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Reflections

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Thoughtful Curricula Developing Thinking Students

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What is Important in a Physical Science Textbook?

Bob Stair

As you approach any textbook adoption, each of the books under consideration should be closely examined to see if it meets your requirements and addresses the needs of your students. To be most effective, there should be a match between your educational philosophy and that of the authors. All too often, however, it is not possible to pin down the views of the authors because many textbooks are not even written by the people who are listed as authors! That is not the case with *Introductory Physical Science*. So to let you know a bit about our educational philosophy, here are some thoughts in *Q&A* format. The answers will give you insight into the premises we used as we developed the new, 9th Edition of *IPS*. See how they line up with your philosophy.

Q: *What is the role of labs in science education?*

A: Laboratory experiments should form the backbone of any science course. They should be truly inquiry-based, not recipe-like, and they should encourage the development of reasoning skills. It is not enough to toss in a qualitative, or minimally quantitative, lab at the end of a chapter of reading. Experiments should support the development of content throughout the chapter. Any balance between experiments that use students' data and conclusions to advance the content and those that simply verify what has been read should be heavily weighted in favor of the former. And the labs must be tested before publication to be certain that they work! To this end, before its publication this month, the 9th Edition of *IPS* was tested over a period of 19 months by teachers and close to 650 students in Colorado, Florida, Pennsylvania, Washington, and Louisiana.

Q: *Should a physical science textbook help scaffold students' reading skills?*

A: Yes! But this does not mean "dumbing down" text by using only below-grade-level vocabulary, providing vocabulary lists, or inserting summary notes in the margin. Vocabulary should be introduced in context only when it is needed—not as a list of new words to be memorized out of context.

Students should be challenged to expand their vocabulary, but not through the use of lists of words isolated from context. New terms should be introduced only when they are needed, and

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then the first appearance of a term should be indicated in some way. In *IPS*, the first occurrence of a new term is placed in italics so that it stands out. Then, rather than breaking the flow of reading by forcing a student to refer to a glossary, the new term is defined either explicitly or contextually as it is introduced. To avoid interruptions in the reading flow, distracting "sidebar" features and irrelevant photos are kept to an absolute minimum in *IPS*.

Summary notes in the margin of the textbook are counter-productive to the development of reading skills. They are an invitation to students to read the note, but not the text! In the 9th Edition of *IPS*, we instead position "Comprehension Guide Questions" in the margins. These CGQs are designed to allow a student to self-assess his or her comprehension of the paragraph that has just been read. Rather than inviting students to skip reading, they encourage students to reread the material if they are not sure of the answer to a CGQ, or raise a question about it for discussion in class.

Q: *Should a physical science textbook support the development of writing skills?*

A: Features that encourage the development of good writing skills should be a part of any science textbook. For that reason, *IPS* includes "Themes for Short Essays" in each chapter. These features are strategically placed at the end of each chapter, allowing students to creatively summarize what has been learned from the chapter.

In *IPS*, students are also encouraged to keep detailed lab notebooks. Write-ups in these notebooks do not have to be in a cookie-cutter format. Instead the writing goal in the lab notebook should be one of clarity. Someone who is not in the *IPS* class should be able to pick up a student's lab notebook, read it, and understand what has been learned from a lab.

Q: *What tools should a textbook and its supplemental materials make available to a teacher?*

A: There is probably no tool in a teacher's instructional toolbox that is more important than good, high-quality questions. Without good questions, a teacher cannot assess where students are or where subsequent instruction needs to go. And without good questions, students cannot self-assess. Questions may be posed in the text, asked by the teacher in class, or presented on a test. They may be formative — assessing the current state of a student's understanding and skills as an idea or principle is being developed — or they may be summative, at the end of a unit of study. They may involve a verbal response, a written response, or the performance of a laboratory activity. They may require varying depths of understanding and should progress from predominantly concrete at the beginning of a course to more abstract toward the end. In *IPS*, we include the following types of questions and answers:

- Comprehension Guide Questions™ that allow students to self-assess reading comprehension;
- Bulleted questions that lead students to formulate experimental procedures rather than being given a cookbook-style recipe for doing a lab;
- Formative assessment questions at the ends of most sections in the textbook;
- Additional formative assessment questions in the *Teacher's Guide and Resource Book* that are keyed to specific paragraphs in the text;
- In-depth and application questions at the ends of sections and chapters;

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- Open-response (essay) questions at the end of each chapter, as well as in the *Assessment Package*;
- Multiple-choice questions whose incorrect "distractors" have diagnostic value (in the *Assessment Package*), along with explanations of those diagnostics;
- Lab test questions, in the *TGRB* and the *Assessment Package*.
- Answers in the *TGRB* to all of the questions posed in the textbook.

