Online Professional Development: Applying What the Research Says for Effective Learning

Al Byers, Ph.D.
Greg Sherman, Ph.D.
Kristine Chadwick, Ph.D.
Flavio Mendez
Session Overview

• Professional Development Landscape

• The NSTA Learning Center

• Research and Efficacy
Where are we in Science in the US?

- **4th Grade:**
  - 34% scored “Proficient” or above
  - 28% scored below “Basic”

- **8th Grade:**
  - 30% scored “Proficient” or above
  - 37% scored below “Basic”

- **12th Grade:**
  - 21% scored “Proficient” or above
  - 40% scored below “Basic”

**NOTE:** Proficient represents solid academic performance. Basic shows partial mastery of skills.

2009 NAEP Results: The Nation’s Report Card
Teacher Content Knowledge

- A significant, positive correlation exists between student achievement and teachers’ content knowledge (subject matter AND pedagogical content knowledge).

- Detrimental classroom effects when teachers do not feel confident in their knowledge of science.

The US PD Landscape

What we know—Local Systemic Change K-8 Evaluation:
(75,000 data points -10 yr NSF Longitudinal study)

Teachers of Science with less than 16 hours of PD in last year:

– What % at K-4 level? 76%
– What % at 5-8 level? 57%
– What % at 9-12 level? 32%

Research calls for 50-80 hours/yr to effect a change in practice.

Welcome to Your Professional Development Web Space!

Albert, you've already earned 1250 Activity Points!

You've recently earned: Ruby Commenter - Post comment/questions
You're close to earning: Sapphire Commenter - Post 16 more comment/questions

Be sure to update your profile and review your points & badges!

With these resources you can build your professional development plan, track your activities and assess your progress. You can start at "Explore Learning Opportunities" below or by creating your game plan with the PD Plan and Portfolio tool. You may also review an archived Web Seminar or a multimedia overview of the Learning Center.

:: Explore Learning Opportunities
- Advanced Search
- See all FREE Lesson Plans
- See all FREE Resources

By Subject
- Earth & Space Science
- Life Science
- Physical Science

By Grade Level
- Elementary
- Middle School
- High School
- College

By State Standards
- Select your state to begin:
  - Choose a state
Barclay! The adjacent school district’s test scores went up 25% last year apparently due to ‘e-learning.’ Whatever that is...I want two of them!
2010 National Education Technology Plan

Through online learning systems, teachers may enhance their learning through blending the best of onsite PD with online PD that provides immediacy, convenience, self-direction, and collaboration with other colleagues and experts via professional learning communities.

For teachers to effectively facilitate using interactive resources, learning systems, and connectedness to online communities, teachers need to experience it firsthand as part of their own learning and professional development.

The NSTA Learning Center

Jan. 2011 Collection: 6,000+ PD Resources and Opportunities Available

- SciGuides [37]
- Science Objects [80]
- SciPacks [21]
- Archived Seminars/Podcast [350+]

- Journal Articles [3,600+]
- NSTA Press Books [252+]
- e-Books [136+]
- e-Chapters [784+]

- Web Seminars [120/yr]
- Short Courses [50+/year]

- Symposia [6-10/year]
- PD Institutes [6-10/year]

http://learningcenter.nsta.org
The NSTA Learning Center
http://learningcenter.nsta.org
Welcome to Your Professional Development

The Learning Center is NSTA's e-professional development (PD) portal to help you address your classroom needs and busy schedule. You can gain access to more than 6,000 different resources, of which over 1,800 are free. A suite of practical tools such as My Library, My PD Record, and My PD Plan and Portfolio help you organize and document your PD growth. Create your free account and watch the overview.

NEW: Earn as you learn! Collect points and badges as you aggregate, comment, and complete PD! Create collections with your own resources and share with others!

NEW: Live Support! Chat with Online Advisors while navigating your professional development. Simply log in or register to get started.

Explore Learning Opportunities
- Advanced Search
- See all FREE Lesson Plans
- See all FREE Resources

NSTA Featured Resources

Login
- Last Name:
- ID Number:
- Login
- Enter your Last Name and NSTA ID Number above
- Register Now for Free
- Lost password?

