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AUTHOR Kleinfeld, Judith; Yerian, Sue
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ABSTRACT

The project described in this report was designed to develop curriculum materials on gender equity issues for prospective teachers in education programs both at the University of Alaska and nationwide. Practicing teachers, together with university researchers, developed 10 teaching cases which present real-world classroom difficulties centering on gender issues, particularly the development of scientific and mathematical abilities in young women. This report summarizes project activities and presents abstracts as well as cases developed by teacher colleagues. The cases are being tested and refined in both elementary and secondary programs at the university during the 1991-92 school year and will then be published and submitted to selected national publications. An appendix provides relevant research articles on gender equity issues to accompany teaching cases with special reference to science and mathematics. Titles include: "Gender Equity and Educational Reform"; "...About Girls and Science"; "A Gender at Risk"; "Finding Reality among the Myths: Why What You Thought About Sex Equity in Education Isn't So"; "Sexism in the Classroom: From Grade School to Graduate School"; "The School Experiences of Black Girls"; "What's a Nice Girl Like You Doing in a Math Class?" "Sexism in Our Schools"; "Encouraging Girls in Science Courses and Careers"; and "Integrating the Sciences." (LL)

FINAL REPORT:

Preparing Prospective Teachers to Develop the Mathematical and Scientific Abilities of Young Women:

The Development of Teaching Cases

Principal Investigators:
Judith Kleinfeld and Sue Yerian

Teacher Colleagues:

Leslie Gordon	*Badger Road Elementary School*
Theresa Hall	*North Pole High School*
Janine Lombardi	*Nenana City Schools*
Betty McKinny	*Ryan Middle School*
Pamela Himsworth Randles	*University of Alaska Fairbanks*
Deb Reynolds	*Lathrop High School*
Stephanie Rudig	*Weller Elementary School*
Michelle Saiz	*Immaculate Conception Elementary School*
Sue Yerian	*North Pole Middle School*
Gerry Young	*North Pole Middle School*

University of Alaska
Fairbanks, Alaska
July 1991

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ABSTRACT

This project was designed to develop curriculum materials on gender equity issues for prospective teachers in education programs both at the University of Alaska and nationwide. Practicing teachers, together with university researchers, developed ten "teaching cases," which present real-world classroom difficulties centering on gender issues, particularly the development of scientific and mathematical abilities in young women.

This report briefly summarizes project activities and presents the ten cases developed through this project. Also included is an appendix of relevant research articles on gender equity with special reference to science and mathematics.

These cases will be tested and refined in both the secondary and elementary programs at UAF during the 1991-92 school year. After further revision, the cases will be published through the Rural College and submitted to selected national publications, such as The Journal of Teacher Education.

PART I:

PURPOSE OF PROPOSAL

This project addressed the third objective of the Faculty Research and Curriculum Grants to Promote Educational Equity:

"to provide (a) course modules and bibliographies for designing new courses that focus on women or integrate knowledge of and about women and (b) strategies for curriculum change."

This project was designed to provide, as its major product, a course module on educational equity issues for use in basic, required courses at the University of Alaska Fairbanks and in other education programs throughout the country.

This course module on gender equity will be used in education courses at UAF during the 1991-92 academic year. Specifically, we have produced ten teaching cases centering on issues of gender equity -- problems of young female science teachers in rural Alaska, difficulties of sustaining the interest of girls in mathematics as they enter adolescence, the sudden dropping out of high school of an exceptionally talented young woman, difficulties of female science and mathematics teachers in a school environment they perceive as uncongenial to women, and so forth.

While the original proposal sought funding for the preparation of four cases, we have actually produced ten cases. Teacher enthusiasm was very high, and the principal investigators, Judith Kleinfeld and Sue Yerian, chose to decline the $1000 budgeted for each of them in this project in order to provide additional support for the teachers to develop the cases.

We note as well that the original proposal specifically called for the development of teaching cases in the area of science and mathematics. While teachers originally proposed such cases, and all teachers participating in the project were female science and mathematics teachers, several cases, when actually written, dealt with gender equity issues more broadly. We have included these additional cases in this project report because the cases are well within the basic purpose of the Faculty Research and Curriculum Grants to Promote Educational Equity.

The original proposal called for the try-out of the teaching cases in education courses taught in the 1990-91 academic year. While we began project activities in the spring of 1990 and were well underway in the fall of 1990, many of the teachers did not produce

final drafts until May, 1991. The case writing process took a good deal more editing and revision than we originally anticipated. We therefore plan to try out the completed cases during the 1991-92 academic year, evaluating student responses as described in the original proposal. After further revisions, based on student response, we will publish these cases in the Case Series of the Rural College.

We also expect to publish some of these cases in national journals in teacher education. The field of teacher education is undergoing a major shift toward qualitative and narrative modes of thinking and is beginning to welcome the publication of "teaching cases" (as opposed to the traditional research case) in professional journals. The kind of "teaching cases" we have developed are in the forefront of this change. As Sykes and Bird, in a forthcoming article in Review of Research in Education, frame this transition:

> We are undergoing a "refiguration" in the substance, methods, and genre of social thought, and teacher education is participating in that refiguration. At the risk of oversimplifying a very complex business, one may discern a set of connected (and relative movements), from a law-seeking to an interpretive aspiration, from a more masculine concern for universal principal to a more feminine concern for particular relationships, from the positivistic stance of an observer on the scene to the more pragmatic stance of the actor in the situation, from conditioned behavior to meaningful action as a model for teaching and learning, from a cooler appraisal of teaching as teachnique to a more passionate consideration of teaching as moral agency..., from lecture to conversation as the mode for interaction between professors and teachers, and from exposition to narrative--stories--as a genre for that conversation.

The cases we have produced under this gender equity grant are examples of the type of materials that are being sought---stories about common and significant classroom dilemmas. These narratives raise ethical and value questions, as well as issues of pedagogical strategy, and provide the basis for valuable conversations about what the problems are, how they came about, and what, if anything, can and could be done about them.

PROJECT ACTIVITIES

1. Identification of Teacher-Researchers to Write the Cases

Sue Yerian, who has extensive working relationships with science and mathematics teachers in the Fairbanks North Star Borough School System, contacted teachers whom she thought might be interested in developing cases about gender equity issues, particularly in science and mathematics. She sent out a general letter of invitation to schools, talked with teachers at inservice programs, and contact as well teachers in certain specialties, such as Gifted and Talented Programs. Judith Kleinfeld similary contacted science and mathematics teachers in the Catholic School System.

We were disappointed to find a lack of interest on the part of male teachers of science and mathematics in the preparation of cases on gender equity.

Many female teachers, however, were delighted to participate in the project. While most wrote their own cases and the co-investigators did editing, two teachers furnished background material and requested Yerian and Kleinfeld to write the cases.

2. Development of Cases on Gender Equity

The case-writing group met in the fall of 1990 to develop ideas about central issues in gender equity, as these problems and dilemmas were actually expressed in the classroom. The initial ideas developed from the classroom experiences of these science, mathematics, gifted and talented, and other teachers.

Each teacher was asked to identify a pardigm situation, a real world case which she hadd experienced, which illustrated these gender equity issues.

Following the meeting, Yerian or Kleinfeld met with each teacher individually to help develop her ideas. After the meetings, Kleinfeld and Yerian wrote case outlines which summarized the possible issues of the teacher's case and gave suggestions for how to write the case through an outline of crucial classroom scenes and valuable background information.

After assembling several draft cases, the case-writing group met to discuss the drafts and make suggestions for revision. The group helped the case writers interpret the situation, spot more significant issues, provide relevant detail, and increase the drama of the case. Each teacher then revised her case, on the basis of these suggestions, and presented the revised case to the group. The group met four times during the spring of 1991 to discuss and revise cases.

During June, 1991, Kleinfeld and Yerian assembled the ten cases, made stylistic and other minor revisions, and assembled the cases for the final report and for initial try-out during the 1991-92 academic year.

3. Securing of Permission to Conduct Research, Notification of Principals, and Procedures to Protect Confidentiality

Permission was secured to conduct this research through the proposal review process established by the Fairbanks North Star Borough School District. Principals of schools were also notified.

No concerns or objections were raised about the purposes of the research or the case themselves.

All cases are heavily disguised so that the particular students and school staff members are not recognizable. Teachers had the option of publishing cases anonymously or not, as they preferred.

4. Try-outs of Cases During the 1991-92 Academic Year and Revisions

As previously discussed, we were uable to obtain the cases in time to try them out during the spring of 1991. Therefore, we will use the cases for the first time in the fall of 1991 and revise them for publication during the spring of 1992.

Kleinfeld will teach selected gender equity cases to all secondary students at UAF. Pam Randles, a case-writer, is one of the team members in the UAF elementary program and will teach selected cases in this program.

5. Collection of Useful Background Research Articles on Gender Equity Issues in Education with Special Reference to Science and Mathematics

In order to provide a conceptual framework for interpreting issues in the cases, we have collected central articles on gender equity and research summaries. These are attached in an Appendix to this final report.

These articles can be given directly to students to help them understand the issues of the case or the articles can be used by the professor teaching the case to enhance his or her own understanding of gender equity issues.

PART II. CASE ABSTRACTS

We summarize each of the ten cases in a brief abstract below and then include the full text of the case. Several cases are designed to be taught sequentially.

In a number of cases, the narrative is in two parts: The Part A of the case presents a teaching problem or dilemma. Education students read Part A and then discuss the teaching issues posed and what the teacher can and should do.

Part B of the case is handed to students after the initial discussion. It describes what happened and provides a basis for appraising the teacher's response to the problems. Some cases also contain an "Epilogue," which tells students what happened over the long term as a result of the actions taken in the case.

Not all cases follow this format, however. In some instances, teachers preferred to tell their story as it unfolded. These cases follow the form the Harvard Business School calls the "retrospective case." After reading the case, the students frame the issues, appraise the actions of the teacher and other principal characters, and discuss what other strategies might have been taken.

1. "Burn Schools to the Ground" Prepared by Betty McKinny and written by Judith Kleinfeld

April, a young woman gifted in music and writing, comes to Ms. Adams, who has been her Gifted and Talented teacher at the Middle School, and announces her intentions to drop out of high school. She has refused to attend high school classes, is spending her time with an emotionally disturbed friend, has begun to get into trouble, and wants to leave high school and finish up through correspondence courses. Ms. Adams considers what, if anything, she can do to prevent an exceptionally talented young woman from leaving school and reflects as well on what is causing April's difficulties.

Issues include emotional disturbance, counseling techniques, appropriate school programming for gifted children, and explanations and interventions for the downward spiral that can occur at adolescence of what have appeared to be stable and academically successful young women.

2. **"The Hunt for the Golden Egg"**

Patsy, a science and physical education teacher, enjoys challenging stereotypes, particularly stereotypes about women. Patsy was the first female high school teacher to work in Shumayuk in many years and the first student teacher ever. She saw herself as a role model for the young women in an Inupiat community where men held public authority and women's lives were circumscribed.

While Patsy succeeds in increasing the interest and achievement of the junior high school girls in science, she finds herself constantly confronted with challenges to her authority from the high school students. They refuse to follow her directives, goad her with obscene music, and are disinterested in science that doesn't come straight from the textbook. The teacher aides, maintenance man, and others in the community turn against her, setting her up as a scapegoat in the Easter Egg Hunt.

Issues include the nature of authority, gender role differences in the expression of authority, methods of handling challenges to authority, conflicts in gender role expectations in different communities, and the effects of social change on tensions surrounding gender roles.

3. **"The Square Parachute: Cooperative Science Groups in Rural Alaska" Prepared by Pam Randles**

Meg Eliot, a new science teacher, comes to Goose Bay intent on teaching science through inquiry methods. She wants students to be able to frame scientific questions, observe and measure, and design experiments. But her carefully prepared activities and laboratories founder. The class careens out of control when she tries a laboratory dissection. Boys always assume leadership roles in group work, even when Meg Eliot specifically rotates the role of leader through the group. Meg Eliot's principal is unsympathetic to her aims either in science teaching or in developing the skills of young women. The case traces Meg Eliot's eventually successful efforts to teach inquiry skills, to develop the abilities of both boys and girls to work in mixed gender groups, and to teach young women to assume group leadership roles.

Issues in this case include developing young women's scientific and leadership abilities, problems of implementing cooperative learning, conflict between teachers and administration on instructional philosophies, especially gender equity.

4. "Angie, Her Mother, and Mathematics" by Leslie Gordon

Angie, a third grade student in the Gifted and Talented Program freezes in fear when she must deal with mathematics. Her mother and Angie have nightly battles over mathematics homework which typically end with Angie having a temper tantrum and being banished to her room. Angie's mother threatens to pull her mathematically talented daughter out of the Gifted and Talented Program since the subject is causing her and the family so much stress. The Gifted and Talented teacher must figure out how to deal not only with mathematics phobia but also with the problems at home.

Issues include mathematics phobia among young women, relationships between teachers and parents, and the line between appropriate and inappropriate counseling roles for classroom teachers.

5. "The Vertebrate Dilemma" by Michelle Saiz

When Ann transfers to a school with much higher expectations for science work, she finds herself failing seventh grade science. Her teacher, Mrs. James, has encountered this problem with other students and brings up the issue of implementing a special "Satisfactory/Unsatisfactory" grading policy for transfer students who lack the expected background. When the faculty greet this suggestion with disinterest, Mrs. James tries a series of interventions designed to assist Ann. The case explores the variety of approaches a teacher can use to provide assistance to academically unprepared students.

Issues include grading policies and ways of assisting low-performing students while maintaining high levels of expectation for science achievement.

6. "The Reluctant Mathlete" by Sue Yerian

A female middle school math teacher who also coaches the school's math team gradually realizes that within a matter of months one of her top female team members has changed interests from math to boys, clothes and parties. The case study follows the teacher as she prepares the four team members for the district and state competitions, wondering at various moments if she should permit the girl to drop off the team, as the girl wants, or if she should continue to encourage her in the competition. To win the state competition would mean a chance at a college scholarship for another student living at the poverty level, but the team needs the girl's outstanding math skills and cooperation in order to win.

This case highlights the following gender issues: To what degree does a teacher support and nurture an underrepresented individual, a female, in the field of math at the expense of other students? How should math be taught to middle school students, particularly girls, who may lose interest in the subject during puberty, fall behind boys in terms of math courses completed by the end of the high school, and give up opportunities for further advancement and future career in math and science?

7. **"Heterogeneous Grouping: It Didn't Work"**

This case addresses the problems of a new female teacher who tries to use in a 7th grade science lab the heterogeneous grouping techniques she learned at the university. The teacher notices that the students segregate themselves by gender and by ability. Her attempts to change the class grouping structure, two months after school has begun, result in a chaotic lab. A parent call and negative comments from her colleagues prevent the teacher from trying cooperative strategies the rest of the year.

The issues raised in this case revolve around gender and ability grouping patterns that have already been established and whether teachers can change patterns already ingrained by the time the students reach the secondary level; whether teacher education and in-service programs can effectively train educators to minimize gender bias in the classroom.

8. **"Mrs. Johnson Hates Me"**

Parental pressure encourages an elementary enrichment teacher with a strong math background to develop an accelerated math class for the school's 5th and 6th grade gifted math students. The female teacher carefully follows the guidelines established by her colleagues and principal for choosing the students and contacting parents, but her efforts are derailed by school politics, misunderstandings, and personal rivalries. The case follows the teacher as she attempts to place Nate, a math prodigy, at the proper math level, and how this attempt eventually involves teachers and counselors at all school levels in an increasingly complex dilemma.

The gender issues in this case stem from the elementary enrichment teacher's strong math background and the discrimination she felt from other teachers, both elementary and secondary, whom she felt were threatened by her strong content background, math ability, the math awards she had earned as an enrichment teacher rather than as a math teacher, and her persistence in trying to keep her gifted students out of the district's lock-step math system.

9. "The Teacher Who Knew Too Much"

In this case a teacher strongly identifies with a female student she has in her chemistry and physics classes. As she gets to know the student, she finds that the student's life parallels her own: an alcoholic father, too much family responsibility, not enough time for her own activities. The teacher has high standards and strict deadlines. The young woman cannot complete her spring project by its due date because of too many after school family duties. The teacher debates whether she should allow the student to turn in a late project -- something she has never permitted before -- because she understands on a personal level what this young woman's life is like.

The gender issues that arise from this case include: How flexible should a teacher be with established classroom policy in order to encourage a young woman's interest in science? How involved should a teacher become in the personal lives of her students? At what point does the time taken to support and nurture one student interfere with the time needed by the other students? Does the science teacher's gender and non-competitive classroom environment positively affect the attitudes of her female students toward science?

10. "One Parent Counts for Thirty Teachers"

This case concerns a female math teacher who has difficulty with a male student in her Basic Algebra class. The teacher, who believes she is following school policy, will not issue passes to students during the last ten minutes of the class period. The male student insists he needs a bathroom pass; the teacher refuses to give him one. The student challenges the teacher's rule by leaving the class without permission. In the ensuing action, the teacher perceives that the school administrators establish an inappropriate degree of camaraderie with male students and give in to parental pressure by accepting the student's version of what happened in class, by not punishing the student for leaving the class without permission, and by implying that the problem resided with her classroom discipline.

The case brings up the following gender related issues: the differences between male and female classroom discipline styles; the standards by which female teachers are judged as classroom disciplinarians when the standards have been determined by male administrators; and the degree to which female teachers need to be backed by the school administration when physical size and intimidation cannot be as easily used as discipline measures as they are by some male teachers.

BURN SCHOOLS TO THE GROUND

Betty McKinny
Judith Kleinfeld (Writer)

ABSTRACT

April, a young woman gifted in music and writing, comes to Ms. Adams, who has been her Gifted and Talented teacher at the Middle School, and announces her intentions to drop out of high school. She has refused to attend high school classes, is spending her time with an emotionally disturbed friend, has begun to get into trouble, and wants to leave high school and finish up through correspondence courses. Ms. Adams considers what, if anything, she can do to prevent an exceptionally talented young woman from leaving school and reflects as well on what is causing April's difficulties.

Issues include emotional disturbance, counseling techniques, appropriate school programming for gifted children, and explanations and interventions for the downward spiral that can occur at adolescence of what have appeared to be stable and academically successful young women.

BURN SCHOOLS TO THE GROUND

Part A

"Your mom tells me you are thinking about dropping out of high school."

Ms. Adams looked at the fifteen year old high school sophomore slumped into a chair in the Gifted and Talented Room. She recalled the exuberant April of two years ago when April was a superstar in her Gifted and Talented program. She could picture her hunched over the page layout for Writers' Cramp, the literary magazine she and her friends published.

"It's the people, they're just so immature. They don't like anyone who is different," April replied.

"Is it the teachers?" Ms. Adams probed.

"They're OK. They're not that bad," April shrugged.

"Is it the curriculum?"

"That's OK. But it's just so boring. Why do we have to learn all that stuff? It doesn't make any sense."

I'm not getting straight answers, Ms. Adams thought.

April wasn't the first girl she had known who had done brilliantly in school only to fall apart when she hit adolescence. April was genuinely talented. She had won literary prizes for her creative writing. She was passionate about music, played the saxophone and the piano, and composed and arranged her own songs. Was she going to be another girl who dropped out of school, got pregnant, and threw away her chances? Ms. Adams had seen this pattern before. Was there anything she could do? Would anything she said or did make any real difference?

Ms. Adams and April

Ms. Adams' Gifted and Talented Room was filled with half-completed student projects and videotape equipment for the media projects she encouraged. An experienced teacher, who had run a restaurant before getting her Educational Specialist Degree in Gifted and Talented education, Ms. Adams favored an individualized approach where students wrote contracts to do creative, independent projects.

