Flexible and Flipped Delivery Modules for First-Year Chemistry

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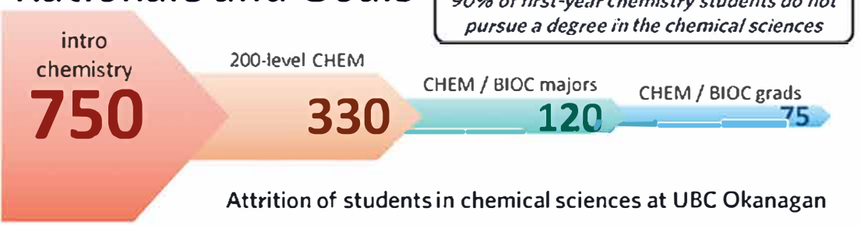
Rationale and Goals

90% of first-year chemistry students do not pursue a degree in the chemical sciences



Attrition of students in chemical sciences at UBC Okanagan

An introductory chemistry course should:

- teach a *last* chemistry course, not a first one
- prepare scientifically-informed, critically-thinking citizens
- explain relevance of chemistry to global and societal issues[1]

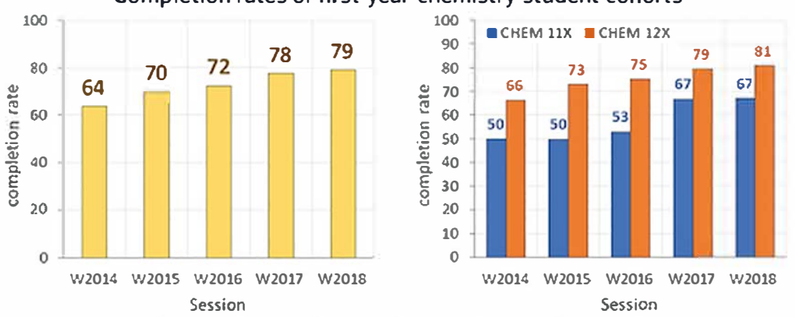
Impact on Curriculum

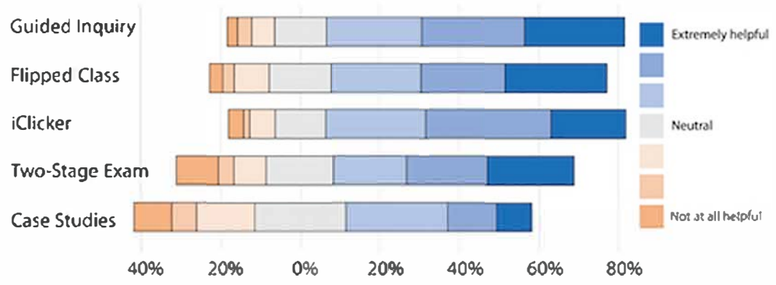
- revised objectives / concepts / topics for CHEM 11X/12X
- explicit cognitive and affective learning objectives
- thematic context of UN Sustainable Development Goals[2]

Impact on Student Learning

- learning modules used with > 6500 students since 2016
- 2015 – 2019 overall success rates +23%, among CHEM 11X students (with CHEM 11 entry) +34%
- student perception of conceptual learning favourable for all module formats

