DOCUMENT RESUME

ED 395 793 SE 058 379

AUTHOR	Bellipanni, Lawrence J.
TITLE	The Science Fair Experience: Profile of Science Fair Winners.
PUB DATE	Dec 94
NOTE	9p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Awards; *Educational Resources; *Science Fairs; Science Projects; Secondary Education

ABSTRACT

The purpose of this investigation was to determine if a significant relationship existed between the criterion variable of receiving or not receiving awards at the 1993 International Science and Engineering Fair (ISEF) and the predictor variables of resources and facilities, resource personnel, personal costs, time, and personal characteristics. Data was collected from students (N=829) from grades 9-12 who attended the ISEF. Results indicate that there was a significant relationship between the criterion of whether a participant won or did not win and the composite set of predictor variables. Further analyses were conducted to examine the independent contributions of individual sets of predictors labeled as resources and facilities, resource personnel, personal costs, and personal characteristics. The aggregated resources or facilities variable was found to be significantly related to the criterion of whether participants did or did not win an award. Findings indicate numerous differences between winners and nonwinners in the use of facilities. Nonwinners made significantly more use of high school labs and parents' or friends' personal shops. Winners made significantly more use of parents' or friends' businesses, medical schools, and other research facilities. (JRH)

The Science Fair Experience: Profile of Science Fair Winners

by

Lawrence J. Bellipanni

BEST COPY AVAILABLE

The Science Fair Experience: Profile of Science Fair Winners

Lawrence J. Bellipanni
Mississippi State, Mississippi
December 1994

Abstract

Organized science activities that eventually led to our current science fair competitions began in the United States in 1828. They were organized to promote industry throughout the United States. These industrial fairs eventually evolved into the International Science and Engineering Fair (ISEF) in 1964.

Decker (1984) noted that science and engineering entrants come from rural communities as well as urban areas. He stated that rural students usually become interested in science projects as a way to help solve real-life problems and made up approximately one-fourth of the participants at the 1983 ISEF.

Science Service, a nonprofit organization, was established in Washington, D.C., in 1921 with the major responsibility of forming science clubs in order to promote science. Edward Pendrey, of the Westinghouse Corporation, organized the first talent search in conjunction with Science Service in 1942. The Westinghouse Talent Search was organized specifically to help promote science activities and science teaching in American schools. The first national science fair which involved student participation was held in Philadelphia, Pennsylvania, in 1950. This science fair established guidelines for other fairs that were to follow, and in 1964, the first ISEF was held in Seattle, Washington. The first ISEF included finalists from 208 U.S. regional science fairs, 17 foreign countries, Guam, and American Samoa (Brown, Bellipanni, Brown, Pendarvis, & Ferguson, 1986).

Educators, industrial representatives, parents, and other interested groups have attempted to improve education in the sciences and mathematics by supporting local, state, regional, and international science fairs. Over the last 40 years, the ISEF program has played a key role in fostering the development science and math education in this country. In spite of the 40 years of science fair activities, ISEF has collected little data and offered no in-depth research into the effectiveness of this international program. In 1993, Science Service allowed the collection of data from ISEF participants for the first time.

The Science Fair Survey (SFS), developed by Gifford and Wiygul in 1992, was used as the instrument to gather data for this study. The SFS was validated for content and construct validity by members of the Mississippi Region V Science Fair Steering Committee.

The purpose of this investigation, based upon the data collected by the Gifford and Wiygul questionnaire, was to determine if a significant relationship existed between the criterion variable of receiving or not receiving awards at the 1993 ISEF and the predictor variables of resources and facilities, resource personnel, personal costs, time, and personal characteristics. The subjects of this study were all students, grades 9-12, who attended the 1993 International Science and Engineering Fair and completed the survey questionnaire. The data were collected by a direct approach of the ISEF participants by the researcher or a person designated to represent the researcher during the participants' free time on May 11 and 13, 1993.

The science fair, for better or worse, remains one of the central science learning experiences for children. Yet, despite the fair's long-lived popularity as a teaching tool, comparatively few research studies have undertaken a serious look at its intent, format, and impact. Carlisle and Deeter (1989) used a questionnaire to find five conditions which they hoped would lead to a positive change in their local district science fair. The conditions were:

1. Teachers need to be enthusiastic about science and the science fair.
2. Participation in the science fair needs to be high.
3. Participation in the school science fair has little effect on science instruction.
4. Science fair organization varies.
5. Competition among students is controversial.

