WHAT WE LEARNED FROM A TOMATO

PARTNERING WITH A CONTENT EXPERT PLANTS NEW IDEAS FOR INSTRUCTION

By Bradley A. Ermeling

Researchers from the Pearson Research and Innovation Network investigating partnerships between teacher teams and outside content experts got a close-up look at how these relationships impact teachers' instructional practice.

The partnership model they have been studying is called Learning Studios, developed by the National Commission on Teaching and America's Future. Learning Studios are project-based learning environments in which interdisciplinary teacher teams collaborate with local scientists, researchers, and university faculty to develop and implement yearlong project investigations with students (National Commission on Teaching and America's Future, n.d.).

Through these partnerships, teachers gain access to experts' extensive content knowledge, exposure to latest research, practical experience in the field, and resources and perspectives that can help teachers expand their professional knowledge and move beyond persistent images of traditional practice (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; National Research Council, 2012).

Using the National Commission on Teaching and America's Future 2013-14 Learning Studios project in Maryland, Pearson researchers conducted case studies of planning meeting interactions between outside experts and teacher teams at secondary schools, explored the effects of these interactions on teachers' instructional plans, and examined specific actions that might be important for coaches and experts to productively partner with teacher teams (Ermeling & Yarbro, in press).

HIGH SCHOOL CASE STUDY

In one case study, a research fellow from the National

Institutes of Health partnered with an interdisciplinary teacher team from an urban high school in Maryland. The high school team included six veteran teachers responsible for English, math, science, and technology education.

For the 2013-14 school year, the high school team worked on a project called Tomatosphere, sponsored by the Canadian Space Agency. The project's goal was to engage students in the study of life support requirements for extended space exploration.

Students would design and conduct a scientific experiment with dependent and independent variables by comparing germination rates and plant growth for an experimental group of primed tomato seeds (i.e. presoaked in water) and a control group of unprimed seeds. The project also included resources for cross-curricular application in areas such as nutrition, energy, weather, and environmental studies (Canadian Space Agency, n.d.).

During the initial summer collaborative design sessions, the teachers and the research fellow agreed that it would be valuable to connect some of her studies on health and aging to why lycopene or other nutrients might be beneficial and why tomatoes, which are rich in lycopene, might be a viable crop for space travel. However, while conducting research on lycopene over the summer, the research fellow discovered there was limited evidence to support the nutritional benefits of lycopene supplements.

Between the summer and fall planning sessions, the research fellow offered teachers three scenarios for how they might approach a lesson involving the idea of supplements and health. The options included:

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- Ignore the role of lycopene and focus on antioxidants in general;
- Discuss the studies pointing to limited evidence for lycopene and use them as an opportunity to engage students in critical thinking; or
- Press forward with their plan to discuss the benefits of lycopene and focus on the few available studies that demonstrated an effect.

This served as a launch point for the team's planning discussions at the next design session in September. The following edited excerpt from that session captures the changes in instruction that resulted from the research fellow's suggestions.

PLANNING DISCUSSION EXCERPT

Teacher 1: Since most of us have introduced the Tomatosphere project design, I was thinking we could have you come in and they could learn, "Why tomato?" — with the lycopene.

Research fellow: I was looking online for evidence of lycopene and human health, and, unfortunately, there is not very strong support. So the direct role of lycopene itself seems to be pretty tenuous. It doesn't seem to have a great connection to human health. But I think that this could be a learning opportunity. Another option is that you can use it as a critical thinking opportunity to have them look at the evidence, see what there is, and have them decide if it's good evidence.

Teacher 1: I was going to go with that.

Research fellow: It could be a little bit trickier, but it may be rewarding.

Teacher 1: I like both things, but what I was thinking when you started talking is not just learning facts from a textbook, but learning how scientists learn the science that we teach in our classrooms. So when you just said that there's not a whole bunch of evidence to say that lycopene is perfect, I thought it was good for students to see that it's an ongoing process.

Research fellow: Looking at different studies and identifying why they're flawed or why they don't agree with one another is not only teaching the material of what evidence there is for lycopene in health but also critical thinking skills.

Teacher 1: So maybe you could give them something and then say, "Does this look like it's reliable data?"

Research fellow: What if I went to the studies and looked at the abstracts and wrote a simplified version? Then I could provide a couple of abstracts about lycopene and, let's say, prostate cancer. The students could read it over and hold up a letter grade for how good they think the study supports it and say why they think it's a great study or why they think it's a bad study.

Teacher 1: That's a good idea.

Teacher 2: I like that idea.

Teacher 3: I think it directly relates to what we've been talking about for our writing samples for claim, evidence, reasoning. We've been discussing having students as a goal for the year increase their ability to write a scientific explanation. The components of a scientific explanation are claim, evidence, reasoning. So if they can evaluate a simplified version of the abstract, they're processing through that filter of, "Does this evidence support this claim or not and why?"

Research fellow: I could write up the abstracts, and you could print them out and give them to the students to read the night before so they have some time to digest it. And then I could come give a 15-minute talk about lycopene and human health or what makes a good research study solid.

Teachers 1 & 2: I like what makes a good research study solid.

After alerting teachers to oversimplified claims about the benefits of lycopene, the research fellow presented the team with a wider range of instructional options to consider that might better support their learning goals.

EXPANDING HORIZONS

These interactions represent a clear example of teachers expanding horizons of instructional plans as a direct result of outside expert contributions. After alerting teachers to oversimplified claims about the benefits of lycopene, the research fellow presented the team with a wider range of instructional options to consider that might better support their learning goals.

In follow-up focus groups, teachers described how their lesson plans became more focused on helping students think critically about the scientific process than would have been possible without the outside assistance. They also described how these lesson changes directly supported important learning outcomes for students.

KEY FACILITATIVE ACTIONS

Pearson researchers noted facilitative actions by the external expert that contributed to teachers' rethinking of the project design and instructional plans.

Adapt expertise to local needs. The research fellow stressed the importance of listening, genuinely tuning in to the needs of the group, and learning from the group's knowledge and experience to effectively adapt and assist the emerging project.

This approach not only laid a foundation of trust and shared understanding, but also helped the outside partner gain insight into teachers' thinking, sometimes revealing important gaps in lesson plans or a specific blind spot where teachers might need assistance.

Follow up between meetings. After learning from teachers and gaining knowledge of their local context, the research fellow was able to apply her expertise and contribute ideas through diligent follow-up work between meetings. The research fellow not only made a substantial effort to review existing literature on lycopene, she carefully outlined three specific instructional options for how they might approach this teaching opportunity. Teachers reported that they appreciated the follow-through and responsiveness.

Judiciously apply pressure. After taking time to listen and develop a shared understanding of project plans, the research fellow also looked for critical junctures to stretch teachers' thinking.

In the interaction between the research fellow and teachers related above, she patiently guided teachers to new insights and judiciously applied pressure to expand their vision of instructional possibilities. While she had clear ideas of instructional activities that might help increase scientific rigor and critical thinking, she introduced these ideas through a sequence of understated facilitative moves rather than aggressively asserting opinions or overtly leveraging her authority as an outside expert or researcher.

She frequently chose words that softened her tone to engender respect and cultivate openness, while at the same time pushing teachers to consider an alternative instructional approach. She reinforced teachers' interest with slightly more direct state-

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