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A **collection of the best recordings** from the ACS Webinars Library will occasionally be rebroadcast to highlight the value of the content.

www.acs.org/acswebinars

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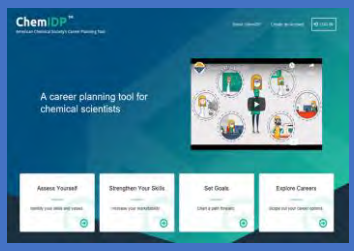

ChemIDP.org

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ACS Career Navigator: Your Home for Career Services

Whether you are just starting your journey, transitioning jobs, or looking to brush up or learn new skills, the **ACS Career Navigator** has the resources to point you in the right direction.

We have a collection of career resources to support you during this global pandemic:


Professional Education


Virtual Career Consultants

ACS Leadership Development System


Career Navigator LIVE!


ChemIDP


College to Career

ACS Webinars

Virtual Classrooms

Visit www.ACS.org/COVID19-Network to learn more!

7

Join us in our efforts to increase the diversity of chemistry.

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www.acs.org/donate

ACS Office of Philanthropy
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A Career Planning Tool For Chemical Scientists

ChemIDP is an Individual Development Plan designed specifically for graduate students and postdoctoral scholars in the chemical sciences. Through immersive, self-paced activities, users explore potential careers, determine specific skills needed for success, and develop plans to achieve professional goals. **ChemIDP** tracks user progress and input, providing tips and strategies to complete goals and guide career exploration.

https://chemidp.acs.org

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ACS Bridge Program

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ACS Department of Diversity Programs

Advancing ACS's Core Value of Diversity, Inclusion & Respect

We believe in the strength of diversity in all its forms, because inclusion of and respect for diverse people, experiences, and ideas lead to superior solutions to world challenges and advances chemistry as a global, multidisciplinary science.

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ACS Diversity

ACS Voices Diversity Podcast
acsvoices.podbean.com/

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Date: Wednesday, July 28, 2021 @ 2-3pm ET
Speakers: Kenneth Sibley, Carbon Inc. / H.N. Cheng, 2021 ACS President and US Department of Agriculture
Moderator: Jim Skinner, Terregena Inc. and ACS SCHB

Register for Free!

What You Will Learn:

- The basics of intellectual property, how it must be protected, and the importance of filing date
- What are the pros and cons of a patent filing or a provisional patent
- What are the various types of patents and what is Freedom to Operate

Co-produced with: ACS Industry Member Programs, ACS President-Elect, ACS Board Committee on Corporation Associates, ACS Committee on Technician Affairs, the ACS Division of Small Chemical Businesses, and the ACS Division of Business Development and Management

Date: Thursday, July 29, 2021 @ 2-3:30pm ET
Speaker: Punit Seth, Vice President, Ionis Pharmaceuticals
Moderator: Charvi Nanavati, Ionis Pharmaceuticals

Register for Free!

What You Will Learn:

- What are the general principles for delivery of RNA-targeted oligonucleotide drugs
- How local delivery occurs to tissues such as the lung and the CNS
- How receptor-mediated delivery to hepatocytes, pancreatic beta cells, skeletal muscle and heart tissues occur

Co-produced with: ACS Division of Medicinal Chemistry, American Association of Pharmaceutical Scientists, and ACS Publications

Date: Wednesday, August 4, 2021 @ 2-3pm ET
Speakers: Andre Argenton, Dow / Scott Collick, DuPont Mobility & Materials / Adwoa Baah-Dwomoh, W.L. Gore & Associates
Moderator: Rebekah Paul, American Chemical Society

Register for Free!

What You Will Learn:

- The variety of ways companies promote diversity, equity, inclusion, and respect
- What programs companies are using to drive change
- Opportunities for the next generation workforce within industry

Co-produced with: ACS External Affairs & Communications and ACS Industry Member Programs

www.acs.org/acswebinars

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ACS Chemistry for Life®

co-produced with: ACS Education

How to Maximize the Impact of Science Outreach

FREE Webinar | TODAY at 2pm ET

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THIS ACS WEBINAR WILL BEGIN SHORTLY . . .

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ACS Chemistry for Life®

How to Maximize the Impact of Science Outreach

WILLIAM DORIA
Associate Professor of Chemistry,
Rockford University

LILY RAINES
Manager, Office of Science Outreach,
American Chemical Society

Presentation slides are available now! The edited recording will be made available as soon as possible.

www.acs.org/acswebinars

This ACS Webinar is co-produced with ACS Education, ACS Office of Science Outreach, and the ACS Committee on Community Activities.

