

# TWIST

## Teachers Working in Science and Technology Science Encouragement Programs



**Class of 2018**

*The 3M TWIST (Teachers Working in Science and Technology) Program allows middle school and high school math, science and technology teachers to spend six weeks during the summer working closely with a 3M host on a research project. The objective of the TWIST Program is to provide active and challenging technical experiences 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 different grade levels and a mixture of teaching disciplines – science, math and 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 goodwill for 3M in the community

3M selects about 30 teachers for the program each year. 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 tour 3M facilities, learn about 3M, and 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 winter when 3M receives applications from interested teachers. Because the program is located at the 3M Center in St. Paul, MN, most participating teachers traditionally have been within commuting distance of the Twin Cities. 3M manufacturing and research facilities outside of St. Paul also participate in the program.

After receiving the proposals, the TWIST committee selects the teachers that will participate in the program.

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. 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 expectations of the TWIST program and an opportunity to meet their hosts. The program begins in June with a first-day safety training session.

### **Weekly meetings**

The research is supplemented with weekly meetings attended by the teachers. These meetings feature presentations by 3M professionals, tours of 3M labs, and there is time allotted for teachers to compare their research experiences.

The program ends with an opportunity for the teachers to share their research experiences with the 3M technical community.

### **Bringing experience back to the classroom**

When the six weeks of the TWIST project are completed, the teachers are encouraged to discuss their experiences and share their ideas with their colleagues. Through this process TWIST can benefit not only the participating teachers but also the teachers and students in their districts. Teachers are also 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**

*A 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.*

*A 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 appreciated working in such a welcoming environment and being presented with authentic challenges. The experience of working develop a solution to a problem that had not yet been solved was very satisfying.

“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.”

### 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.”

Getting the tours to see the different departments was really interesting and gave me a better perspective on what 3M does.

## 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
- 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 projects have benefited from the creative minds of the teachers.

### 3M:

- Teachers carry positive feelings from their experiences at 3M 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.

## Benefits of TWIST

### TWIST funding

TWIST is funded by a grant from 3M to the Minnesota High Tech Association.

Corporate funding is an essential feature of the program. It helps to ensure that hosts will be chosen for their strengths in supervision and mentoring, rather than their ability to secure funding from their laboratories. Corporate funding also helps correctly place the emphasis of the program on improving science and math teaching as opposed to using the teacher as an “extra pair of hands” in the laboratory.



### History of TWIST

TWIST is one of many 3M Science Encouragement Programs which were started in 1958 to promote science in K-12 schools. We believe that more students need to be encouraged to pursue careers in technology, and that science teachers can be more effective when they discover new ways to implement hands-on methods of teaching.

TWIST began in 1984, and in its first decade more than 210 teachers participated. In 1993, the TWIST organizing committee approved two initiatives to improve the program. Graduate credit is now available for TWIST participants through the Minneapolis Center of St. Mary's University of Minnesota. Additionally, we have designed an evaluation tool for documenting the impact of our program on teachers, students and the school districts.

Exit surveys to date have demonstrated that TWIST is meeting or exceeding the expectations of participating 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 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 chairpersons,

Caleb Brian  
651 737 5487  
[cbrian@mmm.com](mailto:cbrian@mmm.com)

or

Teri Fick  
651 575 3182  
[tkfick@mmm.com](mailto:tkfick@mmm.com)