RSS + SHARE
Welcome to Your Professional Development Web Space!

Flavio, you've already earned **360 Activity Points**!

You've recently earned:
- **NSTA Resource Optimizer**
  - Add NSTA Resources

You're close to earning:
- **Onyx Commenter**
  - Post 5 more comment/questions

Be sure to **update your profile and review your points & badges**!

With these resources you can build your professional development plan, track your activities and assess your progress. You can start at "Explore Learning Opportunities" below or by creating your game plan with the PD Plan and Portfolio tool. You may also review an archived Web Seminar or a multimedia overview of the Learning Center.

**Explore Learning Opportunities**
- See all FREE Lesson Plans
- See all FREE Resources

**NEW LIVE SUPPORT**
- Online Advisors now available!

**Featured PD Resource**
- Universe: How We Know What We Know
Learning Center

e-PD Resources
• Two-hour free online learning experience in a particular topic
• Interactive simulations of phenomena in an engaging way
• Questions to promote interaction and learning via inquiry strategy
• Based on science literacy goals in science education standards
• Eighty (80) Science Objects currently available
Add Science Objects to your “Library”
See All Science Objects

or

Display Science Objects by Subject

Science Objects

Ready When You Are — for Free!

You’re teaching a subject for the first time, or for the first time in a long time. You need a content refresher now. Where can you find help that’s engaging, high-quality, easy to access—and affordable, too?

From NSTA’s latest ready resource: Science Objects! Science Objects are two hour on-line interactive inquiry-based content modules that help you better understand the science content you teach.

With support from sponsors, Science Objects provide all teachers of science open access to these valuable new resources—at no cost!

The system check will detect your current browser settings and plug-ins you have on your computer as are required to access the rich media content in the Science Objects, such as the Flash and QuickTime media players.

[Learn More]

FEATURED SCIENCE OBJECTS

Click on any of the titles below to launch the Science Object:

**Topic: Coral Reef Ecosystems**
- THE LIVING REEF
- THE ABIOTIC SETTING
- INTERDEPENDENCE

**Topic: Ocean’s Effect on Weather and Climate**
- GLOBAL CLIMATE PATTERN
- GLOBAL PRECIPITATION

Click on any of the titles below to launch the Science Object:
Add a Science Object to Library
10-Hour, self-paced, learning experience

3-5 Science Objects

NSTA SciPacks

Content Mentor
Email Support

Assessment and Certification

Pedagogical Implications
<table>
<thead>
<tr>
<th>Completed</th>
<th>Earth &amp; Space 9 Topics</th>
<th>Physical 7 Topics</th>
<th>Life 13 Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earth, Sun &amp; Moon</td>
<td>Force &amp; Motion</td>
<td>Cell Structure &amp; Function</td>
</tr>
<tr>
<td></td>
<td>Gravity &amp; Orbits</td>
<td>Energy</td>
<td>Coral Reef Ecosystems</td>
</tr>
<tr>
<td></td>
<td>The Solar System</td>
<td>Nature of Light</td>
<td>Science of Food Safety</td>
</tr>
<tr>
<td></td>
<td>The Universe</td>
<td>Chemical Reactions</td>
<td>Resources &amp; Human Impact</td>
</tr>
<tr>
<td></td>
<td>Weather &amp; Climate</td>
<td>Electric and Magnetic Forces</td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>Rock Cycle</td>
<td>Atomic Structure</td>
<td>Cell Division &amp; Differentiation</td>
</tr>
<tr>
<td></td>
<td>Plate Tectonics</td>
<td>Explaining Matter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earth’s Changing Surface</td>
<td>with Elements, Atoms, and Molecules</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Production (Expected release date by end of 2011)</th>
<th>Earth’s History</th>
<th>Cells &amp; Chemical Reactions</th>
<th>Flow of Matter &amp; Energy in Ecosystems</th>
<th>Interdependence of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Coming Soon (Expected release date by end of 2012) |                         | Heredity & Variation         | Biological Evolution                   |                         |
|                                                   |                         | Natural Selection             |                                        |                         |
|                                                   |                         | Regulation & Behavior of Organisms |                                      |                         |
Learning Center
Other e-PD Resources
• SciGuides
• Web Seminars Live/Archive
• Podcasts
• Journal Articles
• eBook Chapters
• eBooks
• Online Short Courses
Searching for Resources in the Learning Center
Welcome to Your Professional Development Web Space!

