Talk Science

Professional Development

Transcript for Grade 5 Classroom Case: An Explanation Discussion

1. What Happens in an Explanation Discussion?

Talk is an essential part of any science investigation. Students sharpen their understanding of science content as they explain their ideas to one another. Through talk, they learn to look critically at data, make the case for evidence to support a claim, and reason about explanations of processes that can't be observed.

In this classroom case, students investigate dissolving, a transformation of matter that can't be observed directly. The investigation question is What changes and what stays the same as salt dissolves in water? Students crush salt crystals thus transforming them into tinier and tinier pieces. They stir salt into a cup of water and watch it disappear. They collect weight and volume data for the dissolved salt and assemble a class data table.

Then it's time for students to discuss their ideas about dissolving salt. Their teacher, Colleen, wants students to use data to explain **how** they know what happened to the dissolved salt that they can't see any more. She knows students tend to fall back on their senses to explain and plans to keep the focus on measurement data to support their claims.

With careful measurement, students can discover that during a transformation such as dissolving, something remains constant: the total amount of matter, as indicated by its weight. The weight of the salt solution is equal to the weight of the water plus the weight of the salt before it was dissolved. Weight explains how we know salt is present even when we can't see it.

There's second kind of explanation Colleen asks students to consider. **Why** can't you can't see the salt any more once you're convinced it's there? Is there a scientific principle or model to explains why dissolved salt disappears? That's the kind of explanation Colleen invites when she says, "So what do you think happened?"

Several students propose size as an explanation: that salt granules get smaller as they dissolve. This explanation – that dissolved particles are too small and too spread out to see – will be more fully developed in a later discussion.

Left to themselves, without facilitated discussion, students very likely will not consider some core ideas embedded in these activities with salt, ideas that are precursors to understanding the Particle Model of matter that is so central to this curriculum.

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2. Explaining how we know the salt is there

Students explain what evidence convinces them that the dissolved salt that they can no longer see is present in the water. The key evidence is the weight of the salt solution that is equal to the sum of the weight of the water plus the weight of the salt before it was dissolved.

Text on screen:

Explanation Type 1

Explaining *how* I know the salt's still there even though I cannot see it

Teacher: Okay. And what was your salt only?

Lorie: 19

Teacher: 19 grams. We're looking at data folks, I really should see your eyes up here trying to pick out some sort of pattern, to gain some sort of knowledge

[students continue to report data]

Teacher: Interesting. Look what's happening, just like we did…

Aisha: I see a pattern.

Teacher: Do you see some sort of pattern?

Teacher: Go ahead

Aisha: Well, um, I was going to say about the pattern. I think that … with the water and salt combined, it's the same thing as the salt dissolved in the water because like it seems like that when the salt and water combine it's the exact same thing as the salt dissolved in the water. So then the salt water … the salt .. the salt's weight goes also into the water's weight and then equals it.

Teacher: I wonder if somebody can repeat what you just said. I'm not even sure if I can and I was listening. Can you repeat what she just said?

Julia: I think so.

Teacher: You think so. You should listen to Julia.

Julia: I think Aisha is trying to say that the combined weight of the salt – the salt and water – it would be really close to the amount the salt and water… the salt dissolved in the water.

Teacher: OK Is that what you said? [Aisha nods yes] Can you

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confirm that? So, if I can just sum up what they said. They are both saying this water weight, this water salt combined – which I put in blue – should match the salt dissolved in water weight.

[Some students say it should be the exact same thing.
Some students say it should be close.]

Teacher: It should be the exact same thing or it should be close? You say it should be close

Aisha: It should be exact

Teacher: Can you prove the salt's there by weight only?

Janaya: It's still there because if you have 144g of water and you add 22g of water [salt] and dissolve it and weigh it again and you have 163g of water it proves it's still there because it weighs more than it did the last time.

Teacher: Janaya seems convinced [pause] She's convinced that weight is a good indication the salt dissolved because you can see the difference in the weight and they're just about the same. Hmmm.

I really want to know if the salt is still there.

Teacher: Can we actually go around the circle. All I want to know is how many of you believe that the salt is still there.

Text on final screen:

When they engage in Explanation Discussions

- Students explain the reasons they think their data provides evidence to support a claim.
- Once these ideas are clearly understood by all, they are open to respectful discussion and debate.

3. Explaining why dissolved salt is invisible

Students propose an explanation for why they cannot see the salt when it is dissolved in water. The salt is invisible because the particles are too small and too spread out to see.

Text on screen:

Explanation Type 2

Explaining *why I* cannot see the salt any more.

Teacher: A resounding yes. Why do you know it's still there and you are going YES versus why do you think no? Why yes?

Student: Maybe you would know if you weighed the salt and weighed it again and you could see how many grams it changed.

Teacher: Did we do that?

Student: Or you could taste it

Teacher: you could taste it but you could also weigh it before and after. You did that though. How do you know it's there for sure?

Student: You know that it's there for sure because if you look at the water you can still see stuff floating around in the water.

Julia: Even though you can't see it, when you weigh with the salt the volume increases so you know the salt's still there and it ended up increasing the amount of water.

Teacher: It increased the volume so you know it's there for sure? That's what you're saying?

Aisha: It also increased in weight.

Teacher: It also increased in weight. Kyle.

Kyle: I would think that if you used a magnifying glass you can see it.

Teacher: If you use a magnifying glass you could see it. Did anybody try that?

[Yes. No.]

Teacher: Why not? You were getting there. If you did use it, and could you see it?

Students: Yes. No. A little bit but not that much.

Teacher: A little bit but not that much. Why do you think you could only see a little bit?

Students: Because it *dissolved.*

Teacher: Well, let me ask you what dissolving means. You're telling me it's still there. Let me ask you what do you think dissolving means …

Student: It gets smaller

Teacher: You're telling me it's still there, for sure, You might be able to see a little bit but some people are saying no, you can't see it. So… But it's smaller

[Students talk at the same time using the words *dissolving* and *smaller*]

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Teacher: What do we think is happening when salt dissolves in water?

John: It becomes smaller.

Teacher: It becomes smaller. Can you say more?

John: When we put it in the cup it gets smaller than when you stir it in

Teacher: I couldn't hear you. It's smaller than …

John: When we stirred it up.

Teacher: You said when we put the salt in the cup, and stirred it up, it dissolved…

John: It dissolves and gets smaller

Teacher: So you're just …Interesting. Anybody else?

Michael: Like salt is clear and so is water. so maybe it blended in.

Teacher: The salt blended in with the water?

Final Screen:

- Students use evidence and reasoning to find a general principle that explains a phenomenon – in this case why the dissolved salt disappears.
- They begin to converge on a principle: When a substance is dissolved, as when salt dissolves in water, the particles still have weight and take up space but they are too small and too spread out to see.

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