

# 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

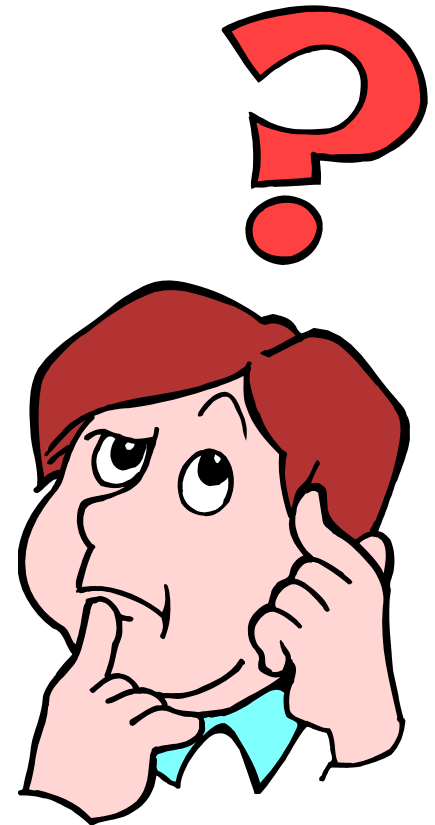
- When it's not safe
- When students don't know the underlying techniques
- When it's “copycat” inquiry



**Students are clueless!**

# Do your students do these things?

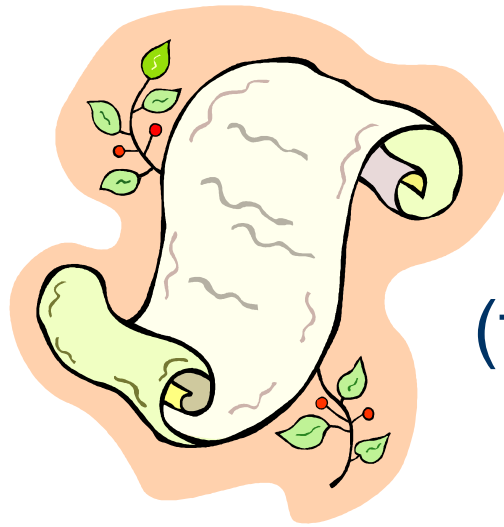
- Stare at a blank paper or ignore the assignment
- Ask you how to do it
- Write the lab up and then still don't know what to do
- Whine and complain
- Don't know where to begin





## It's not on purpose (usually)

They think that labs are handed down from on high

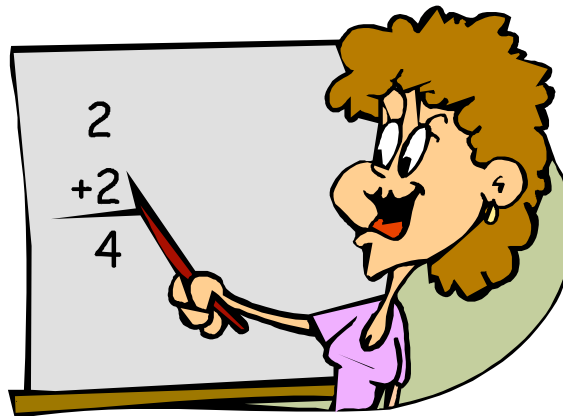


(that means from the teacher)

