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ABSTRACT

Attitudes toward science of magnet school students were compared with those of their counterparts in two regular schools. This study attempted to replicate the findings of a 1988 study by A. Solomon and J. Wroblewski involving the same magnet school, the John Moffett Neighborhood Elementary Science Magnet School located in North Philadelphia (Pennsylvania). (That study found that magnet school students expressed more favorable attitudes toward science than their comparison school counterparts, and that these attitudes continued through gender, ethnicity, and grade level). In the later study, participants consisted of: 124 fourth- and fifth-graders attending the John Moffett Neighborhood Elementary Science Magnet School; 85 fourth- and fifth-graders from the regular school that participated in the earlier study; and 169 fourth- and fifth-graders from a regular school that was not involved in the earlier study. The same set of attitudinal items that was used in the previous investigation was used in this study, as well as results from the school district's citywide testing program. Investigations focused on general attitudes toward science, gender, and grade level. Results indicate that: (1) magnet school students were no more likely to select science as their first or second favorite subject than were their counterparts in the regular elementary schools; (2) grade, overall, was not a significant factor but it did emerge as significant in the magnet school and one of the comparison schools; (3) gender was not significant in the analysis reported here; and (4) differences in achievement were slight in each of the comparisons. Designation of the school as a magnet school did have some bearing on desegregation. In general, findings of the study conflicted with those of the 1988 study. No firm judgment about the effects of magnet schools on attitudes or achievement could be made. (TJH)

# Elementary Science-Magnet School Student Attitudes Toward Science As Measured By Selected National Assessment Of Educational Progress Items And Achievement In Science: A Replication And Extension



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Elementary Science-Magnet School Student Attitudes Toward Science As Measured by Selected National Assessment of Educational P ogress Items and Achievement in Science: A Replication and Extension

The John Moffet Neighborhood Elementary Science Magnet School is located in North Philadelphia. Industries and small businesses surround the school while the Frankford Elevated tracks lie a block away. A few row homes break the cold gray pattern. Inside, there is a different atmosphere as science exhibits stand in the entranceway, encouraging visitors to examine them at length. Posters and displays which convey past and current ideas in science line the halls and beckon the visitor through the messages they convey and the artistry of the students who created them.

The message continues in the classrooms. Each one devotes some space to science. Naturally, the level varies in line with the grade in each class, but the point cannot be mistaken: Science education is a priority at John Moffet. This priority emerged through a series of events which began with a proposal submitted by the School District of Philadelphia in 1987. The proposal was funded and the School District created ten neighborhood elementary magnet schools through a portion of the funds which were provided.

Funds provided through this award were designed to foster the School District's desegregation effort. Here, schools with predominantly minority enrollments implemented a magnet theme in an attempt to attract white students who

lived in their attendance areas. The grant ran for thirty months, terminating at the end of the 1989-90 school year. We examined students' attitudes toward science and used a set of twelve attitudinal items preapred by the National Assessment of Eductaional Progress in order to collect our data. We administered the items to 177 fourth through sixth grade students enrolled at John Moffet and 184 students in the same grades enrolled in a neighboring school so that we could compare the findings from the two schools.

Last year, Solomon and Wroblewski (1989) found that the magnet school students expressed more favorable attitudes toward science than their comparison school counterparts and the NAEP report group according to the set of NAEP items used in the study. These attitudes continued through gender, ethnicity and grade level. The first item in the set, in the researchers' judgment, held more importance than the others. Here, the students were asked to name their first and second favorite subjects in school. Sixty-three percent of the magnet school students and 42 percent of the comparison group students said that science was either their first or second favorite subject. This difference was significant according to chi-square.

The current study attempted to replicate this finding and follow the science achievement of the students who participated in the 1988 study. We used the same set of attitudinal items to collect our first data set and results

from the School District's citywide testing program for our second.

Solomon and Wroblewski cited a number of studies which examined the relationship between student attitudes toward science. Conwell, Helgeson and Wachowiak (1987) studied the effect of matching cognitive style and science instruction. Finson and Enochs (1987) claimed that student attitudes toward science can be improved by visits to science-technology museums and Kyle, Bonnstetter and Gadsden (1988) found that students who spent a year in a process oriented science program had more positive attitudes toward science than their counterparts who studied science through a traditional approach.

Solomon and Wroblewski were unable to locate any recent studies which linked attitudes toward science and achievement in the subject. This state of affairs has continued and we took steps to extend the research in this area.

## Procedures

As in our initital study, we asked the principals of the John Moffet Neighborhood Elementary Science Magnet and the neighboring school which joined the study if they would like to participate in a replication. Both principals agreed. We also asked a the principal of another nearby school to join the study in order to verify the first comparison school's results. This principal also agreed to participate in the effort.

