The Molecule Project: Linking Concepts in a One-semester GOB Course

Laura Frost
Department of Chemistry
Georgia Southern University
Statesboro, GA

Background: Reforming the GOB Course at Georgia Southern

One-Semester Integrated GOB Curriculum
- Cover organic functional groups early (after T1)
- Cover organic chemistry topics in the context of biochemistry
- De-emphasize stoichiometry, e- configuration, and quantum numbers
- Cover measurement and unit conversion in lab (2 pds.)

Other
- Recitation Sessions at beginning of lab session
- Molecule Project


The Molecule Project

Students receive the name of a biologically active molecule during the first week of class. By the end of the semester they must generate a report that includes the following:

- The molecule’s Lewis structure
- The molecule’s organic functional group(s) and chiral centers
- A color, three dimensional perspective ball-and-stick model of the molecule computer generated
- A statement predicting of the molecule’s solubility in water
- A summary of the molecule’s biological function including at least one chemical reaction in which the molecule is involved
- References to any materials used to compile the report
Goals of the Molecule Project
- Apply knowledge covered during the course to their individual molecule
- Think about more complex topics earlier in course
  - Enhanced learning of topics
  - Linking topics together in a meaningful way
- Understand the relevancy of chemistry to life
- Appreciation of chemistry

Student Feedback - Instrument
- Did they think they learned anything from the molecule project?
- Could they make connections between topics?
- Was there an enhanced appreciation for chemistry as a result of the molecule project?
- Student Assessment of Learning Gains (SALG) survey
  - Five point Lickert scale: 1-5 where 1 is not much, 5 very much
  - [http://www.wcer.wisc.edu/salgains/instructor/](http://www.wcer.wisc.edu/salgains/instructor/)

Student Feedback - Parameters
- Surveys given during F'05 and Sp'06
- 3 different professors (all did Molecule Project)
- 4 sections
- ~140 students
- ~80% of students / section responded to survey
Did students think the molecule project enhanced their learning?

“How much did (the molecule project) help your learning?”

3.58 ±1.14  
N=141

Conclusion: Students felt that the molecule project was moderately helpful to their learning.

Did students remember what they learned?

“How much of (your molecule) do you think you will remember and carry with you into other classes or aspects of your life?”

3.73 ±1.1  
N=140

Conclusion: Students felt that they will remember a lot about the molecule project as they advance.

Could students link the class concepts in a meaningful way?

“To what extent did you make gains in (being able to tie multiple concepts together to understand several aspects of a single molecule) as a result of what you did in this class?”

3.77 ±1.02  
N=139

Conclusion: Students felt that they made a lot of gains in tying together concepts to understand a single molecule.
Could students link the class concepts in a meaningful way?

“The molecule project was useful for making connections between material throughout the course.”

Scale: 1-5 where 1 is strongly agree, 5 is strongly disagree

2.02 ± 0.97
N=142

Conclusion: Students agreed that the molecule project was useful for making connections between material presented in the course.

Does Instructor Matter?

For statements presented, the responses were subjected to Chi Square test.

No!

The distribution of responses was independent of instructor

Student Comments on the Molecule Project - Analysis

- Number of Responses
  \( N_{\text{TOTAL}} = 142 \)
  \( N_{\text{NO RESPONSE}} = 88 \)
  \( N_{\text{RESPONSE}} = 54 \)

- Tone of Comment (N=54)
  Positive Responses = 32 (59%)
  Negative Responses = 9 (17%)
  Neutral Response = 13 (24%)
Student Comments – Linking Concepts

“It was interesting to see how our understanding of our molecule increased as we learned more of the course material.”

“The project tied in information that was learned in the very beginning of class until the end. Doing the project helped a lot in refreshing my memory and hopefully will stick with me during the exam.”

“Strangely enough, I actually enjoyed the molecule project because I was able to tie all the material together for one major project I was solely responsible for. It was neat to see how certain topics we discussed in class related to my specific molecule.”

Student Comments – Appreciation of Chemistry

“I felt the molecule project provided me with insight to how my drug, ibuprofen, worked in my body. This information will be useful to me as a nurse and a mother someday.”

“It helped me understand a lot about how the Human body works in general because of all the research I had to do for my molecule”

“It allowed me to know more about something that was very common to me and that I use often.”

Considerations for Implementation

- Molecule Selection
- Grading of Projects
  - For large classes, grading papers can get time consuming!
  - Some previous knowledge of molecules greatly reduces grading time.
Conclusions

- The molecule project is helpful for enhanced student learning.
- The molecule project is helpful for linking class concepts together in a meaningful way.
- The molecule project is a memorable experience; some students even implied it enhanced their appreciation for chemistry.
- Student response to the molecule project was independent of instructor.

Acknowledgements

Todd Deal, Dept. of Chemistry, GSU
Karen Welch, Dept. of Chemistry, GSU
Faculty Development Committee, GSU
Department of Chemistry, GSU

References