Results of a survey of finalists in the North Dakota Science and Engineering Fairs from 1951-1985 indicated that participation in science fairs influenced the contestants' career direction and education (Olson, 1985). Of the 213 respondents, 73.5% believed science fair participation had some influence on career choice. Fifty-one percent of the finalists from the 1950s, 1960s, and 1970s chose science professions. Of the 51% who chose science professions, 47% chose biological, agricultural, and health sciences; 47% chose engineering and applied sciences; and 6% chose physical sciences and mathematics.

Olson (1985) reported that the value of doing a science fair project was rated high by 96.2% of all respondents, medium by 3.8%, and low by 0%. All respondents indicated that science fair participation should be encouraged for others. The benefit most often expressed by the finalists in this survey was that of providing travel. Other benefits indicated by respondents were increasing poise, self-confidence, and communication skills; earning the respect of peers; and developing research and experimental design skills.

From a questionnaire survey of the contestants at the Mississippi Region V Science Fair in 1987, Gifford and Wiygul (1992) identified eight variables that differentiated between winners and nonwinners. The most discriminating variables were the use of college or university resources and the costs of developing the project. Other variables favoring winners were hours spent using high school laboratories, other resource facilities, and public libraries. Gifford and Wiygul concluded that location of a contestant's secondary school, in relation to colleges or universities, could significantly affect success in science fair competition.

Variables that were more indicative of nonwinners than of winners were use of businesses and shops belonging to parents or friends and help from secondary school teachers other than science teachers. The following 10 variables were not found to have a significant discriminate coefficient: (a) use of school libraries, (b) use of school shops, (c) use of farms belonging to parents or friends, (d) use of medical schools, (e) use of other research facilities, (f) use of nonresearch resources,
(g) consultations with personnel at medical schools,
(h) consultations with personnel at universities,
(i) consultation with personnel at other research facilities, and
(k) consultations with personnel at nonresearch facilities.

No research had been conducted on the existing ISEF in its 44 years of existence. In 1993, Science Service allowed the collection of data from student participants in the ISEF held in Mississippi. The survey instrument developed by Gifford and Wiygul (1992) was selected because it was the only available research instrument for the collection of data on winners and nonwinners in science fairs. With these data, one should be able to profile science fair winners.

Science Service in Washington, D.C., was established in 1921, in part, to aid in the development of science clubs. This led to the formation of local and state science fairs. Science and engineering fairs have been an integral part of the science education curriculum in the United States since 1950. The establishment of a National Science Fair was followed by the formation of the International Science and Engineering Fair in 1950. Gowen and Marek (1993) recommended that science teachers, when and if assigning topics for science fair projects, become more interdisciplinary in their topic selection. Other subjects such as English and social studies should be included in the science fair program.

Based on his experiences as a science fair judge, Grobman (1993) expressed criticism of science fairs. He argued that science fair projects tend to foster individual competition rather than fostering team effort, the more desirable quality, in his opinion. He also believed that, too often, science fair projects reflect the work of the parents rather than the work of the students.

Smith (1980) and McBurney (1978) openly questioned whether science fair projects are accomplishing their stated goals. McBurney (1978) addressed the concern that mandating student participation in science fairs is tantamount to forcing students into the use of intellectual skills that may not have been properly developed. Smith (1980) stated that all elementary science fairs are alike in that most of the projects in science fairs have little relevance to the goals of science teaching.

The kinds of science fair projects seen in science fairs reveal a disparity between the goals of science fairs and those of science teachings. Nearly all projects can be placed in one of the following categories: (a) model building; (b) hobby or pet show-and-tell; (c) laboratory demonstration taken directly from a textbook or laboratory manual; and (d) reports and poster projects that do not involve the student in critical thinking and science processes such as measuring, reproducing data, and drawing conclusions. If the goal of science teaching is to improve skills in model building, library research, poster making, or following laboratory manual directions, then these first four categories are appropriate. But if one of the primary goals in science is to teach critical thinking, inquiry, and investigative skill, then a category five should be added. The essence of science is found only in this category in which the student must conceive and plan a project, perform an investigation, and analyze data to arrive at some conclusions or some new understandings (Smith, 1980).

