



Reflections

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Publisher of *Introductory Physical Science (IPS)* and *Force, Motion, and Energy (FM&E)*
Thoughtful Curricula Developing Thinking Students

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Should Students Write a Hypothesis Before Beginning Each Experiment?

Many science teachers require their students to write a hypothesis that predicts the outcome of each experiment before they begin the experiment. Then, at the end of each experiment they have students conclude whether their hypothesis was true or false. The justification given for this hypothesis requirement is “This is what scientists do.” But, although this may often be true of scientists, making it a routine has little value in beginning science courses such as *IPS* and *FM&E*.

To determine whether the requirement to form a hypothesis is pedagogically sound, it is important to consider the purpose of an experiment. Scientists (and students) usually do experiments for one of two reasons:

- (1) If an experiment applies to a new field of study, it is done to find out how nature behaves. In this case, the experiment starts with a *question* rather than a hypothesis, such as “What is the solubility of a substance?”
- (2) If prior experimentation has amassed sufficient data to lead to a model or a theory, experiments might be done to test that model or theory. In preparation for doing so, a hypothesis that predicts the outcome would be formed.

For *IPS* and *FM&E* students, the content of the *entire course* is new. Therefore, we structure most of the experiments in the spirit of researchers working in a new field. These experiments often begin with a question concerning a topic or phenomenon about which students have little prior knowledge, so the experiment is done to find out how nature behaves. For example, what useful hypothesis could students be expected to write in their notebooks

Lead-Time Matters When Preparing for Visually-Impaired Students

Tasha King, Coordinator of School Services

Quality education resources like *IPS* and *FM&E* can be hard to come by, especially for teachers working with students having visual disabilities. Although Science Curriculum does not publish our books in Braille or large print, those materials are still available to educators working through their school or local school district. *IPS* and *FM&E*, as well as most other textbooks, are available in both Braille and large print through state- and nationally-

funded efforts that coordinate interstate book loans and commission new translations.

Your initial point of contact when looking for a needed book or other resources is with your local disability-learning specialist. “Every state and school district is different,” says Cindy Higgins, Disability Services Supervisor for the Anchorage School District.

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before performing *IPS* Experiment 1.1, Heating Baking Soda? Could they predict that a gas and a condensed liquid would be produced when the baking soda is heated? Similarly, could students predict the density of the gas produced in Experiment 3.7, The Density of a Gas? In *FM&E*, before performing Experiment 1.4, The Magnetic Force, would students have any basis for knowing that the magnetic force does not vary linearly with the separation of two magnets? Having students develop a hypothesis when they do not have sufficient information to form a valid one can be frustrating, legitimately confusing, and may develop poor attitudes toward science. In such a case, a requirement that students develop a hypothesis to be confirmed or refuted by experimentation is not only of little value, it is contrary to real scientific investigative practice.

Once a body of data has been accumulated and a model or theory has been proposed, experimentation continues. This is the second of the two reasons listed for doing experiments. Asking for a hypothesis in this case makes sense since a meaningful prediction can be

formulated and tested based on previous observations and data. This is the approach taken as students work with the buoyant force in *FM&E* Experiment 2.7, Testing a Prediction. But requiring that students enter a hypothesis into their notebooks before every experiment trivializes scientific work and may even create a bias in how students view their experimental results.

Stating a hypothesis is an advanced stage in the process of understanding a body of observations or experimental results. It can occur only after students have acquired enough data and knowledge to provide the basis for forming a hypothesis. It is not the first step that your students are facing in most of the experiments in *IPS* or *FM&E*. We suggest that foregoing a hypothesis in favor of beginning an experiment with a question and an open mind concerning what the results might be is often a better approach.

Adapted from the **In Greater Depth** essay on page 2 of the *Teacher's Guide and Resource Book for IPS Eighth Edition*. **In Greater Depth** is a new feature in the 8th edition. For more information, visit <http://www.sci-ips.com/ips/products.html>.

Do you teach students who are new to English?

Science Curriculum Inc. is looking for teachers who have both a dedication to the *IPS* and *FM&E* programs and experience working with an "English language learner" (ELL) student population. We'd like to know more about your school and students, your teaching experience, and how ELL students have impacted your approach to *IPS* and/or *FM&E*. If you would like to share your story with us, and help better our program at the same time, send a short email to our School Services Coordinator, Tasha King, at tasha@sci-ips.com. We look forward to learning more about our teacher base and are eager to hear from you!