In both the seventh and eighth grades, April had been in Ms. Adams' room for two courses--Advanced Reading and Gifted and Talented (a course elective). Ms. Adams and April's mother also co-sponsored the literary magazine. The student staff met after school and on some Saturdays. April had never missed a meeting. April's mother also attended, but the girl hadn't seemed to resent her mother's presence.

When April went on to high school, Ms. Adams no longer saw her. But she had run into the wife of a fellow teacher in the grocery store who told her April was in trouble. Later April's mother called and asked if she could bring April in to see her. Her daughter had run away with a friend, she said, but she was just trying to help out the other girl who had been sexually abused. April's mother had paid the $70 cab fare and had driven to a neighboring town to get the girls.

April was not going to her high school classes. Her mother would drop her off at the front door and she would leave through the back. April wouldn't even work in her favorite literature course. She had failed Introduction to Literature three times because she refused to read the Iliad. She wanted to drop out and take correspondence courses.

Her mother brought April to the G/T room and left the two of them alone.

April's School Career

April's teachers had oddly different perceptions of her. Most of her elementary school teachers saw her as a child exceptionally talented in creative writing and music but not especially gifted intellectually. April was an overachiever, they said, whose mother pushed her very hard to succeed. April's sixth grade teacher said her mother questioned any poor grade her daughter received and the teacher had to justify the grade by showing her mother each entry in her gradebook.

April's middle grade teachers took the opposite view. They saw her as an underachiever--a gifted student who did not use her capabilities. Due to her high language abilities, April had been placed with the G/T teacher for English to work on special projects.

She achieved quite well until the middle of her eighth grade year. As an eighth grader, April had managed to get into the G/T room for social studies as well. April did very well in social studies, Ms. Adams found, if she could personalize the projects. For example, April wrote a first person journal about what it was like to be a

member of the first explorations in the Americas. She wrote a play on the Holocaust. But April did not do well on objective tests or even essay tests. Even though she wrote well, she did not have good general background knowledge, and she was weak on specific information.

April's test scores had started out high but had declined at adolescence, especially in mathematics. At age 5, she had scored in the superior range (IQ = 125) on the Slossen Intelligence test and she had received a similar score (IQ = 127) when tested again at age 7. But her achievement tests showed a pattern of decline.

Grade Level	Reading Grade Equivalent	Mathematics Grade Equivalent
Kindergarten	4.2	3.2
Fifth Grade	12.9	11.1
Eighth Grade	12.8	9.0

When April entered high school, a comprehensive secondary school of about 2000 students, she had to leave the Gifted and Talented program offered at the middle school level. Other than Honors courses, the high school had no special programming for gifted students.

Of the 46 days of school during the fall of her sophomore year, April had only attended 28 days. She told the counseling office she was sick and she didn't like what was happening in school.

April had been absent so much that none of her teachers remembered her very well. Even her high school counselor was vague about April. He did not know how old she was and seemed to think she was a junior or senior.

The reason April was doing badly, the counselor said, was that she had poor attendance and wouldn't do what was required of her. With the exception of a D- in Elementary Algebra, she was failing all her high school classes.

"April is living in the sixties," the high school counselor remarked. "She is just rebelling because it is the thing to do. When you get to high school, students really don't have a lot of choices. There are required courses they have to take, and many students don't understand that."

April in Her Family

April was nine weeks old when she was adopted by her present family. She was the second adopted child. Her brother Robert, three years older than April, was also in the Gifted and Talented Program but got into the drug scene and then drifted out of school. April never got along well with Robert and has cut off communication with him.

April's mother adopted two other children, both from a mixed racial background and with disabilities. The first child arrived when April was three years old, and the second came when April was a fifth grader.

April resented the adoption of these children. She asked her mother why they had to take in misfits and why they had to adopt all these kids. According to her mother, April sees herself as a premium baby because she is Caucasian and she doesn't like the fact that she has to wait for things and make the money stretch.

April's father, an electronics technician who works out of town every other week, doesn't have what he calls a "one-on-one relationship" with his daughter. April's problems with school, he said, come from her being unable to handle the pressure to conform. At times, he felt, the pressure to conform was so hard on her she would explode.

April's mother calls herself a professional volunteer--active in all her children's school activities, Boy Scouts, Girl Scouts, and community organizations. She adopted all the kids, she said, because all she wanted to do was to be a nurturer and raise a family.

In her mother's view, she and April had a good relationship until the eighth grade. But April has pushed the limits.

April's mother had to go down to the police station when she and two soldiers were picked up in a parking lot at 1 A.M. The soldiers had helped April crawl out of her bedroom window. April insisted she had done nothing wrong. "All we were doing was talking."

April's closest friend right now, said her mother, was a disturbed child. But the friend shared April's passion for music and poetry. In elementary and middle school, April had friends from stable families, children involved in scouting activities. Now she was forming what her mother termed "addictive relationships" with one friend at a time. She and her friend had been picked up for shoplifting, and April was seeing a probation officer.

Her mother feared April would just disappear some day. When she finally does get to leave, April said, she would never come back.

Ms. Adams and April in the G/T Room

As she looked at April's stubborn face, Ms. Adams searched for what to say. It would be such a waste--a disaster--if April dropped out of high school.

At least it wasn't drugs. April's mother said she had taken the girl to a drug and alcohol assessment center and they reported that April was not using drugs.

Could April have been sexually abused? Dramatic behavior change was one of the signs. The music teacher at her high school had been convicted of sexually abusing students. But April's name had not come up, and April refused to talk about the subject.

Ms. Adams remembered a disturbing story April had written for her two years ago, when she was an eighth grader. (See Appendix). While a work of fiction, it described the suicide of a young girl who seemed a duplicate of April.

Her mother said April's favorite remark was, "Who cares? We're all going to die anyway." But her mother also told the story of April at ten, when she had been pushed off the monkey bars and had broken her hand. She had convinced the doctor not to put a full cast on her hand so she could play her saxophone for the Christmas pageant. She had learned to write with her left hand so she could do all her homework even though most of the homework was excused.

Could she come up with some way to channel this passionate energy? And, even if she could come up with a plan, how could she convince April to consider it?

"If it were up to me," April said, "there wouldn't be school. I'd do everything on my own. We should burn schools, burn them to the ground!"

4/13/88

But Jessie, I'm so confused. I don't know what to do. Everything keeps getting worse and worse. I've finally realized that I do love my brother, but it's too late. He hates me. And my mom, my mom is constantly hovering over me, checking up on me. I'm trying real hard to get my grades up, but it's so hard with all this pressure. She just isn't being Fair. And then there's my music. It isn't going anywhere. I've got a strong feeling that music isn't going to play any part in my future. It's just not fair! And to top it all off, the guy I really care for, the guy I know I could never live without, the guy I would die to be a part of, only likes me as a friend! I just can't take the pressure anymore, Jessie! I feel like screaming my head off, or better yet, blowing my head off. Yes! That's it! I'll kill myself! Oh, Jessie, it's so easy! Don't you see how easy it is? I'll never have to worry about any of my problems ever again! And it won't hurt many people at all. You know, I can't think of more than a handful of people that would shed a tear at my funeral. And look at how much hurt their unfairness has bestowed on me! Jessie, please don't be mad at me. This is the only way

out. I'm tired of caring, worrying, or trying to solve my problems. Can't you understand, this is the only way. You know I'll always love you, so do me one favor, Don't cry for me. I'll finally have conquered my problems forever, if Forever is for real. I know this is for the better. Goodbye."

Love,
Alex

That letter to Jessie was the first many people had heard of Alexs' problems, and, unfortunately, the last they had heard from her. Alex did kill herself, like many teens do, and she was right; it did solve her problems. She didn't have to put up with anything anymore. No more naggy, concerned, parents, no more sibling rivalry, no more problems in school, no more worrying about her music, no more talking to her friends, no more "wild" Friday nights with the guys, no more tomorrows to wonder about, no more changes to hope for, and no more love to long after. Alex had, without realizing it, thrown away a lifetime full of tomorrows, hopes, and satisfactions. For what? What did she get in return? Nothing.

That is not fair.

A

Part B.

"April," Ms. Adams said, looking at the girl slumped before her, eyes fastened on the table. "Have you checked out your options?"

"I try to teach G/T kids how to approach teachers to get things changed. For G/T kids, it's a survival skill. I asked April if she had talked to her high school teachers about modifying the curriculum. I asked her if she had looked into the alternative high school. Had she thought about transferring to another high school? What about university classes? She said no, she hadn't done anything, she hadn't checked out anything.

"I said to her, 'There are possible options but I need to know what your goals are. What do you want?'

"I asked her to do a contract for me, like she had done in my G/T classes. The contract lists: 1. Goals 2. Steps 3. Resources 4. Roadblocks 5. Rewards."

April came back with the contract filled out:

1. Goal

To be able to attend a school in which I can:

A. work somewhat at my own pace
B. use my creativity for credit
C. use my music for credit
D. get along with the teachers and students
E. take the courses I'll really need in my career
F. improve my attitude (towards every aspect of school)
G. graduate
H. (maybe) get a scholarship

2. Steps

I'm planning to:

A. withdraw from high school
B. enroll somewhere else
C. become more self-motivated and self-confident
D. live up to everyone's, including my own, expectations of me

3. **Resources**

To reach my goal, I'll need:

A. my teachers' support
B. a good attitude
C. my family's support
D. some quiet time at home
E. my friends' support
F. a Flat out miracle

4. **Roadblocks**

Things that might get in my way are

A. my laziness
B. my self-doubt/self-criticism
C. not enough praise and support for my work
D. I might not get along with the teachers and/or students wherever I end up either

5. **Rewards**

If I reach my goal, I expect

A. a better attitude towards school and learning
B. a diploma
C. possibly a scholarship
D. to be prepared for a musical career
E. a few new friends
F. at least one teacher recommendation letter for college

April promised she would check out the options before she made her decision.

Ms. Adams swung into action. She called over to the high school, but none of April's teachers remembered much about her or wanted to meet with Ms. Adams. The guidance counselor was no help either. She then spent three days on the telephone trying to find out what April's options were.

She took a day of personal leave, picked April up, and they set off to check out the possibilities. April wouldn't consider staying at her present high school, no matter what. She didn't even want to be inside the building.

They went to a different high school. The counselor was negative about the idea of arranging a flexible curriculum for April.

They drove to the university. The head of the music department said April could take music courses while still in high school.

They swung back to the school district central office and reviewed the correspondence courses. The material was not challenging.

After taking April out for lunch, Ms. Adams ended with a visit to the Alternative High School, which she had spotted as the best choice all along. The students worked on individual projects and had a lot of freedom to combine school with work and other activities. April commented that the students looked tough, like they were involved with drugs, or might be. But she seemed to like the approach at Alternative.

Ms. Adams dropped April off at home and told her mother what she needed to do to get April into the Alternative High School.

Two months later she ran into April's mother at the grocery. "What happened with April?" she asked.

Epilogue

April refused to enroll at the Alternative High School saying that "most of the kids were druggies and really weird." She was speeding through correspondence courses. Her mother had tried to enroll her in music courses at the university, but April was skipping out of them.

At sixteen, April had a baby with a soldier she had met. Her parents encouraged her not to get married. She now is living at home with the baby. April recently enrolled in a vocational program where young mothers can bring their babies and leave them in a day care program at the school.

"I was so frustrated," Ms. Adams concluded. "I was frustrated because I couldn't fix it. In retrospect, I should have followed up with the Alternative High School.

"We can't identify kids at risk. We can't seem to do any effective interventions."

Ms. Adams is looking into correspondence schools of the performing arts for April.

THE HUNT FOR THE GOLDEN EGG

Edited by Judith Kleinfeld

ABSTRACT

Patsy, a science and physical education teacher, enjoys challenging stereotypes, particularly stereotypes about women. Patsy was the first female high school teacher to work in Shumayuk in many years and the first student teacher ever. She saw herself as a role model for the young women in the Inupiat community where men held public authority and women's lives were circumscribed.

While Patsy succeeds in increasing the interest and achievement of the junior high girls in science, she finds herself constantly confronted with challenges to her authority from the high school students. They refuse to follow her directives, goad her with obscene music, and are disinterested in science that doesn't come straight from the textbook. The teacher aides, maintenance man, and others in the community itself turn against her, setting her up as a scapegoat in the East Egg Hunt.

Issues include the nature of authority, gender role differences in the expression of authority, methods of handling challenges to authority, conflicts in gender role expectations in different communities, and the effects of social change on tensions surrounding gender roles.

THE HUNT FOR THE GOLDEN EGG

Part A

"I have bum ankles!" yelled a senior high school girl.

Soon a chorus of kids began to call, "I have a bum leg, ankle, knee ..."

"I have a bowel movement!!" yelled a boy.

The situation developed so fast that the student teacher, Patsy, didn't know how to curb it. She gave them her "knock it off" look, walked to the center of the soccer field and said, "Time to begin. Set up your teams and let's GO!"

Ever since she arrived in Shumayuk, an Inupiaq village off the Bering Sea coast, Patsy had been trying to come up with good athletic activities. The high school had a tiny gym and little equipment. The high school students had already completed units on fitness, aerobics, Native Youth Olympics, Eskimo baseball, badminton, basketball, and cross-country skiing.

Patsy decided to try snow-and-ice soccer outdoors. Spring had finally come, and she could hardly bear to be inside.

The high school students complained that they had never played soccer in the snow and ice, didn't want to go outside, and didn't have the right shoes. But on Monday everyone had had a good time.

"We are playing soccer today for gym, and we will begin NOW," Patsy said. She placed the ball in the center spot, and yelled "GO!!"

One boy, unopposed, took the ball and quickly scored. That got them started.

Play continued until Lorraine, the goalie, tried to kick the ball, missed, and landed on her back. She was laughing at first, but she didn't get up.

Patsy waited a minute and then slowly walked over and watched her.

"Don't stare at me!" she said, smiling and laughing. Patsy was aware that Inupiaq didn't like to be stared at, but she also knew this girl loved attention and often played the "dumb, helpless girl" routine. Patsy could not tell if she was really injured or not.

When Patsy asked the girl if she needed help getting up or wanted to go the clinic, the girl lit into her, telling her this game was stupid, that the conditions were too bad to be doing anything outside, and she didn't want to play. Theatrically, she arose, and, milking the scene for all it was worth, hobbled like an old lady toward the school building.

Patsy ordered the students to resume play. She took Lorraine's place as goalie.

As Patsy defended the goal, the opposing team kicked the ball as hard as they could directly at her. One of the boys on her own team would not play defense.

A kick for Patsy's goal missed and the ball took off down the hill. Since Patsy had ducked, she didn't see where the ball went.

"Go get the ball!" Byron ordered Patsy.

"There are not out-of-bounds in this game," Patsy said. "The ball is still in play."

"The goalie is supposed to get the ball," said one of the boys.

Patsy responded, "Not true, the goalie CAN go get the ball but doesn't have to. There are no out-of-bounds. The ball is still in play."

No one moved. Patsy was fed up.

She decided she would go look for the ball, and, when she returned with it, they would go inside. She would have them do push-ups. Then she'd take them outside to resume play.

The problem was she couldn't find the ball.

"Where is it?" she asked.

"Around that building," replied one of the students.

Patsy looked around the building, a foul-smelling outhouse, but found no ball. The kids had deliberately misled her.

She told them to follow her back in to the classroom and ordered them to do 50 push-ups. Shirley refused, and Patsy kicked her out of class.

After push-ups, the class went back outside. Patsy saw the ball far down the alley and told one of the students to get it. As

Patsy walked towards him to take the ball, he acted like he was going to throw it at her. Patsy said such a display was inappropriate and unnecessary.

"Man, what is your problem!" he demanded.

"I am not the one with the problem. You want to be treated like an adult---act like one."

All the other team members had been running a lot, said a quiet boy, why couldn't she go get the ball.?

Were they just trying to egg her on, Patsy wondered, or didn't they really understand why she was so disappointed in their behavior?

She began to explain her reasoning when Byron exploded. She was making them play soccer outside, he said, when they were getting hurt and wet. He had sprained his ankle. Other guys were getting hurt. Lorraine got really injured, and Patsy didn't care and wasn't fair.

"Byron, you just do not understand," Patsy said. "I am the teacher in this class, not you, and we will do the activities that I decide on. The behavior of the class will be to my satisfaction, not yours, or there will be consequences to pay. If you do not want to abide by my decision, you can take an F for the day. That is your prerogative. My prerogative is the activities that we will do, when we will do them, and how we will do them."

"No, you're the one who just doesn't understand," Byron yelled. "You just won't understand. WE DON'T WANT YOU HERE. YOU ARE NOT WANTED HERE. We won't do what you say, because WE DON'T WANT YOU HERE!!"

Patsy marched the students into the school building, told them to stay in the gym, and went straight to Darren Sawyer, her cooperating teacher. He told her she did the right thing and they both went back to the gym.

The school, Darren announced, would offer two gym classes for the rest of the year. One would be inside with him--gym out of a book. The other would be activities with Patsy. Each student could choose, but his class would entail homework every night and reading and reports every day. He reminded the students that Patsy's gym class had the backing of the school.

"The only injury you will sustain in my class," Darren concluded with heavy sarcasm, "is writer's cramp. We're doing this because YOU don't run the school. The principal, the teachers, and the school board run this school. YOU don't."

He turned and walked out with Patsy right behind him.

Background

Patsy had been ecstatic when she found out she would get to do her student teaching in Shumayuk, her first choice school. After many years of trying to prepare herself for teaching and living in an Alaskan village, she finally felt ready to tackle it.

Patsy looked at village teaching as a commitment to a community and a people. Her professors felt she exhibited a high degree of sensitivity and an eagerness to learn from Native people.

Patsy chose Shumayuk, in large part because of Tim and Laura McNeil, teachers who had lived in this community for many years. Patsy wanted to find out what it took to be "long-term committed" and what difference it would make. The system of transient teachers, she believed, created an educational climate which was not good for the students, the village, or the teachers. For this reason, Patsy did not choose to work with a well-known science teacher or to find a village in a fantastic setting. She chose to work with teachers who were committed to a community.

Shumayuk was exactly what she had hoped for---a small, dry village, a Yupik culture she held in high respect. The village even had a church of her denomination. She was excited to find out that the current pastor was Native. She would teach science classes from grades 6-12 and might even be assistant coach of the cross-country ski team. A fantastic adventure was beginning!

When Patsy asked to become the first student teacher Shumayuk ever had, the administrators warned her that no community housing was available. Patsy ended up sleeping in a cubicle in the school. She used the home economics facilities as her kitchen, a high school classroom as her dining area, the elementary office as her living space, and the elementary school's only bathroom as her toilet and shower.

Patsy knew that privacy would be non-existent. The first week she arrived the toilets were backed up, smearing the bathroom with human waste. The smell was overwhelming. Toilet back-ups, she soon learned, were routine. But the cubicle wasn't so bad. Patsy had lived in a tent for 5 months at a time. She could handle roughing it once more. After all, everyone in Shumayuk was crowded into small houses.

Gender Issues and Science Teaching

Patsy was not only the first student teacher in Shumayuk but also the first female high school teacher in several years. The last

female high school teacher, people told her, had been run over by the students and had left not only Shumayuk but teaching.

The first hint of community attitudes toward women came when she observed Darren Sawyer's junior high school social studies class. He had married a Native woman so he had a personal, as well as a professional, perspective on the local culture.

"Now let me get this straight... You are saying that girls are not as smart as boys? There is something genetic so that girls can never be as smart as boys?" Darren was asking incredulously.

"That's right!" answered a chorus of students, mostly eighth grade girls. Most of the boys weren't saying anything.

"Girls are just dumb," one female student said.

"Well, you have already told me that girls can't be good athletes ..."

"Yeah, that's right," one girl said. "Girls are stupid and girls are weak."

