



**ONLINE
WORKSHOPS**

Working through Difficult Concepts in the Explore Science: Earth & Space Toolkit

Lindsay Bartolone, M.S. & Brian Kruse

Online Workshop Follow-Up 4/18/2017

- **Recording of the online workshop**

<https://vimeo.com/213740466>

- **Important links shared during the online workshop**

1. National Research Council. (1997). Science teaching reconsidered: A handbook. National Academies Press.

<https://www.nap.edu/catalog/5287/science-teaching-reconsidered-a-handbook>

2. Sadler, P. M., & Sonnert, G. (2016). Understanding Misconceptions: Teaching and Learning in Middle School Physical Science. *American Educator*, 40(1), 26-32.

<http://files.eric.ed.gov/fulltext/EJ1094278.pdf>

3. The Diagnoser Project Tools

<http://www.diagnoser.com>

<http://www.facetinnovations.com/daisy-public-website/fihome/resources/diagnoser.html>

4. Tips for Leading Hands-on Activities from the Earth and Space Science Kit

http://www.nisenet.org/sites/default/files/catalog/uploads/ExSci_Space_TipsforLeadingHands-onActivities.pdf

5. Understanding Student Ideas in Astronomy, 45 Formative Assessment Probes

https://www.nsta.org/store/product_detail.aspx?id=10.2505/9781936137381

6. Beyond Misconceptions, STEM Teaching Tool#37

<http://stemteachingtools.org/assets/landscapes/STEM-Teaching-Tool-37-Beyond-Misconceptions.pdf>

7. Private Universe Project

<https://www.learner.org/workshops/privuniv/>

8. Beyond the Solar System Professional Development DVD video playlist:

https://www.youtube.com/playlist?list=PLfhHnX59VA_4QTn1E7-TgEZ4blCetW5F9

9. Sadler, P. A Tool for Evaluating the Effectiveness of Educational Programs in Astronomy: The Astronomy and Space Science Concept Inventory. Astronomical Society of the Pacific 118th Annual Meeting: Engaging the EPO Community, Baltimore, MD, 9/30/06
https://www.cfa.harvard.edu/seuforum/download/SadlerASSCI_ASP06.pdf
10. **Exploring the Solar System: Pocket Solar System** activity page, includes written materials, training & content videos:
<http://www.nisenet.org/catalog/exploring-solar-system-pocket-solar-system>
11. **Exploring the Universe: Orbiting Objects** activity page, includes written materials, training & content videos: <http://www.nisenet.org/catalog/exploring-universe-orbiting-objects>

Strategies for Addressing Difficult Concepts

- **Ask** questions and listen to learners' explanations
- **Anticipate** the most common misconceptions and be alert for others
- **Identify** learners' misconceptions.
 - (Categorize as necessary)
- Provide a forum for learners to **confront** their misconceptions, **or build** on their facet of thinking.
- Encourage learners to **test** their conceptual frameworks in discussion with others and by thinking about evidence and possible tests
 - Yes and.. (but not no!)
- Help students reconstruct and **internalize** their knowledge, based on **scientific models**.

- | | |
|---------------------|---------------------------------------|
| • Ask | • Confront or Build |
| • Anticipate | • Test |
| • Identify | • Internalize scientific model |

Upcoming Online Workshops: <http://www.nisenet.org/events/online-workshop>



Developed and distributed by the National Informal STEM Education Network.

Copyright 2017, Science Museum of Minnesota. Published under a Creative Commons Attribution-Noncommercial-ShareAlike license: <http://creativecommons.org/licenses/by-ncsa/3.0/us/>

This material is based upon work supported by NASA under cooperative agreement award number NNX16AC67A. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).