Flavio, you've already earned **360 Activity Points**!

You've recently earned:
- NSTA Resource Optimizer
  - Add NSTA Resources

You're close to earning:
- Onyx Commenter
  - Post 5 more comment/questions

Be sure to update your profile and review your points & badges!

With these resources you can build your professional development plan, track your activities and assess your progress. You can start at "Explore Learning Opportunities" below or by creating your game plan with the PD Plan and Portfolio tool. You may also review an archived Web Seminar or a multimedia overview of the Learning Center.

- Explore Learning Opportunities
  - Advanced Search

- See all FREE Lesson Plans
- See all FREE Resources
Search all NSTA resources and offerings below:

Keyword: 

Author: 

Type of Learning Resource: All Products

Grade Level: All Grade Levels

Science Discipline: All Subjects

Price: All Prices

Search
Nutrition: What are Nutrients?

Science Object

Science Objects are two hour on-line interactive inquiry-based content modules that help teachers better understand the science content they teach. This Science Object is the third of four Science Objects in the Nutrition SciPack. It explores nutrients and the specific physiological functions associated with each nutrient. Carbohydrates, fats, and proteins provide energy for body movement and physiological processes; proteins provide building material...

Member Price: Free  Nonmember Price: Free

Grade Level: Elementary School, Middle School, High School
Add other e-PD resources to your “Library”
Learning Center
Tools
My Library: NSTA Resources

Welcome to your collection of professional development resources. Select from the links and tabs below to access your NSTA resources, your uploaded items, organize them into collections, and then share your collections with others.

My NSTA Resources  My Uploaded Resources  My Resource Collections

Do-it-Yourself Learning  Books & Articles

SciGuides (32 items)
SciPacks (15 items)
Science Objects (4 items)
Podcasts (1 item)
Web Seminar Archives (1 item)

Journal Articles (13 items)

Live Online Seminars & Classes  In Person Experiences

No Items
Search for resources to add

No Items
Search for resources to add
My Library: Uploaded Resources

Welcome to your collection of professional development resources. Select from the links and tabs below to access your NSTA resources, your uploaded items, organize them into collections, and then share your collections with others.

My NSTA Resources  My Uploaded Resources  My Resource Collections

Resource Upload

New to the Learning Center! Enjoy the convenience of having all your electronic resources in one location. Upload up to 1.5 GB of your resources to your Learning Center library, add them to your collections, create notes about them, and email them to your friends. File formats include PowerPoint presentations, Word documents, Excel spreadsheets, PDF files, image files, and more. Each file must be 10 MB in size or smaller. Please read the Terms and Conditions.

Upload a Resource

You are currently using 0.2% of your 2 GB

You have 2.00 GB of available space

My Uploaded Resources

NSTA Learning Center
This is the URL for the NSTA Learning Center.

NSTA Learning Center Marketing Brochure.pdf
PDF file of the NSTA LC Marketing Brochure.

Sample Agenda for APS implementations.doc
Sample agenda created for APS administrators to run implementation workshops.

Sample PPT for APS implementations.ppt
Sample PPT created for APS administrators to use at their implementations.

• Email to a Friend
• Modify Collections
• Create Note
• Delete this Resource
Welcome to your collection of professional development resources. Select from the links and tabs below to access your NSTA resources, your uploaded items, organize them into collections, and then share your collections with others.

Collections enable you to group together and organize your NSTA resources. You may also share collections with friends and colleagues.

