Let's Do Chemistry Train-the-Trainer Workshop

Content Module Transcript

[00:00-00:44]
Welcome to Module 3: Content strategies. My name is Allison, and I'm one of the researchers for the Let's Do Chemistry project. If you have not already done so, please review the welcome module, which provides background on the project and our research. In this video we will talk about the research findings related to activity design, specifically – content strategies to increase interest, relevance, and self-efficacy. We will also talk about how to apply the research findings to your own practice – in selecting, modifying, or creating activities for outreach or visitor engagement, as well as training others.

[00:45-00:49]
Let's start with the research findings!

[00:50-01:41]
In the welcome module, we previewed the design strategies framework that was developed as part of this project. We know that content and format are interconnected when designing an activity, and that facilitation is also an important part of the experience. However, in this module we will be focusing on looking more closely at the content strategies in the left column and how they support interest, relevance, and/or self-efficacy, which we learned about from the research connected with the Let's Do Chemistry kit activities. As a reminder, content strategies are the topics, information, or concepts that visitors discuss, think about, or hear about during an activity.

[01:42-02:10]
In the format module, we shared how content and format broadly play into increasing visitor attitudes. Before we dive into specific content strategies, we want to revisit this graph with a focus on content. You may notice on the upcoming graph that percentages for each area do not equal 100% as visitors may have talked about both content AND format.

[02:11-02:21]
Overall, we saw that content strategies seemed to be the most important for increasing visitors' feelings that chemistry is relevant.

[02:22-02:33]
We also saw that content strategies were fairly important for increasing interest, although format strategies were a little more prevalent for this attitude.

[02:34-02:55]
However, for self-efficacy, format strategies were what seemed to be most important. As I go through this presentation and share details about specific content strategies that can be intentionally included in an activity, you'll notice that many connect with relevance and interest.

[02:56-04:26]

Throughout the next section we will be sharing information about each of the content strategies including a definition for the strategy, and a graph that shows how frequently visitors attributed a content strategy to their increased attitudes about chemistry—these are our research findings. Just as a reminder--definitions for each strategy are based off how the team was originally thinking about content for the framework, as well as common responses that emerged from visitor interviews. These are the definitions we used for our analyses, which you can find in more detail in the research guide included in your participant packet.

The graph represents what percentage of visitors attributed their increased interest, in red, relevance, in purple, or self-efficacy, in yellow to that particular strategy. As the responses were open-ended, visitors had a wide variety of things to say so in some cases the percentages you see in this graph might be small. We excluded from our framework any strategy mentioned by 5% or fewer visitors. We have included the sample size, which ranged from 176-207 responses for each question, to help put those percentages in context.

[04:27-04:38]
We will also share a brief example of how one of the Let's Do Chemistry activities incorporated this particular content strategy.

[04:39-05:03]
Finally, we will show an example from our data, including which attitude the visitor reported an increase for after participating and their response to a follow-up question asking what about the activity made them feel this way. These quotes will give you a sense of how our visitors talked about the strategies that informed our framework.

[05:04-05:35]
Starting with the strategy of chemistry concepts, chemistry concepts refer to information about a basic concept, term, or idea of chemistry, or an explanation about the mechanism(s) behind a concept the visitors are learning about, such as a phenomenon that they are witnessing or discussing. This strategy seems to be important for all three attitudes of interest, relevance, and self-efficacy, to varying degrees.

[05:36-06:01]
Let's look at how one of the Let's Do Chemistry activities incorporated this design strategy. The Sublimation Bubbles activity uses the chemical reaction between water and dry ice to create soap bubbles, which creates opportunities to talk about the chemistry concepts related to the activity topic – specifically, phases of matter and sublimation.

[06:02-06:16]
In this example, a visitor shared that chemistry felt more interesting after doing the Sublimation Bubbles activity, and explained that it was because they learned "How it works, how the dry ice creates bubbles."

[06:17-07:05]
When thinking about the content of an activity, there is a lot more than just the chemistry concepts you are trying to teach! The rest of our strategies are other ways to think about

the types of content you can include in an activity. Starting with connections to everyday life, this refers to information that helps a visitor make an explicit connection between the concepts in the activity and their own life or personal experiences. This could include talking about something related to school, work, play, or any other aspect of everyday life. This strategy seems to be particularly important for relevance, but also supports interest and self-efficacy to varying degrees.

[07:06-07:28]
The Rocket Reactions activity uses the chemical reaction between citric acid and baking soda, which creates opportunities to talk about similar reactions that a participant might be more familiar with. An educator can talk about how this is similar to some of the chemical reactions found in baking or cleaning.