In the first year of the study, the elementary science magnet school housed students in kindergarten through sixth grade. In the second year, the sixth grade was dropped because of a school district reorganization. Therefore, our study group consisted of students in grades four and five.

Table 1

Number of Students by Grade and Gender:
John Moffet and Comparison Schools

| | Grade | | | | |
|---|---|---|---|---|---|
| | Four | | Five | | |
| | Male | Female | Male | Female | Total |
| School | | | | | |
| Moffet | 30 | 37 | 27 | 30 | 124 |
| Comparison 1 | 4 | 13 | 30 | 38 | 85 |
| Comparison 2 | 44 | 47 | 42 | 36 | 169 |
| Total | 78 | 97 | 99 | 104 | 378 |

Table 1 shows that Moffet contributed 124 students to the study, thirty fourth grade boys, thirty-seven fourth grade girls, twenty-seven fifth grade boys and thirty fifth grades girls. The comparison schools contributed 254 students. The first comparison school contributed four fourth grade boys, thirteen fourth grade girls, thirty fifth grade boys and thirty-eight fifth grade girls. The second comparison school, forty-four fourth grade boys, forty seven

fourth grade girls, forty-two fifth grade boys and thirty-six fifth grade girls.

We administered the surveys to students in their classrooms. The classroom teacher and one of the researchers were present at each administration. We anticipated that some students might have some problems in reading the items because of their low standardized test scores. In these cases, we helped the students work through the item because our interest was directed toward attitudes rather than reading ability and we wanted to nullify the effect of the reading variable.

The three schools were similar in that all were eligible for Chapter 1 services and enrolled relatively large minority and Hispanic student populations, from 74 percent to 98 percent. Student enrollment ranged from 566 to 692 and the percentage of students not meeting promotion criteria varied slightly, at two of the schools, 31 percent and the other, 32 percent. Similarly, faculty attendance showed a very small range, from 93 percent to 95 percent.

While the three participating schools offered a number of programs for their disadvantaged students, John Moffet had the only magnet program. Here, the school received additonal funds under the grant. These funds were used to purchase materials and supplies, underwrite field trips and support four positions, three classroom teaching and one science coordinator. Through the addition of these positions, the

principal was able to install the magnet program and reduvce class size in an attempt to desegregate the school by recruiting white students.

The science coordinator was responsible for carrying out the policies associated with the implemetation of the magnet. The woman who took the position was a certified elementary science teacher. She handled the necessary paperwork, set up the pertinent staff development activities, prepared publicity releases, worked with groups of teachers within and across grades, assisted individual teachers when they had problems in implementing their classroom science activities and arranged field trips and other events.

Students visited the Franklin Institute, a well-known science museum in Philadelphia, the Schuylkill Valley Nature Center, an environmental facility on the city's fringe, the Baltimore Aquarium and Washington DC. The students made presentations to the Board of Education, and participated in the School District's and the Commonwealth of Pennsylvania's science fairs, winning a number of awards. Parental and community involvement programs took place during the course of the school year.

Science activities took place in each classroom. Although the teachers had to adhere to the School District's standardized curriculum for science, their individual interests in science were obvious to classroom visitors. Some teachers, for instance, emphasized life science as a

large drawing of the human heart dominated a second grade classroom. Another teacher had a strong interest in earth science and had her students construct models of volcanoes.

Parental involvement was strong. One meeting attracted the parents of 324 students. This meeting took place near the end of the school year and parents were given materials and supplies for their children to work on during the summer vacation. Previously, very few attended the scheduled parental and community programs.

We used the same instrument to collect our data as we had in the previous year. A copy of the instrument is appended. We felt that the NAEP's use of the items established reliability and validity and that it was not necesssary to confirm these properties. We asked the principals to administer the instrument to all of their fourth and fifth grade students. The data were analyzed through three SPSSX (1986) programs.

In addition to the replication of attitudes, we examined the science test performance of the students who were enrolled in the magnet. This phase of our study can be looked on as an extension of our previous effort. Here, we identified the magnet school students who joined last year's study and collected and analyzed their science test scores.

The School District prepared a series of science performance measures in the early 1980's. There is one measure for each grade and different versions are

administered in the fall and spring of each school year. A checklist prepared by the teacher for each student is used through third grade and a test is used thereafter. The measures are reviewed continuously in order to cull inappropriate items and replace them with more meaningful ones.

We were interested in the subsequent relative science performance of our initial study cohort in terms of their peers who did not have the science magnet experience. Limitaitons in the science tests themselves precluded more sophisticated analyses: Since the items differed from one administration to the other, only limited reliablity and validity data were available and we were hesitant to construct conclusions which extended beyond the available information.