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What You Will Learn

By the end of this webinar, you will be able to:

- Define what science outreach is and why it is worth doing
- Describe a framework that defines effective science outreach
- Apply research findings to improve your own outreach
- Find additional ACS resources to support your work

Lima, Peru. 2019

Agenda

- Defining science outreach
- Why bother with outreach?
- Define success with IRS
- Incorporate research findings
- Example: improve an activity
- Additional ACS resources

ACS / D. Horwitz. USASEF 2018

DEFINING SCIENCE OUTREACH

ACS / L. Guzzetta. Orlando USA. 2019

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Why do you do science outreach? (Please select all that apply)

- Show kids that chemistry is fun
- Inspire the next generation of scientists
- Encourage kids to take chemistry classes in the future
- Get people to see that chemistry is interesting
- Reveal that chemistry is an important part of our daily lives

Broadening Our Understanding

- Science outreach is **not just**:
  - Information distribution
  - Hands-on activities (although our emphasis for today)
  - Recruitment for future chemists
  - For science museums
  - For children
  - For Ph.D.s
  - For chemists
  - In-person

A Working Definition

*A framework that **brings together scientific and non-scientific communities** around a set of shared science outreach goals, which are met through the application of **effective science communication, public engagement, and/or informal education best practices**, and it **achieves outcomes** characterized by mutual learning for all involved.*

Recommendations for the Continued Professionalization of Science Outreach within the Scientific Enterprise, Garbarino, 2020

WHY OUTREACH MATTERS

ACS ICSC United Arab Emirates. Sharjah. 2017

Global Need for STEM Outreach

*"Today's challenges such as climate change, biodiversity loss, decline of ocean health and pandemics **are all global**. This is why we must mobilize scientists and researchers from all over the world."*

- Audrey Azoulay UNESCO Director General[1]

- **80%** of countries dedicate less than 1% of their GDP to research[1]
- **93%** of research spending is from G20 countries[1]

"Public" Interest

- **84%** **"want to hear more from scientists about their work"** [2]

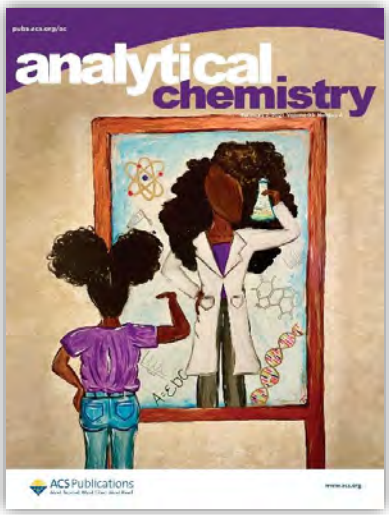
• While there is interest in informal learning opportunities, these do not benefit all groups equally.[3]

- **> 40%** **said students would be more inspired to pursue STEM if[2]:**
  - Science were taught in a more engaging way
  - Students had a better understanding of career opportunities
  - Students could see how science makes the world better

2. State of Science Index Survey, 3M. 2021 | 3. Reimagining publics and (non) participation: Exploring exclusion from science communication through the experiences of low-income, minority ethnic groups. Dawson, 2018 | Image: Chemoji, https://cen.acs.org/sections/acs-chemoji.html

Importance of Role Models

- **33%** of researchers, and **28%** of engineers, worldwide are women [1]
- **73%** of people believe that underrepresented minorities often lack equal access to STEM education [2]
- Direct interaction with scientists can encourage students to see themselves as scientists in the future [4]
- Children who see themselves in others imitate traits with which they most identify [5], arguing for the need for diverse role models.



1. UNESCO Science Report: the race against time for smarter development, 2021 | 2. State of Science Index Survey, 3M. 2021 | 4. Scientist-image stereotypes: The relationships among their indicators, Karaçam 2016 | 5. The Importance of Early Exposure to Innovation. National Inventors Hall of Fame, 2018. | Image: See it. Believe it. BECOME it!: Changing the Future of the STEM Workforce through Outreach and Mentorship. Pritchett, 2021

Informal Environments

- People spend **95%** of their lives outside a classroom, so informal education opportunities are a key way to reach out[6].
- People engage with and can learn science outside of school though museums, after-school programs, libraries, and television and other media, where participant interest, excitement, and self-conception as science learners improves.[7]
- Chemistry is still less commonly presented in informal education environments than other science topics such as biology or physics.[8]

