

TWIST

Teachers Working in Science
and Technology



Science
Encouragement
Programs

The 3M TWIST (Teachers Working in Science and Technology) program allows a group of K-12 math and science teachers to spend six weeks during the summer working closely with a 3M host on an actual 3M research project. The objective of the TWIST program is to provide active and challenging technical experience for teachers in an industrial setting. TWIST is based on the idea that the way to learn science is to do science – an axiom that applies as much to teachers as it does to their students.



Other aims of TWIST are to:

- Involve teachers from all grade levels K-12 and a mixture of teaching disciplines – science, math and computer technology.
- Enhance teachers' knowledge of science, math and technology, and how these are applied in industry.
- Provide teachers with models of how science and technology are actually practiced.
- Encourage teaching of science, math and technology in more effective ways.
- Renew the participants' commitment to teaching and their enthusiasm for science.
- Build positive attitudes in students toward science and technical careers.
- Generate good will for 3M in the community.

3M selects about 25 teachers for the program each year from one or more school districts. During the six weeks of the project, the teachers work under the supervision of their hosts on a research project related to a 3M product or technology. The participants also attend weekly luncheon meetings in which they compare knowledge and experiences with other teachers.

After this portion of the program, the teachers are encouraged to participate in follow-up sessions with their school districts to discuss how to best use their new knowledge and share it with their colleagues.

Chronology of the TWIST program

The TWIST program begins in the fall when 3M receives proposals from interested school districts in Minnesota and western Wisconsin. Because the program is located at the 3M Center in St. Paul, participating districts traditionally have been within commuting distance of the Twin Cities.

After receiving the proposals, the TWIST committee meets early in December to select the district or districts that will participate in the program. In recent years, the committee has tried to serve the needs of smaller schools by inviting more than one district.

Hosts are volunteer 3M scientists and engineers who have open-ended research projects suitable for teacher participation. The teachers are matched with hosts in March and notified of their selection shortly thereafter. We conduct an orientation program for the teachers later in the spring. The orientation provides teachers with valuable information about 3M, a clear understanding of the expectation of the TWIST program and an opportunity to meet their hosts. The program begins in June with a first-day safety training session and an introduction to technical record-keeping.

Weekly meetings

The research is supplemented with weekly luncheon meetings attended by all of the teachers. Some of these meetings feature

presentations by 3M professionals, some involve trips to manufacturing sites and others – especially the last few meetings – are used specifically for teachers to discuss and compare their research experiences.

These last meetings are an especially important element of TWIST. The teachers have an opportunity to summarize and share their work experience and more importantly, explain how it will affect their teaching.

Bringing experience back to the classroom

When the six weeks of the TWIST project are completed, the school districts are encouraged to arrange follow-up sessions for the teachers to discuss their projects and suggest ways of sharing the information with their colleagues. Through this process TWIST benefits not only the participating teachers, but also the teachers and students in their districts. Teachers also are encouraged to invite the hosts to visit their classrooms to share career information and discuss the projects.

Ideally, we hope school administrators will call on participating teachers to provide input on the following:

- Presenting science to students in a more appealing fashion.
- Developing new, more effective curricula in their schools.

More directly, we believe the TWIST experience will enable teachers to present science in their own classrooms with greater knowledge, appreciation and confidence.

Past teacher experiences

An elementary school teacher, assigned to a host in a dental products laboratory, conducted experiments to determine the strength of materials used in dental restorations (fillings).

A middle school math teacher investigated the effects of impurities on the crystallization of a polymer. The teacher made use of many state-of-the-art analytical techniques such as electron microscopy.

A high school chemistry teacher investigated photoacoustic spectroscopy as an alternative tool to conventional infrared spectroscopy.

Using optical technology developed at 3M, a high school math teacher designed and built prototype lighting systems.

An elementary school teacher, working in the chemical products area, helped develop commercials to advertise carpet soil repellents.

Comments from Participants in the TWIST program

From teachers:

“I have a new-found enthusiasm for the place creativity and problem-solving skills play in human endeavor. I also will be stressing how necessary communication skills are to young, budding scientists in the classrooms.”

- John Stangl, physical science teacher, Maplewood Middle School

“I plan on carrying my knowledge and experience back to the classroom in several concrete ways – a project-oriented unit on research for sixth graders, a slide presentation of a real research lab, and using guest speakers from 3M in my classroom. This project is by no means over because the six weeks have concluded.”

- A St. Paul teacher

From 3M project supervisors:

“It was a pleasure to work with a mature, motivated and highly intelligent individual. He became involved in helping with many aspects of the project, and several others have remarked on his contributions, attitude and commitment while he was here.”

“He made several key observations and contributed several unique ideas for products to solve specific problems.”

What teachers say about 3M:

“I was impressed by the vast numbers of people and financial

resources that are devoted to basic research – even when it might not have near-term marketability.

I kind of expected to see scientists isolated in the lab like we're isolated in the classroom. Not at all! I was amazed at how much interaction and cooperation there is between the science and business parts of the company. I saw the importance of team building and problem solving as a group. That's not something teachers usually focus on.”

- Susan Silberhorn, life science teacher, Dakota Hills Middle School

Benefits of TWIST

Teachers:

As a result of the TWIST program, teachers have reported that they:

- became aware of current scientific practices in their field of expertise;
- gained a greater appreciation for the relevance of many of the topics they teach;
- collected illustrative examples for their students;
- intended to modify their teaching approaches to create more opportunities for discovery in the classroom;
- discovered the importance of teaching science through experimentation and gained confidence in their abilities to do this; and
- made contacts with other teachers and with scientists in industry.

Hosts:

- Hosts have found teachers to be very reliable. They are able to work on a project after a minimum of instruction and will take responsibility for its progress.
- Many of our projects have benefited from the creative minds of the teachers.

3M:

- Teachers carry positive feelings from their 3M experience back to the community at large.
- We hope that the TWIST program, in the long run, will help ensure that there will be a supply of informed, intelligent science graduates as potential 3M employees.



teachers, and that our program is successfully addressing important needs of education.

TWIST is also striving to maintain contact and continuity with school districts. We invite former participating districts to send different teachers, three to five years later, to participate in TWIST. We hope that the enthusiasm from these teachers will rekindle enthusiasm from the previous participants, and provide the impetus to examine teaching methods and curriculum issues at the district level.

For more information

If you have any questions or would like more information about the TWIST program, please contact the 3M TWIST organizing committee chairperson,
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