Table 2 shows our initial study cohort by grade and the number of students we were able to locate through the fall 1989 test administration. We were interested in those students who enrolled in schools other than Moffet through promotion or changes in residence. While other analytical possibilites were available - students who started in other schools and enrolled in Moffet as upper grade students - the numbers were too small for generalizing.

Table 2

Number of Intial Cohort Students Who Enrolled in Schools Other than Moffet by Grade 1988-89 and 1989-90

| | Number 1988-89 | Number Located 1989-90 |
|---|---|---|
| Grade at Moffet | | |
| Four | 50 | 8 (16 %) |
| Five | 62 | 51 (82 %) |
| Six | 65 | 52 (80 %) |
| Total | 177 | 111 (63 %) |

Eight of the fifty fourth grade students (16 %) who were part of the initital cohort had enrolled in schools other than Moffet in the 1989-90 school year. In fifth grade the figures were fifty-one of sixty-two (82 %) and in sixth grade fifty-two of sixty-five (80 %). The percentage of fourth grade students was substantially lower because these students progressed through the grade structure at Moffet while those in fifth and sixth grades were promoted into local middle schools. We included only the fifth and sixth grade Moffet students in our analysis. We followed them into sixth and seventh grades through their science test performance and used their new school student body test performance as the comparison measure

## Results

### Attitudes

For our initial series of analyses we compared the number of students from each school who identified a subject as their first or second favorite. Our interest was directed toward science and we geared our analyses to it. The results appear in Tables 3 and 4.

Table 3

Student responses to Item 1A: What Has Been Your Most Favorite Subject in School ?

| | School | | | |
|---|---|---|---|---|
| | Moffet | Comparison 1 | Comparison 2 | Total |
| Subject | | | | |
| Science | 46 | 52 | 25 | 123 |
| Gym | 24 | 2 | 41 | 67 |
| Mathematics | 23 | 25 | 4 | 52 |
| Art | 14 | 2 | 7 | 23 |
| History | 4 | 0 | 0 | 4 |
| English | 2 | 0 | 0 | 2 |
| Health | 2 | 1 | 0 | 3 |
| Library | 2 | 0 | 0 | 2 |
| Spelling | 2 | 4 | 2 | 8 |
| Computer | 1 | 63 | 0 | 64 |
| Creative Writing | 1 | 0 | 0 | 1 |
| Literature | 1 | 0 | 1 | 2 |
| Music | 1 | 2 | 2 | 5 |
| Reading | 1 | 10 | 2 | 13 |
| Handwriting | 0 | 2 | 0 | 2 |
| Social Studies | 0 | 1 | 0 | 1 |
| Language Arts | 0 | 0 | 1 | 1 |
| ESOL | 0 | 2 | 0 | 2 |
| No Answer | 0 | 3 | 0 | 3 |
| Total | 124 | 169 | 85 | 378 |

Table 3 shows that forty-six (37 %) of Moffet's 124 study participants selected science as their favorite subject in school. Twenty five selected gym (20 %) and twenty-three (18 %), mathematics. At Comparison 1, fifty-two (31 %) of the 169 participants selected science, sixty-three, computers (37 %), and twenty-five (15 %), mathematics. At Comparison 2, twenty-five (29 %) selected science, forty-one (46 %), gym and seven (8 %), art. Overall, eighteen subjects were mentioned as most favorite.

Table 4 shows that twenty-six (21 %) of Moffet's 124 study participants selected science as their second favorite subject in school. Thirty-one selected gym (25 %) and twenty (16 %), art. At Comparison 1, forty-five (27 %) of the 169 participants selected science, thirty-three, computers (20 %), and twenty-six (15 %), mathematics. At Comparison 2, twenty-two (26 %) selected science, twenty-four (28 %), gym and fifteen (18 %), art. Overall, eighteen subjects were mentioned as second most favorite.

Table 4

Student responses to Item 1B: What Has Been Your Second Most Favorite Subject in School ?

| | School | | | |
|---|---|---|---|---|
| | Moffet | Comparison 1 | Comparison 2 | Total |
| Subject | | | | |
| Gym | 31 | 7 | 24 | 62 |
| Science | 26 | 45 | 22 | 93 |
| Art | 20 | 8 | 15 | 43 |
| Math | 15 | 26 | 9 | 50 |
| Social Studies | 8 | 5 | 4 | 17 |
| History | 6 | 0 | 0 | 6 |
| Music | 4 | 5 | 4 | 13 |
| Reading | 3 | 21 | 2 | 26 |
| Health | 3 | 6 | 0 | 9 |
| Cooking | 2 | 0 | 0 | 2 |
| Language Arts | 2 | 1 | 3 | 6 |
| Computer | 0 | 33 | 2 | 35 |
| ESOL | 1 | 0 | 0 | 1 |
| English | 1 | 0 | 0 | 1 |
| Literature | 1 | 0 | 0 | 1 |
| Spelling | 1 | 6 | 0 | 7 |
| Library | 0 | 2 | 0 | 2 |
| Handwriting | 0 | 1 | 0 | 1 |
| No Answer | 0 | 3 | 0 | 3 |
| Total | 124 | 169 | 85 | 378 |

We used chi-square to analyze these data. We examined science as first choice by school, as second choice and as first or second choice. Tables 5, 6 and 7 present the analyses and show that significant differences did not emerge.