No one was smiling.

"So if girls can't think and girls can't do well in athletics, what can you do?"

"Nothing!" another eighth grade girl exclaimed, straight-faced. She appeared to be serious!

"Gee, I'm glad I'm not a girl growing up in Shumayuk. I wouldn't want to think I am good for nothing. What does that say about how you feel about yourself?"

As he gathered up his books, he said, "You have a lot of work to do here, Patsy."

Patsy thought the girls had been joking, but Darren later told her they had not been. Women have no place as authority figures within the culture, he explained. The last female teacher at the high school, he said, had given up trying to discipline them. He exhorted Patsy to remain firm and not to negotiate. She should be authoritarian, he advised her. He gave several examples where male high school students literally ran their homes and ordered around their mothers and grandmothers.

Patsy felt she was ready for the challenge. She had experience in the field of science. She was full of innovative teaching ideas. As a female in science, she had faced bias and discrimination before.

Patsy did not fit the mold of the typical female anyway. Not only was she teaching high school and teaching science and math, but she was taller than most men in the village. She was single, without children when all the village women of her age had children, whether or not they were married.

Patsy enjoyed being different. She went to church, which no other local teacher did. One day she was delighted to surprise men cutting firewood, when she was skiing 10 miles from town. She was amazed that people were afraid to venture far from town without vehicles or guns, especially women. Patsy was not afraid and thought it amusing that people were in awe of this feat. She was hoping she would be a good role model for some of her female students.

Patsy approached instruction very differently from the other high school teachers. Science class prior to Patsy's arrival had been a matter of reading from the book and copying from the book the answers to the questions at the end of the chapter. Patsy taught the students how to read carefully. She tried to get them to think about the process of doing science rather than just doing experiments in a cookbook fashion. She tried to incorporate into her lessons examples of scientific principles from village life. Her junior high science class centered around activities, labs, and educational games.

After the expected period of initial testing, the junior high students settled down and accepted Patsy as their teacher. Even though she had been warned that some junior high students had severe emotional and behavioral problems, these students seemed to catch on to Patsy's style of teaching. They realized they would have a lot more fun doing science Patsy's way than just reading the textbook. Two junior high school girls went from barely passing grades to getting A's and B's and another girl's grades rose from F's to C's and D's.

Patsy also helped out with science mini-lessons for the kindergarten class and assisted in field trips and activities. The kindergarten class and Patsy started writing letters and notes back and forth, and Patsy was their "guest speaker" on a few occasions. When Patsy got them to sit still for a 20 minute lesson, she knew she was getting them intrigued with science.

With the high school students, however, the situation was out and out warfare. The initial testing seemed to intensify rather than recede. The students did not treat any other high school teacher the way they treated Patsy. Every day she had to send students outside the room or to the principal's office, and flunk them for the day.

Even though science was all around them, the students could not make connections between science in the classroom and science in the world outside the classroom. They were not interested in learning how to think, when they had already learned how to read a textbook and regurgitate it for an exam. They vehemently resisted anything that was new or different, even though they were bored and uninterested in their classes. Whatever Patsy tried went wrong--like the time she took the students outside to examine the snowmachines and one girl sprained several fingers by getting her hand stuck in the snowmachine track.

Of the twelve high school students in the school, Patsy had constant problems with five of them. One student, whose father was the head of the local school board, quit school after a confrontation with Patsy. At least the principal had backed Patsy. While the student came back after a week, she sought out fights with Patsy.

Patsy did not feel comfortable with the authoritarian methods of discipline the other teachers used. She tried to speak with students individually to explain her actions and reactions. She entertained questions. She tried to be reasonable and appeal to their desire to be treated as adults.

When it became apparent that students viewed her methods of discipline as personal weakness, she tried other methods. After talking with the other male high school teachers and observing the ways they disciplined students, Patsy tried their methods---sarcasm, anger, yelling, flunking students who were misbehaving, sending them to the principal's office. None seemed to work any better, and Patsy herself did not feel comfortable with any of them.

The Tape of "2 Live Crew"

As Patsy prepared her lunch one afternoon, music started blaring from the gym. The boom box had been placed on the shelf next to the home economics room where she was eating. Irritated by the volume of the music and her lack of privacy, Patsy first paid no attention to the words of the rap song. She was soon shocked to hear the sexually explicit lyrics of 2 Live Crew. She stepped into the gym and turned off the tape recorder.

"Hey! What are you doing? We're allowed to play music after lunch," the boys yelled.

Patsy explained that it was not the music itself, it was that music in particular that was unacceptable on the basis of the lyrics. The language of the tape was inappropriate for school and would not be tolerated.

By the time Patsy had walked back into the home economics room, the offensive tape had not only been put back on, but the volume had been increased. Patsy turned and walked back into the gym where only Byron remained, shooting baskets. She snapped off the tape recorder, took the tape, and started to leave.

"Hey, you have no right to take that tape. That's not even my tape!" Byron protested.

"No, Byron, you have no right to play that tape here. And it's your problem that it is not your tape." Patsy walked out, slipping the tape into one of the drop pockets of her jumper.

Byron followed, furious, yelling at her to give back the tape. Patsy thought he would give up but he kept walking after her.

"Byron, knock it off! You are not getting anywhere---you are only making things worse for yourself! Just button your lip!" said Patsy, turning toward him.

Byron faced Patsy, hands tightly clenched into fists with arms bent. He was trembling in anger and yelling over and over that Patsy had no right to take that tape and should give it to him.

Patsy ducked around him, intending to go to the principal. To her amazement, Byron continued to follow her, screaming as he went. Lorraine joined him, saying it was her tape and she wanted it back.

To Patsy's immense relief, the students left and she located the principal. He told Patsy to keep the tape. After he talked to the students, he said, he would return it to them.

Patsy asked, "You're going to give it back to them?"

Tim said, "Yes, I will."

Patsy locked the tape in her locker. She did not want to have the tape on her person and certainly did not want to return the tape to the students. Nothing was being done for her benefit, she thought. The students would speak with the principal, but no one had apologized to her or served any punishment. She was in a daze.

At the end of the school day, Tim asked Patsy for the tape. Byron and Lorraine were trailing behind him, laughing and joking. Patsy had no choice but to walk over to her locker, retrieve the tape, and hand it to the principal. The principal handed it to the students.

Patsy felt that she was the one who had been punished and abused.

The rest of the week that same tape blared in the gym every day at lunch. The best way to handle it, Patsy decided, was to skip lunch and escape to her cubicle. To her, the tape represented the students' victory over her authority.

Detentions

The one disciplinary method that Patsy found successful was detentions. Students had to stay 45 minutes after school, and Patsy claimed detentions as time for the students to help Patsy with her work---setting up bulletin boards or tying strings for an educational game. Students could not socialize or do homework during a detention.

One day Patsy sent Lorraine to the principal's office during science class. After class Patsy went to the office to ask Lorraine what had set her off. Lorraine told Patsy to "Fuck off!" Patsy was shocked that a student would say that to a teacher, in the principal's office yet. Patsy gave her another detention and told her to go to lunch.

As Patsy started to leave, she turned around to say something, and Patsy and Lorraine bumped into each other. Lorraine pushed Patsy. Putting both hands on Lorraine's shoulders, Patsy told her to calm down and leave when she was calm.

Lorraine's mother, Alice, was a regular substitute in the school and happened to be in school that day. Patsy told her what had just taken place.

"I wouldn't let her get away with saying that at home," Alice said.

"I don't intend on letting her get away with it in my class either," Patsy replied.

Later that day Alice and Lorraine approached Patsy about serving the first detention that day rather than the next. Lorraine had made special plans to get away for the weekend and didn't want to serve a detention on Friday afternoon. Why couldn't Patsy change her plans so Lorraine wouldn't have to ruin her Friday afternoon? Patsy was irritated and reminded them that a detention was a consequence of Lorraine's actions. Patsy was not going to change her plans for the convenience of a student who was being punished.

Friday afternoon, Lorraine began her detention and brought with her several friends. Patsy separated the other students from Lorraine and set her to work on a bulletin board. Immediately Larry, the custodian and Lorraine's uncle, came in. He started harassing Patsy, telling her that she couldn't handle her classroom or

teaching, that she needed a break from work, that she was suffering from spring fever and blaming the students for her own problems. Lorraine jumped right in and agreed with her uncle. Patsy had stopped her work when the custodian came in to talk but quickly decided the best response was no response at all. Patsy went back to her work and the custodian went back to cleaning.

Larry and his wife Wendy had spoken with Patsy a few weeks ago about detention slips Patsy had made up and sent home. Patsy's idea had been to send home a detention slip which the student and a parent or guardian had to sign before the detention. Patsy had thought it would open up communication between herself and the parents, and the parents would know more of what was going on and how their children were being disciplined.

Larry and Wendy questioned whether Patsy could make up such a form as the detention slip and start instituting detentions without first checking with the local school board. The tone of the conversation was pleasant. Larry and Wendy said they thought the detention slips were a good tool to keep parents informed but did not think a student teacher had the authority to start enforcing such a policy. Patsy had discussed detentions with the principal before implementing them, and Tim had said it was her choice. Patsy had never thought about approaching the school board with a matter this minor.

Patsy discussed the meeting with Larry and Wendy with the principal and asked again about the detention slips. The principal said they did not need school board approval to institute detentions and, if she felt detentions were valuable, she could do so.

Patsy was also concerned about the friction that had already developed between her and Wendy, who was a teaching aide in the primary grades. Patsy respected Wendy as did the other teachers. But Patsy noticed that if she ever disciplined Wendy's daughter, Shirley, Wendy was particularly unfriendly. Patsy was surprised because she knew Wendy had almost completed her teaching credential and should appreciate the importance of discipline in teaching. Patsy had tried to encourage Wendy to finish her credential and had thought they would get along well.

The principal explained that Wendy was jealous of Patsy. Wendy might have been the first student teacher at Shumayuk, not Patsy, except that her husband had not allowed her to finish her education. Wendy was no longer taking classes. Every time Patsy tried to encourage Wendy to finish school, said the principal, she was pouring salt into Wendy's wounds.

The Lock-Out

Tim had told Patsy to lock the door to her cubicle right from the start, but Patsy had not seen any need to. Her few valuable items were in a locker in the hallway and she did not feel threatened.

After the problems with Byron and Lorraine, however, Patsy decided to lock her door. Patty felt she was losing her privacy. One morning, three different people walked in on Patty when she was in the bathroom taking a shower or in her cubicle dressing.

In April, Patsy's university supervisor was observing her, and Patsy went down to the kitchen to see if she could get her supervisor some juice. She left her book bag and books on the cot with the room key in full view of the small desk. When she returned a few minutes later the door was shut and locked. Patsy thought that was odd---surely she would have remembered locking the door as it usually stuck and it took a couple of tries to lock it.

Patsy remembered that once she had gotten locked out before and had gone to Larry the custodian for a spare key. Patsy approached him for the spare key, apologizing for somehow getting locked out. But Larry said he had no spare key to that door.

The principal could not find a spare key either. They tried to pry open the wi dow from the outside but that didn't work. Rather than break the window to get inside, Tim decided he would have the custodian saw off the door handle to the room.

"Poor thing, now we have to saw off the lock, and you won't be able to lock your room anymore," Larry said.

Patsy was shocked to realize that Larry had been working just outside her room when she left, and his tone of voice was an admission that he had locked her out of her room.

When she told Tim what had happened, Tim said he wasn't surprised and to try not to let it get to her. Her university supervisor suggested she pleasantly ask Larry why he did it. Tim said that would do no good, he would just deny it, and then Patsy would have the additional problem of having made an accusation. Patsy knew the custodian was baiting her and was glad to see that her university supervisor could witness her situation first hand.

As soon as the doorknob was sawed off, Larry sat down on the cot and said, "Well, looks like you can't lock your door anymore, doesn't it? That's too bad---now what will you do? Looks like you'll just have to trust us now, doesn't it."

Patsy left the room.

Later that morning Tim instructed Larry to remove the doorknob from the junior high classroom and put it on the door to Patsy's cubicle. Tim kept the extra key himself.

Talking to an Elder

Did the entire village hate her and want her to leave? Had she tried to make too many changes in the classroom? The junior high did not seem to have problems with her and her teaching. So why did the high school students?

Patsy decided to ask one of the village elders for his opinion. While fearful of making cultural mistakes, Patsy decided to ask him frankly if she was doing things that were insulting or culturally inappropriate that she didn't realize. Patsy knew the man from church, and several of his children were on the ski team that Patsy was helping her coach.

To her surprise, the elder told Patsy that the village as a whole thought she was doing a fine job and that he personally would like to see her return to Shumayuk as a full-time teacher. He cited examples where some of his children had commented on what they had learned in her classes. His children liked her as a teacher and coach. The students she was having problems with, he said, were known to be trouble-makers. Many parents, he added, did not teach their children to respect teachers or education, but it was not her personally.

Patsy and the elder spoke for some time. In the olden days, he said, the harshness of the physical conditions disciplined people. Childhood was an indulgent time, and children were considered precious indeed because many died before adulthood. As a child grew up, the elements would discipline them soon enough and life would be harsh. There was little need for discipline in those days.

His explanation regarding the detention slips was also revealing. To some parents, he said, if a child needs discipline at school, that is the teacher's responsibility, not the parents'. Sending home a detention slip was like pointing a finger at the parents.

The Easter Egg Hunt

On the Saturday night before Easter, Claire, one of the women Patsy met at church whose husband was on the school board, stopped by Patsy's room and asked for her help in hiding eggs for the village's Easter Egg Hunt. Patsy was happy to help, thinking this would be a positive community activity to join and assist, and great fun for the young children. Perhaps her participation in a pleasant community activity would help her relationship with the village and ease tensions.

Claire especially asked Patsy for help in hiding the "golden egg," wrapped in shiny gold foil and containing a note for $50. About 20 of the 200 eggs they would be hiding had notes for money rewards. Last year, Claire told Patsy, the golden egg hadn't been hidden well, and people found it much too quickly.

Patsy was not pleased when she realized she would have to get up at 3:30 a.m. to hide the eggs but decided to go ahead.

As Patsy, Claire, and Naomi, a friend of Claire's, worked to hide the eggs around every home with children, she was surprised to find a house with adults still up, gathered on the porch. She asked the young men if they wanted to help hide the eggs but they refused. Following Claire's instructions, she hid the golden egg in a remote spot, near some spruce trees by the airstrip.

Next morning Patsy was awakened at 6 a.m. by children begging for hints as to where she had hidden the golden egg. She was dismayed to find that the majority of the eggs had been retrieved not by the children of the village but by the adults. The young men who had been up at 3:30 in the morning watching her hide the eggs had gathered them up, including the ones with money notes.

Patsy was disgusted to think that the adults would take these eggs from the children, especially on Easter. The children kept coming to her all day long, begging for clues to the golden egg. Some had been searching in vain since 6 a.m. Claire said she had children participating in the hunt so she did not want to know where the golden egg was hidden and did not want to talk to Patsy about giving hints. Naomi had left town to go fishing for the day and wanted nothing to do with the Easter egg hunt.

The other teachers seemed to think the situation was hilarious. That's the reason, they said, that they didn't get involved in village affairs.

If the golden egg weren't found by 8:00 p.m., the village council said, Patsy should retrieve it. At 8:00, Patsy started walking from the school building to the airstrip to get the egg. Along the way children joined her. When they asked her who would get the money, she told them to ask Claire, as the decision was not hers to make.

Accompanied by her entourage, Patsy walked onto the airstrip. She was surprised to see about 20 people, mixed between adults and children, combing the airstrip road again and again. No one was looking off the road. Patsy went directly to where she remembered hiding the egg, praying it was where she thought it was. To her relief she could see the egg from the road. She quickly picked up the egg and the children started shouting that the egg hunt was over. People came over asking where the egg had been hidden.

Patsy started to explain when a cloud of smoke swept into the airstrip. It was Claire on her 4-wheeler, rushing toward Patsy as fast as she could and yelling, "Don't pull the egg! Don't pull the egg! The IRA Council decided you shouldn't take it until 9:00!"

Patsy just stood there, hand outstretched toward Claire, with the golden egg in her palm.

The crowd yelled their disapproval. Now, not only had she hidden the golden egg so people couldn't find it, she also disregarded the IRA Council's directions in retrieving it. Who did she think she was, anyway? The crowd was clamoring for the golden egg to be rehidden so someone could find it before 9 p.m.

Patsy made it back to her cubicle before the tears came. The past 24 hours seemed like a perfect set up to her. Instead of improving her relations with the village, and doing something positive, she had succeeded in alienating more people, and found herself much more likely to be condemned. How could this happen? Why can I try so hard just to fail so miserably? How could I have foreseen this? What could I have done to have prevented this whole thing?

Part B

Patsy decided to talk with the principal Tim McNeil.

"I can give you four reasons why you are having these troubles with the high school," Tim explained. "First, you are female. Second, you are new. Third, you are temporary. And, fourth, you are young. Don't take it personally."

She had heard this advice before. Although the other teachers were nice to her, they did not seem to grasp how she felt.

When Patsy talked with Darren Sawyer, her cooperating teacher, that weekend, he finally caught on to how desperate Patsy was feeling. When he told her not to let it get to her or make her think about leaving teaching, Patsy exclaimed "THINK about leaving teaching?!" She said she had wanted to leave Shumayuk weeks ago and would have packed her bags in an instant. The gravity of the situation dawned on him.

After talking for hours with Patsy, Darren decided to speak with every one of the high school students on an individual basis. He would look over their grades and emphasize to them that Patsy was indeed a real teacher, that her grades counted, and that they should begin to treat her as a teacher.

The students' response blew Patsy away. Their behavior was exemplary, and most were trying academically.

Evidently most of the students were shocked to discover that after getting four weeks of F's, these grades counted. Patsy wondered if the concept of "student teacher" had never been explained to them. She began to understand their view that school with Patsy was just "play school."

All along Patsy had been telling them that she had the same authority as their regular teachers, but she had no authority to tell them she had authority. Patsy was thankful that Darren had spoken with them. But why did it have to get to this point before anything was done?

THE SQUARE PARACHUTE:
COOPERATIVE SCIENCE GROUPS IN RURAL ALASKA

By Pamela Himsworth Randles

ABSTRACT

Meg Eliot, a new science teacher, comes to Goose Bay intent on teaching science through inquiry methods. She wants students to be able to frame scientific questions, observe and measure, and design experiments. But her carefully prepared activities and laboratories founder. The class careens out of control when she tries a laboratory dissection. Boys always assume leadership roles in group work, even when Meg Eliot specifically rotates the role of leader through the group. Meg Eliot's principal is unsympathetic to her aims either in science teaching or in developing the skills of young women. The case traces Meg Eliot's eventually successful efforts to teach inquiry skills, to develop the abilities of both boys and girls to work in mixed gender groups, and to teach young women to assume group leadership roles.

Issues in this case include developing young women's scientific and leadership abilities, problems of implementing cooperative learning, and conflict between teachers and administrators on instructional philosophies, especially gender equity.

THE SQUARE PARACHUTE

Part A.

"Eeeeeeeeeeee!" Marilyn screamed. She was one of the younger girls, pretty and very feminine. (She spent a lot of time working on that.)

Teddy was smart and smart-mouthed. He understood the fish lab, had completed the tasks, and, when he was done, he wanted to do something fun. Like take a skein of fish eggs, sneak up on one of the girls, wave it in her face, and yell, "Yaaaaaaaaaah!"

Predictably Marilyn screamed and sent the fish eggs flying. Immediately all the girls were screeching and all the boys were laughing and grabbing fish guts.

The fish lab, thought Meg Eliot, the new science teacher in this Yupiq community, had been a bust. The kids had been loud and rowdy. The room was a mess. The principal had warned her to keep things under control. He would have her hide.

