

RET & REU PROGRAMS

Impact on Teachers and Students

Columbia University's *Summer
Research Program for Science
Teachers*

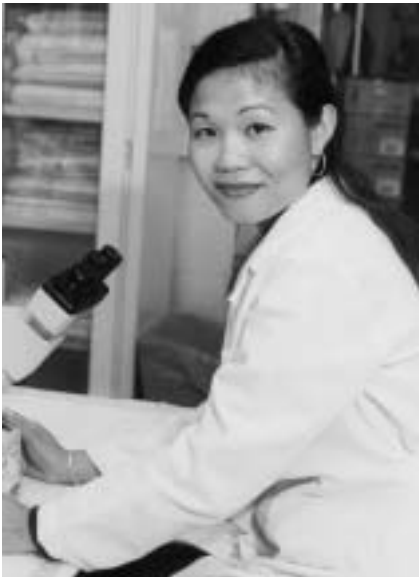


NRCEN
Santa Cruz, CA
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Introduction

Columbia's *Summer Research Program for Science Teachers* was established in 1990 for the purpose of contributing to the improvement of science achievement of students by providing science teachers with experience in the practice of science. Teachers become members of research teams.



Program Demographics 1990-2002

- 135 middle and high school science teachers
- 83% public schools
- 56% women
- 44% minorities

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Columbia University's *NSF-Supported Integrated Multidisciplinary Science and Engineering Centers*

- **EMSI** - Environmental Molecular Sciences Institute
- **MRSEC** - Materials Research Science and Engineering Center
- **NSEC** - Nanoscale Science and Engineering Center

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Integrated Outreach Centers

- MRSEC
 - 10 teachers (1999-2002)
- EMSI
 - 7 teachers (1999-2002)
- NSEC
 - 2 teachers (2002)

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Research Experiences for Undergraduates (REU) MRSEC, EMSI, NSEC Columbia University

- **Goal:** to bring a diverse group to Columbia for a research intensive summer program in materials science, environmental science and nanotechnology
- **Recruitment:** Direct mailings to universities, academic and professional societies, various external web postings, center web sites
- **MRSEC - 51 students (1999-2002)**
 - 18 women, 16 minorities
- **EMSI - 18 students (1999-2002)**
 - 5 women, 7 minorities
- **NSEC - 7 students (2002)**
 - 3 women, 2 minorities

REU Acceptance Criteria:

- Strong GPA, strong recommendations, complete application
- Stated interest in center-related areas and in advanced study/research
- Little previous research (first experience) from non-research oriented institutions, small schools
- Diversity
- Bring in only a few Columbia students
- Aim for entering juniors and seniors, no graduating seniors

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REU Program Structure

Ten-week NSF-sponsored research program

- Comprehensive Columbia and NYC Orientation
- Independent research project incorporating hands-on lab experience
- Faculty mentorship
- Weekly seminars from center faculty on current grant research
- 1-2 field trips to a National Lab and Industry
- Interactions with other REU programs (Chemistry Dept, Minority Affairs)
- Special workshops addressing women and minorities in science, applying for graduate school
- End-of-summer research symposium

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Working Together

Support Systems Between REU and RET

- **Shared Experiences** - students and teachers share lab space, materials, equipment and faculty mentors/research groups and interact daily
- **Knowledge Transfer** - analytical, theoretical and logistical
- **Emotional connections** - research is not as intimidating when working alongside a fellow “research outsider”



