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## REFLECTION

# Identifying research foci to progress chemistry education as a field

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### KEYWORDS

CER;  
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**Abstract** Chemistry education is now increasingly seen as an academic field of scholarship in its own right. This article suggests two important principles to be taken into account when considering the question ‘What should be the key foci for chemistry education research (CER)?’. The first of these applies a typology that divides research into chemistry classrooms as inherent (‘essential’), embedded (‘entangled’) or collateral (‘incidental’), according to the extent to which the research is conceptualised in terms of issues that arise in teaching and learning the specific subject matter of chemistry. It is important for the development of the field that inherent CER is particularly encouraged. The second principle relates to what makes a field scientific. Here it is suggested that research needs to have a programmatic nature so that the field does not just accumulate more studies, but is seen to progress by allowing new researchers to effectively be inducted and then build upon existing work.

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### PALABRAS CLAVE

Investigación en  
educación química;  
Educación química  
como campo;  
Programas de  
investigación

**Identificando los enfoques de investigación para que la educación química progrese como un campo de estudio**

**Resumen** La educación química se está estableciendo como un campo académico con su propia identidad y características. Este artículo sugiere dos importantes principios que deben tomarse en cuenta al hacer la pregunta: ¿cuál debería ser el enfoque de la investigación en educación química (*Chemical Education Research*)? El primer principio aplica una tipología que divide la investigación en las clases de química como inherente («esencial»), incrustada («involucrada»)

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o colateral («incidental»), de acuerdo con el grado en el que la investigación se conceptualiza en términos de asuntos que surgen en la enseñanza y el aprendizaje de contenido específico en el área de la química. Para el desarrollo del campo de la educación química es importante que se favorezca la investigación en educación química clasificada como inherente. El segundo principio se relaciona con qué es lo que hace que un campo sea científico. Aquí se sugiere que la investigación necesita tener una naturaleza programática, de forma que el campo no solamente acumule más estudios, sino que progrese al permitir que los nuevos investigadores sean inducidos al campo y construyan sobre el trabajo existente.

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This invited article addresses the question of ‘What should be the key foci for research studies in chemistry education?’ It is not suggested that any academic field should be regulated in the sense of people being told what to research and study – a field must evolve according to the research interests and concerns of its community. However, the research of individuals and groups is inevitably subject to influences that channel their work. Senior colleagues’ views, editorial policies, referee opinions, funding body priorities, supervisor and mentor opinions, and so forth, will impact upon decisions about what to research, and how to go about it, especially those made by younger colleagues entering a field.

It seems important therefore that the scholarly chemistry education community engages in debate about how it understands the field of chemistry education so that dialogue and considered reflection, rather than simply personal hunches, inform how the field, and its priorities, are presented to new researchers. It is intended that this article will make some modest contribution to such a conversation among colleagues.

This seems a good time for such a conversation to be encouraged. Chemistry Education is developing its presence internationally and is becoming widely recognised as a research field with its own character and identity. Such a progress is inevitably a gradual one, but just as science education slowly established itself as an international research field (Fensham, 2004), so chemistry education is increasingly being seen as more than just a part of science education (Gilbert, Justi, Van Driel, de Jong, & Treagust, 2004). Chemistry education research (CER) will rightly remain located within science education research (SER), and indeed within the wider field of educational research (ER) – but needs to be understood as something more than just those SER studies that concerns chemistry education.

This is important if we consider the motivation for recognising a specialised field, one which responds to pressure from both the practitioner and the academic sides. In some countries chemistry teachers are just chemistry teachers and do not usually teach other subjects. From that perspective, conferences and publications about chemistry education seem justified, even if they simply represent any ER carried out in chemistry teaching and learning contexts. In other countries (such as England, my own country) the main school curriculum subject is science, and in most schools there are science teachers teaching chemistry who

are not just teachers of chemistry. Chemistry specialists will often teach outside chemistry, and indeed, in many schools at least, chemistry topics will often be taught by science teachers who are not chemistry specialists. In such curriculum contexts, the need for a specific field of CER may seem less obvious.

The article starts by considering the issue of publishing articles in the international research literature, and why a paper might be considered as specifically CER. This leads to the discussion of a simple typology of three different levels of CER. This is used to argue for the importance of encouraging research into foci that are essentially – intrinsic to – CER, and indeed establishing research programmes around such inherent CER foci.

### What makes a research manuscript count as SER, or CER?

Academics are often under pressure to publish in journals considered ‘academic’ rather than professional (although it might be argued that the best journals are those that cross over between the communities of researchers and classroom practitioners). Referees for prestigious research journals that can only publish a minority of submitted material will sometimes recommend rejection of a manuscript on the basis of it being too specialised. In the case of the top science education journals, authors may be told that their contribution was of too narrow interest for a general science education journal and they should look to find a more specialised journal – perhaps a chemistry education journal.

This argument, by itself, seems a little dubious considering the articles that do get published in such journals – many are based on research undertaken in a specific context: a particular national system, a particular phase of education, a particular science topic (i.e. usually a topic that is clearly from chemistry, or is part of biology, or physics, or geology etc.). This might suggest that referees recognise particular areas of research as inherently CER (and others as inherently physics education research, etc.) and others as more general SER. However, if so, the criteria for something being at core CER rather than SER are seldom made clear and therefore are presumably tacit. Scientists, students, and educational researchers, all draw heavily on implicit knowledge (Brock, 2015; Taber, 2014c) – but within a research community it is more helpful if evaluative criteria can be made explicit.

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