Table 5

Results of Chi-Square Analysis: Science First Choice by School

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| School | | | | | |
| Moffet | 78 | 46 | | | |
| Comparison 1 | 117 | 52 | | | |
| Comparison 2 | 60 | 25 | 1.79 | 2 | .41 |

Table 6

Results of Chi-Square Analysis: Science Second Choice by School

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| School | | | | | |
| Moffet | 98 | 26 | | | |
| Comparison 1 | 124 | 45 | | | |
| Comparison 2 | 63 | 22 | 1.33 | 2 | .51 |

Table 7

Results of Chi-Square Analysis: Science First or Second Choice by School

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| School | | | | | |
| Moffet | 72 | 52 | | | |
| Comparison 1 | 72 | 97 | | | |
| Comparison 2 | 38 | 47 | .17 | 2 | .92 |

Our next series of analyses concerned grade. Here we used chi-square to examine the data for the three schools combined, compared and individually. Our findings appear in Tables 8 through 13. Significance emerged for grade four and grade 5 across schools, and the grades at Moffet and Comparison 1.

Table 8

Results of Chi-Square Analysis: Science First or Second Choice by Grade

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| Grade | | | | | |
| Four | 101 | 74 | | | |
| Five | 115 | 88 | .01 | 1 | .92 |

Table 9

Results of Chi-Square Analysis: Science First or Second Choice by School - Grade 4

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| School | | | | | |
| Moffet | 31 | 36 | | | |
| Comparison 1 | 63 | 28 | | | |
| Comparison 2 | 7 | 10 | | | |
| Total | 101 | 74 | 10.44 | 2 | .005* |

Table 10

Results of Chi-Square Analysis: Science First or Second Choice by School - Grade 5

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| School | | | | | |
| Moffet | 41 | 16 | | | |
| Comparison 1 | 34 | 44 | | | |
| Comparison 2 | 40 | 28 | | | |
| Total | 115 | 88 | 10.97 | 2 | .004* |

Table 11

Results of Chi-Square Analysis: Science First or Second Choice by Grade - Moffet

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| Grade | | | | | |
| Four | 31 | 36 | | | |
| Five | 41 | 16 | 7.31 | 1 | .01** |

Table 12

Results of Chi-Square Analysis: Science First or Second Choice by Grade - Comparison 1

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| Grade | | | | | |
| Four | 63 | 28 | | | |
| Five | 34 | 44 | 10.26 | 1 | .001*** |

Table 13

Results of Chi-Square Analysis: Science First or Second Choice by Grade - Comparison 2

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| Gradel | | | | | |
| Four | 7 | 10 | | | |
| Five | 40 | 28 | 1.07 | 1 | .30 |

Our next series of analyses dealt with gender. We used chi-square to examine our data and followed the same pattern as we used when we studied grade level. Our analyses appear in Tables 14 through 19. We found significance as males were more likely to identify science as their first or second favorite subject than females. No significant differences emerged in the remaining analyses.

Table 14

Results f Chi-Square Analysis: Science First or Second Choice by Gender

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| Gender | | | | | |
| Male | 111 | 66 | | | |
| Female | 105 | 111 | 3.90 | 1 | 05* |

Table 15

Results of Chi-Square Analysis: Science First or Second Choice by School - Males

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| School | | | | | |
| Moffet | 36 | 21 | | | |
| Comparison 1 | 53 | 33 | | | |
| Comparison 2 | 22 | 12 | | | |
| Total | 111 | 88 | .10 | 2 | .95 |

Table 16

Results of Chi-Square Analysis: Science First or Second Choice by School - Females

| | Selection Science | Other | Chi-Square | df | Sig. |
|---|---|---|---|---|---|
| School | | | | | |
| Moffet | 36 | 31 | | | |
| Comparison 1 | 44 | 39 | | | |
| Comparison 2 | 26 | 25 | | | |
| Total | 106 | 95 | .29 | 2 | .86 |

Table 17

Results of Chi-Square Analysis: Science First or Second Choice by Gender - Moffet