Ashley Smith, MRSEC REU 2002
participant in MRSEC Cleanroom



Khadija Vann, MRSEC RET 2002
participant in MRSEC Cleanroom

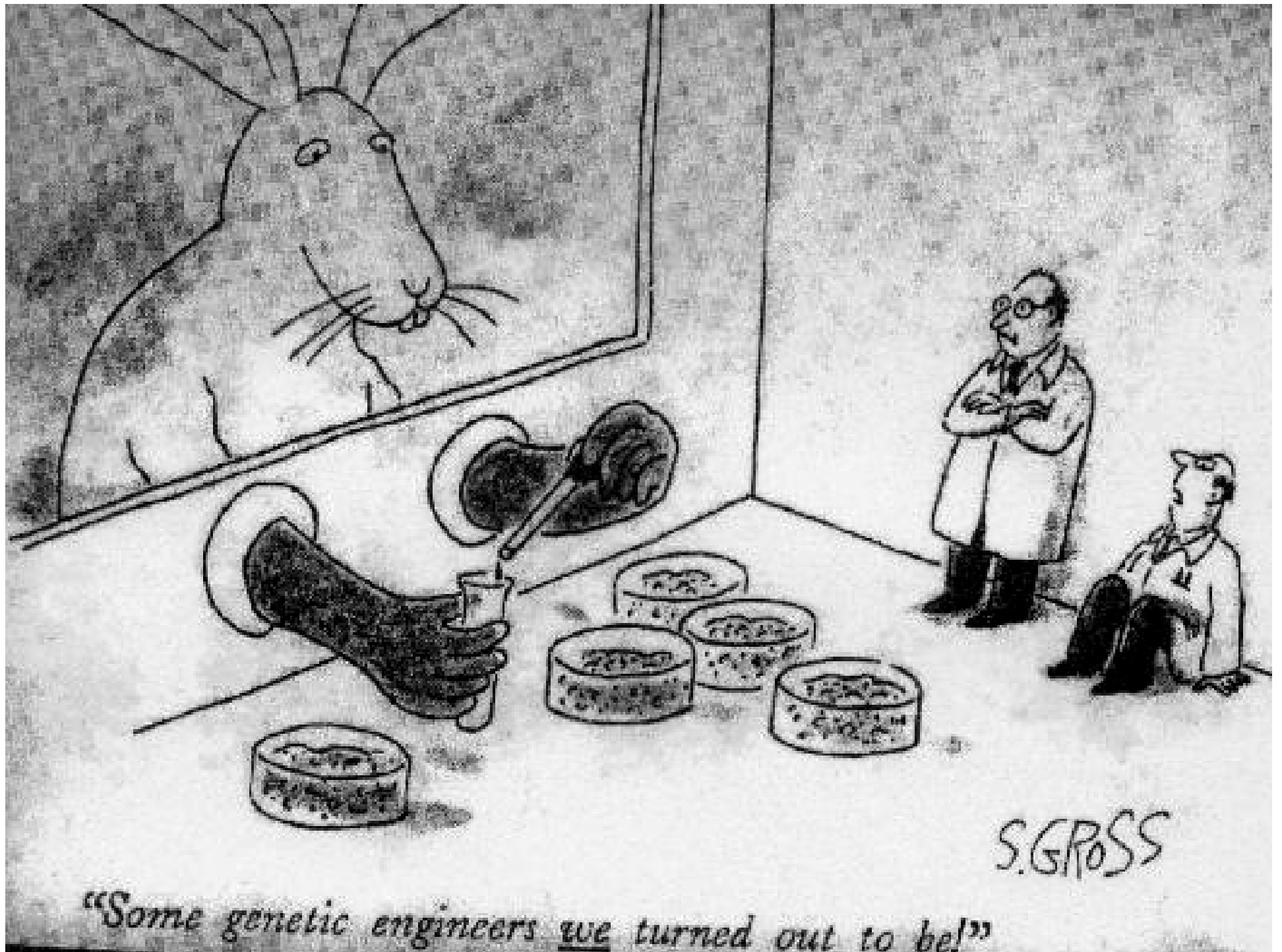


- In 1994, Columbia's Summer Research Program began collecting student quantitative data from NYC public high schools
 - **Treatment Group** -- Students in science classes of Program teachers (*Prior to program participation through completion of 2-year program*)
 - **Comparison Group** -- Students in science classes of non-participating teachers from the same schools

Performance Indicators

- Data Collected for:
 - Science Club Participation
 - Intel Science Talent Project Participation
 - NYS Science Regents Exam Scores
 - NYS Science Regents Exam Pass Rate





"Some genetic engineers we turned out to be!"

Instruments Administered

- Pre-program survey*
- Post-program survey*
- Mentor survey*
- Spring implementation survey

*www.scienceteacherprogram.org/sweptstudy

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2001 Teacher Survey Data

- **88%** stated they have shared Columbia-derived information, materials and/or resources with other school personnel.
- **82%** reported developing new or revised content to lessons and/or labs since participating in Columbia's Program.
- **82%** reported increasing hands-on activities in their classrooms and/or new laboratory exercises in response to their experiences at Columbia.
- **76%** reported discussing science careers and related job requirements with their students.
- **76%** reported increasing problem-solving activities in their classes.

