# Evaluation Resources

# Intel International Science and Engineering Fair (Intel ISEF)

# Evaluation Summary

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Each year, the [Intel International Science and Engineering Fair](#) (Intel ISEF) brings together the top high school students from among millions of competitors worldwide in regional science fairs to showcase their outstanding projects in life sciences and to compete for millions of U.S. dollars in prizes and scholarships. In 2006, for example, Intel ISEF featured more than 1,500 students representing 47 countries and territories, and awarded more than 4 million dollars in prizes and scholarships.

Administered by [Science Service](#), a nonprofit organization promoting scientific education and development, Intel ISEF has three primary goals:
- Encourage and reward student achievement in science
- Motivate students to pursue careers in science and related fields
- Promote inquiry and project-based teaching and learning in schools

The annual fair and a range of associated events and opportunities for science students have had a powerful impact in terms of all three goals. Competing students spend hundreds of hours preparing their projects, often working with adult mentors in universities or science institutions. The growth that students experience from their hard work and exposure to science research is evident in the remarkable quality of their projects as well as in the comments and responses of the participants collected in evaluation surveys, observations, and interviews.

## Evaluations of Intel ISEF

To measure the impact of Intel ISEF, researchers at [Arizona State University](#) College of Teacher Education and Leadership have studied the event using several tools, such as online surveys and interviews, and from a variety of perspectives, including participating teachers, students, judges, and fair directors. This wide-ranging evaluation effort reveals the fair's success in meeting its goals each year and provides key information about what makes students successful in the fair.

# Encouraging Student Achievement

Participating teachers report that in terms of its first goal—encouraging student achievement—Intel ISEF is a success. In fact, 98.5 percent of the 394 teachers surveyed after the 2005 Intel ISEF agreed or strongly agreed that Intel ISEF encourages student pursuit of excellence in science, and 97.2 percent stated that the fair rewards students for their achievements in science, math, and technology. The high quality of the projects that students are able to create also points to Intel ISEF's success in encouraging achievement. Of the 715 fair judges who completed the online evaluation survey in 2005, 95.7 percent agreed or strongly agreed that the projects were of excellent quality.

# Motivating Students to Consider Science-Related Careers

The responses of teachers and students show that Intel ISEF motivates students to pursue science and related fields in their future careers. About 97 percent of the teachers surveyed in 2005 agreed or strongly agreed with the statement that the fair provides motivation to students to pursue science, math, or engineering careers. More than three-quarters of the 412 students surveyed at that time (88.1 percent) also agreed or strongly agreed with the statement that their work leading to Intel ISEF made them more interested in pursing a career in science, mathematics, engineering, or technology, and 89.1 percent of these students also indicated that the Intel ISEF work made them more interested in pursuing an occupation that requires inquiry.

| Statements | Mean (SD) | Strongly Agree | Strongly Agree or Agree |
|---|---|---|---|
| Science fair participation has had a major positive influence on my interest in science. | 3.68 (.57) | 71.8% | 93.7% |
| My work leading to Intel ISEF has made me more interested in inquiry. | 3.53 (.58) | 56.2% | 93.7% |
| Science fair participation has increased my technology skills. | 3.35 (.71) | 47.2% | 86.6% |
| I had access to experts to help me with my research. | 3.12 (.94) | 41.6% | 76.6% |
| Science fair participation has had a major positive influence on my interest in math. | 2.89 (.82) | 25.1% | 65.2% |

**Intel ISEF promotes science-related careers**
In the 2005 online survey of 412 Intel ISEF competitors, responses show that the fair motivates students to pursue careers in science, engineering, math, and technology.