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| Gender | | | | | |
| Male | 36 | 31 | | | |
| Female | 36 | 21 | .77 | 1 | .38 |

Table 18

Results of Chi-Square Analysis: Science First or Second Choice by Gender - Comparison 1

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| Gender | | | | | |
| Male | 53 | 35 | | | |
| Female | 44 | 39 | .95 | 1 | .33 |

Table 19

Results of Chi-Square Analysis: Science First or Second Choice by Gender - Comparison 2

| | Selection | | | | |
|---|---|---|---|---|---|
| | Science | Other | Chi-Square | df | Sig. |
| Gender | | | | | |
| Male | 22 | 12 | | | |
| Female | 25 | 26 | 1.44 | 1 | .23 |

Student responses to items 2A through 12E appear in Tables 20 through 47. Moffet's students were more likely to recognize that they had science in school. They wanted more science and claimed that science made them feel happy, interested, excited, and successful. They stated that science did not make them feel dumb. (Tables 20 through 25).

Moffet's students felt that the things they learned in science were not useful beyond school and that knowing a lot of science would be helpful in later life. Working as a scientist would be fun, would probably not make them rich, would not be too hard, would probably not be boring, would not make one important and would probably be lonely (Tables 26 through 34).

According to the Moffet students, pollution and energy waste were serious problems. Their counterparts saw food shortage and disease in this light. The Moffet students felt that they could help solve problems linked to energy waste and pollution but were not as sure with regard to food shortage and disease. Moffet's students were less likely to claim that science would be helpful in buying cereals keeping healthy or choosing friends but more likely to buy a car or purchase a tube of toothpaste (Tables 35 to 47).

Table 20

Student Responses to Item 2A: Do You Have Any Science in School ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 121 (98 %) | 0 ( 0 %) | 3 ( 2 %) | 0 ( 0 %) |
| Comparison 1 | 164 (97 %) | 3 ( 2 %) | 1 ( 1 %) | 1 ( 1 %) |
| Comparison 2 | 82 (97 %) | 2 ( 2 %) | 0 ( 0 %) | 1 ( 1 %) |

Table 21

Student Responses to Item 2B: Do You Wish You Had More Science in School ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 88 (71 %) | 23 (18 %) | 13 (10 %) | 0 ( 0 %) |
| Comparison 1 | 78 (46 %) | 61 (36 %) | 30 (18 %) | 0 ( 0 %) |
| Comparison 2 | 46 (54 %) | 20 (24 %) | 19 (22 %) | 0 ( 0 %) |

Table 22

Student Responses to Item 3A: When You Have Science in School, How Does It Usually Make You Feel ? Does Science Make You Feel Happy ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 84 (68 %) | 13 (10 %) | 14 (12 %) | 13 (10 %) |
| Comparison 1 | 83 (49 %) | 43 (25 %) | 27 (16 %) | 16 (10 %) |
| Comparison 2 | 43 (51 %) | 16 (19 %) | 22 (26 %) | 4 ( 5 %) |

Table 23

Student Responses to Item 3B: When You Have Science in School, How Does It Usually Make You Feel ? Does Science Make You Feel Interested ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 95 (77 %) | 14 (11 %) | 9 ( 7 %) | 6 ( 5 %) |
| Comparison 1 | 123 (74 %) | 23 (14 %) | 15 ( 9 %) | 8 ( 5 %) |
| Comparison 2 | 64 (75 %) | 8 ( 9 %) | 9 (11 %) | 4 ( 5 %) |

Table 24

Student Responses to Item 3C: When You have Science in School, How Does It Usually Make You Feel ? Does Science Make You Feel Dumb ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 9 ( 1 %) | 88 (71 %) | 10 ( 8 %) | 17 (14 %) |
| Comparison 1 | 10 ( 6 %) | 106 (63 %) | 34 (20 %) | 19 (11 %) |
| Comparison 2 | 6 ( 7 %) | 60 (71 %) | 16 (18 %) | 4 ( 5 %) |

Table 25

Student Responses to Item 3D: Whwn You Have Science in School, How Does It Usually Make You Feel ? Does Science Make You Feel Excited ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 78 (63 %) | 16 (13 %) | 16 (13 %) | 4 (11 %) |
| Comparison 1 | 48 (46 %) | 25 (36 %) | 17 (18 %) | 10 ( 0 %) |
| Comparison 2 | 49 (58 %) | 15 (18 %) | 18 (21 %) | 3 ( 4 %) |

Table 26

Student Responses to Item 3E: When You Have Science in School, How Does It Ususally Make You Feel ? Does Science Make You Feel Successful ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 63 (51 %) | 17 (14 %) | 30 (24 %) | 14 (11 %) |
| Comparison 1 | 69 (41 %) | 36 (21 %) | 42 (25 %) | 22 (14 %) |
| Comparison 2 | 41 (48 %) | 16 (19 %) | 25 (29 %) | 3 ( 4 %) |