[07:29-07:44]
In this example, a visitor shared that chemistry felt more relevant after doing the Rocket Reactions activity, and explained that it was because they "talked about baking a cake, stickiness, and cleaning things."

[07:45-08:19]
The next strategy is including applications or uses of chemistry. While this area has some overlap with connections to everyday life, this content strategy more specifically includes information about manmade products or technologies that are created using chemicals or chemistry. We saw that this was very important for relevance, and somewhat important for interest. It does not appear to be important for self-efficacy, as fewer than 5% of people mentioned it.

[08:20-08:35]
The Nature of Dye activity incorporates cards that can be used to talk about various applications and uses of both natural and synthetic dyes, such as those used in mac and cheese, lipstick, or kool-aid.

[08:36-08:50]
In this example, a visitor shared that chemistry felt more relevant after doing the Nature of Dye activity, and explained that it was because they talked about "the food and cosmetics. I relate to those things."

[08:51-09:25]
Another strategy in our framework is including connections across STEM topics. This includes content information that helps a visitor make a connection between chemistry and another STEM field or understand chemistry's role within those other STEM disciplines (i.e. biology, physics, animal physiology, etc.). The graph shows that while this was not a major strategy, connections across STEM topics did have some influence for interest and relevance if they were built into the activity.

[09:26-09:38]
The Chemistry Makes Scents activity can help visitors recognize how using their sense of smell (a biology concept) relates to the molecular shape of that scent (a chemistry concept).

[09:39-09:54]
In this example, a visitor shared that they were more interested in chemistry doing the Chemistry Makes Scents activity, and explained that it was because "[It's] cool to think about how the nose reacts to molecular models."

[09:55-10:39]
The last content strategy in our framework is including societal issues. This is information about how the activity relates to or could be connected to a societal issue. Looking at the graph, you can see that this might not be as influential a strategy, although you have to consider that with hands-on activities, sometimes even topics that are built in don't always get brought up during an interaction, which may have been the case with some of our activities that tried to incorporate societal issues. We see that societal issues might play a role with relevance, but do not appear to be important for interest or self-efficacy.

[10:40-10:51]
The What's in the Water activity has opportunities to talk about water quality, particularly when using samples from nearby water sources like ponds, rivers, or lakes.

[10:52-11:08]
In this example, a visitor shared that chemistry felt more relevant after doing the What's in the Water activity, and explained that it was because they were "Relating it back to our environment, something right here instead of across the world."

[11:09-11:34]
From these findings, we created the final framework for content strategies that support interest, relevance, or self-efficacy in chemistry. This framework indicates the strategies that connect with different outcomes and can help as you plan your activities, of course, in addition to thinking about format strategies that were shared in the previous module.

[11:35-12:19]
To summarize our findings about content strategies and connections to chemistry attitudes, we have also created this chart that shows the relative frequency with which visitors mentioned each strategy in connection to the three attitudes. This chart visually reflects the findings we just shared on the previous slides through color shading and dot graphics. The data showed that visitors felt the content included in an activity was especially important to increasing their interest and understanding of relevance. You will remember this from the first graph that we showed at the beginning of this module with the blue and teal bars.

[12:20-12:40]
There were several particular content strategies to consider when creating or modifying an activity. As seen in the first two graphs we shared for the individual strategies, chemistry

concepts and connections to everyday life were shown to boost all three attitudes around chemistry.

[12:41-12:54]
And, in some of the later graphs we saw--applications or uses and connections across STEM concepts were shown to boost interest and relevance.

[12:55-13:08]
My name is Patti and I am a practitioner with the Let's Do Chemistry project.

I'll be talking about ways to apply the framework you just learned to help activity facilitators prepare for the conversations they will have with participants.

[13:09-13:49]
Just as you did with the format strategies, use the content strategies as a guide to help you choose, eliminate, modify, and design new activities. Written procedures that you can find online or in books tend to focus on the doing part of an activity, so it may be helpful to look at format first when selecting activities. The next thing to consider is content!

Remember, content is what participants talk, think, or hear about when doing a hands-on activity—it is part of the conversation that happens while doing the activity. And if done well, content will promote feelings that chemistry is relevant, while also supporting interest and self-efficacy.

[13:50-15:12]
Finding the content in an activity can be a bit confusing. In a typical activity write-up, there may be a few applications or uses in the introduction and some chemistry concepts written at the end of the activity. The trouble is that even with this information there are so many different stories a facilitator could tell or points a facilitator can make. How can an activity facilitator, who sees an activity write-up a few days before or reads it an hour or two before the program begins, be expected to know the direction the activity planners intended?

