

Wallingford, CT
May 7, 2010
Online Circulation: 265,419 visitors/month



Training the Next Generation Of Science, Math Teachers



The [Knowles Science Teaching Foundation \(KSTF\)](#) was established in 1999 by inventor and entrepreneur C. Harry Knowles and his wife Janet to strengthen the quality of science and mathematics teaching in U.S. high schools by awarding fellowships to educators. The fellowships are renewable for up to five years and valued at up to \$150,000. Benefits include financial support -- such as tuition assistance, monthly stipends, and teaching materials and leadership grants; extensive summer and academic year professional development; and regular meetings and online discussions that provide each fellow with a strong support network.

This academic year, KSTF fellows are teaching science and mathematics in high schools in 31 states, reaching 14,000 students with engaging, hands-on lessons. The foundation's programs include the KSTF Teaching Fellowships and the KSTF Research Fellowships for doctoral level researchers.

The fellowship organizers want not only to train and inspire math and science teachers, but also to help them stay in the profession by providing ongoing support. (Knowles fellows have lower attrition rates than the general teaching population.)

Dr. Angelo Collins, KSTF's executive director, explained the mission of the foundation and how she hopes the fellows will help transform high-school math and science education.

Education World: Why is the Knowles Fellowship necessary?



Dr. Angelo Collins

Dr. Angelo Collins: The mission of the Knowles Science Teaching Foundation is to increase the number of high-quality high school science and mathematics teachers in the United States. According to many sources, about half of all teachers leave the classroom within the first three years of teaching. Because students deserve good teachers, and there is no disagreement that teachers are essential to student success, we at KSTF work to keep the best and brightest teachers in classrooms and help them become excellent teachers and teacher leaders.

At KSTF we believe that teaching is a complex profession and that it takes a long time to master all the knowledge and skills require to be an excellent teacher. Some of that knowledge includes understanding the discipline in ways that enable students to understand it; understanding how students learn and what motivates them; designing instruction that maximizes student learning; designing, conducting, and utilizing formative and summative assessments; and reflecting on the success or failure of lessons and using that reflection to improve practice. We provide resources to assist teachers as they grow into their roles. Those resources include mentoring, materials, access to many forms of professional development opportunities, and access to experts and like-minded colleagues.

EW: What do you think is lacking in teacher preparation programs for math and science teachers?

Collins: I think teacher preparation programs face an almost impossible task of providing prospective teachers with the knowledge and skills needed to be successful -- and doing so in a relatively short period of time. As Arthur Levine reported in [*Educating School Teachers*](#), a publication of The 2006 Educating Schools Project, there is no consensus in the United States about what teacher education programs should teach or how the knowledge and skills should be taught. There is no agreement about whether teaching is a craft or a profession -- and that simple decision dictates different approaches to what is taught and learned and how it is taught. In the 2006 report, Levine states that "Alumni and principals rate teacher preparation low in such critical areas as classroom management, working with diverse student populations, and teaching to state standards." Recently U.S. Secretary of Education Arne Duncan noted that schools of education have not prepared teachers to use student data to improve instruction.

At KSTF, our stance is that teaching is a profession, so teachers need both theoretical knowledge and practical knowledge and skills to be successful. At a minimum, they need knowledge about the subject they are teaching, about instruction in that subject, about curriculum and standards, about how students of high-school age learn and about the differences in the way diverse students learn, about designing instruction, about how to motivate students, about how to assess student learning, about how to work with parents, guardians and the community, and about how to understand and improve their own practice. I could go on and on about what teachers need to know and be able to do, and that amount

"There is no agreement about whether teaching is a craft or a profession -- and that simple decision dictates different approaches to what is taught and learned and how it is taught."

of knowledge and skill cannot be mastered in a year or two. That is why professional development is needed and why creating new models for teacher preparation are welcome.

EW: What do you look for in a teaching fellowship candidate?

Collins: We have four criteria. The first is exceptional content knowledge in the school subject the KSTF Fellow intends to teach. That knowledge is evaluated by looking at courses taken and subject-specific out-of-classroom experiences, and through interview questions that probe an applicants' deeper understanding of the subject.

Next, we look for commitment to teaching, which includes some experience working with adolescents in some capacity. Third, we look for ability to teach, which includes not only such basics as the ability to read, speak, and organize, but also other characteristics - - such as some ability to be reflective and to manage a full day of work. Finally, we look for potential for leadership. In this instance, current activity is seen as one predictor of future activity.

EW: Do students work on teaching credentials while being a fellow?

Collins: At KSTF, we find that having fellows with a mix of experience and in slightly different stages of their careers contributes to the professional growth of all. We accept new teaching fellows each year in June. A group accepted at the same time we call a cohort. In any cohort, there will be teaching fellows who are just beginning a post-baccalaureate teacher education program, some fellows who are in the middle of two-year programs, and some fellows who have completed a program but have not yet begun teaching. All KSTF Teaching Fellows have at least a bachelor's degree in the subject they intend to teach.

EW: Do you have any statistics on how many fellows are still teaching after three or five years?

Collins: KSTF has awarded 162 teaching fellowships since 2002. We have averaged a 73 percent retention rate since the inception of the program. No one has left the program after the third year of teaching.

EW: What are some of the projects/experiments Knowles Fellows have brought to their classes?

Collins: Many of our teaching fellows have become quite expert at approaching learning science as model building, model testing, and model revising. Others have become good at [problem-based learning \(PBL\)](#) approaches or [process-oriented guided-inquiry learning \(POGIL\)](#). A group of fellows designed a unit for teaching sound by having the students make musical instruments. One of our teaching fellows just returned from the South Pole and will be designing

"In geometry, one of the fellows has his students design and construct geometric figures that are as big as they are."

curriculum materials to share with teachers nationwide. In geometry, one of the fellows has his students design and construct geometric figures that are as big as they are. Several fellows have begun using Facebook to increase student collaboration.

EW: How can the influence of a Knowles Fellow extend beyond his or her own classroom?

Collins: The list is extensive, so let me provide a few examples. Some fellows have become the chairs of their departments, which is unusual so early in their careers; one fellow is taking a KSTF-supported online course for professional development and invited the others in her department to join her and half the members of the department did; another fellow designed a workshop for her school based on a professional development activity provided by KSTF.

At least two fellows have been invited to join the science standards' [panel] writing activities for their respective states. Many fellows have presented ideas for instruction or assessment at national meetings, such as the [National Science Teachers Association \(NSTA\)](#) or the [National Council of Teachers of Mathematics \(NCTM\)](#) as well as at state and regional gatherings of teachers. In the international arena last year, one of the fellows worked with the students she teaches to refurbish used laptop computers for students in Uganda, and then went to Uganda to teach teachers there how to use the technology for instruction. Her work inspired several other fellows to do something similar this year.

EW: Many elementary schools are barely teaching science these days. How do you propose addressing that in order to give students the skills they need for higher level science?

Collins: While we acknowledge the need for improved science instruction at all grade levels, as our resources are limited, KSTF has made the conscious decision to focus on high-school teaching. There are approximately 1.7 million teachers at grades K-8, but only about 150,000 high school science teachers and about the same number of high school mathematics teachers. We believe this is a number of teachers we can leverage with our resources. We applaud those foundations that have focused on elementary and middle school science teaching and learning and hope others will do so also.

This e-interview with Dr. Angelo Collins is part of the Education World Wire Side Chat series. Click [here](#) to see other articles in the series.