Other tools provided in the *IPS Teacher's Guide and Resource Book* include equipment lists, transparency/slide presentation masters, lab setup hints, lab safety tips, sample data, lesson planning information, and answers to all of the questions in the textbook.

How does *IPS* match up with your educational philosophy?

Have other questions that you wish had been addressed here?
Questions about the new edition of *IPS*?
You can reach us at 888-501-0957 or email rstair@sci-ips.com.

The Ninth Edition of IPS *is Now in Print!*

It's been two years in the making, but Science Curriculum Inc. is proud to announce that the 9th Edition of *Introductory Physical Science* is at the printer! Pre-orders are now being accepted for delivery in May, 2010. For pricing and ordering information, visit http://www.sci-ips.com/order_books.html or call **888-501-0957**.

The 9th Edition of IPS continues the *IPS* tradition of providing a well-defined path for educating physical science students. With more experiments than ever before, *IPS* continues to guide students to learn physical science by doing. They perform experiments, evaluate data, construct graphs, read, write, develop arguments, defend conclusions, and solve problems. These attributes, along with the extensive use of students' experimental results to advance student learning, make *IPS* a unique physical science course.

But the 9th Edition is also significantly different from previous editions. The first six chapters address macroscopic properties of matter. Chapters 7 through 11 present atomicity, the classification of elements and the periodic table, and molecular motion. Chapters 12 through 16 guide the study of energy, forces, and Newton's laws. These chapters include some materials from another publication by the same group of authors—*Force, Motion, and Energy*—along with newly written materials. Together, these chapter groupings extend the scope of the course and provide options for adapting the program to meet various local, state, and national physical science standards.

The new *IPS* continues the use of formative assessment questions at the end of each section. Additional formative assessment questions are included in the *Teacher's Guide and Resource Book*. Comprehension Guide Questions™, a feature new to this edition, provide a mechanism for students to self-assess their comprehension of what they read.

Look for a message in your mailbox next week containing more information on the new Ninth Edition of *IPS*!

Summer 2010 SCI Workshops

Whether you've taught science for years or are just starting out, we've prepared summer workshops that will benefit both you and your students! But don't just take our word for it. Here's what past workshop participants have said...

I learned how to perform the labs myself!

The workshop showed me how to use effective questioning to help students extract knowledge from their observations.

I will use this information on a daily basis.

The workshop emphasizes and approach that teaches students the "method" of science as well as the "discoveries." Thanks! Thanks!

This is one of the best workshops I have attended in my 34 years of teaching! Everything I learned I will be able to use in my classes this year. Plus I have a resource of people that I will be able to call if I need help!

Doing the labs and talking with other teachers was extremely valuable. Discussions with staff were great!

The most significant thing I learned from the workshop was the importance of truly understanding the science behind the concepts and that it is important to give students hands-on experience.

I learned ways to use data from labs to draw conclusions about concepts, as opposed to using labs to demonstrate concepts.

Save the dates for your workshop! For more information, visit **http://sci-ips.com/ips/workshops_golden.html**.

IPS and *FM&E* National Workshops

***Introductory Physical Science (IPS)* Workshop Part 1** — **July 26 through July 30, 2010**

Location: Colorado School of Mines (Golden, Colorado) — **Instructors: Peter Gendel, Graden Kirksey**
Tuition and Credit: $300 for 2 semester hours

Content: This workshop covers Chapters 1-6 of the new 9th Edition of *Introductory Physical Science* to enhance your content knowledge and classroom practice. (Note: The topics covered in Chapters 1–6 are essentially the same in the 7th, 8th, and 9th editions.) Experience all of the student experiments and develop an understanding of basic concepts, laboratory skills, safety issues, and classroom management. Reading, reasoning, and communication will be addressed in the context of properties of matter, solutions, and mixtures. The use of software in student experimentation and the evaluation of student work will be discussed.