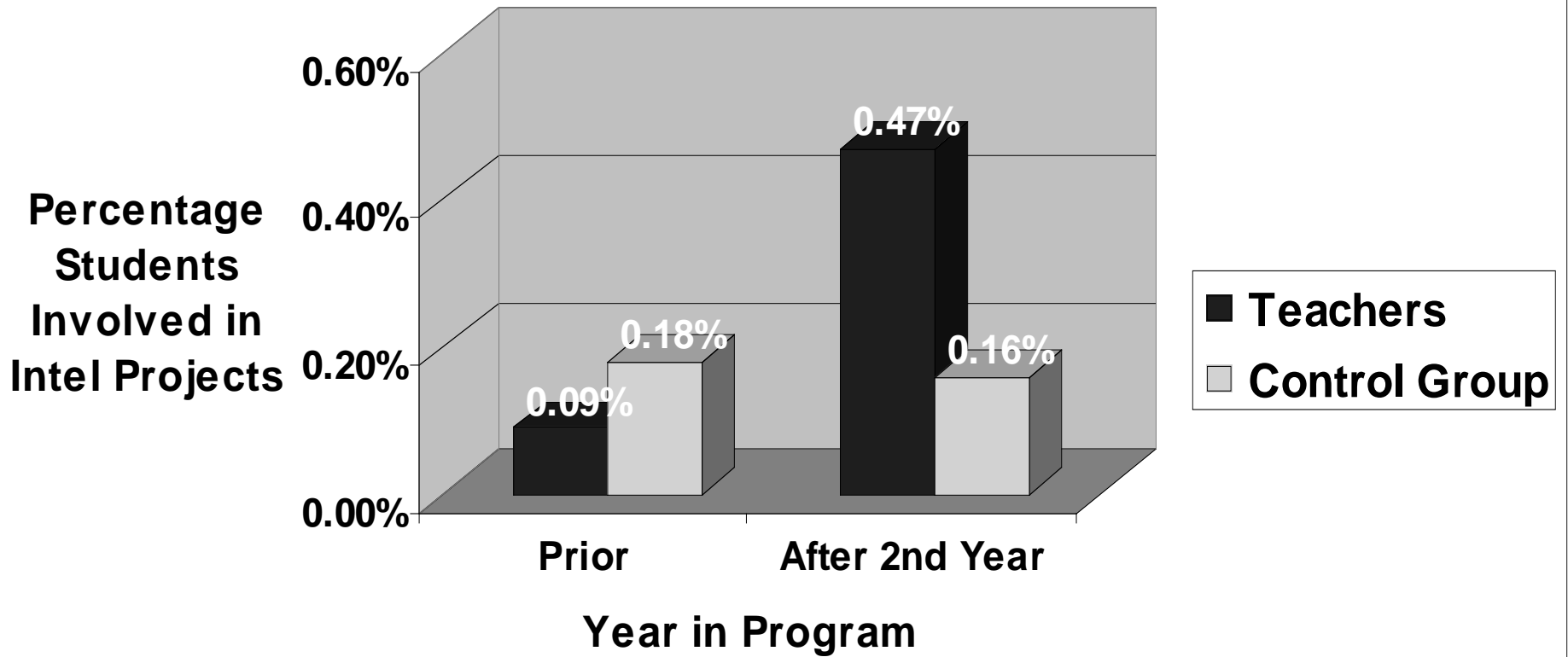
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2001 Teacher Survey Data (con't)

- **71%** reported initiating or increasing their use of computers since their participation in the program.
- **65%** reported the introduction of new technologies.
- **65%** reported reading scientific journals more frequently than before.
- **53%** reported increased requirements for formal written reports and/or oral presentation requirements.
- **41%** reported assuming new leadership roles/responsibilities in their school/district/region.

