Case Study
Development as a Learning Strategy for Senior Chemistry Students

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Who are we serving?

- Many students enter with little understanding of what chemistry is.
- Many students taking chemistry courses are there “because they have to” for their degree.
- Those who do choose a chemistry degree often do so because ‘it was their best mark in high school’.

A traditional approach to teaching chemistry

Teach the models and theory (equations, structures, patterns, lists)

Demonstrate the chemistry

Put chemistry in context

“ You can’t teach electronic spectroscopy without first understanding dipoles. Moments are atoms!”

Chemistry at King’s

Rich context learning:

Teach from the context rather than from the content.

Context of the chemistry

Observe the chemistry

Teach the models and theory (equations, structures, patterns, lists)

What makes scientific learning engaging and relevant?

‘Active learning’
‘Relevance to student’s lives’
‘Independent learning’

Social and environmental responsibility

Scientific intuition

Professionalism: communication, teamwork, organization

Independent and critical thinking

Skills and content knowledge

‘ You can’t teach electronic spectroscopy without first understanding dipoles. Moments are atoms!”

Case studies: a tool for rich context learning

“Cases are stories with a message. They are not simply narratives for entertainment. They are stories to educate.”


Case studies have become a dominant teaching tool in schools of law and medicine.

Rich context learning: case studies in medicine

Teach from the context rather than from the content.

- Context of the chemistry
- Patient
- Observe the chemistry
- Observe the symptoms
- Teach the models and theory
- Reach the physiology, disease behavior, etc.

ie. PBL at U of A

Using case studies in introductory chemistry

2 Building Blocks of Materials

Outline
- A. Family Relations: The Chemistry of Drugs in Sport
- B. Chemical Reactions
- C. Nuclear Reactions
- D. Nuclear Levels of Nucleons
- E. Nuclear Reactions
- F. Choosing the correct answer to answer a question
- G. Choosing the correct answer to answer a question
- H. Choosing the correct answer to answer a question
- I. Choosing the correct answer to answer a question
- J. Choosing the correct answer to answer a question
- K. Choosing the correct answer to answer a question

2.3 Case Study: False Position? The Chemistry of Drugs in Sport

In 1960, Hugh Howes, the owner of the nursery gardeners, found a flower that never blossomed. He decided to cut it when he was told to do so. However, when he was told to do so, he discovered that it was a flower that never blossomed. He decided to cut it when he was told to do so. However, when he was told to do so, he discovered that it was a flower that never blossomed.

What makes scientific learning engaging and relevant?

The Cone of Learning as first developed by Dale, was revisited by Lord in 2007. The application to case study education comes from Herreid.

Herreid, C.F. “What’s Next for Case Study Teaching in Science?” 2011 Spring ConfChem: Case-Based Studies in Chemical Education.

A challenge and an opportunity

If students are exposed to rich context learning in first year, they come to expect it in senior years. The students are equipped to see chemistry in context.

Goals of case study development

- Have students learn through independent development and teaching.
- Have students think about the way science is taught.
- Improve students written and oral presentation skills.
- Develop deep and lasting knowledge about an area of chemistry.
Case study development as a tool for learning

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Project design

First lab period: What is a case study?
Sept 17: Select a topic and write a 1 page summary
Oct 1: Outline of the case study and chemistry along with a list of references
Oct 22: Draft 1 due
Oct 27: Presentations
Nov 12: Draft 2 due
Nov 26: Final Draft due

What is a case study?

A good case tells a story.
A good case focuses on an interest arousing issue.
A good case is set in the past five years.
A good case includes quotations.
A good case creates empathy with the central characters.


Choosing a topic

Historical Issue Idea

Learning objectives: What context and content will you teach

Technique Compound Discovery

Writing

Your case study must show that you have done some independent research into the area you choose. It must contain a chemical theme that serves to highlight an important concept in inorganic chemistry. There is no page limit but anything less than 10 pages will most likely not be adequate. There are many great resources available in the library and many books dealing with interesting topics. It is expected that you create your own case study based on books, journal articles and texts. Online resources and other case study books may be used to guide you but you must show unique research in the scientific literature.

Presenting Peer reviewing Editing

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Presenting Peer reviewing Editing
The case studies

- Class of 8, 2nd and 3rd year students (1 Environmental studies, 1 Biology, 6 Chemistry)
- Focused on inorganic chemistry
- Designed for first year students
- Formatted into booklets with story, content, questions, examples.

Photography and creation of black-and-white, color, and digital images

- Photochemistry, molecular orbital theory, energy levels

Neil Bartlett's discovery of the reactivity of noble gases

- Noble gases, electronegativity, VSEPR, and ionization energies

Industrial chemistry, manufacturing processes, chemical engineering

- Acid and base chemistry

Arsenic poisoning in Bangladesh

- Speciation, chemistry of arsenic, biological chemistry
Stereochemistry, chirality and 3-dimensional chemistry

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Did we achieve rich context learning?

“I loved this class we learned all sorts of diverse types of chem. And I will probably retain the knowledge I have learned for my entire life – I loved this class!”

“Liked the case study assignment.”

“Writing the case study as well as the group presentations really helped to immerse myself in the content of the course.”

Also thanks to...

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