Inquiry Based Textbook Instruction

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Joseph Black Scottish Physicist and Chemist

"Imagining that their own Capacity is inferior to the ordinary rate, they suffer themselves to sink into a dispirited inactivity. But did they know the difficulties and labours the greatest men have struggled thro' in their first advances, they would find their own case to be in no way particular."

Research Questions

- How did the students perform on quizzes using Traditional vs Inquiry Texts?
- What did students dislike about Inquiry Texts?
- What did students like about Inquiry Texts?

Research Design

- 2 classes, 42 total students
- All students
  - read texts
  - complete reading guide
  - take quiz
- 6 students interviewed 3 times

Texts

- Chemistry by Addison-Wesley
- Introduction to Chemical Principles by Peters and Kowerski
- KMT Handout by Alice Putti
- Inquiry Text by Sarah Toman

What does my Inquiry Text look like?

- Discusses Scientists in their historical context

Dunbar, R.E., *Historical Materials in College General Chemistry Textbooks*, Journal of Chem Educ. 1938, 183-186.

- Displays Scientist's original (or similar) data

Foster, L.S., Why not Modernize the Textbooks also, Journal of Chem Educ. 1939, 409-412.

- Allows students to find patterns in the data

Mahaffy, P.G., Breathing Life into Chemists, Journal of Chem Educ. 1995, 767-773.

- Allows students to create an algorithm to fit the data

Charles' Law

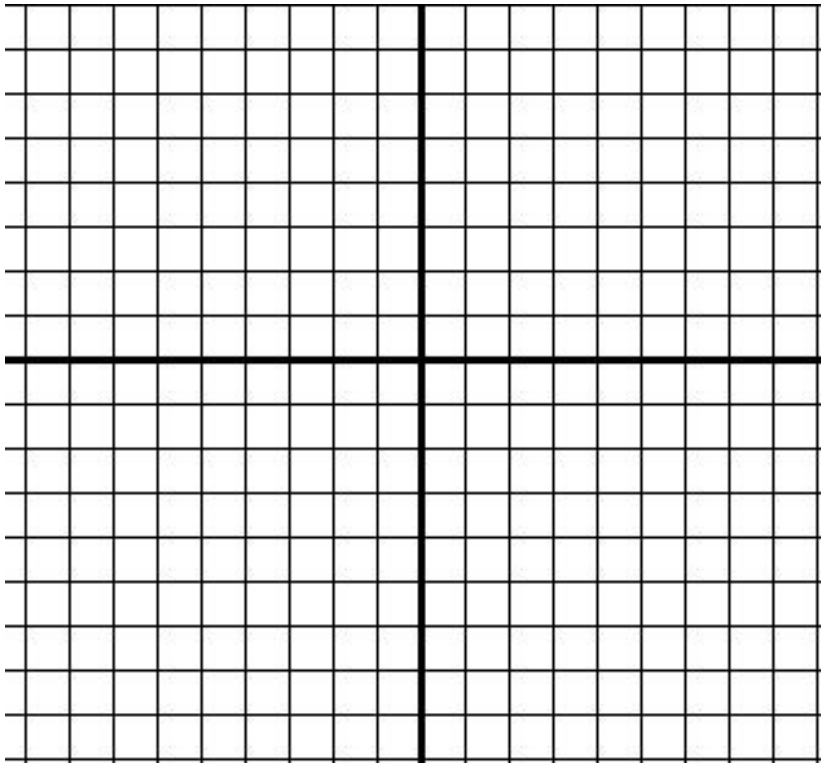
Figure 12.4
August 27, 1783,
Charles' first balloon

You may have heard of the Hindenberg,
the hydrogen gas filled balloon that
exploded over New Jersey in 1937,
but do you know who made the first hydrogen filled balloon?
Jacques Alexandre Cesar Charles in 1783,
he flew the balloon over Paris and sadly,
the peasants were so scared they destroyed the balloon.
Yet, Charles continued to study gases, particularly
the relationship between temperature and volume.

Figure 12.5
Jacque Alexandre
Cesar Charles

Charles' Law

Volume (mL)	Temperature (°C)
440	2
500	42
610	108
675	150



Charles' Law

- Is there a graphical relationship between volume and temperature?
- Is there a mathematical relationship between volume and temperature?

Quiz Scores

Text	Quiz Score								
	Measurement	Problem Solving	Atomic Structure	% Comp	Stoich-iometry	KMT	Gas Laws	Covalent Bonding	Solutions
Addison-Wesley	4.2	4.3	4.4		4.0			4.3	4.3
Chemical Principles				4.5					
KMT Handout						3.8			
Inquiry Text							3.7		

Was there anything you did not like about chapter 12 (Gas Laws)?

- “I guess all the questions kind of seem the same to me.”
- “I don’t like reading the text and then answering the question like while you’re reading it I find that kind of confusing.”

Would you like to have a whole textbook where you fill in the graphs and then see what is going on?

- “I didn’t like graphing cause like I said it was sort of hard to get the x and y values.”
- “The graph and the charts kind of showed you the information where as our text book, I think just gave an example. “
- “Yes because it might be good to get the examples like pounded into you. No because it would be time consuming.”

Was there anything you did like about chapter 12?

- “I think it [the history] gave you depth to the article.”
- “I like it because like the one with the small handout only had examples, the one with just the paper only talked about it but this has like examples and it talks about everything.”
- “These examples they didn't just like show you what you did, you actually had to do it.”

Was chapter 12 different from the other chapters we read?

- “I like it cause like you kind of have to read the material to understand the answers cause you have to you don't know where the question is.”

- “I like how it gave you little other things like little bits of like how gas balloon exploded over new jersey, it tells a story.”

Conclusions

- How did the students perform on quizzes using Traditional vs Inquiry Texts?
  - **Students learned as much using this method compared to traditional methods.**
- What did students dislike about Inquiry Texts?
  - **Students do not appreciate repetitive work.**
- What did students appreciate about Inquiry texts?
  - **Students recognize when they are doing their own work.**

Future Work

- Write another piece to pilot in the classroom.
- Continue discussing the text with students.

Acknowledgements

- Dr. Sherril Soman
- Dr. Deborah Herrington
- Dr. Ellen Yezierski
- Target Inquiry Colleagues
- The Camille and Henry Dreyfus Foundation “2005 Special Grant Program in the Chemical Sciences"
- National Science Foundation (ESI-0553215)

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Questions??