6. The 95 Percent Solution: School is not where most Americans learn most of their science. Falk, 2010. | 7. Learning Science in Informal Environments: People, Places, and Pursuits. Bell, 2009. |. 8. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry. Anderson, 2021

Considerations: Venue

- Indoor or outdoor?
- Public and university venues are often free or low-cost, but have fewer resources
- Museums and private venues may charge but provide more marketing and equipment support

Benefits to Volunteers

- Introduction to social science approaches
- Professional development opportunities
- Communication skills development
- Fulfill some grant requirements

9. Effective Chemistry Communication in Informal Environments. NASEM, 2016 | Photo Credit I Montes

It's FUN!

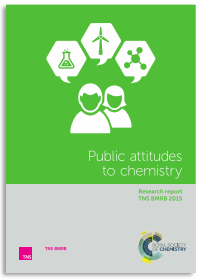
- "It is awesome to see so many people enjoying chemistry."
- "Our section really enjoys the outreach programs. It is a great way to bring all of our volunteers together to celebrate chemistry and involve the public."
- "It is rewarding … to hear from individuals who went on in science study as a result of their exposure to our event as youngsters."

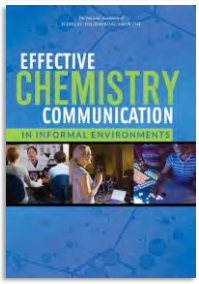
Quotes As of 05-01-19 | Photos left to right: ACS Hungary, Szeged, Hungary 2015; I Montes, Bogota, Colombia 2013; ACS Malaysia, Penang 2015

DEFINE "SUCCESS" WITH I-R-S

J. Zhang. Beijing, China. 2014.

Interest, Relevance, Self-Efficacy





- A U.K. report suggested attitudes towards chemistry include chemistry interest and chemistry relevance.[10]
- A U.S. report suggested the importance of self-efficacy: a person's confidence in their ability to understand, talk about, or participate in a given area.[11]
- Both reports called for use of evidence-based practices in design of informal education activities.

  - Explore Science: Let's Do Chemistry Framework and Strategies for building IRS.[12]

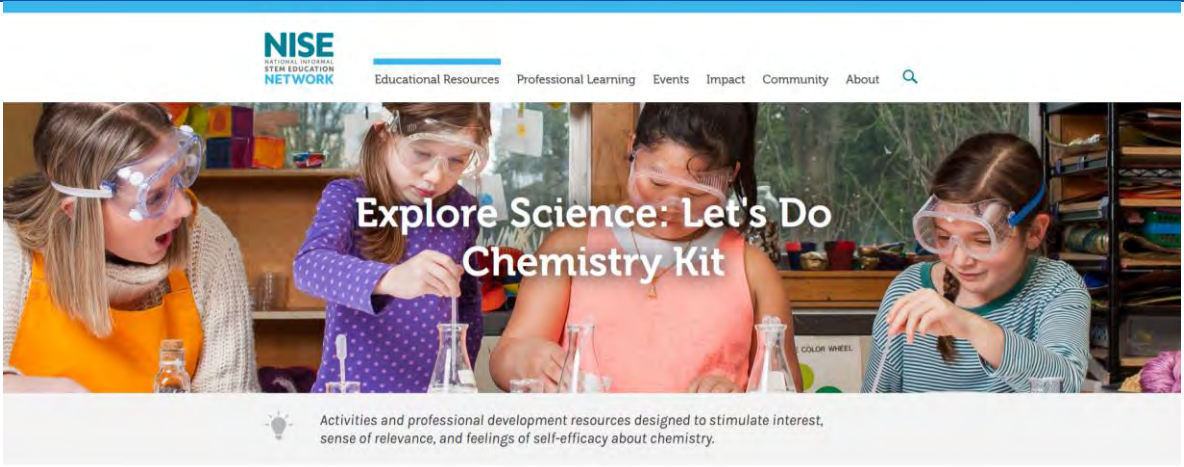
10. Public Attitudes to Chemistry: Research Report., Royal Society of Chemistry, 2015 | 11. Effective Chemistry Communication in Informal Environments. NASEM, 2016 | 12. ChemAttitudes: Using Design-Based Research to Develop and Disseminate Strategies and Materials to Support Chemistry Interest, Relevance, and Self- Efficacy (NSF DRL-1612482), 2016

