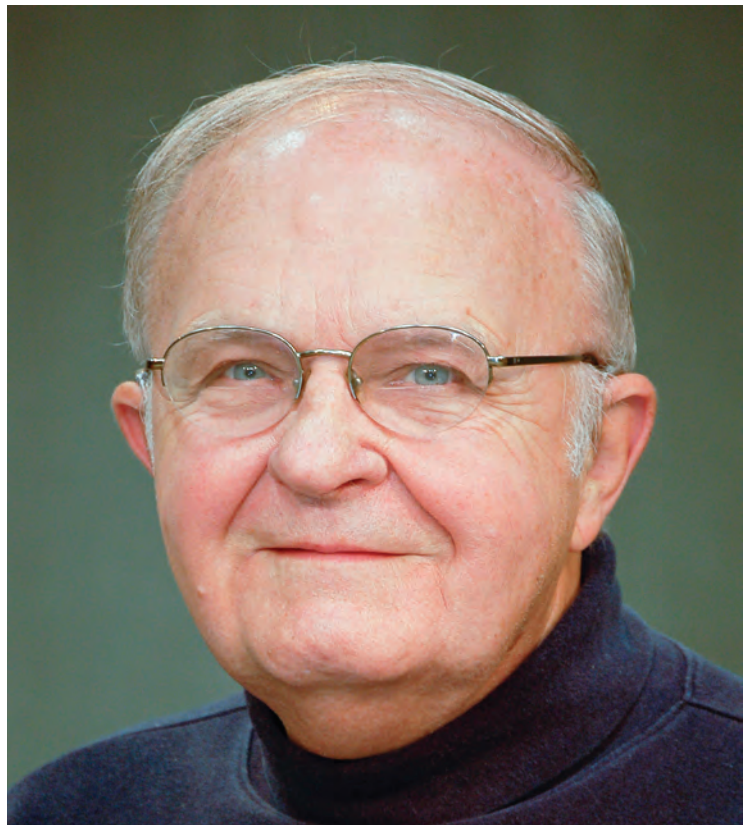


Q&A  
with  
ROBERT YAGER



Robert Yager, professor of science education at the University of Iowa, brings scientific inquiry to teacher education.

# AN OUTCOMES PIONEER

**SCIENCE EDUCATOR IS A PASSIONATE ADVOCATE FOR INSTILLING  
A TRUE SENSE OF INQUIRY THROUGHOUT EDUCATION**

**By Tracy Crow**

**R**obert Yager's work with science educators has long emphasized the importance of examining the student outcomes that result from teacher professional learning. In 1999, Learning Forward (then NSDC) highlighted the Iowa Chautauqua Program in *What Works in the Middle: Results-Based Staff Development* (Killion, 1999) as one of the few staff development programs for science that could demonstrate results. The program included a range of learning designs, including summer institutes, coaching, demonstrations, action research, and curriculum development. Support for participants extended beyond the summer institute with follow-up in

the fall and spring. Data from the program indicate that students of teachers in the Iowa Chautauqua Program outscored their nonparticipating counterparts in four of five domains, and scored at a similar level in the fifth domain. The program was active from 1982 to 2008.

Yager, professor of science education at the University of Iowa, remains active as a passionate advocate for instilling a true sense of inquiry throughout education.

**JSD: I know you have a long history with professional development that leads to student outcomes. What makes professional learning effective in science?**

**Yager:** The main thing is to start with what we expect from students. Science begins with not knowing. Unfortunately, in typical teaching, we don't start with what's not known — the answers are in a textbook or the laboratories

are directed. As a student, you're told why you are going to the lab, and you even know the answer before you do it. I've gone through a lot of science courses (as a student), and I've played the game of learning what the instructor said I should learn. And every college teacher likes someone who mimics them. But that's not doing science.

I've worked a lot, for more than 50 years, with teachers in workshops here in Iowa. I always try to liken what they're doing to science. They need to ask, where's the evidence that what they're doing is effective? I like to expect them to do something with their teaching, something creative, something where others didn't even see the connection. It's almost like living a part of a puzzle, instead of doing what you're told and repeating it over and over.