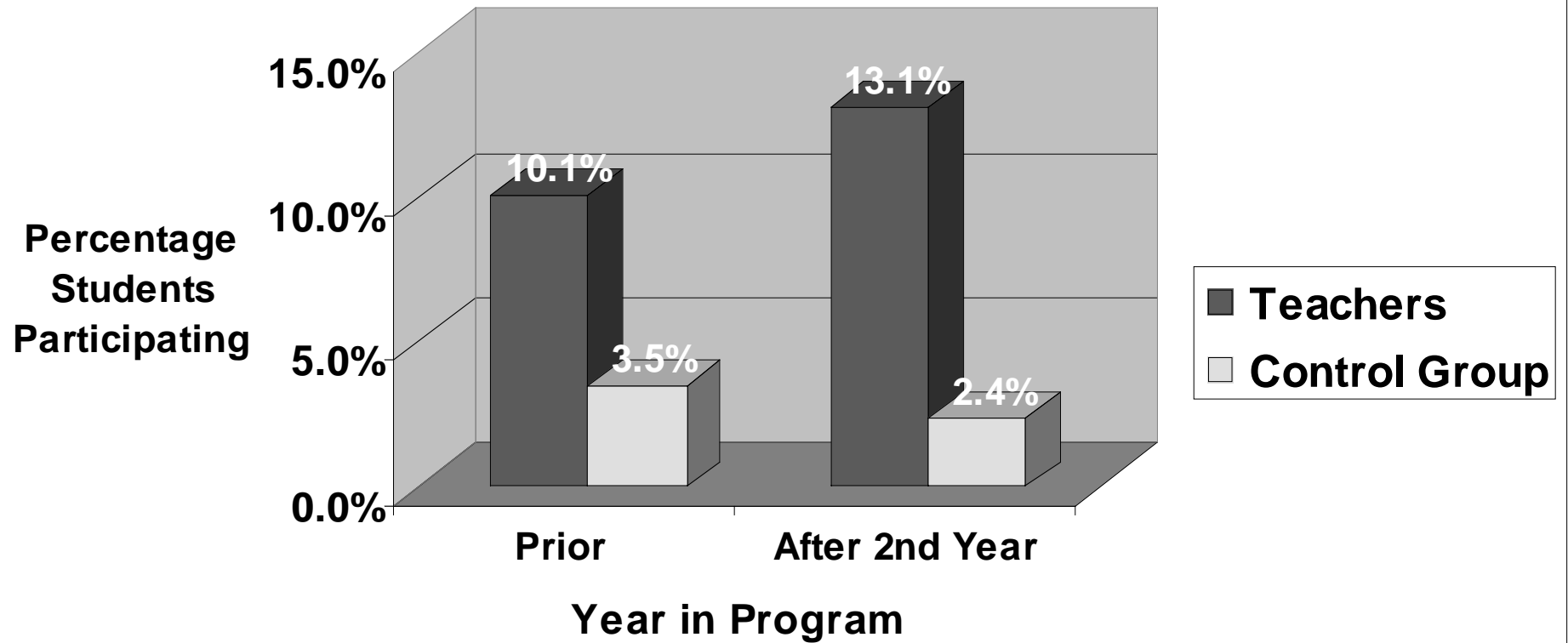
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Intel Science Talent Search



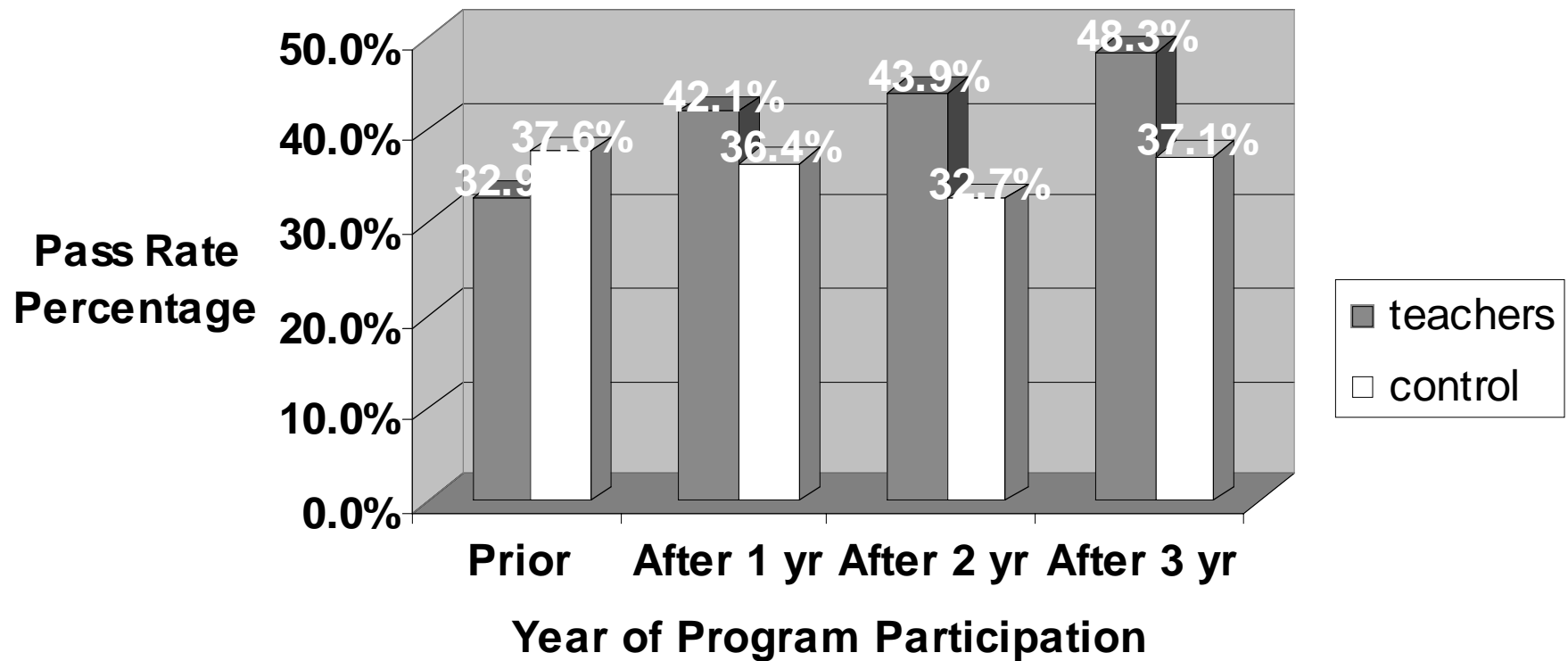
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Science Clubs