To create a new collection:
- Click "Start a New Collection" below, fill in the brief form and click "Submit"
- Choose items from your library, our resource search page, or upload your own files to add to the collection
- NOTE: NSTA resources must first be added to your library before they can be added to a collection
- For more help view the My Library Help Guide (1.24 MB PDF) to see screen shots and step-by-step instructions

### My Collections

<table>
<thead>
<tr>
<th>Title</th>
<th>Created</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change</td>
<td>9/3/2010</td>
</tr>
<tr>
<td>Climate Change Here and Now:</td>
<td>9/10/2010</td>
</tr>
<tr>
<td>Earth Day PD Resources for Teachers of Science</td>
<td>4/12/2010</td>
</tr>
<tr>
<td>FDA/CFSAN: Food Irradiation</td>
<td>9/10/2010</td>
</tr>
<tr>
<td>NSTA REPORTS Freebies Column: Nov. 2010</td>
<td>9/20/2010</td>
</tr>
</tbody>
</table>

### Collections Shared With Me

<table>
<thead>
<tr>
<th>Title</th>
<th>Shared by</th>
<th>Shared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change Here and Now:</td>
<td>The Learning Center</td>
<td>9/10/2010</td>
</tr>
<tr>
<td>FDA/CFSAN: Food Irradiation</td>
<td>The Learning Center</td>
<td>9/10/2010</td>
</tr>
<tr>
<td>Summer PD Resources</td>
<td>Flavio Mendez</td>
<td>5/4/2010</td>
</tr>
</tbody>
</table>
Learning Center
Community
Building a Vibrant Learning Community

- Person at center of online experience, not the product
- Three primary “strategies”
  - Psycho-emotional roles
    - recognition
    - self-actualization
    - coaching/mentoring
  - Content Knowledge
    - compelling & valuable to learner (teacher)
    - subject matter, PCK & pedagogy
  - Social Engagement
    - personal aspect
    - extended connectedness
    - worthwhile dialogue with like-minded colleagues and access to experts
Welcome to Your Professional Development Web Space!

Flavio, you've already earned 360 Activity Points!

You've recently earned: NSTA Resource Optimizer
Add NSTA Resources

You're close to earning: Onyx Commenter
Post 5 more comment/questions

Be sure to update your profile and review your points & badges!

With these resources you can build your professional development plan, track your activities and assess your progress. You can start at "Explore Learning Opportunities" below or by creating your game plan with the PD Plan and Portfolio tool. You may also review an archived Web Seminar or a multimedia overview of the Learning Center.

Explore Learning Opportunities
- Advanced Search

See all FREE Lesson Plans
See all FREE Resources
Discussion Forums

Below are group forums that you may join. Post to existing topics or start your own! All NSTA resources, personally uploaded resources, and collections may be shared and commented upon within these discussions.

26 people currently online

<table>
<thead>
<tr>
<th>Forum</th>
<th>Last Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Science</td>
<td>29 Topics by Patricia Rourke</td>
</tr>
<tr>
<td></td>
<td>540 Posts yesterday, 7:34 PM</td>
</tr>
<tr>
<td>Physical Science</td>
<td>22 Topics by Steve Werner</td>
</tr>
<tr>
<td></td>
<td>310 Posts yesterday, 11:32 PM</td>
</tr>
<tr>
<td>Earth and Space Science</td>
<td>31 Topics by Adah Stock</td>
</tr>
<tr>
<td></td>
<td>426 Posts today, 10:04 AM</td>
</tr>
<tr>
<td>General Science and Teaching</td>
<td>85 Topics by Jan Tuomi</td>
</tr>
<tr>
<td></td>
<td>1053 Posts today, 12:15 PM</td>
</tr>
<tr>
<td>Evaluation and Assessment</td>
<td>2 Topics by Dorian Janney</td>
</tr>
<tr>
<td></td>
<td>5 Posts yesterday, 8:17 PM</td>
</tr>
</tbody>
</table>

Who is Online
Sean Andersen, Debra Bridges, Michelle Brown, Cheryl Dix, Cheryl Dix, Sharon Euler, Eddie H, Julie Heintz, Danielle Hoffman, Marcella Jimenez, Leigh Lace, Renee Lod, Flavio Mendez, Judy Meredith, Arturo Navar, Melissa Ocker, Gina Peters, Julie Poth, Heidi Putman, Joel Rolon, Nancy Shock, Gerald Skoog, Allyson Streeper, Debbie Tomlin, Jan Tuomi, Jennifer Wyland
About: I am the NSTA Learning Center Senior Director. I enjoy working with educators and hope that you find the NSTA Learning Center useful and supportive to your PD goals.