In an effort to control her rising anger, Meg Eliot calmly asked the kids about the "lesson." The students didn't have the foggiest idea what part of the fish was the stomach, liver or brain, let alone what any of these parts did for the fish.

"If I had any brains, I would stick with my tightly structured activities," Meg thought. When the kids were in their seats talking about fish anatomy and fishing in Goose Bay, things went all right. They could handle observing the fish in the classroom aquarium. But they had never dissected anything before. They had only watched her. The dissection lab was falling apart.

Meg had set up the dissection lab with clear objectives. Students would come to know the names and functions of the parts of the fish. They were also supposed to investigate the age of the fish through observing the scales. They were to weigh, measure, and determine the sex of the fish as well. Meg set up dissection trays and broke the students into groups.

First she demonstrated what she wanted the students to do, and what she wanted them to find out. "This is how you cut open the fish." "Be careful to be gentle so that nothing gets cut that you don't want cut." "Open the fish and look carefully at the internal organs." "See how many you can identify, then carefully remove the ones on top so you can see what is underneath."

The students were clearly interested and delighted at the opportunity to do this dissection themselves. They all set to work diligently until Teddy's group got done first.
Meg reminded the kids that they had promised not to be rowdy. To her surprise, Teddy pled with her.

"We were just having a little fun, Mrs. Eliot," Ted said.

Background

Meg Eliot loved teaching science. Since her first year of teaching, she had taken summer courses in science education and Alaskan science, especially if the courses were held outdoors. She had come to the conclusion that science could best be presented to students as something that one does, rather than something one reads about. She had a strong bias toward showing students how to do science rather than telling them what scientists had learned over the centuries.

When she accepted the job to teach a middle school class at Goose Bay, she decided this was an opportunity to try out some new ideas about teaching science. She felt she wanted to try to teach science in such a way that, at the end of the year, students could independently arrive at a question to be studied, state the question as an hypothesis, design and implement an experiment to test the hypothesis, collect and interpret data, draw conclusions and apply the understanding gained. She felt it could be done, but had nagging doubts about whether it could be done in a year, or if she could do it.

Goose Bay was a small, coastal village of about 150 Yupiq people. Her class consisted of 14 students in grades 5 through 8. She had been told at her interview that they were a difficult class, especially the older boys. She knew that junior high school students could be difficult. She was also told that three of the students had "moderate to severe problems learning at school," whatever that meant.

When she arrived, the principal told her that the students were three to four years behind academically, and he expected her to make them work quietly and diligently. While he wanted them to achieve at grade level, he really didn't expect that to happen. He said that their former teacher was "burnt out" and had found these students difficult to cope with. The former teacher spent his energies getting the students to behave and felt, according to the principal, that bringing them to grade level academically could not happen until they learned to behave in school and have respect for learning. The previous year, the principal thought, the students had all been [illegible]e fifth grade adopted text, regardless of grade level.

He also informed her that she would have girls' P.E. and shop, and the male high school teacher would have the boys. He explained that the shop teacher had felt that the boys needed a real shop class, while the girls really needed crafts more.

"The girls make all those knick knacks," he said, "but the boys really need to <u>know</u> this stuff."

Meg spoke to the high school teacher and they concurred that they didn't want to have boys' P.E. and girls' P.E. because the kids ranged from small fifth graders to adult-sized twenty year old high school seniors. Instead, they felt it would be safer to have the

P.E. by grade level -- junior high P.E. and high school P.E. That way, the kids would be of similar size and strength, and the fifth graders wouldn't get run over.

"I understand what you are saying," responded the principal, "but we'll do it this way. This is what the shop teacher wants."

"Well, this sounds like a challenging year!" Meg thought, "but at least I can try to make the science good." She wanted to try inquiry techniques with her students. Prior to the start of school, she perused the science equipment and student files. The school had quite a bit of good science equipment, but most of the chemicals were quite old and the equipment in poor repair and scattered throughout the school. The student files seemed to verify what she had heard about the students.

The First Semester

The first week of school was the honeymoon period. Students were docile and well behaved. Meg established classroom routines, outlined the year, and got to know the students. Yes, indeed, there were fourteen distinct personalities, few of them weak. More than half of them were outspoken to the point of being disruptive, had a negative attitude towards school and enjoyed trying to get the teacher's goat. One student was described by the principal as very bright, but lazy and prone to throwing temper tantrums. Another showed the effects of Fetal Alcohol Syndrome and had great difficulty concentrating. Another was a sixth grader who read on the second grade level and was as large as a professional wrestler. Another was from out of town and was picked on by other students until he blew up. Several students took great delight in making obscene remarks in Inupiaq as well as English. Throwing objects, spitting and slugging each other were common practices. Indeed, it was necessary to be more of a disciplinarian than she liked. But Meg felt that learning couldn't happen in an environment of back-biting and vulgarity. The principal encouraged her to "run a tight ship." She tried to do that. She established strict behavioral guidelines with rewards and punishments.

In science, she tried to establish an atmosphere of questioning. She asked students about the local animals, plants, weather. On weekends, she walked over the tundra, trying to get to know the area. She brought plants and small tundra critters into class to look at. She asked about the Yupiq names of things. When students asked questions, she asked them how they could find out the answers. When she was able, she told them what she knew about the permafrost, the caribou, the willow, and the small water creatures.

Students started to bring things from their environment to class - lemmings, a wounded kittiwake. The students began to show a strong interest in these things. She got an aquarium and planned a unit on fish and fisheries for later in the year. But she also noticed that these kids were quite cruel to the wild animals, going after the parka squirrels with sticks and killing them, wanting to shoot every animal they saw. They were also cruel to each other, calling each other names that caused tears, hitting and spitting on each other.

She decided it was time to find out where these kids were in science. Had they done labs? No. She would try a lab that was straightforward, and would give her an idea of the skill levels of the kids: Could they devise ways of finding out? Did they know about controlling variables? Could they interpret data? Did they know the necessity of accurate measurements? Could they make these measurements?

The lab was a fairly simple observation lab. Students were asked to make observations on a burning candle. All she wanted from it was to find out where the students were. She discussed observation. How does one observe? What are the senses? How does one use the senses? How do tools extend the senses? Students were asked to observe a candle mounted in clay before, during, and after it burned.

She discovered that students saw the less tightly controlled lab as a time to play, an opportunity to get out of their seats and have fun. They looked at the candles, described them as red or blue striped, lit them, burned them until they were gone and then launched into their favorite topic of late: farting.

"Eeeuuu! Mark farted!"
"I did not!"
"You did too!" (Gales of laughter)
"Well, at least I don't fart as much as Tina!," Mark snarled at this sister. (Gales of laughter)
Tina spit at her brother. He slugged her and she cried.

Meg told them to settle down, that farting wasn't a topic for school. They did settle down, sort of. Meg tried to find out if they had made any observations at all. She discovered that the observations were very few and the measurements none. Meg was dismayed. Was this a result of assigning a lab that was too "dumb?" Was it a result of poor directions? Or was it a result of lack of experience with labs by the students? She tried to probe to find out. The students said that they had never done any labs before. It never occurred to them to measure anything, even though she had talked with them about using tools to extend the senses.

Meg felt she would have to try the basic process skills of scientific inquiry one at a time before they could design anything. They needed to learn how to observe, measure, classify, predict, infer, hypothesize, design experiments and interpret data first.

She decided next time to try a quite controlled demonstration with the whole class. She would do a unit on air pressure and all the labs would be demos with one student at a time trying the experiments. But the experiments would then not be as accessible to all students. Air pressure experiments could be straightforward with clear variables, results that were easy to see, and data that were easy to measure and interpret. She could model behavior, she hoped, that would foster inquiry and elicit questions that could be tested. The demonstrations went well, but basically, students were

observers and not participants. When they sat in their rows, with their eyes front and no one talking, the lesson proceeded smoothly. When it was spooned out to them and they could give rote responses, they performed well. But if they were allowed to do something themselves or work in groups, they went berserk.

Meg did acknowledge that some progress was being made in the students' abilities to work in mixed gender groups. Meg chose working groups on the basis of several criteria. The first was who would get along with whom without friction. She had discovered that the social innuendos of the students were extremely important. At the beginning of the year, she could not mix boys and girls in groups. Some of the boys "took over" at the expense of the girls. The girls were always the recorders and never the leaders, even if she designated them to be leaders. Some of the students were socially so self-conscious that they simply opted out of participation when the groups were mixed. She had spoken to the kids about this and said that in the real world men and women had to work together, so she wanted them to learn how to do that and to practice it. The class had finally gotten to the point of being able to work in mixed gender groups if she were very careful about which girls worked with which boys. The second criterion had to do with the various strengths of the kids. Some were better leaders, some were better writers, some were sick of always being the better writers, some had language difficulties and needed to be placed in roles that allowed them successful participation that contributed positively to the effort. This choice of groupings was an ongoing effort that changed every other week. Meg accepted it as a personal challenge to try to keep a finger on the collective pulse of the students and choose groups that worked. Sometimes she managed the task and other times she didn't.

She also noticed, with a shred of hope, that more students asked questions and wanted to know: they asked "what if?" more often; they tried things at home. She also noticed that they became impatient with their peers if they were disruptive, but the disruptions didn't decrease.

But by Christmas Meg was thoroughly dismayed. Never in her career had she felt so discouraged. She decided to take the break to sort it all out. She considered breaking her contract. She flew into town and found a place to house sit that was quiet, where she could think. Despite all evidence to the contrary, she still believed that she could provide a learning environment that would not only allow, but encourage, these kids to learn and think independently. But...That was a loaded word! The kids were out of control when given activities that allowed them to get out of their desks. They had been unable to have a class council, although she still wanted to try that. They were interested when she talked about or demonstrated scientific principles. That was something. She wanted to empower the kids, she wanted them to think for themselves, but every time she undid the ball and chain, they went nuts. They didn't have the math skills or the ability to observe (though that was clearly improving). They didn't know how to measure, to predict and infer, to think an idea through. It did seem that the iron fist was necessary here.

She decided several things. She would back up and teach the basic process skills necessary to scientific inquiry. She would clearly and overtly state what she wanted them to learn during the rest of the year and relate that to the district curriculum. She would tell the students she wanted to have labs, but felt she couldn't because they got out of hand and the kids didn't learn anything. She would tell them that she wanted them to make decisions and think for themselves, but could not allow anyone to hurt anyone else or interfere with any other students' learning. She would tell them that she had to keep the classroom a place where ALL students could learn in comfort. She would ask them how they felt about that. She would offer them a choice: the existing system of extreme structure and control or a system where they could have more freedom, but they must respect the rights of others to learn.

When she returned, she discussed these matters with her students. Of course, they wanted the freedom; of course they were willing to behave to get it.

One girl asked, "Last year, Frank used to give us gum and pop so we would be quiet and get our work done. Why don't you try that?"

Meg was appalled. She knew there was a school rule against gum and pop in the building. How could he give them gum and pop? Why would he set himself up like that? More importantly, why was he trying to buy learning?

She said she wouldn't do that, that she thought learning was important, that it was reward enough. The students argued with that, but only a little.

It was agreed that all would try. Meg was unsure about all of this. But she would try.

Then came the fish lab. The kids were out of control; they had learned nothing. It seemed all her Christmas plans were down the tubes.

Teddy looked at her, "It was only a joke, Ms. Eliot."

"Now what!?!" she thought in exasperation.

Part B.

Meg looked at Teddy. He looked contrite. (She thought, "Yea, sure you're contrite, you little creep!") For reasons unknown to Meg, she began to laugh. It was so absurd! Now she was sure she had lost it completely.

"Teddy, it may have been only a joke," Meg said, "but what about learning? I'm here so you can learn. I already know this stuff. It's for you, not me. Yeh, I know, you've heard all that before and it sounds like a bunch of garbage to you. But it's true. If I'm not here for that, what am I here for?"

"The money. You're here for the money," someone shouted.

She'd heard that before. She looked right at the kid and said, "There is no amount of money that could pay me for this job. Your parents make more than I do and don't have nearly the grief. You know that. Wages here are very high. I would do better painting the community center."

There was a silence. She surveyed the class, all downcast eyes and what looked like remorse. She felt something very tender. "The little rats," she thought...affectionately.

Sherry, one of the "good" kids, said, "We could try it again, Ms. Eliot. We'll get it this time. Promise."

"I don't know if I have enough fish. We'll see." She felt skeptical. Should she pounce on this moment of apparent contrition and risk another fiasco?

"Well, what the heck," she thought, "you never know."

She had enough fish, so the next day she tried the lab again. The cooperative learning book said to keep small groups together for a time before changing them. So she tried to create effective working groups. She put a natural leader in each group. She divided up the kids who had reading and writing problems into different groups. All groups were mixed gender except one. In that one, she put a boy who was overcome with bashfulness when he had to work with the girls. She asked one member of each group to keep track of how well everyone in the group listened, one member was in charge, one was the artist and one was the researcher. She told them that they would remain in these groups for a while and that they would change jobs for each activity. She also reminded them that the purpose here was for them to get to know what the inside of a fish looked like and what each part did, as well as to make some measurements of the fish.

Meg Eliot mentally crossed her fingers and handed out the fish. She wandered from group to group, talking to students. They were doing what she had asked them to do. They were even asking intelligent questions. Occasionally a student would look up

something in the biology references or wash his hands so he could draw. There was a gentle murmur. At one point, one student picked up a skein of eggs and asked what it was and why all the fish didn't have it. A discussion ensued about male and female fish. One student shot a knowing glance at Marilyn and waved the eggs. Teddy told him to knock it off.

A question got asked: Are males bigger than females? Meg didn't know. The students had weighed the fish at the beginning. Meg made a chart that gave data on the fish -- weight, sex, age, length. When the stduents were done, one asked if they could take the dismembered fish home. Meg gave them plastic bags and, with a knowing glare, told them not to take them out of the bags until they were off school grounds at the end of the day. She had learned from a previous event not to throw an enticing gross object into the school trash. It had a way of returning from the dead to be thrown about in the hallway.

The discussion of the chart of data went extremely well. All the students were attentive, asked intelligent questions and offered ideas that showed thought. The discussion of size and gender couldn't be resolved due to the small sample of nine fish. She asked them how they could find out if females were smaller among herring of all ages. They understood sample size. They understood the need to control for both age and gender. They wondered if a different species would show gender differences. Then they discussed how they had listened to each other in their groups. They had worked well. They had enjoyed working well and learning something. They said it was interesting. All of the students participated in the discussion. ("This is too good to be true," Meg thought. "I wonder if we can actually get on to experimental design and controlling variables!")

Meg finished the day in a daze. She had told the students how pleasant it had been to work so well that day. They had agreed. She didn't want to get saccharine for fear of breaking the spell. But she felt like weeping; it was wonderful. <u>They</u> were wonderful.

In the days and weeks that followed, she did more group activities. Some Rubicon had been crossed and Meg didn't know what it was. The kids were great. Not perfect, but vastly improved.

Several physics labs and a few biology and chemistry labs went fairly well. Little by little she let up on the strict rules in the classroom. Meg let the students move their desks occasionally. She let the students listen to their Walkmans when they were done with their work if they didn't disturb anyone. In turn, they were more inquisitive, more interested, more self-policing.

She asked each group member to change roles each time they started a new project: leaders would become artists/expediters, then reporters, then observers. That way everyone would practice each set of skills. At first, when she had shifted the jobs in the groups, there was some dissent. The students wanted the natural classroom leaders to be leaders. All these leaders were boys.

Sometimes when the girls were leaders, they abdicated the job to a boy in the group. Meg made sure she expected the girls to be leader and report when it was their turn. She encouraged them to stand up and make reports. She required more oral presentations. She waited for the girls to talk when it was their turn. She waited past the uncomfortable point. She also made a point to praise them. Little by little the class changed. The girls began to insist on being leaders when it was their turn. Classroom talk was more often about classroom subjects. The subject of farting rarely came up anymore.

One day, in the middle of a social studies lesson about transportation, Teddy asked, "Which kind of parachute is better? A round one or those square ones?" Meg didn't have a clue.

She asked, "What do you mean by better?" Some discussion followed as to whether better meant faster, slower, more maneuverable, prettier or cooler. Consensus was that better meant that the person using it fell to the ground more slowly. Someone mentioned that the difference in size might make a difference rather than the shape. Meg pulled out her by now well-worn question, "How could we find out?"

It was one of those magic days. The kids all were intensely involved in the discussion and what became the planning of the experiment to determine which shape was better. Meg hardly spoke at all. The kids just went on with their ideas. She could almost stand back and watch. This is what she had wanted back in August and thought she would never see. These kids were defining a question, discussing the variables, designing the experiment, designing the parachutes and the methods of recording data, making sure it was all fair and that everyone was involved in a positive way. They were even using the right vocabulary in an unselfconscious way.

> "What is your hypothesis, Mike? That the shape isn't the difference, but only the area of the parachute?"
>
> "We'll each have to take turns practicing timing the drop of the parachute so we will all do it the same way."
>
> "But Tim is taller than Marcia, so we will have to measure the height of the drop so it will all be the same. Height can't be another variable; it won't be fair."
>
> "We could go to the ledge of the gym and drop them from there, then we won't have to worry about wind messing up the fall."
>
> "I get to drop it from the ledge. YOU can time."

Well, nothing is perfect. But they were working together as a group, fair and square, boys and girls, younger and older, enemies and friends, and they were planning a well-designed experiment.

This wasn't part of the curriculum. But that didn't matter to Meg. What was important here to her was that these "rotten" kids were working together to plan a well-designed experiment to solve a problem, and they were behaving like the best of adults.

They built and tested their parachutes. They practiced their timing. They discussed the ramifications. Two days later, they were ready for the test. Meg found a time when the gym was empty. The droppers had to go up through the storage room to get to the ledge. All the other students were at the bottom, timing, observing, and recording. The students did several trials to perfect their technique, then several drops that were recorded. It was getting close to lunch time and the tables had to be set up in the gym. They returned to the classroom and made up a chart of data. Mike had taken a tennis ball from the storage room on his way down from the ledge. Meg sent him to return it. The principal found him in the halls and started to sternly return him to class. Mike showed his pass, returned the ball and returned to class. The kids decided they needed more trials because their results weren't clear enough. Then they went to lunch and the rest of the day went according to schedule.

Meg was delighted. "It isn't such a big deal," she said to herself, "but, damn it, they did it. All by themselves, they did it and they knew what they were doing! These kids, who couldn't weigh a pencil or measure a string at the beginning of the year, can design and implement a real experiment!" She felt giddy all day.

After the students had left for the day, the principal came in to speak to her. "What were you doing in the gym today?" She went on excitedly about the experiment and how well the kids behaved. She said that they were going to repeat it tomorrow. The principal said no. No repeats. Don't go into the gym and use it for those purposes. He had caught Mike with a tennis ball. Students shouldn't be in the storage room.

"But...it went so well." She was astonished. "How about if I go upstairs with them and...."

EPILOGUE

For the rest of the year, Ms. Eliot's class continued to go well. The kids devised several more projects (Meg related the projects more closely to the curriculum). They came up with a recycling project for the whole village. They collected pop cans from the houses, flattened them and found an air carrier to ship them to Anchorage for sale. They did acid snow studies and discovered some toxic substances had been spilled. Meg found her classroom an exciting place to be. Her kids were motivated, interested and learning faster than ever. They liked school, in fact attendance in her class was the best in the school. They published a literary journal. They finally got the class council off the ground and running.

But the principal continued to disapprove of the activities. Students were out of the classroom. They were not always working at their desks. He did have to change the P.E. and shop classes to grade level, mixed gender classes because the smaller boys were getting hurt and refusing to participate. The shop teacher refused to teach the girls welding, despite the girls' interest. Relations between Meg and the principal became more and more tense; she left the following year.