Table 27

Student Responses to Item 4: Are The Things You Learn in Science Useful to You When You Are Not in School ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 78 (63 %) | 24 (19 %) | 22 (18 %) | 0 ( 0 %) |
| Comparison 1 | 108 (64 %) | 35 (21 %) | 24 (14 %) | 2 ( 1 %) |
| Comparison 2 | 57 (67 %) | 14 (17 %) | 14 (17 %) | 0 ( 0 %) |

Table 28

Student Responses to Item 5: Do You Think That Knowing A Lot About Science Will Help You When You Grow Up ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 110 (89 %) | 5 ( 4 %) | 9 ( 7 %) | 0 ( 0 %) |
| Comparison 1 | 130 (77 %) | 8 ( 5 %) | 31 (18 %) | 0 ( 0 %) |
| Comparison 2 | 92 (67 %) | 1 ( 1 %) | 6 ( 7 %) | 0 ( 0 %) |

Table 29

Student Responses to Item 6A: Think About Being A Scientist. Would Being A Scientist Be Fun For You ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 86 (69 %) | 18 (14 %) | 17 (14 %) | 3 ( 2 %) |
| Comparison 1 | 97 (57 %) | 35 (21 %) | 32 (19 %) | 5 ( 3 %) |
| Comparison 2 | 38 (45 %) | 17 (20 %) | 29 (34 %) | 1 ( 1 %) |

Table 30

Student Responses to Item 6B: Think About Being A Scientist. Would Being A Scientist Make You Rich ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 40 (32 %) | 31 (25 %) | 36 (37 %) | 7 ( 6 %) |
| Comparison 1 | 71 (42 %) | 32 (19 %) | 57 (34 %) | 9 ( 5 %) |
| Comparison 2 | 24 (28 %) | 21 (25 %) | 36 (42 %) | 4 ( 5 %) |

Table 31

Student Responses to Item 6C: Think About Being A Scientist. Would Being A Scientist Be Too Much Work For You ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 15 (12 %) | 74 (60 %) | 27 (22 %) | 8 ( 7 %) |
| Comparison 1 | 38 (23 %) | 92 (54 %) | 27 (16 %) | 12 ( 7 %) |
| Comparison 2 | 11 (13 %) | 50 (59 %) | 20 (24 %) | 4 ( 5 %) |

Table 32

Student Responses to Item 6D: Think About Being A Scientist. Would Being A Scientist Be Boring For You ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 12 (10 %) | 87 (70 %) | 16 (13 %) | 9 ( 7 %) |
| Comparison 1 | 28 (17 %) | 96 (57 %) | 34 (20 %) | 11 ( 7 %) |
| Comparison 2 | 8 ( 9 %) | 58 (68 %) | 17 (20 %) | 2 ( 2 %) |

Table 33

Student Responses to Item 6E: Think About Being A Scientist. Would Being A Scientist Make You Important ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 67 (54 %) | 17 (14 %) | 33 (27 %) | 7 ( 6 %) |
| Comparison 1 | 110 (65 %) | 22 (13 %) | 32 (19 %) | 5 ( 3 %) |
| Comparison 2 | 55 (65 %) | 6 ( 7 %) | 21 (25 %) | 3 ( 4 %) |

Table 34

Student Responses to Item 6F: Think About Being A Scientist. Would Being A Scientist Make You Lonely ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 10 ( 8 %) | 79 (64 %) | 26 (21 %) | 9 ( 7 %) |
| Comparison 1 | 20 (12 %) | 106 (63 %) | 32 (19 %) | 11 ( 7 %) |
| Comparison 2 | 6 ( 7 %) | 58 (68 %) | 18 (21 %) | 3 ( 4 %) |

Table 35

Student Responses to Item 7: Do You Think Pollution Is A Serious Problem In The World Today ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 104 (84 %) | 6 ( 5 %) | 14 (11 %) | 0 ( 0 %) |
| Comparison 1 | 123 (73 %) | 8 ( 5 %) | 37 (22 %) | 1 ( 1 %) |
| Comparison 2 | 66 (78 %) | 2 ( 2 %) | 17 (20 %) | 0 ( 0 %) |

Table 36

Student Responses to Item 8: Do You Think Energy Waste Is A Serious Problem In The World Today ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 85 (69 %) | 18 (15 %) | 21 (17 %) | 0 ( 0 %) |
| Comparison 1 | 106 (63 %) | 18 (11 %) | 45 (27 %) | 0 ( 0 %) |
| Comparison 2 | 48 (57 %) | 10 (12 %) | 27 (32 %) | 0 ( 0 %) |

