Teaching Inquiry the Backwards Way

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General Inquiry Information
Inquiry

Students writing their own procedures

Guided inquiry

Open-Ended Inquiry
Benefits of Inquiry

- Students doing science
- Applying practiced techniques to new situations
- Understanding of “why”
- Student interest/motivation
- Students taking part in their learning
- Students learning they have valuable thoughts and ideas
Reasons that stop teachers from using Inquiry

- Takes more time
- Student complaints
- Loss of control
- Safety concerns
- Lack of knowledge of how to teach it
When not to use Inquiry

- When it’s not safe
- When students don’t know the underlying techniques
- When it’s “copycat” inquiry
Students are clueless!
Do your students do these things?

- Stare at a blank paper or ignore the assignment
- Ask you how to do it
- Write the lab up and then still don’t know what to do
- Whine and complain
- Don’t know where to begin
It’s not on purpose (usually)

They think that labs are handed down from on high

(that means from the teacher)

And they don’t know how to write one
They have to be taught

It takes direct instruction to understand how to write a lab
Begin by looking at Traditional Labs

- Problem/purpose
- Hypothesis/prediction (appropriate versus not)
- Variable (appropriate versus not)
- Materials (what is/isn’t commonly included)
- Safety (common concerns)
- Procedures (what is/isn’t commonly included)
- Data (direct/indirect measurement)
- Calculations/Results (done in this section—not in data)
- Conclusion (what’s usually asked for)

Bring specific attention to these things that usually aren’t talked about!
Then Look at Previous Student Labs

- Use old student labs (or fake them)
  - Use common mistakes: Not enough information, too much information, illogical order, etc.
- Hand different versions of the same lab to each group
- Groups discuss strengths & weaknesses
- Groups present to class
- Groups revise their list of strengths & weaknesses
Teachers and scientists design labs backwards!
Order as handed to the student:
Order the lab was designed in:

You might not even realize it…

You might just do it in your head…

But we always have the end in mind at the beginning!
Why students are clueless

They don’t know we start at the “end”…they’re trying to go top-down!

But if we teach them how

Then they’ll know (and complain a lot less!)
Additional tips
Other things they need to know

- It’s OK to leave your paper in the “backwards order” unless being asked to type it up. (if that’s OK with you)

- It’s OK to change your procedure mid-stream…just make sure that your final written paper reflects what you ACTUALLY did in the lab.

- There’s often more than one correct way
Other things you need to know

- Once you get past the first or second one, it gets easier!!!
- You may need to lead them through one as a class
- Bite your tongue…they’ll figure it out…eventually!!!
- Give more hints to lower level students and less to more advanced students
What this system does not do...

- Teach a “Scientific Method”
  - Rather it focuses students on the end goal
- Take the challenge out of Inquiry
  - It allows them to focus on the science rather than being frustrated at not knowing what to do next.
More Information
More info on Inquiry from Me

- Student Opinions on Inquiry Labs, JCE 8/05
- Inquiry In the Chemistry Classroom, TST 12/04
- My textbook www.reallifechemistry.net
  - Has resources for looking at old labs & what to write in each section