***Force, Motion, and Energy* (*FM&E*) Workshop** — **July 25 through July 30, 2010**

Location: Colorado School of Mines (Golden, Colorado) — **Instructor: Bob Stair**
Tuition and Credit: $300 for 2 semester hours

Content: This workshop covers all seven chapters of the Force, Motion, and Energy curriculum encompassing: 1) force and pressure in equilibrium, 2) motion of objects and waves, and 3) thermal, potential, and kinetic energy. You will perform 17 experiments. For each experiment and for reading sections, teaching strategies, classroom management, safety issues, and the questions students pose will be addressed.

***Introductory Physical Science (IPS)* Workshop Part 2** — **August 2 through August 6, 2010**

Location: Colorado School of Mines (Golden, Colorado) — **Instructors: Peter Gendel, Graden Kirksey**
Tuition and Credit: $300 for 2 semester hours

Content: This workshop covers Chapters 7-11 of the new 9th Edition of *Introductory Physical Science*. (Note: This includes all of the topics covered in Chapters 6–10 of the 7th and 8th editions of *IPS* plus a new chapter on molecular motion.) You will perform all student experiments, discuss classroom strategies, basic concepts, laboratory skills, and safety issues. Reading, reasoning, and student communication will be addressed, in addition to the use of software in student experimentation and the evaluation of student work.

***Introductory Physical Science (IPS)* Workshop Part 3** — **August 2 through August 6, 2010**

Location: Colorado School of Mines (Golden, Colorado) — **Instructor: Bob Stair**
Tuition and Credit: $300 for 2 semester hours

Content: This workshop covers an entire alternative branch included in the new 9th Edition of *Introductory Physical Science*. Topics include energy, force, motion, and Newton's laws. This workshop will help you enhance your classroom practice as you experience student experiments and develop an understanding of basic concepts and laboratory skills. As in the other 9th Edition workshops, reading, reasoning, and student communication will be addressed in addition to the use of software in student experimentation and the evaluation of student work.

Lodging on the Colorado School of Mines campus will be available for each of these courses for an additional fee (to be determined by CSM). Please give us a call at 888-501-0957 or email office@sci-ips.com if you have questions about any of these workshops. To register for one or more of these workshops, visit http://www.sci-ips.com/events.html or fill out and mail in the registration for on the next page.

Reserve your spot! Send in your registration today!

Application for the Science Curriculum Inc. 2010 National Workshops

At Colorado School of Mines, Golden, Colorado
July/August, 2010

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

___ ***Introductory Physical Science*–Part 1** **July 25–30, 2010**
___ ***Force, Motion, and Energy*** **July 25–30, 2010**
___ ***Introductory Physical Science*–Part 2** **August 1–6, 2010**
___ ***Introductory Physical Science*–Part 3** **August 1–6, 2010**

NAME _____

GENDER *(for lodging purposes-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 area of science teaching? (please 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, which program and for how many years? _____ At what grade level(s)? _____

Tuition: For each one-week workshop, the tuition cost is $300.
Credit: Credit is awarded by Colorado School of Mines as graduate-level semester hours in continuing education. 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 assignments.**

Your accommodation preference: (All on-campus accommodations are single bedroom.)
_____ One week: $213 (6 nights: check-in Sunday; check out Saturday)
_____ Two weeks: $462 (13 nights: check-in Sunday; check out Saturday)
_____ I will be staying off-campus and will not need on-campus accommodations.

Meals: (It is recommended that participants have lunch together to facilitate an informal exchange of ideas.)
Lunch (Monday-Friday) _____One week ($47) _____Two weeks ($94) _____I will bring my own lunch.
To arrange for a plan that includes additional meals (breakfast and/or dinner), please contact us.)

Signature _____ Date _____

A non-refundable deposit check for **$50** payable to **Science Curriculum Inc.** must accompany this application. Please mail both to: **Coordinator of School Services, Science Curriculum Inc., 200 Union Blvd, Suite G-18, Lakewood, CO 80228**. Phone: 303-988-5041 or toll-free 888-501-0957; fax: 303-989-1473: email: workshops@sci-ips.com .