluation eines Materialpaketes für den naturwissenschaftlichen Sachunterricht. [Enabling experiences and insights into chemical aspects of everyday life. Development and evaluation of a material package for science teaching in primary school] In: Holzinger, A., Kopp-Sixt, S., Luttenberger, S. & Wohlhart, D. (Eds.). Fokus Grundschule Band 2. Qualität von Schule und Unterricht. Waxmann. P. 261-270
18. Nosko, C., Jaklin-Farcher, s., Reiter, K. & Lembens, A. (2022). Entwicklung und Evaluation von Materialien, zur Anregung von Sinnkonstruktionsprozessen im naturwissenschaftlichen Sachunterricht. [Development and evaluation of materials to stimulate processes of constructing meaning in science teaching] In: Habig, S. & van Vorst, H. (Eds.). Unsicherheit als Element von naturwissenschafts-bezogenen Bildungsprozessen. Gesellschaft für die Didaktik der Chemie und Physik. Jahrestagung 2021. <https://gdcp-ev.de/tagungsbaende/tagungsband-2022-band-42/>
19. Rost, M. & Knuuttila, T. (2022). Models as Epistemic Artifacts for Scientific Reasoning in Science Education Research. In: Education Sciences. 12, 4.
20. Spitzer, P. & Krumphals, I. (2022). Wie funktioniert eigentlich ein MRT-Gerät? Ein Science-Spotlight zur Funktion von MRT und Kontrastmitteln. Plus Lucis, 1/2022, 23–26.

## 6. Liaison with the chemical industry

There is no cooperation between the didactics in pre-service chemistry teacher education and industry.

## 7. International and European initiatives

The Tyrolian College of Teacher Education is coordinator of the Erasmus+ project **VidNuT**

The University of Innsbruck is the coordinator of the Erasmus+ project **sensiMINT**

The Austrian Educational Competence Center Chemistry (AECC Chemistry) is partner in two transnational Erasmus+ programmes:

- **sensiMINT** deals with language sensible teaching material for chemistry and biology. <https://www.sensimint.eu/>
- **VidNuT** develops video-vignettes to foster professional vision in chemistry, physics and technology teacher education. <https://www.vidnut.eu/>

The Upper-Austrian College of Teacher Education contributes to the following Erasmus+ programmes:

- **SchoolEducationGateways**  
[https://www.schooleducationgateway.eu/de/pub/teacher\\_academy/catalogue/results.cfc](https://www.schooleducationgateway.eu/de/pub/teacher_academy/catalogue/results.cfc)

University of Salzburg contributes to the following project:

- **EXBOX-Digital:** Development and Evaluation of Digital Experiment Boxes for Chemistry and Physics Classes. <http://exbox.uni-salzburg.at/>

## 8. Other events and activities

In June 2020 the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology established a platform for "Green Chemistry" where Anja Lembens is elected as representative for primary and secondary Chemistry Education.

Science-Spotlights at the campus of the University of Vienna (Focus: Green Chemistry)

Science-Spotlights at the Dachstein-Glacier (in cooperation with the Dachstein cable car).

[www.spottingscience.com](http://www.spottingscience.com)

Foundation of the "SCHOOL OF CREATIVE SOLUTIONS".

This is an initiative to raise the importance of science subjects by targeting these subjects to develop the creative problem-solving potential of young people. Schools receive this school label if they have teachers in their ranks who have completed the above-mentioned courses "flex-based Learning" and "Innovative Problem Solving" and actively implement their contents in the school. In June 2021, the first 10 schools across Austria were awarded the label of "School of Creative Solutions".

The College of Teacher Education in Salzburg and the University of Salzburg contribute to the following project:

- **Augmented learning lab Salzburg** <https://edtechall.at/en/home>

## 9. Name of delegate and deputy

Univ.-Prof. Dr. Anja Lembens

## 10. Contact details of delegates

University of Vienna

Austrian Educational Competence Centre Chemistry (AECC Chemistry)

Porzellangasse 4

1090 Vienna

Austria

<http://aeccc.univie.ac.at/home/>

[anja.lembens@univie.ac.at](mailto:anja.lembens@univie.ac.at)

+43 1 4277 60350

**11. CV of delegate**

<http://aeccc.univie.ac.at/ueber-uns/team/professur/user/lembena8/inum/1333/backpid/62010/>