Explore Science: Let's Do Chemistry

- Use I-R-S as metrics of success for iterative design-based research of hands-on activities in museums.[12]
- **Guiding questions:**
  - Can hands-on chemistry activities positively impact visitors' attitudes toward chemistry?
  - What content and format strategies included in hands-on activities support visitors' positive attitudes?
- Similar use by NISE Net for nanotechnology project.[13]

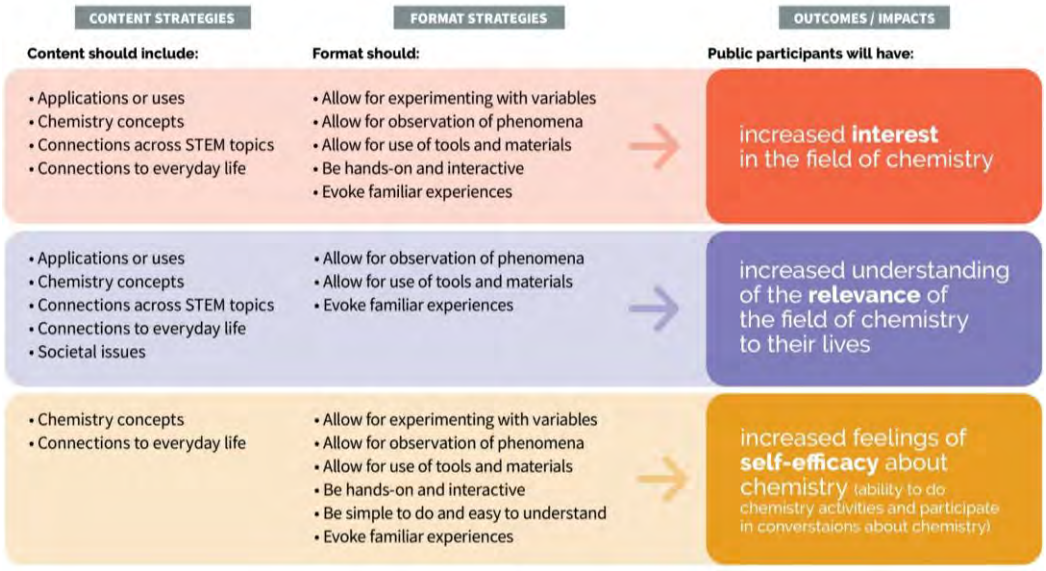
12. ChemAttitudes: Using Design-Based Research to Develop and Disseminate Strategies and Materials to Support Chemistry Interest, Relevance, and Self- Efficacy (NSF DRL-1612482), 2016 | 13. Evaluating the NISE Network: Reflections from the Evaluation Workgroup. Kollmann, 2016.| 14. Let's Do Chemistry: A Framework and Strategies to Encourage Positive Attitudes Toward Learning Chemistry in Museums and Informal Settings. Ostman, 2018

