Virginia Intiative for Science Teaching and Achievement (VISTA)

Summary

VISTA is a research-based professional development program for K-12 science teachers, district science coordinators, and science education faculty in Virginia. During the first three years of the 5-year ongoing randomized control/treatment study, research findings indicated:

- A greater percent of science teachers (K-12) used computer simulations, including ExploreLearning Gizmos®, in their science instruction following VISTA professional development compared to teachers that did not receive the professional development. Teachers participating in VISTA embedded Gizmos in lessons that supported scientific inquiry, problem based learning, and nature of science instruction *(Gonczi, Maeng, Bell, & Whitworth, 2014; Gonczi, Bell, Maeng, & Wheeler, 2013)*.
- VISTA teachers gained confidence in incorporating computer simulations, inquiry instruction, problem based learning, and nature of science into their science instruction *(Bell, Maeng, & St. Clair, 2014)*.
- VISTA teachers used instructional support strategies to help students critically engage with Gizmos, develop scientific practices, and understand targeted science content *(Gonczi, Maeng, Bell, & Whitworth, 2014)*.
- Economically disadvantaged students of VISTA 5th grade teachers in cohort one performed significantly better on science standardized tests than students whose teachers did not receive the VISTA professional development *(Konold, Maeng, & Bell, 2013)*.

VISTA Professional Development and ExploreLearning

The Virginia Initiative for Science Teaching and Achievement (VISTA) is a federally funded professional development program intended, in part, to identify instructional variables that increase student achievement in science. The U.S. Department of Education awarded the 34 million dollar Investing in Innovation (I3) grant to validate previous research findings (e.g. Sterling, Matkins, Frazier, & Logerwell, 2010). Currently, six Virginia universities and more than 80 school districts in Virginia are working together to strengthen science teaching through VISTA.

Science teachers apply to VISTA and are randomly assigned to control or treatment groups. Science teachers in the treatment group receive VISTA professional development that focuses on problem-based learning, hands-on learning, inquiry-based instruction, and explicit nature of science instruction. VISTA professional development also encourages technology integration to help K-12 science teachers enact reforms-based science instruction and improve students' science standardized test scores.

Explorelearning Gizmos are an integral component of the VISTA professional development. Teachers in the treatment group learn to use computer simulations, including Explorelearning Gizmos, because these simulations have the potential to build students' science conceptual understanding while facilitating inquiry-based, student-centered, teaching methods consistent with current science education reforms. In addition, Explorelearning is working with VISTA researchers to help identify instructional methods that characterize effective teaching with computer simulations.

Results

Preliminary results from the first three cohorts of VISTA teachers indicate that following VISTA professional development:

- VISTA treatment teachers had a significantly greater understanding of problem-based learning, inquiry instruction, and nature of science instruction compared to control teachers.
- VISTA treatment teachers' confidence implementing problem-based, inquiry-based, nature of science, and technology-integrated science lessons improved following VISTA professional development.
- VISTA treatment teachers implemented problem-based learning, inquiry instruction, and explicit nature of science significantly more often in their science instruction than teachers in the control group.
- VISTA participants used Gizmos to deliver student-centered science instruction and help students develop scientific practices foundational to scientific inquiry. Examples are provided in Table 1.

Table 1. Reform-Based Science Instruction with Gizmos

INSTRUCTIONAL PRACTICES	EXAMPLE
Problem-based Learning ***(Bert, Observation 1)***	Before starting a lesson the teacher reminded the class of the overarching problem by asking, *"Why do you think the pipes burst in Minnesota in the winter?"* The teacher then used the **Phases of Water** Gizmo to show students how water molecules change at different temperatures so that students could ultimately solve the overarching problem.
Scientific Inquiry ***(Bert, Observation 1)***	The teacher asked the class, *"So when it froze what happened to the water inside?"* A student answered, *"it expanded and pushed out."* The teacher said, *"We are going to test that hypothesis."* Students then used the **Phases of Water** Gizmo to collect data, test their hypotheses, and draw conclusions.
Explicit Nature of Science ***(Norma, Observation 3)***	The teacher emphasized the collaborative and social nature of science when she told the students they will be working in pairs while using the Gizmo because *"scientists tend to talk to each other."*
Hands-on Science ***(Riley, Observation 4)***	The teacher told her students, *"What we're about to do next is we're going to actually look at a real flower and look at the parts of the flower where reproduction occurs. So make sure that when you have the flower do what it's asking you to do. So when it tells you to click on the stigma and watch the pollen stick to the stigma or to click on the anther or the style make sure you're clicking on those different things because when you get the real flower it will be more clear."* For approximately 20 minutes students interacted with the **Pollination: Flower to Fruit** Gizmo to learn about flower parts and their function. Gizmo use prepared the students for the subsequent lily flower dissection.

Many VISTA participants found that Gizmos were easy to use and facilitated laboratory experiences, especially when time or resources were limited. For one teacher, Gizmos was "a cheaper way to do a lab, and still get the same content from it." For another, Gizmos took "less time to set up and break down and reset."

References

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