Completion rates of first-year chemistry student cohorts

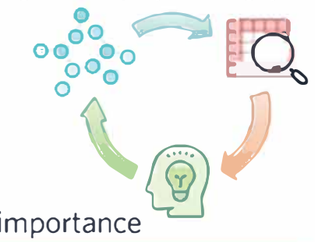




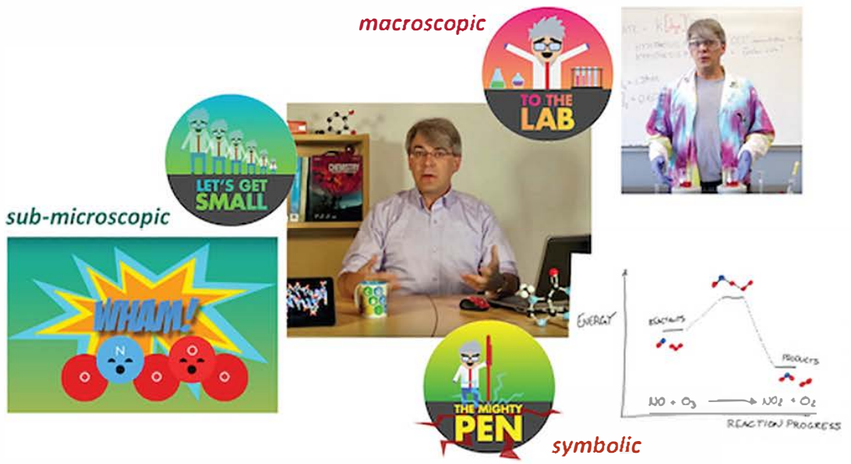
Student responses to prompt "Rate how you believe [specified set of course activities] has helped you to understand and apply the concepts in this course".

Impact on Teaching Practice

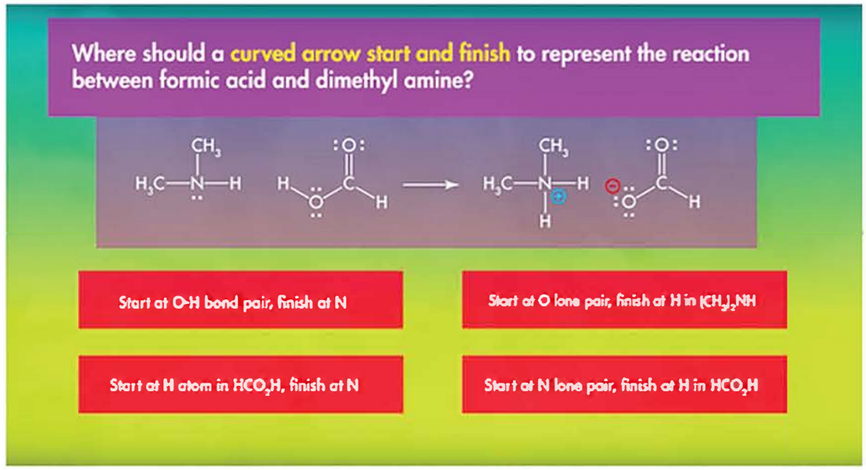
guided-inquiry learning cycle



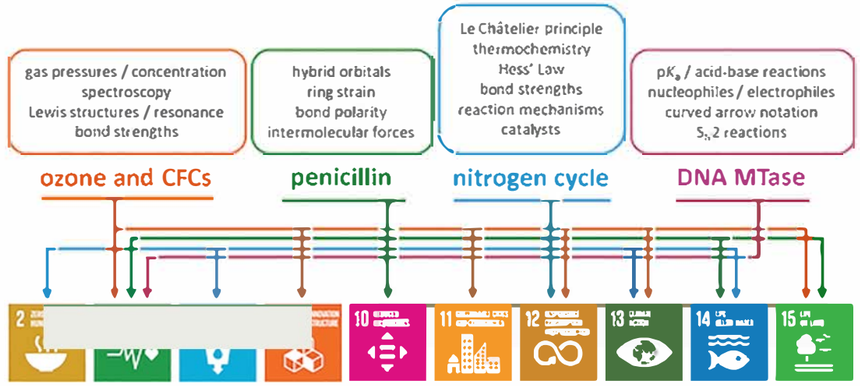
- developed 16 large-class active- and peer-learning activity modules in different formats[3]
- *guided inquiry modules*: foundational concepts students develop / apply themselves with scaffolding, in cycles of exploration, invention, application[4]
- *flipped modules*: challenging concepts in H5P interactive instructional video, students apply in class[5,6]
- *context studies*: application of multiple course concepts to a topic of societal / environmental / biological importance



Sample images from flipped module instructional videos



Example interactive video question using HTML5 Package (H5P)



Course topics applied in context study activities with applications to UN SDGs

Outcomes and Future Work

- 2 publications[2,7] and >20 conference presentations / workshops, 4 further publications forthcoming
- UN SDGs as thematic framework promotes affective learning
- H5P interactivity in instructional videos improves student cognitive learning and engagement
- dramatic improvement in student completion rates
- Open Educational Resource grant will be used to develop and disseminate open access versions of all learning modules

References / Bibliography / Acknowledgements

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