Learning progressions and teaching sequences in chemistry education

You are invited to submit contributions to the *Chemistry Education Research and Practice (CERP)* special themed issue on learning progressions and teaching sequences in chemistry education, scheduled for publication in autumn 2018.

Chemistry Education Research and Practice

CERP is the international peer-reviewed research journal for teachers, researchers and other practitioners in chemistry education, published by the Royal Society of Chemistry (RSC). The editor is Prof Keith S Taber, University of Cambridge, UK.

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Students' learning development has been researched for decades in several traditions, including Didaktiks and teaching experiments, theory of mind and metacognitive development, conceptual change and epistemology, and sociocultural development. Insights from these lines of research have contributed to a surge in the past decade of research on learning progressions and teaching sequences.

Learning progressions are generally defined as hypotheses of pathways of learning over an extended period of time (eg years) that can be validated empirically. Teaching sequences are plans for instruction that guide learning through intended pathways. While the entry points of studying learning progressions and teaching sequences may differ, they share the goal of tackling large concepts fundamental to the domain – in our case, in chemistry. They intersect in at least two important ways: it is assumed some learning pathways are better than others, and the assessment of learning is tantamount to validating proposed models.

There has also been considerable criticism of research on learning progressions and teaching sequences. Critics have pointed out learning is complex, therefore difficult to reduce to linear, monotonic growth; learning is idiosyncratic, therefore inextricably tied to context; learning is not separable from epistemological beliefs or affects, therefore demands attention to these; and learning depends on instruction, therefore the variety in teachers' own content knowledge, beliefs about instruction, and assessment stances needs to be taken into account.

This themed issue intends to illustrate the bandwidth of research on learning progressions and teaching sequences in the domain of chemistry, varying across educational levels, and focusing on a variety of aspects relevant to these areas of study. Together, the papers can offer perspective on both advantages and pitfalls in the construction of learning pathways in chemistry and approaches to the assessment of learning in chemistry that make possible the validation of models that can advance chemistry education.

Possible topics may include, but are not limited to:

- Design-based cycles involving various stakeholders in developing learning progressions and teaching sequences (eg participatory action research cycles)
- Comparisons of different developmental patterns of learning (eg linear v recursive)
- Incorporation of pedagogical and structural features associated with the learning environment (eg epistemology, teachers' assessment stances) into the design and study of learning progressions and teaching sequences
- Qualitative and quantitative analytical methods for addressing idiosyncrasies and variety in learning pathways

- Teaching experiments to foster students' abilities to reason in different contexts in learning pathways
- Theoretical and methodological treatments that address aspects (eg granularity, scope) of the usefulness of the products of these research efforts

Articles should:

- Align with the principles and quality criteria of the journal[1]
- Provide an argument for new knowledge supported by careful analysis of evidence
- Be situated in existing literature, and either report the meaningful analysis of carefully collected research data or the rigorous evaluation of innovative practice

Guest editors

The guest editors for this themed issue are:

- Hannah Sevian (Department of Chemistry, University of Massachusetts Boston, US)
- Sascha Bernholt (Leibniz-Institute for Science and Mathematics Education, University of Kiel, Germany)

Submission of manuscripts

Manuscripts should be submitted in the format required using the ScholarOne online manuscript submission platform.

General guidance on whether the theme of a contribution falls within the scope of the journal may be found in a published editorial.[2] Enquiries concerning the suitability of topics of potential contributions for the theme issue should be sent directly by email to one of the theme editors: Hannah Sevian (hannah.sevian@umb.edu) or Sascha Bernholt (bernholt@ipn.uni-kiel.de).

Acceptance and publication

Manuscripts should be submitted by **Monday 15 January 2018** to be eligible for consideration in the theme issue. All manuscripts will be subject to editorial screening and peer review. Manuscripts received after the deadline may still be considered for the theme issue, but the usual peer review process will not be compromised to reach decisions on publication. If such articles are accepted for publication too late to be included in the theme issue, they will be included in a subsequent issue.

As with other *CERP* contributions, articles intended for the theme issue will be published as advance articles online as soon as they have been set and proofs have been checked, ahead of publication in the theme issue itself. Authors also have the option of accepted manuscript publication, where a pdf of their accepted manuscript is published immediately after acceptance (to be substituted by the professionally set and proofed copy once available).

[1] K S Taber, *Chem. Educ. Res. Pract.*, 2012, **13**, 4 (DOI: 10.1039/C1RP90058G)
[2] K S Taber, *Chem. Educ. Res. Pract.*, 2013, **14**, 151 (DOI: 10.1039/C3RP90003G)