Affiliation: National Science Teachers Association

Location: Arlington, VA

Aggregator: Add personal resources to your library
Disseminator: Share your resource collections
Advocator: Review and rate resources
Commenter: Post in the Discussion Forums

4605 Activity Points

Visit the activities page to learn how you can earn points and badges. The NSTA Learning center awards badges based on activities performed within the website. Pursuing badges is a great way to explore all the resources and professional development tools the Learning Center has to offer.

Contact

Statistics

Joined: Tue Nov 07, 2006 3:39 AM
Last Visited: Today, 4:49 PM
Total Posts: 83
by Patricia McGinnis, Sat Aug 28, 2010 10:52 AM

Subject: Patty McGinnis' Collection

I will be working with gifted students this year as a gifted resource specialist so I have started my collection with items that I can use with the gifted students. I have selected 3 articles from NSTA journals and 3 archived webinars about science competitions like Exploravision. Normally teachers don't have time in the curriculum to conduct competitions. It is my hope that I can build a program that would include all sorts of challenging activities for students, including science competitions.

by Patricia Rourke, Mon Aug 30, 2010 11:43 AM

This will be interesting since I just went in and copied my current Library Profile and attached it below. I will take the time to explore NSTA Resources with new eyes looking for items that may be useful to us as on-line advisors. As I scanned the posts prior to this one, and I am sure those that will follow, I know that there will be additional areas selected by you that I will want to explore also. My current profile reflects my recent collaboration with NSTA.

Attachments

PAR_Library_Profile_Aug_30.jpg (0.07 MB)
Incentivize Online Community

Physical Science Indexer
Help rescue the reef by completing the Physical Science indexer. Level xp: 250

Aggregator (Sapphire)
Donate a pound of produce by adding 30 personal resources to your Library. Level xp: 300

NSTA Resource Optimizer
Donate a book with 99 others adding 10 NSTA resources to your Library. Level xp: 100

Advocator (Ruby)
Give a day's worth of food by writing 40 reviews. Level xp: 800

Commenter (Diamond)
Plant a food seed by making 100 posts onto the Message board. Level xp: 1,000

Disseminator (Onyx)
Preserve 10 square feet of the Osa Peninsula Rainforest by sharing a collection with 1 person. Level xp: 10
Online Advisors

- Moderate discussion, assist users
- 7 days/week; ~60 hours/week

<table>
<thead>
<tr>
<th>Advisor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wendy Ruchti</strong></td>
<td>Wendy Ruchti has been part of the Educational Foundations Department at Idaho State University's College of Education since 2008. She received a PhD in Education from the University of Idaho in 2005 with an emphasis in curriculum and instruction in STEM education. At ISU, she has taught several educational foundations courses. Her research interests include elementary science education and creating collaborative online learning environments. Before coming to ISU, she taught middle school science and math.</td>
</tr>
<tr>
<td><strong>Lara Smetana</strong></td>
<td>Lara Smetana is an assistant professor of science education at Southern Connecticut State University. She brings classroom experience as an 8th grade physical science teacher and has worked with a variety of informal education programs across the country. Lara teaches courses in elementary science methods and educational technology and mentors student teachers. Her research interests include pre- and in-service teacher education and the use of educational technology in science teaching and learning.</td>
</tr>
<tr>
<td><strong>Kathy Sparrow</strong></td>
<td>Dr. Kathy Sparrow is currently an adjunct professor at Florida International University (FIU), teaching Elementary Science Methods. She previously worked as a middle and high school science teacher as well as the Science Supervisor for Akron Public Schools. She was a Regional Director for SECO, served on the NSTA Board of Directors and was president of the National Science Education Leadership Association (NSELA). Kathy was also awarded the Outstanding National Science Supervisor Award in 1999.</td>
</tr>
</tbody>
</table>
Learning Center

Efficacy and Accountability
Accountability System for States, Districts, and Schools

Texas Regional Collaborative for Excellence in Science and Mathematics Teaching Directors Admin Page

Welcome to your NSTA resource administrator page.