ANGIE, HER MOTHER, AND MATHEMATICS

by Leslie Gordon

ABSTRACT

Angie, a third grade student in the Gifted and Talented Program, freezes in fear when she must deal with mathematics. Her mother and Angie have nightly battles over mathematics homework which typically end with Angie having a temper tantrum and being banished to her room. Angie's mother threatens to pull her mathematically talented daughter out of the Gifted and Talented Program since the subject is causing her and the family so much stress. The Gifted and Talented teacher must figure out how to deal not only with the mathematics phobia but also with the problems at home.

Issues include mathematics phobia among young women, relationships between teachers and parents, and the line between appropriate and inappropriate counseling roles for classroom teachers.

ANGIE, HER MOTHER, AND MATHEMATICS

Part A

Angie's mother came boiling in to my elementary gifted and talented room after school one day.

"Angie was in tears last night and the entire evening was ruined for all of us. How could you give such a horrible homework assignment? If that's the way you're going to teach, we don't want our daughter in GT math." Angie's mother wanted to pull her daughter out of GT Math because she was tired of the almost nightly temper tantrums over math homework. I didn't blame her. Angie really knew how to push her mother's buttons, that was clear immediately. Surprisingly, her mother seemed totally unaware that this was happening. Angie was making it worse by exaggerating problems in class and even twisting the truth in an effort to upset her mother. One time Angie had frozen with panic in class over a newly introduced concept, did not get her classwork done, and had to take it home. Angie told her parents that the class was not given enough time to complete the work, even though all the other students had finished early. It had gotten so bad that the minute the math book came out now, her mother was tense and ready to explode.

"The math is not easy for Angie," I countered, "but her attitude is her worst problem. If she quits now, she'll never get over her fear of math, and she'll see temper tantrums get her what she wants. She is showing frustration and a very negative attitude in class, too." Her mother was not listening.

After her mother stormed out of the room, I realized that I didn't know whether or not I'd see Angie in math tomorrow. Clearly it would be easier all around not to deal with this stressed-out woman and her negative daughter, but could I live with myself if I dropped Angie from math? Was there any chance of turning this situation around and was it worth my effort? On the rare occasions that Angie was in a good mood, she had done very well. Lack of ability was not her problem. Angie would be happier initially if she were in regular math, but she would be forever afraid of math. Even worse, if she dropped out, she would keep on using these negative strategies with her parents. If I kept this little girl in GT math, I would not only have to help her get rid of her math phobia, bit I would have to help her learn to work with her very difficult mother.

Background

I first met Angie when she was in first grade, and her teacher referred her to me for GT testing because she was such a good reader. Angie was very tall, very shy and very intense even as a five year old. Everything was serious business to her. She had no idea how to laugh. Several times I tried to relax her with gentle teasing, but her only reactions were a set jaw and tears. Both her parents were very bright and intense. Her father was an economist, and her mother an accountant.

She qualified for the program with very high reading scores and good math scores. As soon as I began working with her, it became apparent that she was a perfectionist. She was an incredibly focused and creative child, both in writing and drawing. In second grade she wrote and illustrated a huge book on birds. The book was entirely her own idea. She did all the research, drawing and writing herself, including the final draft on the word processor. The birds were beautiful, done wonderfully in blended color pencil. Many of those birds were redrawn five or six times until <u>she</u> felt that they were perfect. She is the only second grader I have ever had do an independent project of such dimensions.

But from the very beginning, she had great difficulty with any new concept in math--no matter how simple--or any math requiring thinking. On math lab days when the other children would be the most enthusiastic, I could watch Angie literally freeze up. She would become paralyzed with fear. Her face and body tensed and her mind shut down. It took almost nothing to set this off, trading base ten blocks in an addition problem or answering orally a simple addition problem. When she got frustrated, she couldn't do the simplest task. She would sit, and not move or make a sound except to cry. This happened on nearly a daily basis. I tried time and time again to get her to relax or even just to look up at me when I talked to her. But my efforts were getting nowhere. The episodes were just as frequent.

In third grade the GT students begin coming to me daily for their math, so I became Angie's official math teacher. Angie was not happy, but she survived because the third grade math curriculum was not difficult. I'm not exactly sure why, but she and I became close friends that year. She would stay after school and help me work. She began to talk to me for the first time about what was going on at home.

In fourth grade Angie hit bottom. She had never been able to make friends and the girls around her were establishing fast friendships and leaving her out. Angie was a very nice young lady, but she radiated tension and insecurity and was not fun to be around. I

used to see her wandering aimlessly alone out on the playground during recesses. She would regularly ask if she could have lunch with me instead of the other children.

Her stress was now not limited to math alone, but included every other subject as well. The GT re-evaluation test coming up in the spring was already worrying her. Stress and unhappiness seemed to have become a habit. Her fourth grade teacher told me Angie was a negative spoiled brat and that her "mother needed psychiatric help" because she was such a destructive force.

Part B

Somehow I became close friends with Angie's parents and spent quite a bit of time with them socially. As I got to know Angie's parents, I began to understand the problem more. Her mother, who had chronic migraine headaches, did not handle stress any better than Angie, and tended to get quite worked up over truly minor problems. I remember one episode in particular that seemed so overblown. We had a school rule that short-shorts were not allowed, but Angie and her sister both wanted to wear shorts. Angie's mother took on the principal over the issue and when that didn't work she went to central office to complain. This battle went on for weeks and weeks and had many people upset. Angie's mother seemed to thrive on these upheavals. She needed a job to channel her energies, but her husband did not want her to work. When Angie got frustrated with homework, her mother would consistently overreact. A nightly battle would ensue when Angie hit a tough spot in her homework and her mother attempted to help her. These screaming battles invariably ended with Angie being sent to her room for the rest of the night without doing her homework. Angie's father worked better with her, but he was gone most evenings leaving her mother to deal with the problem.

At the beginning of the fifth grade I started working with Angie seriously and consistently about learning to control herself and calm herself. We discussed the fact that she was the real loser when she shut down and got so upset that she could not cope. Every time a new problem appeared I listened and helped her formulate a way to cope. I taught her some quick relaxation strategies and she began to use them. For the first time she saw that she could indeed do the math, IF she kept herself calm. Anytime there was a sign of frustration, I took time right then to deal with it and talk to her.

Her attitude in class at that point was improving daily and so was her ability to do math. But she was still a mess emotionally because the nightly battles still continued. I remember sitting at my desk late one night after another phone call from Angie's mother, feeling so frustrated and sad. The situation had always upset me, but it was even worse now, because Angie was blooming under my eyes in class into a marvelous young lady and rapidly becoming my favorite student in all my years of teaching. Both she and I could, for the first time, see what wonderful potential she had. All it took now was an occasional reminder from me about keeping herself under control. I would watch her visibly stop herself, take a deep breath, and get back to work. It was wonderful! But how could I even hope to help her solve the problem at home and was it even my place to try? I had seen what Angie's parents could do to a teacher they were angry with, and I wanted no

part of it. It was clear, too, that this entire situation was causing me stress that I was taking home to my family. Was that fair to them? All my other students got shortchanged when I took class time on a daily basis to take Angie aside and talk to her, sometimes at great length. A large part of my job had always been counseling. I accepted that, but this time I was more involved than I would have liked.

Somehow all the reason in the world made no difference, and in the end I plunged ahead in my efforts to help Angie and hoped for the best. The problem at home was <u>indeed</u> much more difficult to deal with. I couldn't be there to reinforce all the positive behaviors she was learning in class, so initially she would fall right back into her same old habits, getting frustrated and giving up. Part of the problem, too, was that her parents expected her to lose control. They over-reacted when she showed the least sign of frustration instead of working with her.

<u>Every</u> time the frustration homework problem arose, I took time the next morning to talk to her. What had happened? Did she like the way her parents treated her when she got upset? Did she like spending the night in her room? Did she feel it was worth the consequences to behave like that? What could I do to help her? What could she do to help herself? My focus and energies at this point were directed at Angie in an effort to show her she had the power to control a situation at home that she didn't like. I never told her parents what we talked about and they never asked. She finally realized from these dialogues that she was the loser for the night; and the way to fix it was to change her behavior. The behavior pattern was very entrenched, so it took quite a while to change it, but it did change. Angie used the same strategies to calm herself that she used in class. It took a lot longer to see the results, but it did work.

She also stopped asking her mother for help on her homework, preferring to wait for her father's help or mine the next morning. She even called me at home when she hit an especially difficult roadblock. Her mother gradually began to realize that her relationship with Angie was part of the problem. When there was a very difficult assignment, she agreed to allow Angie to put it away and wait to get help from her father or from me.

Angie was learning to control her stress at home and in the classroom, but she still had to deal with the GT re-evaluation test. I purchased a good book written for upper elementary students. It outlined in delightful cartoons five or six simple strategies to reduce stress and to do well on tests, such as a breathing pattern and positive thought. We read it together during the month prior to the test in every spare minute I had, and Angie

practiced the strategies in it daily for a total of about three or four hours. Angie had by now become aware of her own power to accomplish great things when she was in a positive frame of mind. She started the test feeling confident and used the relaxation strategies whenever she felt the need. She passed the test with very high scores even in math - another boost to her growing confidence.

Epilogue

As Angie relaxed, she began to make friends and take some risks. In her last year of elementary school, she ran for school treasurer and won. Then, in middle school, she joined the girls' basketball team and is now one of the star players. She is a straight A student in all her classes, including algebra. She voluntarily took the PSAT for Johns Hopkins Talent Search program and was accepted. She is a leader who leads with both compassion and self-assurance. Because she had taken such a close look at herself over the last five years, she is very perceptive in her dealings other students.

THE VERTEBRATE DILEMMA

by Michelle Saiz

ABSTRACT

When Ann transfers to a school with much higher expectations for science work, she finds herself failing seventh grade science. Her teacher, Ms. James, encounters this problem with other students and brings up the issue of implementing a special "Satisfactory/ Unsatisfactory" grading policy for transfer students who lack the expected background. When the faculty greet this suggestion with disinterest, Ms. James tries a series of interventions designed to assist Ann. The case explores the variety of approaches a teacher can use to provide assistance to academically unprepared students.

Issues include grading policies and ways of assisting low-performing students while maintaining high levels of expectation for science achievement.

THE VERTEBRATE DILEMMA

Part A

Ann, a thirteen-year-old seventh grade student, transferred from a rural elmentary school to a small junior high school in a nearby town. According to her ITBS scores, she has somewhat below average reading and writing skills and below average math and science skills for seventh grade work. Ann is shy, polite, and seldom volunteers to answer questions or share information, but always volunteers to assist with passing out papers or distributing science equipment to her classmates. Assignments, homework, and projects are almost always late and require constant teacher supervision.

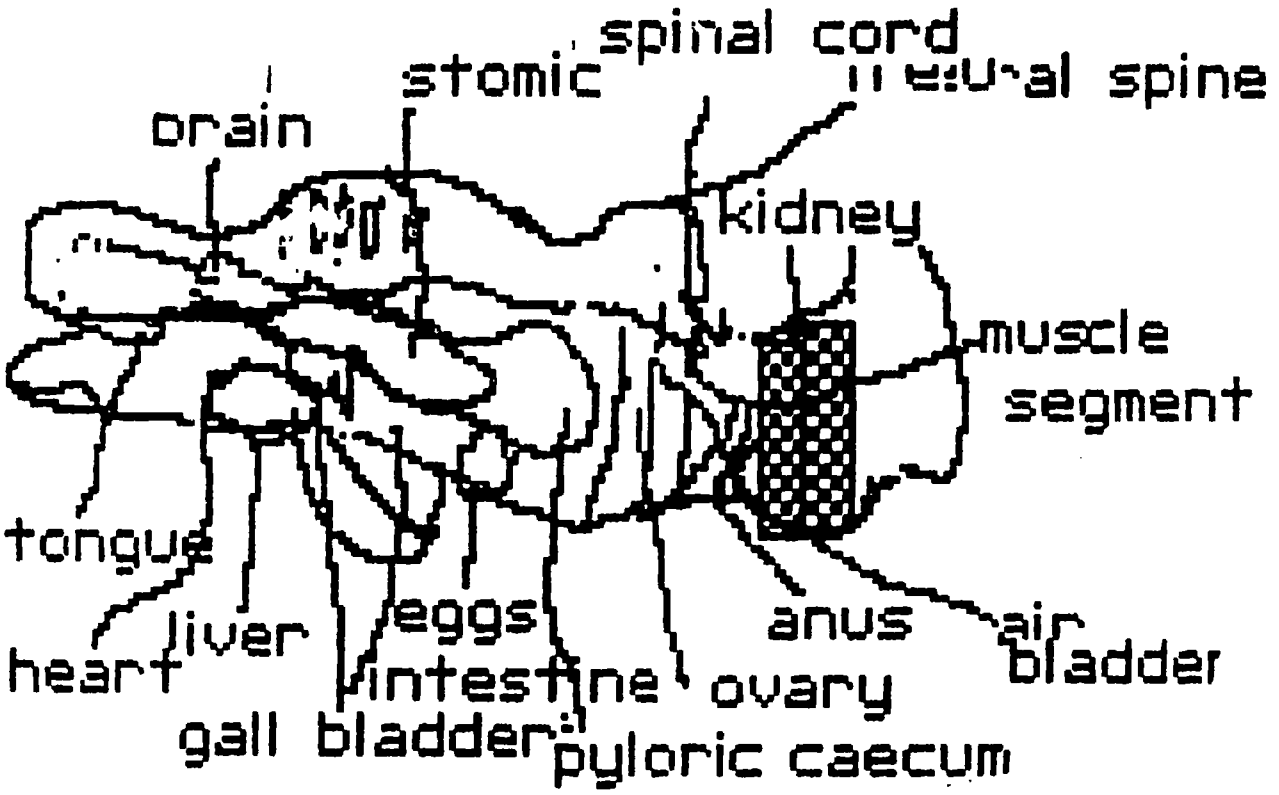
Ann's first science test score (46%) caused teacher concern. Comparing her responses to another student's answers caused Ms. James even more concern. For example, a question asked Ann to list at least four characteristics common to all vertebrates. Ann answered:

all have scales
all live in water
all have systems
all eat insects

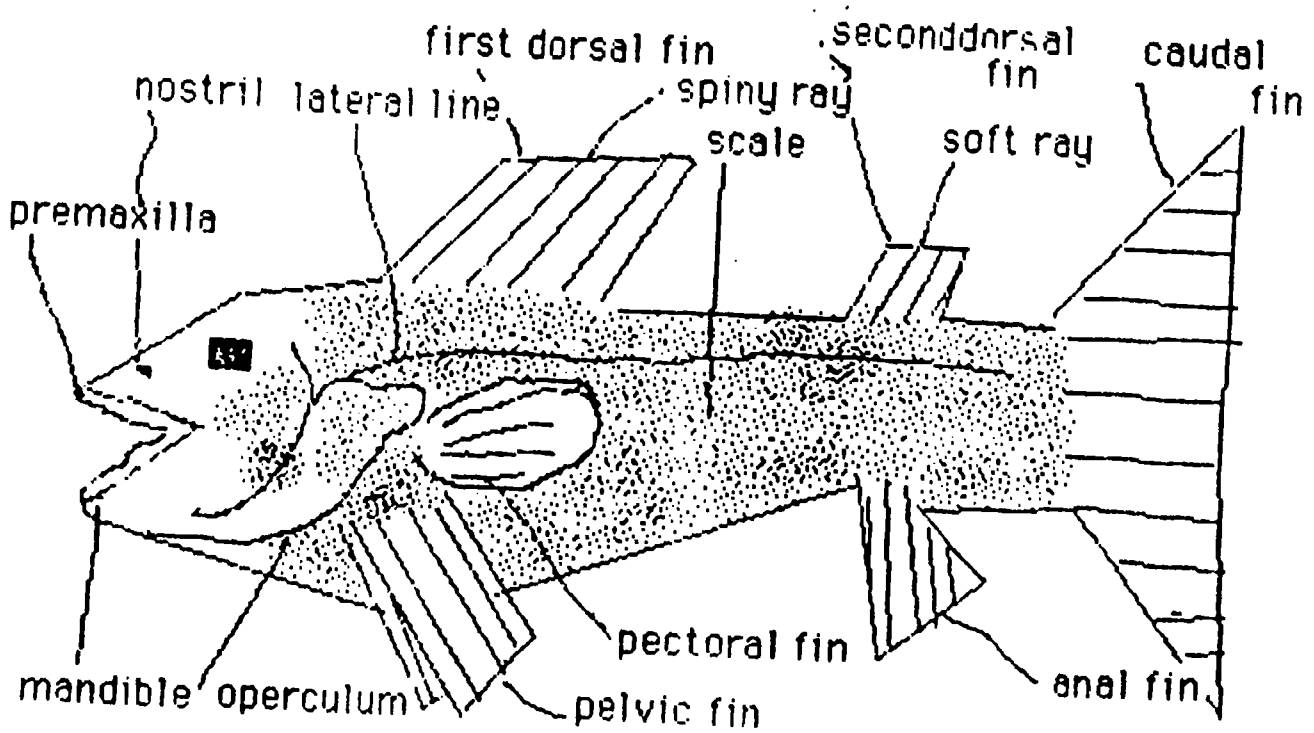
The other student responded: All have backbones, all have hearts, all have endoskeletons, all have complex systems.

Also, as part of a unit on the different classes of fish, each student was asked to sketch a bony fish by following a diagram and labeling its external parts. Here is Ann's final assignment compared to another student's of average capability:

Ann's computer diagram of a fish



The other student's diagram



Ann always handed in her science work first or close to first. Her proofreading consisted of taking her finger and rapidly following each line she had written before handing in her assignment. She would then turn to the teacher and ask what she should do next. The teacher would indicate the front board where the procedure had been explained at the start of the class period and was listed in the sequence the class was to follow. A common response of Ann's was, "Oh, I didn't know I was supposed to follow that." Both her oral and written responses were of minimum quality and she seemed disinterested in her work, whether it be a lab, an activity, or a lecture. After Ann scored 20% on another chapter test the teacher requested Ann see her during a 20-minute free period each day for extra help. Ann only showed up when the teacher sought her out, but Ann's body actions, mood, and responses indicated she did not want to come. Her performance did not improve so the teacher left it up to Ann to seek assistance when she wanted it. Ann never sought this extra help again.

Ms. James was disturbed not only at Ann's science scores, but also at the issue of what grade to give her. Ann had transferred into her classroom without the science background required for her to succeed. Was it fair to fail her? Ann was not the only student to have this problem. Several students were in similar circumstances.

Ms. James considered the possibility of using a special "Satisfactory/Unsatisfactory" grading policy in these circumstances. She approached the principal, who then scheduled the issue for a faculty discussion.

The faculty brought up these comments and questions during the discussion:

a. "Parents would need to be informed of this separate grading policy. Does it require their consent? What if they do not want a separate grading policy?"

b. "How it would be determined what student would qualify for this special grading policy."

c. "We're talking about the justice of the thing, someone working hard and only coming up with F's."

d. "If this new idea became effective and we used an 'S/U' grading policy it may make students less responsible by not trying as hard as they might." This person then gave an example of a previous seventh grader, now in eighth grade, who barely passed with a 1.0 GPA, but who now is working very hard and displaying average skills. Would she show this progress if she had been given the "S/U?"

e. "Why make the "S/U" schoolwide when an individual situation arises and we are already accommodating that student with frequent parent contact, extra help, and fewer requirements?"

f. "What constitutes an 'S' and a 'U?'"

g. "What would a high school think of this idea? What effect would it have on an entering student?"

h. "Implementation should wait and be put into effect later after lots of careful thinking."

The idea of a special grading policy didn't have much initial faculty support, Ms. James concluded. She would have to handle the situation in her own classroom. What steps should she take?