Too often, science in schools exists only through information included in textbooks. These texts and school courses are typically organized as biology, chemistry, physics, and earth science. These are accepted as "science." Unfortunately, these topics usually comprise the entire curriculum, leaving no room for the exploration of what is yet to be known. Information in textbooks has nothing to do with what science is or why and how it can be used.

## AN INQUIRY PROCESS

**JSD: In working all these years with teachers and urging them to be creative, what would you do to help them develop that creative mindset in themselves and in their students?**

**Yager:** I try to stay off the stage, and I always try to get a team member with me. I like the idea of teachers working with teachers rather than the professional development person standing up in front of a group or having all the activities. The unique thing we did — we dealt with leaders who weren't going to preach but who were going to try to get students involved in their own projects and their own thinking and interacting with each other.

They would start with a problem, a personal project where, as a student, you can identify something, something that you wonder about, whether it's a personal problem or a societal problem. And that would be the whole science course. If the problem is societal, you have to get in teams of at least two. You have to go out, identify questions, identify experts, identify corrections, always look for things. You've got to share this with other people and share what you think you know and how you went about it. Rather than students just absorbing this information, it's the process of looking at what they went through and what they found out and where they got the information.

This learning wasn't something in a textbook, it wasn't something the teacher lectured about, it wasn't a lesson that was planned. It's something they did because they had a purpose.

I had an elementary ed major once in a course, and she said to me, "You're the worst teacher I've had. I can't understand what you want me to do." And I asked, "What don't you understand? I'm asking you to identify something that you're interested in, a problem you can do something about, find some information, work on that problem you've identified. What part of it don't you understand?"

We had 23 members in that class, and it's amazing what people came up with. An athlete had some sort of rare hemorrhaging in his blood system. He was a baseball player with a serious health problem, and he learned a lot of things to combat it. Another teacher had a kid who came to class late. When the teacher asked why he was late, the student said, "Oh, there were nine kids, and they clogged up the toilet." So she installed a toilet in her classroom, and the class researched where did the waste go and how did this all work. They tested nearly 50 brands of toilet paper. The teacher said she never thought she would see her new school superintendent with his head in a toilet in her classroom.

## SUSTAINED LEARNING MODELS

**JSD: How do you help teachers create this kind of a learning environment?**

**Yager:** The Chautauqua model was a three- or four-week summer workshop. Then in October, we would come back with a three-day session to hear what plan teachers put into operation. We'd ask: "What have you done? What reports can you share? What were the local/personal problems? What did happen?" Some of them are going to be the next generation of teacher leaders. They're going to get other teachers involved.

We had control groups and action research projects, and the control groups were close enough to knowing what happened with their groups and with their kids so they wanted to learn more. We've won the war when they

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want more, when they can testify, and when they can offer the evidence of what happened without being asked specifically. And then they'd get together again for three days in the spring, when they had done something for a whole nine weeks — the fall projects were shorter. It was a team of learners. Over the full year, it's almost like we formed a cooperative group of researchers.

**JSD: How many teachers were you working with each summer?**

**Yager:** Typically, it would be 30 people in the summer, and, many times, as we got things under control, we would have as many as five different settings. This had to be the science program for the whole school. One of our teachers taught at the school where he grew up — he had his 10th-grade biology teacher as a student, and this teacher was pretty much textbook-oriented, everything was planned out — and he even loosened him up a bit.

**JSD: I'm curious about loosening up those teachers who**

**seem set in their ways. Is it seeing results that make them change their minds?**

**Yager:** Yes, it does. Everybody likes a happy, enthused student. They're the best salespeople out there. Instead of it being a required course, because "I wanted to get into Harvard," students can see what they did with their questions, and they can talk about their experiences in actually doing science.


My dream would be that science education would become a science, would become a profession. If every teacher were a better learner, they would be models, and the idea would catch on with more people. Science is doubting, it is curiosity, it is trying to have ideas to explain things. It's about asking questions, learning more, and, in my mind, that's what Learning Forward should be all about.

#### REFERENCE

**Killion, J. (1999).** *What works in the middle: Results-based staff development.* Oxford, OH: NSDC.

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