Data below is provided to assist you in tracking activity and progress of your program participants.

<table>
<thead>
<tr>
<th>Overview</th>
<th>Individual Users</th>
<th>SciPack Summary</th>
<th>Calendar</th>
</tr>
</thead>
</table>

**Overview**

<table>
<thead>
<tr>
<th>Number of Licenses Purchased:</th>
<th>Number of Licenses Used:</th>
<th>% Used:</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>55</td>
<td>110%</td>
</tr>
</tbody>
</table>

**Total Products Added by Type**

<table>
<thead>
<tr>
<th>Product Type:</th>
<th>Number Added:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SciPack</td>
<td>155</td>
</tr>
<tr>
<td>Science Object</td>
<td>101</td>
</tr>
<tr>
<td>Journal Article</td>
<td>51</td>
</tr>
<tr>
<td>Assessment</td>
<td>Pre-tests</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Force and Motion</td>
<td>1437</td>
</tr>
<tr>
<td>Rock Cycle</td>
<td>226</td>
</tr>
<tr>
<td>Energy</td>
<td>1005</td>
</tr>
</tbody>
</table>
State and District Deployments

Over 200 unique deployments across 68 State/District Partnerships as of January 2011

- West Virginia Department of Education
- Hawaii Department of Education
- Nebraska Department of Education
- Fairfax County Public Schools, Fairfax, VA
- Cincinnati Public Schools, OH
- Louisville County Public Schools, Louisville, KY
- Gwinnett and Forsyth County Public Schools, Atlanta, GA
- Lincoln County Public Schools, NE
- LASER Alliance, Mountain to Harbor Alliance, WA
- Marysville Joint Unified School District, CA
- Zero-G Flight Initiative
- Montana Status University, Bozeman, MT
- Petaluma City Schools, Petaluma, CA
- Shelby County Public Schools, TN
- Duval County Public Schools, Jacksonville, FL
- Arlington County Public Schools, Arlington, VA
- Texas A&M, Texas Centers for Excellence in Science and Mathematics (36 centers across Texas)
- PRISM Grant Program, MT
- Stamford County Public Schools, Stamford, CT
- University of Maryland Baltimore County, MD
- Atlanta Public Schools System, Atlanta, GA
Research on the Learning Center

- Three school division SciPack-based PD programs evaluated (Blended versus 100% Online)
  - Teacher F&M knowledge gains
  - Increase in confidence teaching F&M
  - SciPack PD relevant and satisfying
Research on the Learning Center

- Experimental study of SciPack use in midwestern city
  - Increased teacher knowledge
  - Increased teacher science teaching efficacy
  - Increased teacher preparedness to teach earth science and force & motion
  - Students of teachers completing Sci Packs gained more knowledge than students of controls
Research on the Learning Center

Exploratory Descriptive Study of Upper Elementary Teachers 7 Different Science Content Areas:

- **Significant Gains in Teacher Knowledge** via pre/post assessment and final assessment
- **Positive Significant Correlation between Age and Years Experience** for 3 content-interaction strategies: Simulations, Interactive Reference, and Personal Feedback
- Lends Supports for Online Learning Theory: *Anderson’s Equivalency of Interaction (2003)*
Many focus on fixed stop/start date short courses.

We are focusing on learning efficacy of *self-directed, blended e-PD models* to address scale and sustainability for 3 million teachers in United States.
Thank You

- Al Byers
  PH: 703-312-9294
  Email: abyers@nsta.org

- Kristine Chadwick
  PH: 304-347-0429
  Email: kristine.chadwick@edvantia.org

- Greg Sherman
  PH: (540) 831-6859
  Email: gsherman2@radford.edu

- Flavio Mendez
  PH: 703-312-9250
  Email: fmendez@nsta.org