Let's Do Chemistry: Kit



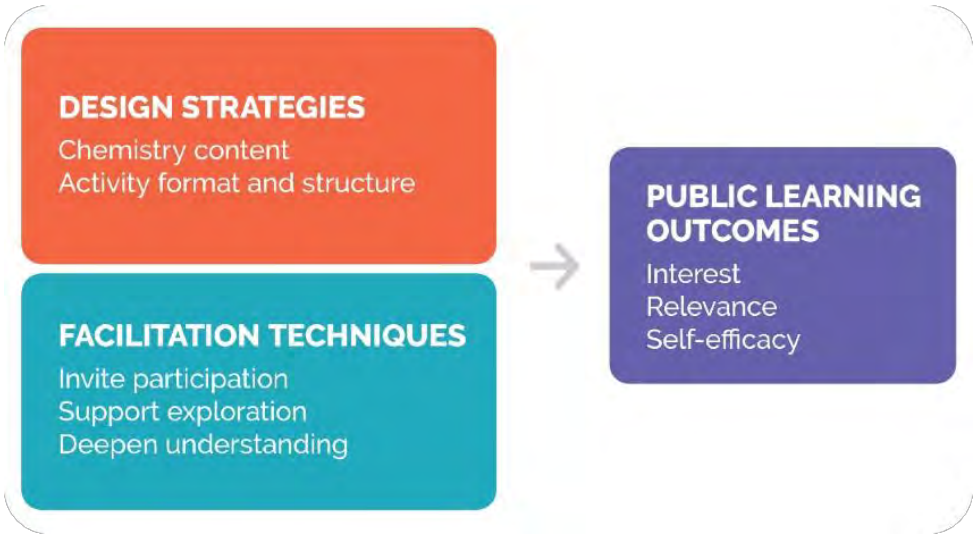
https://www.nisenet.org/chemistry-kit

Design Strategies Framework Overview



15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021

Big Picture



"Let's Do Chemistry" Feedback

"I learned formally something I have suspected for some time - that the demonstrations and hands-on activities that I have engaged in for the last 20 years are not really doing what we hoped they were doing for our audience. The data presented during the workshop comprise some of the most complete studies ever performed on outcomes from chemical demonstrations."

- Matt Mio, Chem Club (ACS Student Members Chapter) Co-advisor, Professor, and Chair Department of Chemistry and Biochemistry, University of Detroit Mercy.

INCORPORATE RESEARCH FINDINGS

ACS LS Midland 2019

Activity Content

Content Strategies	Interest	Relevance	Self-Efficacy
Applications or uses	✓	✓	
Chemistry concepts	✓	✓	✓
Connections across STEM topics	✓	✓	
Connections to everyday life	✓	✓	✓
Societal issues		✓	

15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

In your experience, which of these content strategies are the hardest to do? (Please select all that apply)

- Applications or uses
- Chemistry concepts
- Connections across STEM topics
- Connections to everyday life
- Societal issues

Activity Format

Format Strategies	Interest	Relevance	Self-Efficacy
Allow for experimenting with variables	✓		✓
Allow for observation of phenomena	✓	✓	✓
Allow for use of tools and materials	✓	✓	
Be hands-on and interactive	✓		✓
Evoke familiar experiences	✓	✓	✓
Be simple to do and easy to understand			✓

15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

In your experience, which of these format strategies are the hardest to do? (Please select all that apply)

- Allow for experimenting with variables
- Allow for use of tools and materials
- Be hands-on and interactive
- Evoke familiar experiences
- Be simple to do and easy to understand

Hands-on Facilitation

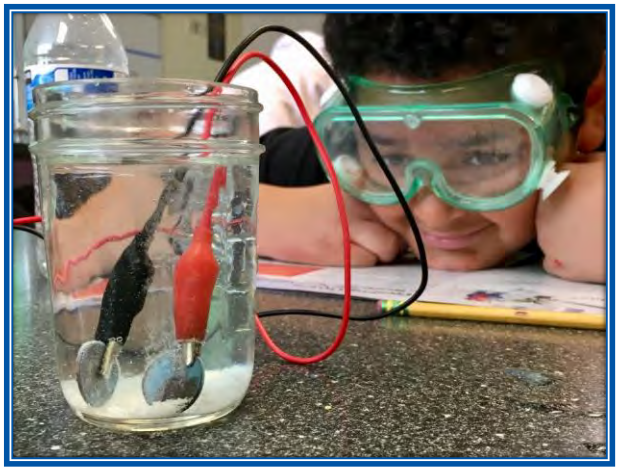
15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021
16. Exploratorium Tinkering Studio. (2015). Facilitation field guide. San Francisco, CA: Exploratorium.

Invite Participation

- Provide an introduction or activity overview
- Introduce and model tools
- Build rapport with participants
- Learn what people have experienced or know about chemistry
- Encourage everyone to participate
- Aid in transitions between different portions of an activity
- Encourage visitors to stay, but give them the option to stop

15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021
16. Exploratorium Tinkering Studio. (2015). Facilitation field guide. San Francisco, CA: Exploratorium.

Analyze an Audience



ACS Puget Sound Local Section, 2018

- What are the demographics (age, income, education, etc.) of this audience?
- What do they know or believe about this issue, event, or opportunity?
- Why would they care about this information?
- What values are emotionally important to them?

Developing Communication Strategies, ACS Leadership Development Course

Audiences at an Outreach Event

- **Your Volunteers**
  - Students
  - Teachers
  - Professionals
- **Your Participants**
  - Younger children
  - Older children
  - Adult family members

Photo: ACS LS Kentucky Lake 2018

Support Exploration

- Offer positive feedback
- Provide basic information and vocabulary
- Give step-by-step instructions
- Ask participants to make observations and predictions
- Encourage iteration and continued experimentation

ACS ICSC Shanghai. China. 2017.