**Visit our booth at the
NSTA National Conference on Science Education
in St. Louis, Missouri — March 29-April 1, 2007**

SCI will also present an Exhibitor Workshop at the Anaheim conference

Title: "Both Inquiry and Important Content in Middle School? IPS and FM&E!"

Location: America's Center, Room 163

Date, and Time: Saturday, March 31, 2:00 - 3:30 PM

We hope to see you there!

It's Summer Workshop Planning Time!

This summer, SCI will offer the following workshops:

Workshop Title	Dates	Location
IPS	July 8-20, 2007	Colorado School of Mines
FM&E	July 15-20, 2007	Colorado School of Mines
Constructing Tests for Science	July 8-13, 2007	Colorado School of Mines
IPS	July 23 - Aug 3, 2007	Wellesley, MA

Teachers make a point of telling us how much these workshops have benefited them and their students. Last year was no exception, with more than three dozen teachers taking part.

To encourage participation in our workshops, SCI sets aside 5% of the purchase price of all *IPS* and *FM&E* copyrighted materials as a workshop credit for the purchasing school or school district. This credit is cumulative over three years and may be applied toward the tuition for the school's or district's teachers in any of our SCI summer workshops.

IPS Workshop

The *IPS* National Summer Workshop at the Colorado School of Mines is hands-on, in sections of up to 22 participants. Peter Gendel and Graden Kirksey, co-authors of the Eighth Edition, lead the workshop.

FM&E Workshop

The *FM&E* National Summer Workshop is also hands-on, in sections of up to 22 participants. Uri Haber-Schaim and Robert Stair, two of the co-authors of *FM&E*, will lead this workshop.

Constructing Tests for Science Workshop

This summer, we are again offering a one-week workshop on constructing tests for formative and summative assessment in science. The course will be held at Colorado School of Mines. The "Constructing Tests" workshop gives teachers practical experience at writing good assessment questions with real diagnostic value.

The course operates in a collaborative environment with participants constructing and critiquing test questions in both multiple-choice and essay formats. Participants will also learn how to use *Diagnostic Analysis* software to analyze student responses to multiple-choice questions. This is an excellent workshop for users of our *Diagnostic Analysis* software or anyone interested in improving the quality of teacher-made tests. Robert Stair and colleagues will lead the workshop.

Workshop Options

We have scheduled this summer's workshops to provide options and meet varied needs: five full days for *FM&E*, ten full days for *IPS* (Eighth Edition), and five full days for "Constructing Tests." The two-week *IPS* workshop will cover the entire Eighth Edition text, and the one-week *FM&E* workshop will cover that entire text. Several options and combinations of workshops are available to satisfy the needs of individual teachers.

Some of the several options are:

1. You can attend only the first week of the *IPS* workshop (covering the first five chapters). This option is for teachers who teach *IPS* for only one semester and teach life or earth science the rest of the year.
2. You can take the first week of the *IPS* workshop, and continue with the *FM&E* workshop in the second week. This option is ideal for those teachers who teach both *IPS* and *FM&E* during a single year.
3. You can take the "Constructing Tests" workshop followed by the *FM&E* workshop. This option is for teachers who either do not teach *IPS* or have already taken the *IPS* workshop.
4. If you have already taken a previous *IPS* workshop, you might consider taking the second week of *IPS* (Chapters 6-10) to become familiar with the changes in the Eighth Edition or simply brush up on your skills.

Making Travel Arrangements

All workshops begin on Monday. However, traveling participants should arrive Sunday afternoon for registration, assignments, and a reception dinner. Commuters may choose not to register on Sunday only if they have picked up materials and assignments the prior week. (Call 303-988-5041 to make arrangements for

Application for the
***Introductory Physical Science (IPS) Workshop
Force, Motion, and Energy Workshop
Constructing Tests for Science Courses Workshop***

Colorado School of Mines
July 8–20, 2007

Course selection - please check the appropriate workshop(s):

- Introductory Physical Science Workshop – July 8–20, 2007* (CT-0508-07M)
 Introductory Physical Science Workshop (Chapters 1-5 only) – July 8–13, 2007 (CT-0508-07M)
 Introductory Physical Science Workshop (Chapters 6-10 only) – July 15–20, 2007 (CT-0508-07M)
(To register for this workshop, you must have previously taken a Chapter 1-5 workshop.)
 Constructing Tests for Science Courses Workshop – July 8–13, 2007 (CT-0359-07M)
 Force, Motion, and Energy Workshop – July 15–20, 2007 (CT-0509-07M)

NAME _____

GENDER (for housing arrangements only; please circle one) M F E-MAIL _____

SOCIAL SECURITY NUMBER _____ DATE OF BIRTH _____
(Required when taking course for credit)