Part B

After Ann's mid-quarter progress report of 52%, Ms. James telephoned Ann's parents, explaining Ann's present performance and asking them for their opinions, comments and insights regarding Ann and science. Her father and stepmother attended a conference and indicated that Ann had always struggled with her schoolwork but that she had been tested by the school district which found math and science to be Ann's best areas.

Ann's cumulative record for grades 1-6 from her rural school verified her parents' statements. Her card indicated C- to C performance in all subjects. There were no records indicating any testing done by the district. Ann's ITBS results from the fall showed her overall achievement to be well below average with a national percentile rank of 23 in science (which was Ann's second highest score next to reference materials), 7 in reading, and 10 in mathematics.

Her parents asked for a weekly check-up giving Ann's scores and a brief comment regarding homework and quality. Ms. James approved and also suggested Ann might benefit as well from a tutor. The parents said that, since her father's employment required him to be close at home and the stepmother was employed full time in the nearby town, an after-school tutor would be out of the question due to transportation difficulties. The teacher then suggested guided use of Ann's daily study period with a parent aide who would work with her each afternoon for 40 minutes. Ann's parents concurred.

Ann's science work in the second half of the quarter improved. She completed tasks, homework assignments, and projects on time, and began to pass her science tests, though not science quizzes. Her attitude was more consistently positive, and she would share information with the teacher quietly. Due to the extra effort Ann was putting in with her work and with the tutor she received a passing score for the quarter.

This pattern of poor performance in the first half of the marking period, then improvement in the second half, repeated itself into the second quarter. Whenever her parents requested a written teacher check-up on their daughter's progress, Ann would improve in written responses, in attentiveness and participation, and in attitude. After her parents requested a written check-up, for example, Ann wrote this description of her lab assignment:

> One day in Science class Ms. James said "Tomorrow we will disect (stet) an owl pellet. Now an owl pellet is the fur and bones of a small animal that the owl had eaten.

> In some owl pellets you will find more then (stet) one skull and barly (stet) any bones but in others you might just find bones and no skull and in others you don't know what to expect.
>
> In my group, we found a house mouse in our owl pellet. Renee and I had fun and Wendy, well she didn't even touch it. After we got all the bones out of the pellet we throw (stet) away the fur and soaked the bones in a cup for 1 hour. Then on Monday we glued them on a black piece of paper.

Ann's science classroom is designed for cooperative learning whereby three students are grouped with a specific task to perform when applicable. Ann's group consisted of two other young ladies, one a C-/B student and the other a B-/A student. These three were selected on the basis of a socic ,ram which asked each student to list three other students in the room with whom they could best work. Ann's group works well together when Ann decides to do her part or assigned task. Otherwise the other two work around her with Ann sitting back and observing.

EPILOGUE

The idea of a special grading policy, whether it be "S/U" or something else, did not receive much attention after the first discussion. There was no follow-up on the questions and comments and the concept was not pursued by either the principal or faculty members.

Ann has been seeing the school counselor periodically at the request of her parents for personal, not academic, reasons. The counselor is not at liberty to discuss Ann's sessions with her teachers due to the parents' request for confidentiality.

A recent sociogram indicated Ann still preferred to be a group member with the same two young ladies. However, neither of these two ranked Ann as someone they preferred to work with. In fact, Ann was not selected by any class member to be her/his working partner.

Ann's science teacher instituted a plan calling for class-wide student portfolios for the third and fourth quarters. Since the school did not seem to want to pursue a separate grading policy, Ann needed something to discuss her science progress with her parents and teacher besides notes sent home. Each student portfolio contained such work as creative assignments, lab write-ups, bar graphs of quiz/test scores, computer activities, project summaries, personal analysis of science progress, a skills checklist, and student selected science work. This portfolio would be used as a catalyst for parent/teacher conferences in third quarter and as a personal "growth chart" for the student.

The portfolio idea seems to be working. Ann kept up with the portfolio requirements on her own, a success in itself. Her parents remarked on their comment section that they thought the portfolio was a good idea since it made them take time out to actually discuss Ann's schoolwork with her, rather than just monitoring Ann's completion of assignments.

THE RELUCTANT MATHLETE

by Sue Yerian

ABSTRACT

A female middle school math teacher who also coaches the school's math team gradually realizes that within a matter of months one of her top female team members has changed interests from math to boys, clothes and parties. The case study follows the teacher as she prepares the four team members for the district and state competitions, wondering at various moments if she should permit the girl to drop off the team, as the girl wants, or if she should continue to encourage her in the competition. To win the state competition would mean a chance at a college scholarship for another student living at the poverty level, but the team needs the girl's outstanding math skills and cooperation in order to win.

This case highlights the following gender issues: To what degree does a teacher support and nurture an underrepresented individual, a female, in the field of math at the expense of other students? How should math be taught to middle school students, particularly girls, who may lose interest in the subject during puberty, fall behind boys in terms of math courses completed by the end of high school, and give up opportunities for further advancement and future career in math and science?

THE RELUCTANT MATHLETE

"No, you can't miss the state math championships, not for a stupid party!"

Linda Johnson shook her head. "That's what I wanted to say to Jane when she asked me, the coach, if she could drop off the math team--but I didn't. It's true she had been frustrating me with her boy crazy behavior in class for the past few months, but I was so pleased that her team had won the district competition two weeks before and made state. She and her three teammates would compete in Juneau against other district winners. So imagine my shock when Jane stopped at my desk after class and announced she wasn't going to Juneau because she didn't want to miss her girlfriend's party that weekend. I felt Jane was making a bad choice -- throwing away a chance to use her considerable math talents.

"I gave Jane my usual 'you can do it' pep talk, even though I was fed up with her recent behavior: her boy craziness, poor attitude, unwillingness to work closely with her team, and disappearances at critical times during the district competition. I thought how easy it would be to coach the team without Jane, and how motivated John, the first alternate, was. I also thought about Sean, the only boy on the team. Sean, Jane, Krista, and Deidre worked very well together. Each one had strengths that had contributed to the current success of the team. Introducing a new student at this point would have disrupted that cohesiveness and jeopardized Sean's chances at winning a college scholarship, one of the prizes offered for winning at the state competition. No one in Sean's family had gone beyond high school. Without financial help, Sean would never get to college. I felt committed to doing the right thing for both Sean and Jane. I wanted Sean to have the best chance at that scholarship, and Jane to get the recognition and awards that she deserved as well. By the end of my pep talk, Jane looked unhappy. I was confused, and didn't know whether to encourage Jane to stay on the team or to let her quit.

Background: Jane

Jane was in 7th grade at Fairview Junior High, a medium sized suburban school of approximately 800 students. She was a year ahead of her peers mathematically and, as a result, placed in the 8th grade Algebra I class. The math competition was one way students could complete the requirements for a math "project" that each student had to do by the end of the year. Practice for the school's math competition lasted from October through December. The school level tests were held in January; the district tests were in February; and the state competition was in March. The four team members were chosen on the basis of scores on the school tests. These four students practiced together for the month prior to the district competition, and another month if they placed either first or second at the district level and went to state. Jane's algebra class had 27 students, 22 of whom elected to enter the math competition.

According to Linda, Jane's test scores in all academic areas were superb--99th percentile on both achievement and aptitude--and she was a straight "A" student. There was no doubt from Jane's performance, comments, attitudes and quick wit in class that she was an extremely bright girl. Her parents (mother an engineer; father self-employed) were very supportive and permitted Jane to make many of her own decisions about her school courses.

In the beginning of the year, Jane was a model student. Her cheerfulness contributed to the overall positive atmosphere that existed in Linda's class. Jane was eager to take risks, paid attention, and enjoyed learning. She was happy, outgoing and friendly.

"I began to notice a change in Jane around December," said Linda. "I was halfway through the three months worth of practice sheets for the math competition, and about one month short of the school competition that determines which people form the team going to district. Jane was forgetting to do her assignments, seemed unconcerned about her grades, socialized more often, became more sophisticated in the way she dressed, daydreamed in class and talked constantly about boys, clothes and parties. She had become friends with a different group of students in my class who were more popular and less academically oriented. There were many kids in that class who wanted to be on the math team. Because it was a voluntary activity, most of the students who chose to do the competition were diligent about getting their work in on time and getting the right answers. I mentioned to Jane and her group that they would have to get their work done in order to have a chance to go to the district competition, but they would shrug, do their work for a day or two, and soon begin missing assignments."

Background: Linda

Linda had spent three years developing and refining the math competition materials so they were both fun and challenging. The first year she had had only five students who wanted to participate. Now there were students begging to be allowed to compete, and asking her each fall when they would start the practice sheets. Younger sisters and brothers told her they were eager to get to Fairview so they could get into the program and have as much fun in math as their older siblings. More pleasing to Linda, however, was the increase in the number of girls who entered the competition.

"I have always felt that we needed to approach math teaching a little differently with girls. The boys seemed more competitive, enjoyed getting that one right answer, and were more self-assured. The girls preferred to work in groups, and took wrong answers more personally. I tried to make the practice sheets fun, downplayed the fast response and right answer aspect, played a lot of math games, let groups rather than individuals find answers, and held more after school and lunch time parties for mathletes only." Linda paused, "It seemed to work. Each year in the competition, all my teams were very strong. And the girls were just as good as the boys."

The Competition

In January Linda gave the math students the three day test that would determine who was to be on the official school team. Half the points would come from this test and half would come from the grades on the practice sheets. She could usually tell ahead of time who would be on the team based upon the practice sheet grades and a guess at the exam scores. This year's results surprised her.

"I couldn't believe the totals," Linda said. "I calculated twice to make sure I had it right."

Sean had made it, as expected, from the consistent high marks he had made through the semester on both his practice papers and tests, but also three of the girls had placed, one of whom was Jane.

"I didn't think Deidre and Kristy had a chance at this," Linda said. "Their practice papers were very good, but they tended to score low on the tests. I thought they wouldn't be able to handle the time pressure. I thought Jane had blown her chance because of the lousy papers she had been handing in, but her test score was so high that it brought her up. I thought she had made a tremendous final effort to join the team."

Jane's performance throughout the next month, practicing with her three teammates for the district test, was--at best--poor. Linda reflected, "This is the time we build team spirit and camaraderie, and Jane just wasn't participating. She participated just enough, though, that I kept my hopes up."

At the district competition Linda's team won a place in the state competitions. Although Jane had done well on her section of the test, she had become enamored with one of the boys on a team from another school, and had spent a good share of her practice time walking around with him or calling friends from a nearby phone. "The team didn't do as well as they had expected, but they still won the opportunity to go to Juneau. This was an exciting moment for all of them, especially for Sean and his parents. Sean came from a large, blue collar family. His father, a carpenter, barely made enough to keep his family in the small trailer they rented near the school. I think they realized at that moment that Sean had a chance of going to college if he won first or second place at state. He had a good chance IF his overall scores were high, and that included the team round.

"I started to drill the four students every day. I wanted all of them to feel successful. I knew a good place at state would open doors to other programs, trips, and prizes, and I wanted those opportunities for my "girls," and for Sean. It was after one of our practice sessions that Jane came up to my desk and asked to leave the team. I "flashed back" to a recent talk I had had with the school's wrestling coach on how I should handle my math team and Jane's superior ability but lackadasical attitude. With no hesitation he had said, 'Kick her off the team. Winning isn't as

important as learning to work together. I don't care how good my wrestlers are, if they mess up, they're off.' That made a lot of sense, but in my case the team wasn't just going for junior high trophies and a little bit of glory. There was more at stake.

Part B.

The State Competition

"I gave Jane the weekend to think about continuing the competition. That night I called Jane's mother to let her know what was happening and hoped she would have the good sense to convince her daughter to stay on the team. I felt that her mother had to know if Jane were to decline the honor of representing the region at the state contest. I would want to know if my daughter won such an award and turned it down."

On Monday, Jane announced that she would continue to participate. "I had some doubts as to how serious she was," Linda said. "I thought her mother had persuaded her to continue and that maybe Jane wasn't as serious about it as I hoped she would be, but when I asked Jane about that she happily insisted she had made up her own mind. Knowing how often Jane was allowed to make these important school decisions by her family, I thought she had."

Jane joined the other students at a separate table near the side of the room. Their work was primarily self-directed group practice with periodic help from Linda. "The other students in the class needed my help with their work. By now, I felt that the math team consisted of very able and highly motivated students. They knew what they had to do and didn't need much direction from me."

Linda began noticing how quiet Jane had become. She sat back in her chair, rarely talked to the other teammates, and daydreamed. "I encouraged her as much as I could, but little worked. She didn't seem to associate with the two other girls. They were more academic, and not as popular as Jane socially. But they were friendly, and occasionally Jane would be drawn into an animated conversation with them.

"By the time the team arrived in Juneau three weeks later, the girls were getting along again. That didn't last long. I began having trouble with Jane on the second day of the competition. She disappeared at critical times -- generally to find a phone, or 'to find a store.' I warned her to stick around. She spent lots of free time with the boy she liked from the other team. The boy stayed with his team, so at least I could see her on the other side of the gym, talking to him.

"I got very angry with her when the teams were called together by our hosts to do some practice drills that were designed to be fun. All the teams were busy--you could look out over the gym and see the students' heads bent over the papers--that is until you got to our table. There was Jane, sitting apart from her teammates and reading a Seventeen magazine. I was furious! 'Get busy,' I hissed, and took the magazine away. Later, she did very poorly in the competition. That afternoon while our team was shopping at the mall, she disappeared, and our team had to look for her. She was shopping at another store and said she had forgotten the time."

Linda settled into the chair. "The last straw was at the awards banquet. Everyone sat as teams at their own tables; Jane sat with the team the boy belonged to. I could have forced her to sit with us, but decided to let her enjoy the evening. I was kicking myself for not letting her leave the competition a month before when she wanted to go. The worst part was that Sean didn't have a chance at winning the scholarship because Jane's scores were low and pulled down the group total. I felt I had let everyone down. Jane's past performance should have told me that her behavior was too erratic for her to be part of the team. She enjoyed her social life too much. I had tried to support her because of my commitment to helping girls in math, but instead prevented Sean, the alternate boy, and the other two girls from doing their best. Though many years have passed since that competition, I still think about the poor decision I made and how it affected so many other lives.

HETEROGENEOUS GROUPING: IT DIDN'T WORK

ABSTRACT

This case addresses the problems of a new female teacher who tries to use in a 7th grade science lab the heterogeneous grouping techniques she learned at the university. The teacher notices that the students segregate themselves by gender and by ability. Her attempt to change the class grouping structure, two months after school has begun, results in a chaotic lab. A parent call and negative comments from her colleagues prevent the teacher from trying cooperative strategies the rest of the year.

The issues raised in this case revolve around gender and ability grouping patterns that have already been established and whether teachers can change patterns already ingrained by the time the students reach the secondary level; whether teacher education and in-service programs can effectively train educators to minimize gender bias in the classroom.

HETEROGENEOUS GROUPING: IT DIDN'T WORK

Introduction

"It was chaos!" Shannon Pearce shook her head in despair. I thought I could apply all the theories on heterogeneous grouping and cooperative learning that I had learned in my education classes last year to a lab I was running in my 7th grade life science classes. To prepare, I made a special point of rereading the handouts we had gotten from the September school in-service on gender and ability grouping. What a waste of time! I should have listened to Bob Jacobs in the class next door who has taught here for 15 years. He said to let the kids group themselves and ignore what I had been taught. After the disaster that day, I concluded he was right."

"I wasn't prepared for the hostility that broke out when I tried to rearrange the kids into heterogeneous groups. I philosophically believe that brighter kids should help slower ones, that boys and girls should be given equal opportunities to lead groups, take notes and collect data, and that everyone in a group should strive to help everyone else succeed. I assumed the students felt the same way I did. During my substitute teaching last year, I didn't get to see how the experienced teachers formed their students into groups. I would tell the students to get together in twos and threes and they had already been taught how to arrange themselves quietly and efficiently. My host teacher during student teaching was the traditional sort of guy who lined kids up in rows by their last names. I never had a chance to apply any of the grouping or cooperative learning theory I had learned at the univerity. But I had always assumed that when I did apply it, my students would respond positively, as the literature seemed to suggest. I wasn't prepared for the destructive personal comments and hostile behavior among my student groups, nor was I prepared for the verbal abuse directed at me for enforcing the arrangements. I had a migraine by the end of that day. It was one of the worst experiences I have had since I started teaching, and I feel I've emotionally damaged the slower and more insecure students."

Shannon's Background

Shannon had graduated the past year from Westmont College with a BS in biology and secondary science certification. Immediately after graduation she had found temporary employment as a summer swimming instructor in a special education recreation program sponsored by the local school district. That experience plus her work as a popular substitute teacher at Northland Middle School landed Shannon a permanent position the following fall as one of two new

hires at NMS. Shannon taught 6 classes: 4 classes of 7th grade life science, one class in basic math, and one reading class. Her science classes averaged 28 students. In addition, for the past four years, Shannon was a Saturday morning volunteer teacher for the Literacy Council. Her experience teaching illiterate or ESL (English as a Second Language) adults had sensitized Shannon to the problems of individuals who had learning difficulties and needed additional help.

The Science Classroom

Shannon's classroom was cluttered with fall collection projects that her students had turned in over the past few days. Geology trays containing favorite rocks lay next to a box of bones, a display of fur samples, and cross sections of tree trunks. Laminated poster boards, colorful compositions of leaves, student drawings and essays, and photographs of nature lined the walls. Fish tanks, animal cages, lab tables and storage bins competed for space in Shannon's room.

The School

Northland Middle School is a large urban school in Anchorage, Alaska. Its 800 students come from a population that is predominantly white and middle class. The 15% ethnic minority are composed primarily of blacks and native Athabascan Indians. A small number of students are Asian immigrants. Five per cent of the students have been identified as gifted; 20% of the students receive some kind of remedial help. Special education students are mainstreamed into regular classrooms as often as possible. In a single period it is not unusual for a teacher to have as many as five identified special ed students, two gifted students and at least one student for whom English is a second language. Many students have learning disabilities for which they receive no special help.

In order to become a middle school and maintain a team meeting period every day, teachers have voted to keep class numbers high: 27-30. The majority of teachers at NMS are older and have taught more than 14 years. Many teachers have been at NMS their entire careers. The school functions smoothly; the teachers are comfortable with the status quo and with the relationships they have established in their teams over the years. The community values are conservative. Parents are not involved in day-to-day school issues, but are vocal if there is a perceived problem. Within the past year parent pressure resulted in the removal of certain supplemental science texts in favor of material that expressed more conservative values. Although many students come from single parent homes and the majority of mothers work, traditional gender roles are favored.

The Students

The seventh grade Life Science class met every day for 50 minutes. Hands-on activities or labs were part of Shannon's daily lessons. Students had selected their own seats in the beginning of the year, arranging themselves around eight black topped lab tables, each of which accommodated up to four students. Shannon observed that in each class the students segregated themselves both by gender and by ability with the seemingly brighter and more outgoing girls and boys forming the two most cliquish groups. One boy, Danny, sat by himself in the back of the room during his 1st period science class.

Shannon shared her observations from the beginning of the year. "I was too busy with all the other class details to be too concerned about grouping when I first started teaching. The students had formed groups naturally, and though these groups were obviously gender segregated, and possibly ability segregated, I decided to leave this problem to a later date when I had more time to deal with it.

"I did notice certain grouping patterns. The 'bright' kids grouped immediately -- boys in one group, girls in another -- perhaps based upon their friendships formed in their gifted/talented classes. These boys tended to look down on the less able boys and would constantly tease them. If another male student had to work with this 'alpha' male group, the brighter boys would make the new boy do the work while they overviewed and critiqued him. I seemed to have in each class a group of girls who were less academic than the others and more uncooperative and defiant toward me. They reluctantly formed a group of their own, but did not enjoy working together. The equivalent group of boys -- uninterested in academics -- invariably found each other right away, and tended to spend the class period reinforcing each other's off task behavior. I spent most of my management time on this type of group.