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

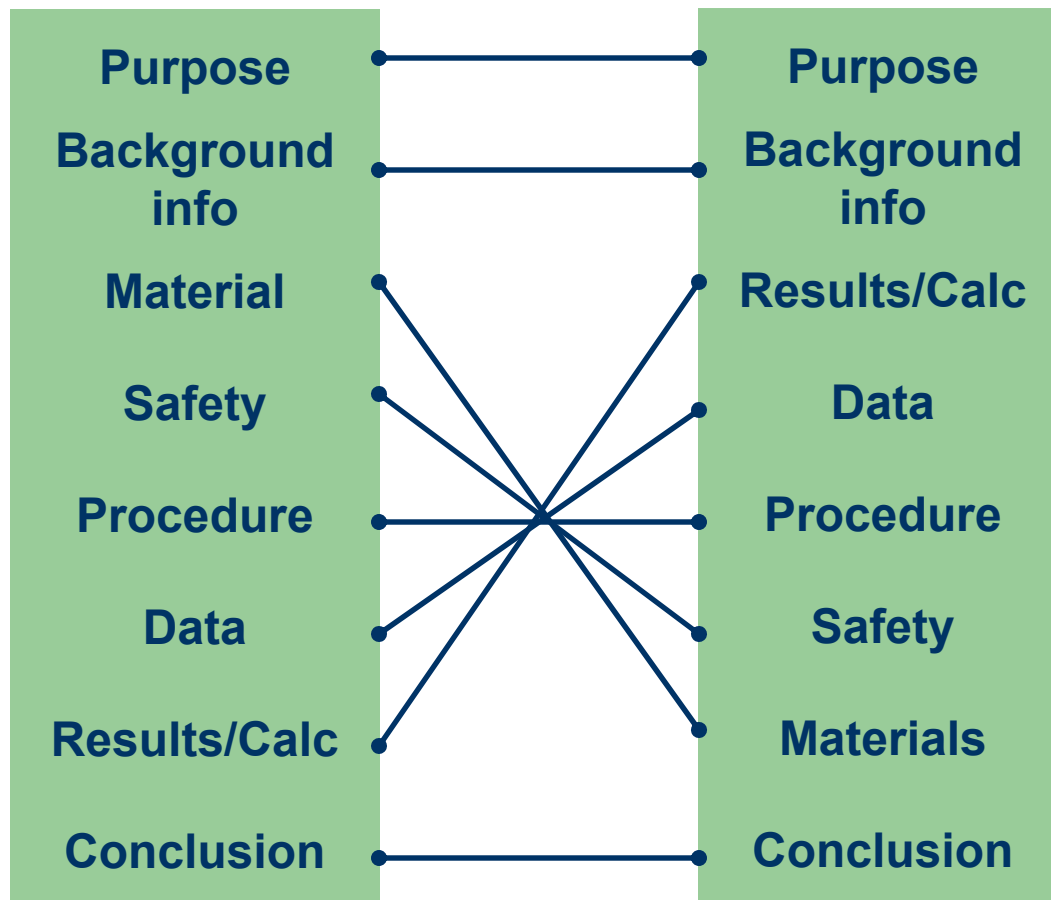


**Teachers and scientists design  
labs backwards!**

# Order as handed to the student:

**Purpose**  
**Background  
info**  
**Material**  
**Safety**  
**Procedure**  
**Data**  
**Results/Calc**  
**Conclusion**

# Order the lab was designed in:



You might not even realize it...

You might just do it in your head...

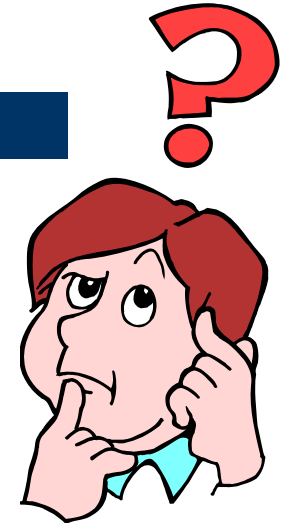
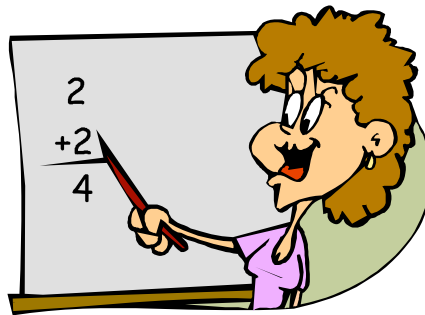
But we always have the end in mind at the beginning!

# 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!)





The image features a green background on the left side, which is partially cut off by a white rounded rectangle. Inside this white shape, the text "Additional tips" is written in a dark blue, bold font. A dark blue horizontal bar extends from the right side of the white rounded rectangle across the page.

## **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](http://www.reallifechemistry.net)
  - Has resources for looking at old labs & what to write in each section