HOME ADDRESS _____

HOME PHONE _____

SCHOOL NAME _____ PHONE _____

SCHOOL ADDRESS _____

SCHOOL DISTRICT NAME _____

What is your major field of science teaching? (check one)

Physical Science General Science Earth Science Other (please specify) _____

What was your major in college? _____ Graduate concentration, if any _____

Have you attended a previous IPS or FM&E workshop or summer program? Yes No

Have you taught IPS or FM&E before? Yes No

If yes, for how many years? _____ At what grade level(s)? _____

Tuition cost: For the two-week IPS workshop, the tuition cost is \$499; for each one-week workshop, it is \$250.

Credit: Credit is awarded by Colorado School of Mines as graduate-level semester hours in Continuing Education. The two-week IPS workshop can be taken for 4 semester hours credit; each one-week workshop can be taken for 2 semester hours credit.

I do ___ do not ___ plan to take the workshop for credit. NOTE: The tuition is the same with or without credit, and all registrants are expected to complete and submit all graded assignments and tests.

Your accommodation preference:

Single occupancy room & board: One week (\$309) _____ Two weeks (\$622) _____

Commuter's lunch (Recommended if not residing on campus.) One week (\$40) _____ Two weeks (\$80) _____

Signature _____ Date _____

A deposit check for \$35 payable to Colorado School of Mines must accompany this application. Please mail both to:
Ms. Linda Baldwin, Office of Continuing Education, Colorado School of Mines, Golden, CO 80401.
Phone: 800-446-9488, x3995 or 303-273-3995; email: lbaldwin@mines.edu

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“We have a very strong visual disability program and do most of the legwork ourselves.”

That work includes the search for already existing resources or, if necessary, commissioning a Braille or large print translation. The American Printing House for the Blind, which records all available Braille and large print textbooks in a searchable database, offers the first step in the search. If the resource already exists, it may be purchased or possibly borrowed for the school year or semester. Otherwise, permission to reprint the book is requested from the publisher. Science Curriculum generally receives several of these requests over the school year, making sure to approve the single-copy requests as quickly as possible.

The entire process can take from two weeks

to seven months, says Ann Hicks of the Colorado Instructional Material Center, a resource facility operated by the state. The timeline depends on whether a Braille or large print copy of the text already exists and how quickly reprint permission is received from the publisher. Obviously, it's best to act as much in advance as possible, making contact with your disability-learning office long before you actually need the resources. Learning about the idiosyncrasies of your district's request process now could save you and your student much frustration and delay in the future.

For more information on the translation process, contact the American Printing House for the Blind at <http://www.aph.org>.

SCI Holds the Line on Textbook Costs!

Educational budgeting can be difficult. We know that, so we are doing our part to help. In spite of rising paper, printing, and shipping costs, SCI is maintaining our prices at January, 2006 levels. We hope you agree that there is no better textbook value out there from any publisher.

For more information on pricing and ordering, visit http://sci-ips.com/order_books.html

Summer Workshops from page 3

prior week pick-up.) All workshops will run until the end of the day on Friday, so travel arrangements should be made with this schedule in mind.

Credit, Tuition, and Room & Board

For any one-week session, the tuition, credit through Colorado School of Mines, and room & board costs are as follows:

Semester credit hours:	2.0
Tuition:	\$250.00
Credit cost:	Included
Single room & board:	\$309.00
Commuter lunch:	\$ 40.00

For the two-week *IPS* workshops, the tuition, credit, and room & board costs are:

Semester credit hours:	4.0
Tuition:	\$499.00
Credit cost:	Included
Single room & board:	\$622.00
Commuter lunch:	\$ 80.00

Workshop Registration

To register for Colorado School of Mines courses online, go to the following web addresses:

For *IPS*:

https://hagrid.mines.edu/outreach/cont_ed/ips-reg_pgp.htm

For *FM&E*:

https://hagrid.mines.edu/outreach/cont_ed/fine-reg_pgp.htm

For Constructing Tests:

https://hagrid.mines.edu/outreach/cont_ed/course_pgp.shtml

To register by mail:

Fill out and mail in the application included in this issue of *Reflections*.

To register for the Wellesley workshop, please contact us at 888-501-0957.

Applications are processed in the order in which they are received. Deposits received after the course is fully enrolled will be returned.

Register now to reserve your place!



SCIENCE CURRICULUM INC.

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A NEWSLETTER FOR SCIENCE TEACHERS

***Visit the SCI Exhibit Booth at the
NSTA National Conference in
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