A science fair is an opportunity for a student to receive professional assessment and recognition for some personal scientific endeavor of interest to that student. Science fairs should seldom have any of the following as the primary objectives: (a) a demonstration to the community of the fine science program being conducted in the local school, (b) an opportunity for teachers to display to the public the accomplishments of their students, (c) a goal toward which students are encouraged to work as an incentive to "doing a project" or learning something new about science, or (d) a means for establishing competitive spirit. McBurney (1978) believed that we cannot justify science fairs unless the science fair is first and foremost a learning experience for the student--not for the community, nor for other students, and not for parents. Science fairs must reinforce the learning that has already occurred and encourage that which is yet to come.

McBurney (1978) believed that every science fair entry should be a product of "student sciencing." The student must conduct an active investigation. Students like to find out things on their own; they like to solve real problems; they like to learn new things; and they like personal challenges.

McBurney (1978) and Smith (1980) agree that the science fair experience should be reserved for students who want to do something extra. Students should never enter a science fair unless the assignment is optional with no academic strings attached.

Gifford and Wiygul (1992) pointed out that all students do not have an equal and fair chance of winning in a science fair competition. Access to a college or university and resource dollars are the most important factors teachers or with their parents' or friends' businesses or shops.

Beyond developing a profile of the science fair winner, it is important to also consider other factors which contribute to the experience. The student, the school, and the community are all affected by the science fair. Many student-related factors have already been considered. The school may profit from the fair for its educational value. The school and the community may be positively or negatively affected by the fair depending on how the school approaches the fair.

Riggins (1985) developed a list of rationales supporting the use of science projects as an educational tool. Included in his list are: (a) develops social talents and abilities; (b) improves written, oral, and organizational skills; and (c) nurtures an interest in science and improves research skills.

The data collected by the Science Fair Survey developed by Gifford and Wiygul (1992) were used to decide if a significant relationship existed between the criterion variable of receiving or not receiving awards at the 1993 International Science and Engineering Fair (ISEF) and the predictor variables of resources and facilities, resource personnel, personal costs, time, and personal characteristics. An ancillary purpose of this study was to decide if one could profile science fair winners.

The subjects of this study were 829 participants of the 1993 ISEF held in Mississippi. The event occurred in Biloxi in the arena at the Mississippi Gulf Coast Coliseum. Forty-three percent, or 360, of the participants returned usable surveys.

The following hypothesis was formulated for this study: The hypothesis stated that there will be no significant relationship between whether or not students receive awards and the composite set of variables grouped under the factors of resources or facilities, resource personnel, personal costs, time, and personal characteristics.

There was a significant relationship between the criterion of whether a participant won or did not win and the composite set of predictor variables, consisting of resources and facilities, resource personnel, personal costs, time, and personal characteristics. With the probability of the test of significance established at .05, it was significant according to regression analysis. Approximately 14% of the variability in winning or not winning was explained by the composite set of predictors. Although this is only a moderate amount of variability, this amount of variability is the result of only resources or facilities and did not include traditional factors such as ability and achievement. Further studies in these areas may be appropriate.

Further analyses were conducted to examine the independent contributions of individual sets of predictors labeled as resources and facilities, resource personnel, personal costs, time, and personal characteristics. The aggregated variable named resources or facilities was significantly related to the criterion of whether participants did or did not win an award (R2 change = .031, F = 4.20, df = 2, 233, p = .016). However, only 3.1% of the variability in winning or not winning an award was independently explained by resources or facilities. Although the result showed only a small independent relationship, it was significant. Further analyses were conducted to decide which of the resources or facilities variables were uniquely and independently related to the criterion. Hours of use of libraries, either public or high school, had no significant relationship to whether students received or did not receive awards. However, use of additional resource facilities, which included aggregate use of all those listed on the SFS under Item A, 3-11, were significantly related to the criterion. Although there was a relationship between winning and not winning by the use of additional resource facilities, it was small in magnitude. Descriptive analyses were performed by breaking down usage of additional facilities and resources in Item A of the survey by whether an award was or was not received. This indicated numerous differences between winners and nonwinners in the use of facilities. Nonwinners made significantly more use of high school labs and parents' or friends' personal shops. Winners made significantly more use of parents' or friends' businesses, parents' or friends' farms, medical schools, other research facilities, and other resources.