A Follow-Up Study on a 2007 National Teacher Fly-In

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This study consists of a follow up with twenty-four teachers who flew into the Piedmont Triad region of North Carolina from around the country on October 17-19, 2007 to participate in a two-day workshop. Bio-Link and the National Center for the Biotechnology Workforce jointly sponsored this event funded by the U.S. Department of Labor High Growth Grant and the Advanced Technological Education which is a partner of the National Science Foundation. The goal was to introduce middle and high school teachers to science activities they could take back to their classrooms and share with their students. This study took place during September through December of 2010, about three and a half years after the original event, and was designed to evaluate the teachers' experiences since the Fly-In.

These educators enjoyed tours and presentations by industry leaders such as Biogen Idec, Carolina Biological Supply Company, Tengion, Targacept, Wake Forest Institute for Regenerative Medicine and North Carolina schools such as Atkins Academic & Technology High School, Alamance and Forsyth Technical Community Colleges. They had hands-on workshops in DNA extraction from strawberries, and Gel electrophoresis as well as an activity in which they collected their own cheek cells, isolated the DNA and made pendants out of the heart- shaped tubes containing their DNA. Each teacher was able to take home the strawberry DNA "lab in a kit" to repeat with their classes.

Attempts were made to contact all 24 of the original participants using the contact information provided during the affair. But, only ten of them were successfully surveyed, the others were lost to follow-up. A series of questions were formulated and asked. The replies of those who responded are below.

1. **Did you gain new ideas in North Carolina at the biotechnology "National Teacher Fly-In"?**
   Nine out of ten stated they received great ideas from this event. Some of the comments were, "It opened my eyes to advances in Biotechnology"; "It was wonderful to see connections between the classroom and the real world"; and "I really enjoyed the tours and enjoy sharing with my students the amazing things currently occurring in medical research."

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[2] Bio-Link
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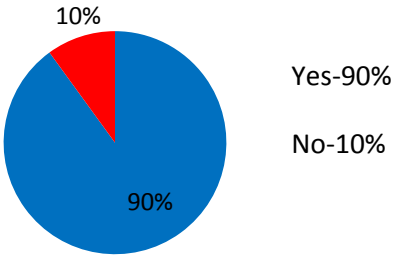
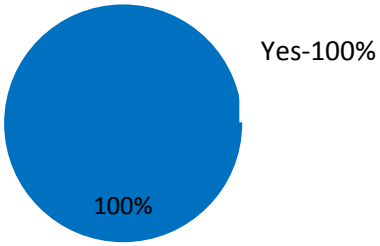
Did you gain new ideas during theTeacher Fly-In?



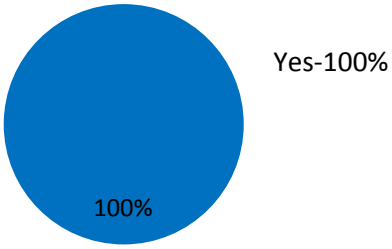
2. **Have you added any of these ideas into your classroom?**
   Ten out of ten are implementing something from the Fly-In event in their classroom. Teachers are enthusiastically discussing the labs they toured and the advances in biotechnology they heard about. They are also including the hands-on workshops when they can.

Have you added any of these ideas into your Classroom?



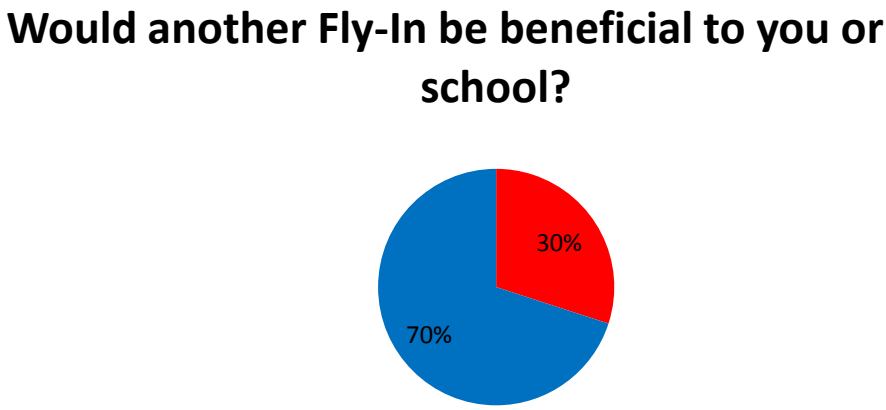
3. **Describe what you are doing in the classroom to bring biotechnology to your students.**
   These teachers are including one of the experiences on a regular basis, but usually only one or the other. Some are doing the strawberry DNA while others share the electrophoresis exercises. Others utilize a “lab in a kit” on topics other than the ones from this event. Two stated that they are currently not teaching and the remainder state they include only discussion about biotechnology in their classrooms.
4. **Do these new lessons excite your students?**
   Unanimously, the teachers responded that this information is very exciting to their students. They used words like “Thrilling”, “Love it” and expressed that students recognize the connection to current television shows in the crime scene investigation genre and were fascinated with the research at Wake Forest Institute for Regenerative Medicine.