15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021
16. Exploratorium Tinkering Studio. (2015). Facilitation field guide. San Francisco, CA: Exploratorium.

Deepen Understanding

- Describe why or how something is happening
- Provide information and support making connections outside the activity
- Encourage participants to apply something they learned during the activity
- Encourage participants to explain why or how something is happening

15. Design Strategies for Hands-On Activities to Increase Interest, Relevance, and Self-Efficacy in Chemistry, Anderson, 2021
16. Exploratorium Tinkering Studio. (2015). Facilitation field guide. San Francisco, CA: Exploratorium.

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Which facilitation step do you think takes the most time?

- Invite participation
- Support exploration
- Deepen understanding

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Time in Each Phase Varies

ACS Chemistry for Life®

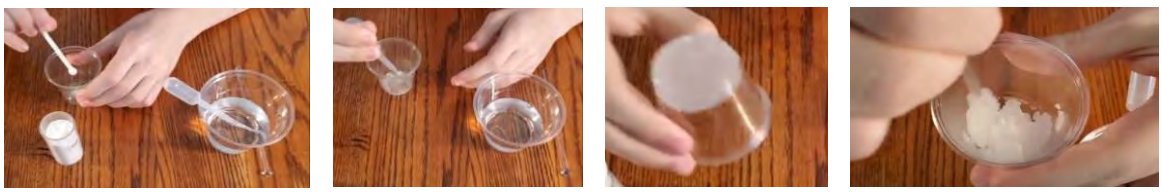
Facilitators go back and forth between the stages regularly

National Informal STEM Education Network, Let's Do Chemistry" Framework. http://www.acs.org/letsdochemistry

EXAMPLE: IMPROVING AN ACTIVITY

ACS / L. Wang. Washington DC USA. 2017

Sodium Polyacrylate: Three Cup Monty



Sodium Polyacrylate: Content

Strategies	Interest	Relevance	Self-Efficacy
Applications and uses	✓	✓	
Chemistry concepts	✓	✓	✓
Connections to everyday life	✓	✓	✓
Connections across STEM topics	✓	✓	
Societal issues		✓	

Content Improvements

ACS / L. Wang. Washington DC USA. 2017

- Connections across STEM topics
- Societal issues
  - Water conservation in agriculture

Sodium Polyacrylate: Format

Strategies	Interest	Relevance	Self-Efficacy
Be hands-on and interactive	✓		✓
Be simple to do and easy to understand			✓
Evoke familiar experiences	✓	✓	✓
Allow for observation of phenomena	✓	✓	✓
Allow for experimenting with variables	✓		✓
Allow for use of tools and materials	✓	✓	✓

Format Improvements

- **Allow for experimenting with variables**
  - Add salt, ask for a prediction of what will happen
- **Allow for use of tools and materials**
  - Use a pipet or glass stirrer
- **Be hands-on and interactive**
  - Let the participant do the mixing

Photo: Panama City, Panama, 201

Facilitation Improvements

Photo: D Horwitz, 2018

- Practice!
- Plan out your words
- Choose one or two foundational chemistry principles to focus on
- Research uses and applications

Plan Ahead

- **Which activities will you do?**
- **Can you modify or improve your activities?**
  - Not all activities need to include every strategy
- **How can you incorporate safety?**
- **For each activity, what will participants and facilitators**
  - Say?
  - Hear?
  - Do?

ACS SC San Diego State University. Tblisi, Georgia. 2019.

Plan with the Facility

- **Distance**
  - Keep a minimum of 10 ft. / 3m between demo and observers
  - Warn audience of loud noises and other hazards
  - Provide appropriate shielding

Tips for Planning Chemistry Demos. inChemistry. 2018.

ACS Puerto Rico Local Section, 2019

Outreach Materials: Event Equipment

- Tables and tablecloths
- Chairs
- If you are outside, what will you do if it rains?
- Tents

ACS LS Georgia 2019

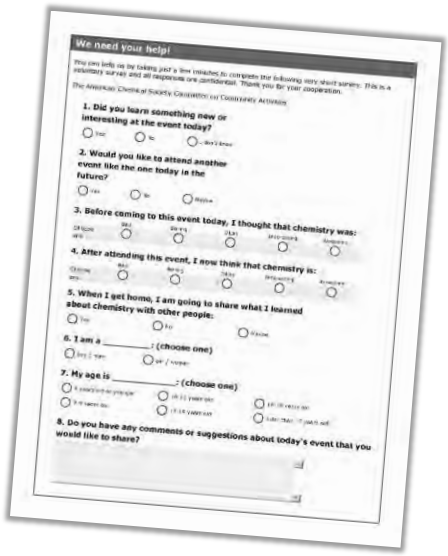
Outreach Supplies

- Visit store.acs.org for periodic tables, moles, and giveaway items
- Discounts for ACS members

www.store.acs.org | www.acs.org/ncw | www.acs.org/ccew | www.acs.org/moles

Don't Forget!