As you and the activity planning team select activities for your event or program, consider the story that you would like to tell with your collection of activities. Then, identify the main point each activity should make within that story. Finally, looking at each activity separately, highlight parts from the activity write-up that you want communicated to participants in one way or another. Then, include the whole story, main points, and highlights in the volunteer packet, video, or training you provide to activity facilitators. Facilitators need to be aware of how their activity fits with the others so that they can provide participants with a cohesive experience.

[15:13-16:00]
Chances are, because you choose this workshop, that you intuitively decide what the point of an activity should be when you read a description or watch a video. Then, you consider the audience and tailor the content to fit them. You identify the right level for chemistry concepts, identify applications or uses that are important to people at different stages of their lives, and make connections that resonate with your audience. Most people need help getting to this level.

Help activity planners and facilitators think about the participants' experience. Ask them, "What do you want participants to [1] talk about, [2] think about, and [3] hear?" The content strategies provide specifics for you to share with your team so that they know what to focus on as they prepare for the conversations they will have with participants.

[16:01-17:15]
Let's use the sodium polyacrylate activity to show how the content strategies can be used to prepare for the conversations between facilitators and participants.

Growing creature toys that hatch out of an egg after soaking in water, baby diapers, hair gels, and surgical sponges, are examples of applications and uses of super absorbent polymers such as sodium polyacrylate.

If you are working with elementary, middle, or high school students, you may want to look at the science standards for your county or district. A parent or public version is usually published online. This will help you identify chemistry concepts as well as make connections across other STEM topics that students are familiar with. The chemistry concept for the sodium polyacrylate activity could be absorbency as a characteristic property of materials.

To get participants thinking about absorbent materials used in everyday life, I could ask what they might use to wipe up spilled water.

If I want to include societal issues, I could bring up examples of super absorbent polymers used in agriculture. The benefit is that people who live in dry regions will not need to use as much water to care for their crops.

[17:16-18:21]
If you want the chemistry concept to be about attractions between molecules, rather than properties of materials, participants will need some background and context. I added a modeling activity, that utilizes the format strategies, to support this conversation.

This is how it works. The metal slinky represents sodium polyacrylate and the water molecule and ion pieces are magnetic. While exploring, participants discover that water molecules stick to each other and to the slinky. The ions that make up salt stick also stick to each other and to the slinky. However, each ion is able to pull one or more water molecules from the slinky at one time. Soon there are few water molecules left on the slinky. When asked what might happen when salt is added to the gel, they are pretty confident that the salt will pull the water off the sodium polyacrylate. The watery appearance after adding salt, confirms their prediction.

[18:22-20:05]
As we have talked about in the research portion of this video, content strategies include more than just chemistry concepts! Give activity planners and facilitators time to think, write, and workshop at least at least one thing to say and at least one question to ask for strategy as it relates to one activity.

For applications and uses...

- You might say: Let's take a look at the secret science of diapers!
- You could ask: How do you make grow creature toys grow?

For connections to societal issues...

- You might say: Potassium polyacrylate is used to coat seeds for crops that are planted in dry regions. Seeds need moisture as they germinate. The coating prevents the water from evaporating in the hot sun and holds the water close to the seed. This is one way to increase the number of seeds that germinate and grow, while using less water.
- You could ask: Why might a person who wants to have plants in a pot outside on a sunny patio during the summer, choose to add a super absorbent polymer to the soil?

No one should expect to say all of the statements and ask all the questions in every interaction. The purpose of this exercise is to give your trainees time to think of what they might say and practice talking so that they can respond to each participant, rather than say the same speech over and over. Just like format strategies, all content strategies do not have to be in use to make a strong activity. However, use of the strategies are indicators that an activity will increase feelings of relevance, interest and self-efficacy in chemistry.

[20:06-20:53]
Activity facilitators need quite a bit of practice. After reviewing the [1] talking points and questions, they will need to practice saying these out loud. It's helpful to [2] practice with other activity facilitators, so that they can talk, listen and shamelessly steal from one another. Encourage them to be on the look-out for well-worded questions that get participants to think, clearly-explained chemistry concepts, and real-life examples that will resonate with participants. And if it all possible, give activity facilitators an opportunity to [3] practice their content strategies with just a few actual participants. It takes a great deal of practice to be able to customize conversations based on the background experience and interests of each participant.

[20:54-20:59]
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