Table 37

Student Responses to Item 9: Do You Think Food Shortage Is A Serious Problem In The World Today ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 65 (52 %) | 25 (20 %) | 34 (27 %) | 0 ( 0 %) |
| Comparison 1 | 97 (57 %) | 38 (22 %) | 34 (20 %) | 0 ( 0 %) |
| Comparison 2 | 55 (65 %) | 16 (19 %) | 14 (16 %) | 0 ( 0 %) |

Table 38

Student Responses to Item 10: Do You Think Disease Is A Serious Problem In The World Today ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 109 (88 %) | 6 ( 5 %) | 9 ( 7 %) | 0 ( 0 %) |
| Comparison 1 | 145 (86 %) | 7 ( 4 %) | 16 ( 9 %) | 1 ( 0 %) |
| Comparison 2 | 79 (93 %) | 1 ( 1 %) | 5 ( 6 %) | 0 ( 0 %) |

Table 39

Student Responses to Item 11A: Can You Help Solve The Problem of Pollution ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 78 (63 %) | 20 (16 %) | 25 (20 %) | 1 ( 1 %) |
| Comparison 1 | 102 (60 %) | 29 (17 %) | 36 (21 %) | 2 ( 1 %) |
| Comparison 2 | 24 (28 %) | 24 (28 %) | 37 (44 %) | 0 ( 0 %) |

Table 40

Student Responses to Item 11B: Can You Help Solve The Problem of Energy Waste ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 63 (51 %) | 29 (23 %) | 29 (23 %) | 3 ( 2 %) |
| Comparison 1 | 57 (34 %) | 50 (30 %) | 59 (35 %) | 3 ( 2 %) |
| Comparison 2 | 25 (29 %) | 20 (24 %) | 40 (47 %) | 0 ( 0 %) |

Table 41

Student Responses to Item 11C: Can You Help Solve The Problem of Food Shortages ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 63 (51 %) | 19 (15 %) | 40 (32 %) | 2 ( 2 %) |
| Comparison 1 | 90 (53 %) | 34 (20 %) | 43 (25 %) | 2 ( 1 %) |
| Comparison 2 | 34 (40 %) | 21 (25 %) | 30 (35 %) | 0 ( 0 %) |

Table 42

Student Responses to Item 11D: Can You Help Solve The Problem of Disease ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 38 (31 %) | 43 (35 %) | 40 (32 %) | 3 ( 2 %) |
| Comparison 1 | 60 (36 %) | 58 (34 %) | 49 (29 %) | 2 ( 1 %) |
| Comparison 2 | 16 (19 %) | 40 (47 %) | 29 (34 %) | 0 ( 0 %) |

Table 43

Student Responses to Item 12A: Can You Or Your Family Use Information Gained From Scientific Experiments To Decide What Cereal To Buy ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 53 (43 %) | 40 (32 %) | 29 (23 %) | 2 ( 2 %) |
| Comparison 1 | 80 (47 %) | 50 (30 %) | 34 (20 %) | 5 ( 3 %) |
| Comparison 2 | 28 (33 %) | 38 (45 %) | 19 (22 %) | 0 ( 0 %) |

Table 44

Student Responses to Item 12B: Can You Or Your Family Use Information Gained From Scientific Experiments To Keep Healthy ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 99 (80 %) | 15 (12 %) | 8 ( 7 %) | 2 ( 2 %) |
| Comparison 1 | 122 (72 %) | 23 (14 %) | 22 (13 %) | 2 ( 1 %) |
| Comparison 2 | 57 (67 %) | 14 (16 %) | 14 (16 %) | 0 ( 0 %) |

Table 45

Student Responses to Item 12C: Can You Or Your Family Use Information Gained From Scientific Experiments To Buy A Car ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 42 (34 %) | 51 (41 %) | 28 (23 %) | 3 ( 2 %) |
| Comparison 1 | 47 (28 %) | 65 (38 %) | 52 (31 %) | 5 ( 3 %) |
| Comparison 2 | 20 (24 %) | 43 (51 %) | 22 (26 %) | 0 ( 0 %) |

Table 46

Student Responses to Item 12D: Can You Or Your Family Use Information Gained From Scientific Experiments To Choose A Toothpaste ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 51 (41 %) | 49 (40 %) | 21 (17 %) | 3 ( 2 %) |
| Comparison 1 | 63 (37 %) | 70 (41 %) | 30 (18 %) | 6 ( 4 %) |
| Comparison 2 | 26 (31 %) | 45 (53 %) | 14 (16 %) | 0 ( 0 %) |