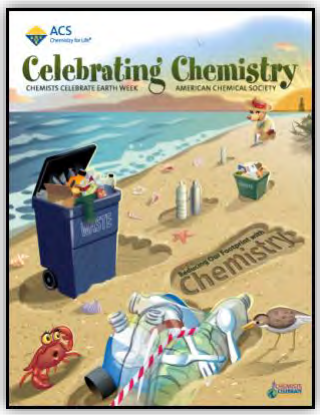
- Take pictures (legally)
- Post live on social media
- Collect participant surveys
- Dispose of all waste properly
- Thank all partners and volunteers
- Have fun!



ADDITIONAL RESOURCES

ACS / L. Wang. Washington DC USA. 2017.

From the ACS



- Kid-facing: www.acs.org/kids
- K-5 science lessons about science in everyday life: www.acs.org/InquiryInAction
- At-home activities around CCEW and NCW: www.acs.org/CelebratingChemistry

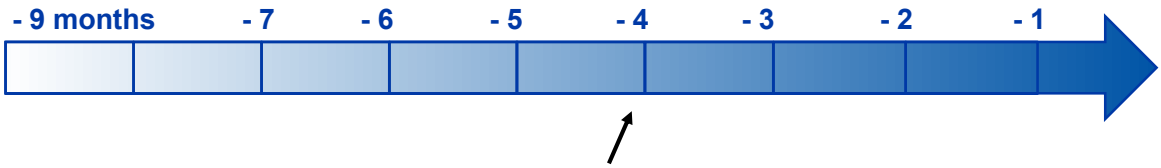
National Chemistry Week and Chemists Celebrate Earth Week

- **What:**
  - Public awareness campaigns that unite ACS groups in communicating the importance of chemistry to the public at the local, national, and global levels.
  - Unique theme each year
- **When:** Third full week of October (NCW) and week of April 22 (CCEW)

From the ACS

- Kid-facing: www.acs.org/kids
- K-5 science lessons about science in everyday life: www.acs.org/InquiryInAction
- At-home activities around CCEW and NCW: www.acs.org/CelebratingChemistry
- Virtual events and supporting documents: www.acs.org/KidsZone
- Grants for events outside the U.S.: www.acs.org/Festival
- Outreach Training Program: www.acs.org/OTP

Example Timeline



4 Months Out - Practice and Details

- Test out your desired activities
- Schedule hands-on activity training for all volunteers
- Order supplies for activities and giveaways
- Write press releases, other notices for local schools and companies to increase attendance
- If necessary, acquire insurance (if not sooner)