Science Regents Pass Rate

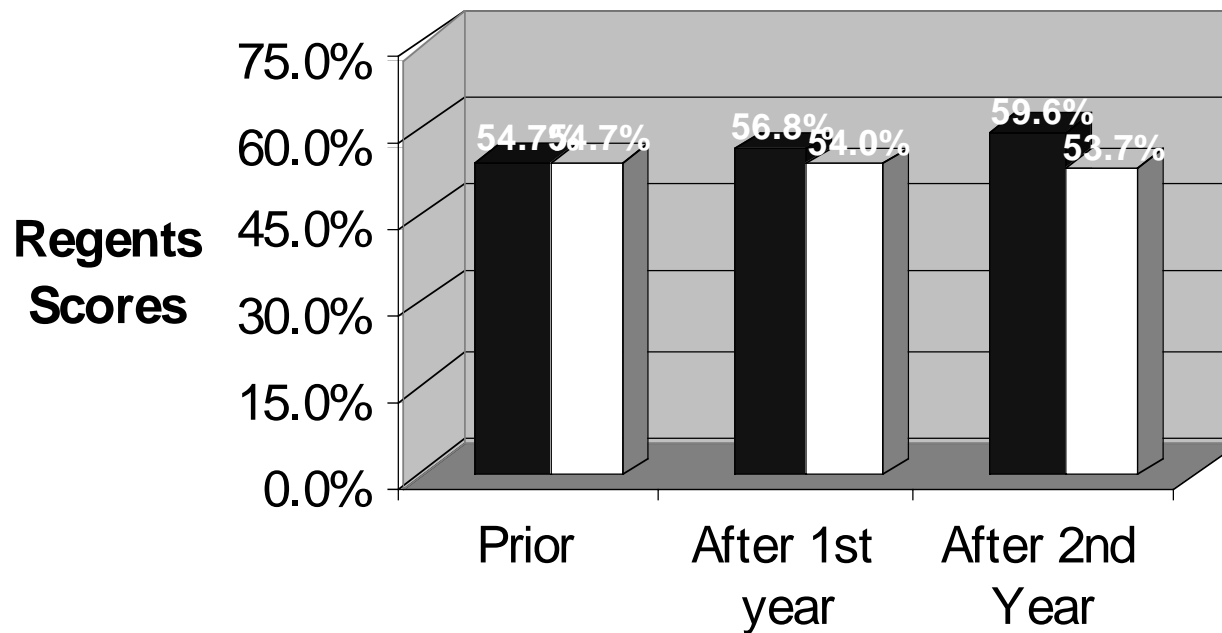
Regents Pass Rate



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Science Regents Scores

Regents Scores



■ Teachers

□ Controls

Years of Participation
19 Complete Data Sets (*all NYC Public*

High Schools)

4,003 Study Students

13,786 Control Students

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