Do these lessons excite your students?



5. **What do you need to enhance your Biotech curriculum?**
   A majority said they wish they had a greater variety of "lab in a kit" options. Budgetary restrictions were mentioned as an issue that inhibits what they can afford to do. Better marketing of STEM (Science, Technology, Engineering and Mathematics) careers would also help, because middle or high school is often the student's first exposure to the reality of Biotechnology. One teacher stated that networking with colleagues would enhance their curriculum and one simply was not interested in trying to incorporate this into their classroom.
6. **Have you discovered any problems introducing biotechnology into the classroom? If so, what are they?**
   Responses were split— 50% who encountered problems and 50% who saw no significant problems other than time and money. Time and money, however, were the biggest problems. Their time is devoted to preparation for the end of grade (EOG) tests and those tests have little or no biotech material, so in that light, the time spent on biotech subjects is wasted or simply not available. One state is extremely standards-based and consequently a teacher from that location stated feeling limited in what they can do in the lab. Most stated that their budgets are already stretched and the inclusion of Biotech labs and/or supplies is cost prohibitive. Another indicated the need to "start them early". Labs for students at the 5^{th} or 6^{th} grade level would help get students involved and diminish the lack of interest exhibited when they reach middle school.
7. **Do you have any comments about teaching biotechnology that you would like to share?**
   This is an open ended question and some didn't provide any comments. The responses were positive about the future of science in America and that Biotechnology "is our future". The Fly-In provided them with tools to entice students toward STEM careers even though the students have not yet graduated from high school.

8. **Would another "Teacher Fly-in" be beneficial to you, your school or other faculty members in your area?**
   Seven out of ten gave a resounding "yes" that they would be interested in another National Teacher Fly-In event. These said that another similar experience would benefit them, other faculty at their schools and other schools in their area. One is interested in shadowing the researchers at WFIRM for more than an hour next time and another said she would only participate if there was a greater focus on earth or space science because those are the subjects she is currently teaching. The only dissenter is leaving the classroom and would therefore not be interested in another Teacher Fly-in.



Summary

Ten of the twenty-four teachers were questioned about their experiences since the 2007 Fly-in. Based on statements collected from them, the event provided these teachers with ideas and tools to enhance classroom time and encourage students toward STEM education and perhaps eventually careers. Feedback from students was positive because the hands-on labs and current topics of discussion made biotech something to which they could relate. One teacher from New Hampshire stated, "Yes, many students enjoy TV shows like CSI and they recognize the similar terminology, they find it very interesting." Another from Washington State said, "I had never taken a tour of a lab and hadn't seen what was going on in the world of biotechnology and medical research firsthand. It was fascinating and I was able to convey this newfound knowledge to my students." This sentiment was repeated by another middle school teacher from Washington when she said, "I know about multiple sclerosis in our area, the Pacific Northwest. I liked seeing that poster in Biogen Idec of the woman thanking the workers for making the medicine that was saving her life. It's not only research,

kids have MS in their lives, they know about it. And the strawberries: that was awesome! The kids love it!"

The preponderance of teachers, who responded to the follow up, indicated that the research they are now able to share with their students is enticing them toward more biotech education. This was reflected in this quote from one teacher from Winston-Salem, North Carolina who, when responding to the question about whether or not this subject is exciting to students, said "Yes, very much! It is difficult for students to sometimes comprehend what we are capable of in biotechnology and it is exciting for them to see and do some of the procedures."

The most commonly shared hindrance was that of money and time as stated by an instructor from California who said that he could include biotech procedures "only in the AP Classes (transformations and gel phoresis) and only kit-contained labs. This material is not on the [EOG] test so there isn't time for it, thus little can be included." Another teacher summarized that local budget restraints were the biggest problems she faces in the addition of biotechnology to her classroom.

Conclusion

These ten teachers had positive experiences introducing biotechnology into their classrooms. Students responded positively when they began to see the application of biotechnology in drug therapies and as it related to favorite shows on television. This indicates that exposure to biotechnology may increase the number of students with an interest in the field of biotechnology and STEM training in general. Teachers felt limited to teaching course material that prepares students for the end of grade test. That test includes little or no biotechnology related material which creates a situation in which they have to choose between these new "exciting" exercises or maintaining the status quo. Nevertheless, teachers are interested in additional training opportunities to assist them in finding novel ways to add hands-on laboratory projects to the classroom. They look forward to the possibilities these projects may open up for their students.