Example Timeline

- Kid-facing: www.acs.org/kids
- K-5 science lessons about science in everyday life: www.acs.org/InquiryInAction
- At-home activities around CCEW and NCW: www.acs.org/CelebratingChemistry
- Virtual events and supporting documents: www.acs.org/KidsZone
- Grants for events outside the U.S.: www.acs.org/Festival
- Outreach Training Program: www.acs.org/OTP
- ***In development: Safety in outreach settings, activities databank, volunteer toolkit***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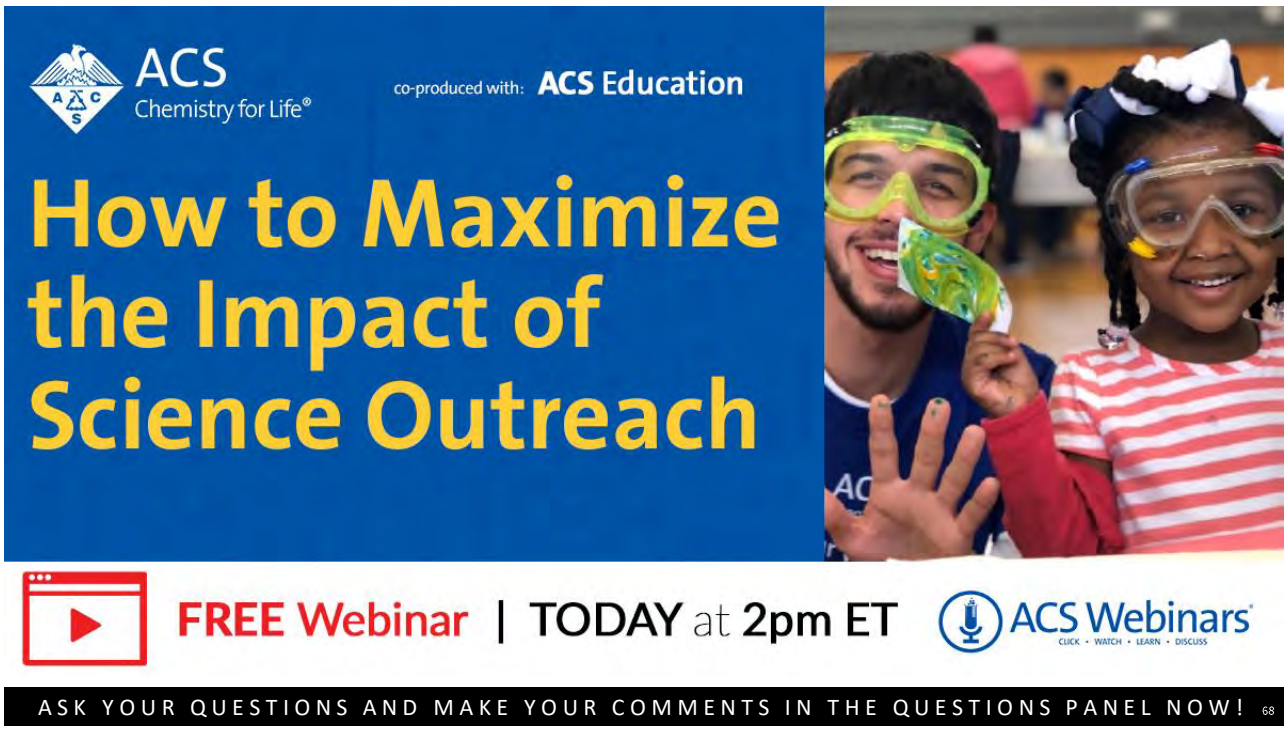
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How to Maximize the Impact of Science Outreach

WILLIAM DORIA
Associate Professor of Chemistry,
Rockford University

LILY RAINES
Manager, Office of Science Outreach,
American Chemical Society

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FINAL THOUGHTS

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ACS / L. Guzzetta. Orlando USA 2019.

FINAL THOUGHTS

- Science outreach is an important, fun, and mutually beneficial thing to do
- Using IRS is an effective way to define success of hands-on science outreach activities
- Research findings suggest ways that activity content, format, and facilitation can be optimized to reach these goals
- ACS volunteers and staff are here to support you

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Date: Wednesday, July 28, 2021 @ 2-3pm ET
Speakers: Kenneth Sibley, Carbon Inc. / H.N. Cheng, 2021 ACS President and US Department of Agriculture
Moderator: Jim Skinner, Terregena Inc. and ACS SCHB

Register for Free!

What You Will Learn:

- The basics of intellectual property, how it must be protected, and the importance of filing date
- What are the pros and cons of a patent filing or a provisional patent
- What are the various types of patents and what is Freedom to Operate

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Date: Thursday, July 29, 2021 @ 2-3:30pm ET
Speaker: Punit Seth, Vice President, Ionis Pharmaceuticals
Moderator: Charvi Nanavati, Ionis Pharmaceuticals

Register for Free!

What You Will Learn:

- What are the general principles for delivery of RNA-targeted oligonucleotide drugs
- How local delivery occurs to tissues such as the lung and the CNS
- How receptor-mediated delivery to hepatocytes, pancreatic beta cells, skeletal muscle and heart tissues occur

Co-produced with: ACS Division of Medicinal Chemistry, American Association of Pharmaceutical Scientists, and ACS Publications

Date: Wednesday, August 4, 2021 @ 2-3pm ET
Speakers: Andre Argenton, Dow / Scott Collick, DuPont Mobility & Materials / Adwoa Baah-Dwomoh, W.L. Gore & Associates
Moderator: Rebekah Paul, American Chemical Society

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What You Will Learn:

- The variety of ways companies promote diversity, equity, inclusion, and respect
- What programs companies are using to drive change
- Opportunities for the next generation workforce within industry

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