# Promoting Inquiry and Project-Based Science Learning

Teachers report that while Intel ISEF affects participating students, it also affects the teaching and learning of science in schools. In the online 2005 survey, 91.6 percent of teachers agreed or strongly agreed that Intel ISEF promotes inquiry at their schools, and 89.1 percent agreed or strongly agreed that it promotes project-based science at their schools. About two-thirds of the teachers agreed or strongly agreed that their involvement in Intel ISEF has changed their teaching, and 89.1 percent agreed or strongly agreed that external competitions have a positive impact on their teaching.
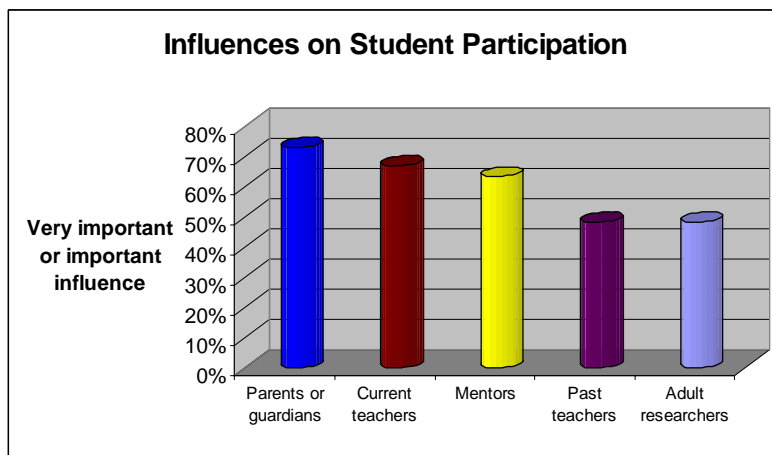
# Success Factors for Students

Student finalists at Intel ISEF are also surveyed and interviewed to help identify the factors that are most important for success at the fair. In terms of basic background characteristics, the finalists represent a balanced group. For example, roughly equal numbers of finalists in 2005 came from urban, rural, and suburban areas. In addition, similar numbers of finalists learned research methods through after-school programs versus in-school research classes. However, some factors did emerge during the 2005 evaluation as key characteristics of students who succeed at the fair.

Most finalists identified hard work, dedication, and a willingness to give up other activities to work on the project as key to succeeding. In fact, on average, these students spent 276 hours on research for their projects and 59 hours on the displays for their projects. Teachers surveyed also reported that a strong work ethic was the top factor in success at the fair.

The commitment and dedication required from the students is perhaps supported by another key characteristic of successful competitors. Of the finalists in 2005, 72 percent reported having a mentor who motivated and supported their efforts. This mentor group was divided somewhat equally into current teachers (26.4 percent), college professors (24.3 percent), and science researchers (23.3 percent). In fact, having a mentor was a more significant factor in student success than having access to outside laboratories.

The finalists also identified parents or guardians as their top influence, however, for Intel ISEF participation. This identification with family influences is not surprising given the high percentage (81.8 percent) of finalists in 2005 who came from households in which a family member has a college degree.



**Influences on Student Participation**

## Parents and mentors are key influences for student success

In the 2005 online student survey, parents or guardians were identified as the top single influence on participation. Mentors in general and particular types of mentors—such as current and past teachers and adult researchers—were also identified as key influences.

# Impact on Educators: The Intel Educator Academy

The researchers at ASU studied the effects of the Intel ISEF event on the students who participate in the fair as well as the adult participants. In particular, the team considered educator impact through studies of the weeklong Educator Academy.

Educator Academy is a conference and series of workshops held in conjunction with Intel ISEF each year that focuses on preparing adult participants to promote science fair participation, inquiry, and project-based learning in their schools. During the Educator Academy, participants attend presentations on key topics in science teaching, science fair promotion, and science fair administration. Participants also attend team working sessions in which they design action plans for promoting greater science fair participation in their schools.

In 2006, the ASU researchers combined surveys, interviews, and pre- and post-test data to help reveal how educators are changing their practices and their schools as a result of participation in the Educator Academy. Of the 2006 Educator Academy participants surveyed, more than 90 percent agreed or strongly agreed that the conference had prepared them to:

- Improve science fairs (94.9 percent)
- Promote inquiry learning (91.9 percent)
- Promote project-based learning (91.2 percent)
- Grow a local science fair (90.4 percent)

In fact, a pre- and post-test questionnaire administered before and after the event revealed statistically significant gains among participants in three key areas of knowledge:

- How to effectively organize a science fair
- How to support teachers in inquiry and project-based learning
- How to understand project-based learning

Studies of graduates from several years of the Educator Academy also showed that this professional development experience had a significant impact on science fair participation among students. Of the graduates surveyed, 48 percent were able to report how many students participated in their science fairs before they began the Educator Academy and then after the experience. For these graduates, the number of students participating in their fairs more than doubled (a 125.1 percent increase) after they finished the Educator Academy.

# Further Reading

Rillero, P., & Zambo, R. (2005). *Science fairs, inquiry, and project-based learning.* Tempe, AZ: Arizona State University, College of Teacher Education and Leadership.

Rillero, P., Zambo, R., & Haas, N. (2005). *Intel International Science and Engineering Fair 2005 evaluation report.* Tempe, AZ: Arizona State University, College of Teacher Education and Leadership.