"The kids who were hardest to deal with, and the ones I worried about the most, were the loners -- the kids who didn't quite fit in with the others. One of these is a girl who is neglected at home. I thought she was slow until I discovered she didn't have glasses and couldn't see the board. She needed to be at the front of the room but another group of girls was there and didn't want her to join their table. Another girl has learning disabilities. She achieves at the 11th grade level when she is allowed to listen and write, but when she has to read from the board and write, her achievement drops to the 2nd grade. Her erratic performance was driving me crazy until I talked to other teachers and the counselor about her problem."

Shannon pointed to the back of the room. "Danny never found a group because of his peculiar quirks. I put him with one group, then another, but he couldn't get along with anyone. No one wanted to work with him. Kids complained that Danny leaned into their space, or kicked them, or disrupted their work. He tattled on them, and was often inappropriate in what he said and did. He never turned in assignments. One day I sent him to the back of the room for punishment and discovered he like playing there alone with Ratso, the class rat. Eventually, I let him stay at the back study carrel with Ratso if he did his work. That seemed to make him happy."

Groups

"After two months of teaching, I felt fairly comfortable with the students and wanted to do something about the inequities I had observed in the lab groups. I didn't like the same sex groups we had because the boys and girls never had a chance to work together cooperatively over a long period of time. I also found that unless I had specific tasks for each student in the group, the weakest person would be forced to do the writing. Generally, one person would emerge as the leader of the group and get the others working. A few students were doing most of the work and the rest were copying. My evaluation was coming up in a couple weeks and I wanted to have the students working in heterogeneous groups using cooperative learning skills prior to that. I decided to apply some of the strategies I had learned at the university to the lab the next day. We would have two weeks to work out any bugs that occurred."

The Incident

"The boys and girls in first period hated the new grouping from the beginning. They argued with me that I wasn't being fair; that they worked best with their friends. Some of the kids swore, and a few told me they wouldn't do the assignment -- it was "Stupid." The shy kids and loners who didn't fit into the groups got most of the negative comments. Jason yelled, "He's a jerk, no way!" when told he'd have to work with Bill. With a lot of effort I managed to get the students seated together in mixed ability groups of three, with each group having at least one girl. I left Danny in the back of the room doing a lab of his own. I gave instructions for the lab: each individual group was to have an experimenter, a secretary, and a director. For this first lab, they were to choose their roles, finish the lab by the end of the period, and turn in their written observations. I thought everyone would be very democratic and get along...how naive I was!

"Some groups argued among themselves for half the period over who was going to be secretary, the most unpopular task. In two-thirds

of all my groups the girls became the secretaries. In several classes the arguments over who would be the writer would continue until a girl would say, "OK, I'll do it." In one class all the secretaries were girls. Boys actually stood up and said, "This is a girl's job," or "Men shouldn't be secretaries." The director's role generally went to the most assertive student in the group. The more non-assertive students were picked on by the class bullies.

"The lab took two days to complete instead of one. Several student directors stopped working and as a result their groups fell apart. Two boys in one group started to fight across the lab table over a slur one had made about the other. They apparently had conflicts outside my classroom that I didn't know about before I put them together. The girls who didn't get along and who were in the same group tended to be very sarcastic with one another. The students hated me for trying to keep the mixed groups going. I sent a few boys to the office for disrespect, and a couple others sat outside the class door from time to time to cool off. The number of lunch detentions and referrals was higher than usual.

"I spent a large amount of time working with individuals, getting them to turn in anything. The work was sloppy. No one seemed to put much effort into it. Afterward, when the students went back to their original self-selected groups, they seemed much more vocal in their dislike of other people in the room. The result of my 'experiment' was that putting the kids in heterogeneous groups reinforced the negative stereotypes rather than sensitized kids to them. The weaker kids, boys and girls, were treated worse than they had been before my grouping experiment."

Reactions

"I struggled through this one lab, then abandoned my plans to use mixed grouping for the rest of the year. A parent called me after that first lab day and wanted to know why her son was put in a group with another boy who always bullied him, and why I didn't stop some of the name calling that went on. He had come home in tears and didn't want to go back to school the next day. The truth was that I didn't hear a lot that went on between students in the class. It was too noisy, had too many students, and was out of control. I only heard the most vocal students.

"I don't know anyone else here in the school who uses mixed grouping. I think it would benefit the students, but I don't want to take a chance on this disaster happening again. It took weeks to get the class to trust me. My management was shaky and the kids took advantage of it. The shyer kids didn't come around to talk as often..as if I had lost something in their eyes. The class bullies

were worse. Other teachers heard what had happened from the students, and approached me with this 'You poor new teacher, you'll learn' look. That made me angry. I didn't feel I should be blamed for trying something new in the class."

Reflections

"I may try to do mixed grouping next year, starting from the beginning of the year. I know that these kids have friends and they know who they work best with from being together in elementary school. I wonder how reasonable it is to put two or three strangers, or kids from different social groups, together and expect them to work well. But how long does it take to get students to work well together, and how do you do that? Is it possible for me to counter years of stereotypes in just one year in my class? The girls want to be popular, so is it fair to expect them to become assertive and stand up for themselves when they hurt their popularity? Could I expect the brighter kids to want to help the slower ones when it seems so boring to have to slow down? How do I teach kids about acceptance of differences when all they want is to be like their friends? And I never figured out what to do with kids like Danny who never fit in anywhere. I do know that I never want to face a day like that again.

MRS. JOHNSON HATES ME

ABSTRACT

Parental pressure encourages an elementary enrichment teacher with a strong math background to develop an accelerated math class for the school's 5th and 6th grade gifted math students. The female teacher carefully follows the guidelines established by her colleagues and principal for choosing the students and contacting parents, but her efforts are derailed by school politics, misunderstandings, and personal rivalries. The case follows the teacher as she attempts to place Nate, a math prodigy, at the proper math level, and how this attempt eventually involves teachers and counselors at all school levels in an increasingly complex dilemma.

The gender issues in this case stem from the elementary enrichment teacher's strong math background and the discrimination she felt from other teachers, both elementary and secondary, whom she felt were threatened by her strong content background, math ability, the math awards she had earned as an enrichment teacher rather than as a math teacher, and her persistence in trying to keep her gifted students out of the district's lock-step math system.

MRS. JOHNSON HATES ME

Introduction

Nina Martin looked at the sobbing 6th grader standing next to her desk.

"Mrs. Johnson sent you to the principal?"

"She said I was wrong when I told her she had a mistake on the board. And when I tried to explain it to her, she got mad and sent me to the office."

Nate wiped his face with his sleeve. "Mrs. Johnson hates me."

Nina, the enrichment teacher at Wood Lake Elementary School, knew that Nate had been getting poor marks all semester in his regular math class for what seemed to her to be minor things: forgetting to put a period after "ml" and "gm," as Mrs. Johnson insisted; solving simple arithmetic in his head; skipping problems he could easily do; having sloppy writing. Mrs. Johnson criticized Nate unnecessarily, Nina thought, for asking inquisitive questions and challenging the teacher's answers. But Nate was one of the most brilliant math students Nina had seen in her nine years as an enrichment teacher. In her math enrichment class last year, he was an "A" student who easily grasped algebraic and geometric concepts.

Nate was in the regular 6th grade math program this year. He was bored with the work and the slow pace of the class. "Mrs. Johnson makes a lot of mistakes," he had told Nina. "She doesn't explain things very well. All we do are dumb worksheets, and then she gives us the answers from the back of the teacher's book."

Nina was tutoring Nate secretly, at his father's request. The three 6th grade teachers at her school, led by Mrs. Johnson, had convinced the principal to eliminate Nina's proposed advanced math class this year because it "would take the 'bright lights' out of the regular math classes." From the enrichment class, Nina knew that Nate thrived on challenge and extra attention. The advanced math class would have been perfect for Nate and for other students with high math ability.

Nina looked at the disheveled, rumpled boy. She had counseled him in the past to "toe the line" with Mrs. Johnson; not to challenge what she said and to do the work she asked. Now it appeared that Nate was bearing the brunt of the conflict that had occurred last year between Nina and the other teachers at her school. Maybe her advice to Nate had been wrong. Mrs. Johnson would always find

fault with Nate, no matter how hard he tried. Perhaps Nate should be moved to another classroom...but whose? The two other 6th grade teachers were no better in math than Mrs. Johnson. The principal backed his regular classroom teachers and the status quo, so there was no point in taking the problem to him.

Nina had to tell Nate something...but what?

Background

Nina Martin had been Wood Lake's enrichment teacher for the past four years, ever since the school opened. She had established a reputation as a highly creative, bright, student-centered, and energetic teacher, well suited to the emotional and academic needs of the gifted students who qualified for her program. Nina had a math specialist credential from Michigan State University, and a master's degree in math education from Harvard. In 1989 she had won the Presidential Award for Excellence in Math Teaching. Her original curriculum materials in writing, math and social studies had gained recognition at the local and state levels.

Nina's enrichment classes were structured to supplement the regular classroom curriculum. Students who had composite scores at the 95th percentile and above on both achievement and aptitude tests were eligible to enter the program. Students generally worked on projects within their own areas of interest. In specific content areas, Nina would broaden the child's knowledge by giving the student more diverse, creative work at the same grade level rather than accelerate the student to the next grade's material. This class format enabled her to challenge the students without "stepping on other teachers' toes."

Last spring, Nate's father, Evan Parker, had come to see Nina. Mr. Parker was moving his family across town to a larger house in the Wood Lake area. His son was in an accelerated math class, through the enrichment program at his current school, and Mr. Parker wanted to know if Nina would provide the same acceleration opportunities for Nate in next year's math class that he had been getting since he was a first grader. Nina thought accelerating some students in math rather than giving them broad enrichment was a good idea and something she could easily put into practice within her program. For the past few years, she had been bothered by the remarks her high math students had made about their regular math classes -- how boring they were. She knew that in at least one instance, the teacher was excusing one of her high math students from the class so he could grade his classmates' math homework. She promised Mr. Parker to get back with him once she had checked things out with her principal.

Nina's principal told her the accelerated class was fine, but that she should come up with a plan that she could present to the other teachers during the next week's faculty meeting. Nina spent most of the week thinking about how she could schedule all the qualified students from grades K-6 into her room at least twice during the week, and still have one block of time free for an accelerated math class of 5th and 6th graders. She decided to open the class to any student who might benefit from it. She would have to ask the teachers to coordinate their math teaching times, so that all the qualified students could be "pulled out" together.

At the faculty meeting the following week, the teachers reacted favorably to Nina's plan. Nina suggested that the teachers themselves choose the students they felt would benefit from the accelerated class, as her principal had suggested. Nina offered several criteria that would help the teachers in their selection of qualified students: scores in the top 5th percentile on standard math tests, consistent "A" work in math, students who seemed bored or unchallenged. The teachers agreed to look for these characteristics and to adapt their next year's teaching blocks to coordinate with Nina's class.

By the next week, thirteen students had been identified as having the potential to benefit from Nina's accelerated class. The students' math scores ranged from the 60th to the 99th percentile. The teacher descriptions of the students' characteristics ran the gamut: hard-worker, brilliant, involved in lots of extra-curricular activities, lazy, spoiled, introverted, arrogant, "space case," manipulator, forgetful, responsible, careless, doesn't listen, artistic, argumentative, "BS'er." About half of the class would be composed of Nina's enrichment students; the other half were identified as "having potential." The next year's accelerated math class was shaping up. Nina realized it would take a lot of effort on her part to bring these diverse students together and to challenge all of them, but she was excited at the opportunity she would have to use the creative teaching strategies, manipulatives, and higher level thinking activities in a regular accelerated math class.

Confrontation

Two weeks after the faculty meeting, Mrs. Johnson came into Nina's room. Nina was grading papers at her desk.

"I've thought about your math class next year. I don't think it's going to work. June and I have changed our minds about having those students pulled from our math classes next year."

"Why?"

"Those students are our 'bright lights.' If they leave, the whole class is pulled down. They're the only ones who know the answers, or ask questions. If I didn't have someone like George in my class, I'd have to stand there all day before someone gave me the right answer. I'd never get through the material quickly enough."

"But do you think it's fair for the good math students to have to slow down for the poorer ones? George is far beyond what he's learning now. He's bored with the regular class. Don't you think he should work at his own level?"

"He can work at his level through your enrichment class, and he won't have to miss his regular math period. I don't want those kids pulled out of my math class. The other students would suffer for it."

When Mrs. Johnson left, Nina pondered her options. Mr. Parker and the other parents had already been told that the class was available to their children. It seemed too early to involve the parents or the principal in what might be no more than a bad day on Mrs. Johnson's part. Nina decided to check with June and Ralph, the other 6th grade teachers in the school. June and Ralph seemed much less enthusiastic now about Nina's accelerated class than they had been at the staff meeting. Both echoed Mrs. Johnson's concern about their classes falling behind if the "bright lights" were taken out. Nina knew that, although June and Ralph were excellent language arts teachers, neither one liked teaching math. Both relied heavily on traditional lecture, seat work, and drills. All three 6th grade teachers were balking at the new class, even though, Nina felt, their bright students were the most likely to benefit from it.

Nina stopped in the office to talk to the principal before she left school that day.

"I'll do whatever the 6th grade teachers want to do," he said. "If they don't want an accelerated math program, we won't do it."

Politics

At the grocery store that evening, Nina ran into Mr. Parker.

"I saw Mary Seiglund the other day," he said. "I told her about the new math class you would be starting. Her daughter, Karin, has been placed in Mrs. Johnson's class next year and Mary isn't too pleased about it. Her daughter's pretty good in math, her mother says, so I suggested she talk to the principal about getting in your class." Nina realized that this girl was not one of the students the teachers had selected. Mrs. Seiglund was, however, one of the main parent volunteers in the building, and very active in the local and state PTA.

The next morning, Nina talked to the counselor to see who had been added to her next year's math class.

"We added Karin Seiglund to the list," she said. "Mrs. Seiglund asked us to do it. The principal said OK." She closed the door to her office. "That afternoon Mrs. Johnson came down here, hot as could be. She really lit into Jack for approving another kid being taken out of her class next year without her permission. She said she thought the teachers had the final say on which kids were pulled for your new math class. Jack finally said that whatever the 6th grade teachers wanted was what he wanted. When Johnson left the office, she was a little cooler. But it wouldn't surprise me if she convinced Ralph and June not to agree to this class next year. I hear from other teachers that it might not work out."

Nina was troubled the rest of the day. It was difficult to keep her mind on her teaching. In the teacher's lounge at lunch, a friend confided that she had heard that Mrs. Johnson thought Nina was encouraging parents to call the principal in order to get their children out of her math block next year. Too, Nina remembered the caustic comments Mrs. Johnson had made when Nina had vehemently complained about a particular sub that the principal had insisted on calling first if there happened to be a teacher who needed a substitute. The sub had been the second finalist for a job at the school this past year, and rumor had it that she had been promised a first call each day as a consolation. This sub had no experience in math, and Nina hated to be forced to use her. When Nina returned to school after an absence, the students were always a day or two behind. Also, it took much longer to write her instructions to the sub in greater detail. Mrs. Johnson had said something about letting the kids have an easy day with the sub once in awhile; that they were "too brainy" already. Nina knew Mrs. Johnson thought the enrichment class was elitist. She wondered if Joyce knew the sub outside school.

That afternoon the principal came to Nina's door. "We're going to have to cancel the math class next year, Nina. A parent of one of your accelerated students called earlier. She said that a boy her son knew from another state was coming to live with them, and wanted the new boy to be with her son in your math class. I heard the 6th grade teachers have changed their minds about having an accelerated math class next year, so I told her the class was being dropped. Sorry, but I have to keep the other teachers in mind, too."

Nina thought of the thirteen students she had on her original list for the accelerated math class. She had called parents, looked over files, and had made a point of greeting them in the halls and talking to them on the playground. She thought what a waste of

potential it was to keep these kids in the regular math class, and how much her students had enjoyed the math sessions she ran in enrichment classes.

She looked at Jack, and wondered what she could do to help these students.

Compromise

"What about running an after school math class? I'd be willing to stay after school with the kids who could come, and that way the students wouldn't have to miss their regular math classes."

Jack thought for a moment. "Well, if you're willing to do it, I don't see how that could interfere with the other teachers. I'll let you know."

In a few days, Jack told Nina that her after-school class would be OK. He asked her to call the parents to let them know the in-school accelerated math program had been eliminated, and that the after-school option was offered in its place. The school received many calls from irate parents, but Jack refused to change his policy. The parents wanted to schedule a meeting for all concerned parents and involved teachers. The enrichment teacher from the junior high school called Nina to ask why Nina was trying to mess up her junior high enrichment program.

"If you accelerate these kids I'll have to fit them into advanced classes here. With our schedule-driven classes that's impossible. After a year, they'd have to be bused from their regular math classes at the junior high to the high school math classes, and back again. Our secondary schools are on different rotating schedules. It would be a nightmare to coordinate each student's schedule. And I don't have the time or the inclination to teach different levels of high school math to each group of kids as they come over...that's not my field."

The parents' meeting was attended by the high school math teachers and counselor, the junior high enrichment teacher, the elementary school parents who had asked for the meeting, and Jack, Nina, Mrs. Johnson, and Ralph. The high school math teachers said that accelerated students had been allowed into the high school math programs in the past, and though most of them were extremely good at conceptual understanding, they lacked the basic arithmetic skills, organizational skills, and emotional maturity required for high school classes. Many of them had not done well, and their lack of basic skills, combined with their immaturity, took too much of the teacher's time. The counselor said these students would eventually "get lost in the system." The math students should stay

with their peers through the junior high level where the academic and personal support structure was better. By the end of the meeting, the principal's decision stood. The thirteen students would remain in the regular math classes, but could attend an after-school accelerated class if the parents desired.

After Effects

In the weeks after the meeting, Nina noticed a change in the 6th grade teachers' attitudes toward her enrichment class. Ralph's students began staying in the regular classroom instead of coming to her room during the enrichment time. "He gives pop quizzes when we're gone," one student said. "We can't make them up and they count on our grade." June was outwardly supportive, but still used her "bright lights" to grade papers and xerox. She occasionally asked Nina to help with the math material. Mrs. Johnson never asked for Nina's help.

Nate was placed in Mrs. Johnson's class the next year. Mr. Parker asked Nina to tutor Nate in advanced math outside school hours. Mr. Parker insisted on paying Nina for her time. Both of them agreed to keep the arrangement secret because of the ethical considerations, the professional ramifications if the other teachers found out, and to protect Nate from harassment. Already Nate had begun to complain that Mrs. Johnson hated him, and picked on him in class. Nina knew Nate was an outspoken young man who needed proof before he would believe anything a teacher said. Nina enjoyed the intellectual challenge Nate provided. He needed to be in an environment that stimulated him, not held him back.

And now, five weeks into the new school year, Nate was standing in front of her, crying.

Epilogue

Nina told Nate to stay quiet in Mrs. Johnson's class until she could work something out. By working closely with Mr. Parker and the counselor, Nina was able to get Nate switched into Ralph's class. It wasn't the best placement for Nate's math talents, but at least Ralph wouldn't destroy Nate's self-esteem. Nina continued to tutor Nate privately through the rest of the year.

As Nina expected, most of the identified gifted math students could not attend her class after school. Many of these youngsters were also involved with music lessons, or after-school sports, or had to take the bus home right after school. The few students who could attend did so sporadically. Eventually Nina dropped the program.

