

PhD course “Rethinking (and rewriting) Introductory Chemistry”

SYLLABUS

1 Lecturer information

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2 Title of the course

Rethinking and rewriting Introductory Chemistry

3 Course program

(150-200 words)

The aim of this course is to apply reflective writing to elaborate on General Chemistry concepts. We will cover different aspects of scientific writing, including the application of refutational texts to clear common misconceptions in Chemistry.

4 Course content detailed per lesson of two hours (possibly with dates and room real and virtual)

Lesson 1 – The role of writing in the personal elaboration of concepts.

This lesson, mainly theoretical in content, will focus on the relationship between writing as an external representational tool and thinking processes. It will conceptualise writing as an epistemic tool and relate it to learning.

Lesson 2 – Red sky at night, shepherd’s delight – discussing complex phenomena in simple terms

This lesson will address writing as a problem-solving activity. Factors influencing the correct handling of writing will be specified: genre knowledge, strategies for writing, self-regulation, awareness of the audience, etc. The Self-Regulated Strategy Development (SRSD), for writing will be presented as an evidence-based instructional approach for teaching composing across grades and genres, including persuasive/opinion, informative/explanatory, and narrative/ story writing.

Practical activity: writing with awareness (explaining a scientific phenomenon, adjusting the text according to the characteristics of the audience).

Lesson 3 – How to ice skate – clearing common chemical misconceptions

This lesson will aim to raise awareness of the potential of refutational text to combat scientific misunderstanding and to promote conceptual change. Introductory Chemistry concepts are often flawed with misconceptions, which can be blatant or subtle, therefore it is a perfect playground for experiencing refutational texts.

Practical activity: Write a refutational text about a chemical misconception of choice.

Lesson 4 – Bridges between argumentative writing and science learning.

The aim of this lesson will be to introduce the link between argumentation and scientific thinking. Specifically, we will work on reflective and deliberative writing to combat one-side reasoning; a cognitive bias that often occurs in relation to socio-scientific topics.

Practical activity: Choose a controversial socio-scientific issue and write an argumentative essay that integrates the competing perspectives.

5 Suggested reading

<https://xkcd.com/archive/>

<https://what-if.xkcd.com/>

Asterhan, C. S. C., & Resnick, M. S. (2020). Refutation texts and argumentation for conceptual change: A winning or a redundant combination? *Learning and Instruction*, 65, 101265. <https://doi.org/10.1016/j.learninstruc.2019.101265>

Bricker, L. A., & Bell, P. (2008). Conceptualizations of argumentation from science studies and the learning sciences and their implications for the practices of science education. *Science Education*, 92, 473–498. <https://doi.org/10.1002/sce.20278>

- Carvalho, J. B. (2002). Developing audience awareness in writing. *Journal of Research in Reading*, 25, 271–282. Portico. <https://doi.org/10.1111/1467-9817.00175>
- Harris, K. R., & Graham, S. (2016). Self-Regulated Strategy Development in Writing. *Policy Insights from the Behavioral and Brain Sciences*, 3, 77–84. <https://doi.org/10.1177/2372732215624216>
- Menary, R. (2007). Writing as thinking. *Language Sciences*, 29, 621–632. <https://doi.org/10.1016/j.langsci.2007.01.005>
- Klein, P. D., & Boscolo, P. (2016). Trends in Research on Writing as a Learning Activity. *Journal of Writing Research*, 7, 311–350. <https://doi.org/10.17239/jowr-2016.07.03.01>
- Oatley, K., & Djikic, M. (2008). Writing as Thinking. *Review of General Psychology*, 12, 9–27. <https://doi.org/10.1037/1089-2680.12.1.9>
- Tippett, C. D. (2010). Refutation text in science education: a review of two decades of research. *International Journal of Science and Mathematics Education*, 8, 951–970. <https://doi.org/10.1007/s10763-010-9203-x>
- Zengilowski, A., Schuetze, B. A., Nash, B. L., & Schallert, D. L. (2021). A critical review of the refutation text literature: Methodological confounds, theoretical problems, and possible solutions. *Educational Psychologist*, 56, 175–195. <https://doi.org/10.1080/00461520.2020.186194>

6 Learning Objectives

1. To know the fundamentals of writing as a representational tool for epistemic purposes.
2. To know the factors that determine good writing praxis (both linked to the context of the task and to the cognitive and affective functioning of the subject who writes).
3. To apply the principles of correct writing to the learning and explanation of concepts related to the area of chemistry.
4. To know the principles of refutational writing and its potential to promote conceptual change in science.
5. To apply refutational writing to promote conceptual change related to concepts in the area of chemistry.
4. To know the potential of argumentative writing for learning content related to the area of science.

5. To apply argumentative writing to inquire into socio-scientific dilemmas and construct informed opinions.

6. To develop a positive attitude towards writing as a fundamental and transversal competence in all areas of knowledge.

7 Knowledge and Skills to be acquired

Improving consciousness about the role of writing in learning; improving dissemination and communication skills

8 Prerequisites

None

9 Teaching Methods

MODE 1 - Pre-recorded lessons uploaded on the moodle platform (a meeting must be organized with PhD students in order to clarify eventual doubts)

x MODE 2 (preferred) - Lessons delivered in-person and in remote with simultaneous recording by the WEBEX platform

(The lessons must be recorded and available to all the students that cannot take part to the lessons in streaming. The Webex platform must be used. All course content should be uploaded to the Moodle platform on the Chemical Sciences PhD page “Courses and Seminars of the PhD in Chemical Sciences 2021-2022”)

10 Further information

11 Type of Assessment

The final evaluations will have to be validated maximum 1 month after the end of the course

Lessons 2, 3 and 4 will be divided in lectures and writing sessions, and will be evaluated during the course.

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12 Period

Lessons are planned for the second semester.