Table 47

Student Responses to Item 12E: Can You Or Your Family Use Information Gained From Scientific Experiments To Choose Friends ?

| | Response | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | No Answer |
| School | | | | |
| Moffet | 42 (34 %) | 61 (49 %) | 18 (14 %) | 3 ( 2 %) |
| Comparison 1 | 62 (37 %) | 74 (44 %) | 27 (16 %) | 6 ( 4 %) |
| Comparison 2 | 15 (18 %) | 59 (69 %) | 11 (13 %) | 0 ( 0 %) |

Achievement

For achievement, we used the Citywide Achievement Test in science as our database. This test is administered to all of the District's students twice a year, in the fall and spring. After each administration, the test constructors examine the results and make revisions where necessary. While the test meets the District's needs in terms of assessment, it is inappropriate for measuring growth. In addition, Citywide summaries are not available. With these limitations in mind, we took the Moffet students who moved to other schools and compared their test performance with that of their counterparts. The results are expressed as percentages and appear in Table 48

We were able to locate 103 Moffet graduates. Forty-nine enrolled in Middle School 1, forty-six in Middle School 2 and eight in six other sites. We limited our work to the

Table 48

Student Science Performance by Moffet Graduates and Others by Grade and School: Spring 1989

| | Grade Six N Score | Seven N Score |
|---|---|---|
| School | | |
| Middle School 1 | | |
| Moffet | 20 (72 %) | 29 (64 %) |
| Others | 112 (69 %) | 121 (62 %) |
| Middle School 2 | | |
| Moffet | 27 (74 %) | 19 (65 %) |
| Others | 109 (70 %) | 133 (62 %) |

students who enrolled in the two middle schools because of numbers. In Middle School 1, our cohort included twenty sixth grade students and twenty-nine seventh grade students. In Middle School 2, there were twenty-seven sixth grade students and nineteen seventh grade students.

Our results showed that the Moffet graduates earned higher scores than their counterparts at both grades in both schools. These differences ranged from two percentage points at Middle School 2's seventh grade to four percentage points at Middle School 1's sixth grade.

## Conclusions

We found that our magnet school students were no more likely to select science as their favorite or second favorite subject than their comparison school counterparts. In grade four, the comparison school students selected science as their first or second choice significantly more frequently than the Moffet students. The reverse held in grade five. Significance by grade continued for Moffet and Comparison 1. For gender, a significant difference occurred overall.as males were significantly more likely to select science as their first or second favorite subject. Significance did not emerge in any of the subsequent analyses based on gender.

We reported our findings on Questions 2A through 12F. For the straightforward questions, 2A through 3E, the Moffet students were more likely to feel comfortable with their science experiences. When some interpretation was called for, the responses varied.

For achievement, students who left Moffet and enrolled elsewhere earned higher scores than their respective student bodies. This finding was noted in both grades we studied and in both schools.

## Discussion

Last year, found that our Elementary Science Magnet School students were more likely to select science as their first or second favorite subject than their counterparts

enrolled in a nearby elementary school. We were unable to replicate this finding in our study this year. Although the percent of magnet school students who selected science as their first or second favorite subject was close to the same level, the comparison school students were much more likely to select science in the second year. As a result, the differences did not reach significance.

Grade, overall, was not a significant factor but it did emerge as one in our magnet school and one of the comparison schools. Here, the magnet school's effect was less than Comparison 1's in fourth grade but greater in fifth grade. Again, we are at a loss to determine the underlying factors here.

This set of findings differed dramatically from that of our earlier effort where the magnet school students were more likely to select science as their favorite or second favorite subject in grades four and five to a point which reached significance. In grade six, the magnet school principal stated that a substitute teacher had been placed in one class and was unable to implement the magnet program as directed. He felt the substitute's presence limited the students' ability to take advantage of the program.

Gender was significant overall but nonsignificant in our subsequent analyses. In our previous effort, gender was not significant in any of our analyses. We did not take ethnicity as a factor this year because our Hispanic students

accounted for such a great proportion of our sample that we felt any findings could be misleading.

Our findings on achievement were gratifying. However, the limited sample and the nature of the measuring instruments which were used temper this feeling. The differences in percent between the magnet school graduates and their counterparts from other schools were slight in each of the four comparisons, two schools and two grades, and should be verified before firm conclusions can be drawn.

Let's get to the primary question: Is setting up a science magnet school worth the money in terms of desegregation, attitudes or achievement ? Four positions were supported by the grant. In addition, materials and supplies were purchased. The proportion of white students increased by 2 percent and the school was able to maintain its desegregated status in a city where the proportion of whites is declining. It is not possible to make a firm judgment on attitudes or achievement at this time. Therefore, an answer to the question is elusive at this time.

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