At the beginning of the next school year, when Nate entered junior high, Nina discovered that all her math students had been placed in the regular 7th grade math classes. She called the counselor to tell them that most of these students were beyond that level; that they should be tested and placed appropriately. She got no response. Mr. Parker continued to be an outspoken advocate for acceleration, but in the end nothing was done.

Nina heard that the high school teachers felt she had "stirred things up" and had tried to "screw up the algebra program" at the high school level. She wondered if her national award had anything to do with the resentment she felt from the secondary math teachers, many of whom competed for the same award.

Nina's enrichment class has become a de facto accelerated math class for students who choose to do the work. Nina doesn't want trouble; she calls it enrichment.

THE TEACHER WHO KNEW TOO MUCH

ABSTRACT

In this case a teacher strongly identifies with a female student she has in her chemistry and physics classes. As she gets to know the student, she finds that the student's life parallels her own: an alcoholic father, too much family responsibility, not enough time for her own activities. The teacher has high standards and strict deadlines. The young woman cannot complete her spring project by its due date because of too many after school family duties. The teacher debates whether she should allow the student to turn in a late project -- something she has never permitted before -- because she understands on a personal level what this young woman's life is like.

The gender issues that arise from this case include: How flexible should a teacher be with established classroom policy in order to encourage a young woman's interest in science? How involved should a teacher become in the personal lives of her students? At what point does the time taken to support and nurture one student interfere with the time needed by the other students? Does the science teacher's gender and non-competitive classroom environment positively affect the attitudes of her female students toward science?

THE TEACHER WHO KNEW TOO MUCH

Introduction

What does a teacher do when she knows too much about a student's personal life? Does she give the student extra time, attention, and help -- time that could be spent preparing, grading, and helping her other one hundred and nineteen students? Does she make exceptions for deadlines because she knows why the work is not getting done? Is it beneficial for the student to be given preferential treatment? Is it fair?

The School

Manning High School is considered the elite high school in town. It is relatively new and, in contrast to the other three high schools in the district, has carpeted floors, clean bathrooms, and unmarked halls. To visitors, MHS gives the appearance of being a well-rounded college preparatory school where students and faculty find togetherness of spirit and pride in belonging. To an "insider," however, it does not feel this way. After five years of teaching at MHS, I have never felt a cooperative spirit among staff or students.

I believe that the lack of cooperation is a result of the high percentage of MHS students who come from professional homes where parents have high standards for their children as well as for the MHS staff. The pressure from parents and administrators for teachers to perform above and beyond their colleagues creates an atmosphere of stress that no one acknowledges. This is the atmosphere in which I work, and in which I first met Katie.

Katie

Katie was in my chemistry class during her sophomore year. She was a quiet young woman who sat in the back of the room on the right hand side. She didn't participate in class discussions very often. The only interaction I saw between her and her peers was with a girl who sat next to her and later became her best friend. Academically, Katie was an A student earning a D. She had problems with any class that required outside work and constant attendance, mentally or physically. I sensed she was a conscientious person but I couldn't understand why she wasn't turning in her work or coming to class.

I found out a year later when Katie was in my physics class. Little by little she began to see that I was trying to create a safe place so students could trust each other and learn to work

together. She saw that I cared; that I was interested not only in her academic performance but in her. Eventually, she began to tell me about her life.

Both her parents worked. Her dad was almost always drunk at night. After work, her mother sat in a chair all evening and watched TV. She told me that her sister and her sister's two year old son lived with them. Her sister worked and went out a lot and her parents had given Katie the responsibility of taking care of her nephew as well as taking care of the household chores. She told me that these things needed to be done and that she alone was the one responsible for them. She believed this sincerely. Occasionally she seemed resentful that she couldn't go out with friends or join a school activity. As I learned more and more about Katie and her home life, I felt sad and angry. I suppose a little sadness and anger was for myself, having grown up in similar circumstances.

The Teacher

I am the second oldest in my family, as was Katie. I, too, had to take care of the household chores and my little brothers. My sister, like Katie's, went out drinking and partying and took none of the responsibility for the family. My father drank constantly, and my mother was either yelling or watching TV. I got good grades in school and found some esteem in that. Katie, however, didn't do well academically.

I grew up with a lack of caring and consistency in my life just as Katie had. I think I went into teaching so I could provide a safe place, a class, where teenagers could get excited about science; where they could be loved for themselves, no matter how badly they performed. I wanted to provide students with a consistent environment where they had certain responsibilities and knew the consequences of their actions.

My classes are known as being hard yet fun. For the most part, I teach upper level science classes (chemistry and physics) to college bound kids. I expect a lot from my students in terms of doing their own work and getting it in on time. I heavily penalize late work and in some cases will not accept it under any circumstances.

The Problem

In my physics classes, the students are required to do two major experimental projects. The first is a group effort during fall semester, and the second is an individual project during spring semester. The projects in the spring are displayed in the library for three days so that individuals in the school can look at and

play with them. This arrangement makes it impossible for the projects to be turned in late. I made no exceptions. I had devised a system by which the students had to give me a data update every two weeks for eight weeks before the project was due. This helped keep some students current, but there were still a few who chose to put their projects off. Katie was one of these people.

Two weeks before the projects were due I talked with her again about getting started. She had chosen the difficult task of setting up a holography lab at the university. Since my students had been using equipment and lab space there for four years, I knew that wouldn't be a problem. The problem was with the time it would take to set up the optics and find the correct laser exposure and developing time. Katie responded sheepishly that she had tried to go to the University lab two nights before. She had gone home from school first and was told by her mother that she had too much to do at home; that it was more important for her to be at home, and who the hell cared about a stupid physics project anyway because it certainly wasn't going to get her anywhere in life. I asked her if she wanted to do something else, a project she could work on at school or at home. Her response was a soft-spoken but emphatic "No."

Two days later, Katie approached me. I rarely saw her so excited. She had been to the University, she said, and had talked with Don Maler, a professor of physics, and with some of his graduate students about setting up the optics lab to do holography. Since they had never set up the holography lab before, they were eager to have the opportunity to assist Katie. Katie was to be the one in charge of the project. She was scared but enthusiastic. She went to the university two more times that week to look at equipment and go through catalogues to find film and developer. I heard from Don that Katie was doing a great job; that both he and the grad students were impressed with her knowledge, enthusiasm, and sense of what needed to be done. He felt she would make a good physicist.

The next week Katie told me that she had ordered the film and chemicals but that they wouldn't arrive until the day the projects were due to be displayed. I knew that even when the materials arrived there was no way Katie could get her project done before the end of the three day display period in the library. This was agonizing news. Although Katie never specifically asked for an extension (she would never ask for special treatment), I felt that I had to make a decision. I had made a deadline. I had never made an exception to a deadline. Should I make an exception now because I cared for this young woman and her success? I knew she could have started the project earlier. I also knew it was hard for her to get away from her family responsibilities and parents'

attitudes. I could see a glimmer of self-esteem when she talked about her project. Did I have a right to squelch her feelings of worthiness for an arbitrary deadline that I had set? Or did I have an obligation to her and the rest of my students to stick by my rules and deliver the consistent system that I promised them? It was a dilemma I wrestled with for many hours.

Epilogue

I allowed Katie to turn in her project late. In lieu of displaying it in the library, she was to give a presentation to the class. It was two weeks past the deadline before Katie finally completed all the project requirements. The presentation went well. The other students in the class saw a home-made hologram and learned about the process and concepts of laser photography.

As I look back, I don't know how my other students felt about my decision. I never asked. I know that Katie felt good about completing it, and about gaining the respect of Don and the graduate students, but I don't know how she felt about my extending the deadline for her. I wonder if she felt it was fair. As for me, I still don't know what decision would have been more beneficial to her in the long run. In my life, people have made exceptions for me. The funny thing is that the ones who didn't are the ones I remember --- and respect the most.

ONE PARENT COUNTS FOR THIRTY TEACHERS

ABSTRACT

This case concerns a female math teacher who has difficulty with a male student in her Basic Algebra class. The teacher, who believes she is following school policy, will not issue passes to students during the last ten minutes of the class period. The male student insists he needs a bathroom pass; the teacher refuses to give him one. The student challenges the teacher's rule by leaving the class without permission. In the ensuing action, the teacher perceives that the school administrators establish an inappropriate degreen of camaraderie with male students and give in to parental pressure by accepting the student's version of what happened in class by not punishing the student for leaving the class without permission and by implying that the problem resided with her classroom discipline.

The case brings up the following gender related issues: the differences between male and female classroom discipline styles; the standards by which female teachers are judged as classroom disciplinarians when the standards have been determined by male administrators; and the degree to which female teachers need to be backed by the school administration when physcial size and intimidation cannot be as easily used as discipline measures as they are by some male teachers.

ONE PARENT COUNTS FOR THIRTY TEACHERS

Part A

"Mrs. Brown, I have to go to the bathroom. I've had to go real bad since the beginning of class," said Trent. I looked up at the clock and saw it was 12:48. It didn't surprise me that Trent would be asking to use the restroom considering the talk we had a few days earlier.

"Trent, there are only twelve minutes left. Class will be over at one o'clock and then you can use the restroom." For a moment I thought back to my rookie year at Timberville High. At that time, the vice-principal in charge of discipline was adament about not over-using hall passes, and he was especially critical about teachers issuing them during the last ten minutes of class. Those days seemed to come from a different era.

I shifted my attention to Anne who had her hand up for help. I wanted Trent to drop his request to leave class and I hoped my attention to Anne would put an end to Trent asking again to leave the room. Besides, there were only twelve minutes left before the lunch bell would ring.

For several days I had been expecting Trent to ask permission to use the restroom to test me on an issue he had discussed with me a couple of days earlier. Then, Trent had asked me what I thought of a student who asked to use the restroom during class and a teacher who refused to let him go. "A counselor told me it was a form of child abuse if a teacher wouldn't let a kid use the bathroom." I imagined a class of 23 students all demanding to use the restroom during the last 10 minutes of class. This could become a problem.

I explained to Trent that the 15 minute breaks between classes provided the time to take care of students' personal needs. Trent didn't accept my reasoning. He stated, "If you have to go, you have to go, and you should be allowed to go."

I told him that if a person had this type of problem, he needed to plan ahead and make more use of the breaktimes to use the restroom. He interrupted and said, "There's not always enough time to go to your locker, the bathroom, and then to class."

I told him I thought ten minutes between classes was enough time to do all that. I also realized this conversation was making the initial child abuse question seem ridiculous. I felt an urge to end the conversation with Trent as quickly as possible, which brought me back to my current classroom conflict.

I aware of Trent walking back to his desk and of his negative body language. He began talking to Mary, his closest friend in the class. I could not hear what he was saying but I could tell by the way she was looking back at me that Trent was about to make his move. He looked at the clock, straightened his black leather jacket, picked up his math book and notebook, and, while walking out the door said, "Write me up."

Immediately after the bell rant, I went to the office with Trent's detention form. I planned to explain the episode and the earlier conversation between Trent and me to an administrator. I noticed the time at the office. It was two minutes after one o'clock.

I was surprised to see Trent in the office lobby talking with Mr. Hammet, the principal, and Mr. Gregory, the vice-principal of discipline. I assumed Trent was telling his side of the story. I was also eager to hear why Trent did not return to class after using the bathroom.

"Mr. Hammet, we need to put a time on the school calendar for our Timber Carnival," Trent said. "We want to have it during Spirit Week."

I realized after a few moments of confusion that Trent was not talking at all about leaving my class early and not being permitted to use the restroom. I was watching a completely different Trent! In contrast to his behavior with me, he was very respectful of the two administrators. He didn't appear to be suffering discomfort, as he had minutes earlier, from not being able to use the restroom. I also noticed he didn't have his math books with him.

My initial plan to speak with both principals and Trent was delayed when one fo the French teachers ran into the front office yelling that there was a fight near the front entrance. Both administrators left immediately, leaving Trent and me looking at each other.

"I would like to hear why you did not return to class. I noticed when you left you took your things with you."

"You wouldn't have let me back in and besides there were only a few minutes left before the bell was going to ring," said Trent.

I was surprised by his comment. "That is not true. Where did you go when you left class?" I asked as the tardy bell rang for the next class.

"I went right to the office. Right now I've got to go to shop class," said Trent. The front office had their hands full and I realized this affair would have to wait until after school.

When school was dismissed, I spoke with Mr. Gregory. I explained that Trent had left class twelve minutes early with his things and without permission. I told him about the conversation Trent and I had earlier, and Trent's feelings that denying students passes to the bathroom was child abuse. I also refreshed Mr. Gregory's memory that he had been talking with Trent a couple of minutes after one o'clock, just before the fight.

Believing I had past school policy to back me up, I also mentioned to Mr. Gregory about the numerous requests I had from students to leave class. The requests from Trent's class were especially abundant and I was concerned that this might become common practice in classes throughout the building and possibly a staff concern.

Students wanted to leave class for a variety of reasons. "I sprained my finger. Can I get some ice from the nurse?" or "Can I call my mom so she can pick me up after school?" or "I'm thirsty. Can I go get a drink of water?" or "Can I get some tissue from the bathroom to blow my nose?" I can remember Mr. Hammet telling the staff at an earlier faculty meeting, "Just tell them no!"

I asked Mr. Gregory the building policy about using passes especially during the last ten minutes of class. He told me he couldn't make a blanket policy about passes, because every teacher ran his or her class differently. This surprised me because I thought the rule we enforced during my first few years at Timberville High was to minimize student time in the halls and maximize student time in the classroom.

Before I left Mr. Gregory's office, he informed me Trent did not serve after school detentions, at his mother's request, and that when Trent had accumulated three detentions, he would serve a day of in-house suspension instead. I felt frustrated and disappointed in the system.

The next day before lunch, Mr. Gregory spoke with me about Trent. Trent's mom had called him home at during the previous evening. He said she was not happy that Trent was not allowed to leave math class to go to the bathroom. She claimed her son had had diarrhea. She wanted to schedule a parent conferenced immediately with the teacher who forced her son to leave class under such conditions.

Mr. Gregory asked me if there were alternative ways, such as lunch detention, to deal with the situation. I told him I did not monitor lunch detention for students I disciplined. I thought this was an unusual request from an administrator considering the school has an in-house suspension and after school detention room. Before I left for lunch, Mr. Gregory maded the statement that office-generated detentions may not exist anymore and teachers may have to find alternatives for handling their own classroom discipline.

Mr. Hammet, the principal, called me into his office later that afternoon and wanted to know the details of the incident with the students who had diarrhea in my class. I was feeling slightly concerned about the apparently negative perspective that administration now took of my problem. What was the real issue here and what had the issue turned into? This situation seemed to be detouring the wrong way and I did not like manner in which my judgment was being doubted and criticized. I felt as if I were running an obstacle course, and I had better things to do than to spend a lot of time explaining and defending my position.

Was all this discussion and time worth it? I decided it was because passes to leave the classroom interfere with learning and affect the goals and objextives I plan for my students. Spending time now seeking a solution points out to students that I value classroom time. Although I felt my jugment was being doubted, I did not make these concerns and feelings known to Mr. Hammet.

Mr. Hammet said there would not be a parent conference. Instead, we would meet with the student. He advised me, "You need to be more clear, Mrs. Brown, about instructing how students are to leave your room." He said he would personally ask the student if he indeed relieved himself and tell him that this behavior was not to be regarded as a way to leave class whenever he pleased.

When the meeting ended I was left with the impression that a decision had been made on the phone with the parent and that it no longer mattered what my opinion was.

The next day, Trent and I met with Mr. Gregory in his office. Trent was asked to explain where he went after he left class. Trent said, "I went downstairs to the bathroom across from the office, then put my books away and went straight to the office."

Both Trent and I sat across from Mr. Gregory's desk. He said, "The detention will be dropped this time. Trent, do not go back to class and say 'I got out of this one,' and encourage comments from Jeff and Dan. And you understand that it is not child abuse from Mrs. Brown to ask your or another student to wait."

I felt as if I had been knocked down and I was the one who had been disciplined.

Teacher History

I have been a teacher for nearly ten years with my first teachign position in Alapaka, a small Native American village on the mouth of the Kwinluk River. I also student taught in a small rural village outside McGordon. I taught in Alaska for three and one half years before moving to Pine Ridge.

I have been at Timberville for six years and have taught different levels of algebra, computer programming, trigonometry and analytic geometry. The math department has six teachers and, except for one year, I have been the only woman in the department. I feel the members of the department work extremely well together and accept each other's teaching and personality styles.

The Class

There are 23 students (11 boys and 12 girls) in this class. Twelve of them are repeating the course from the year before. There are 11 freshman taking the class for the first time. Three of the students who are repeating are integrated from the resource room. Three other students failed Algebra I the year before and have been dropped back to elementary algebra. Two of these students, Jeff and Don, are extremely bright. Jeff has taken "The Nature of Technology" course and passed with a C grade which seems to indicate he would do well in his math classes. Jeff recently commented, "I swear the only reason I come to school is to know where the parties are on the weekend." Even though both have been failing, I feel they are misplaced in my class because they already know much of the course skills and content. Jeff and Don have recently started working harder to improve their grades. Neither wants to be in this class another semester. After this positive change in behavior, Don came to class the other day and said, "I'm going to transfer to East Pine Ridge High School so I can play football there next year."

Three other students, a freshman boy, a sophmore girl, and a junior boy, are brothers and sister from the same family. Katie, whom I had in the same course last year, sits in the front of the class and has been a model student this year. She says, "I want to pass and never have to take a class over again especially with my brothers." This year she is achieving in the B+/A- range. Her older brother, Dan, often comes to class late with a pass from the office or had an unexcused tardy. He behaves like he has just rushed back from someplace or is impatiently waiting to get somewhere else with little concern for math inbetween. Dan also was participating in the STARS drug intervention program and is usually absent once a week for his group's meeting. Katie's younger brother, Sam, has a learning disability and occasionally asks to work in the resource room because the class is too noisy.

Three other boys in the class are athletes on the football and basketball teams. Bill's personality appeals to many of the girls in the class. Bill and his female "fans" work routinely on passing notes back and forth rather than on math. Mark, a sophmore, is starved for attention and frequently interrupts direct instruction by sighing, leaning back in his chair, or slamming his book down on

the desk and then apologizing. He tends to do what is necessary to get the class focused on him instead of the lesson. He seems to know when and what "buttons" to push without suffering too many negative consequences. Phillip, a senior, has math anxiety. It took the administration several weeks to track him down and get him to attend class. During this time he had his counselor, parents, and teachers convinced he didn't need this class because he was taking math correspondence. The bottom finally dropped out and the charade ended after a quarter when he was told he needed the credit to graduate.

It is difficult to predict how this class will respond to me, to each other, or to the lesson from day to day. It depends upon student absences, a student arriving late from another class, students being uplled out by counseling or the office or their frequent requests to leave class. It literally feels like riding a roller coaster.

The School

The town of Timberville, population 4,000 is located 20 miles south of Pine Ridge, a community of 45,000. Pine Ridge supports several major businesses, transportation, tourism, an international airport, and a university with 12,000 students. Timberville is supported by two major businesses, a pulp and paper mill which employes 600 people and mining in rural areas.

Timberville High School, home of the Lumberjacks, has nearly 700 students who are busssed in from as close as two miles and as far away as 40 miles. Many of the high school students have a reputation of being rough, undisciplined and disinterested in academics as compared with the two other high schools located nearer to the university.

The Timberville High administrators consist of one princpal and three vice-principals each one individually responsible for discipline, attendance, and extra-curricular activities. Since teaching at Timberville, I have noticed a change in the manner discipline is handled by the administration.

The past discipline policy had firm consequences. If a student did not show up for detention, the student spent the next day at in-school suspension. Teachers were responsible for assigning homework to students in in-house suspension. If a student did not follow the rules during in-house, the student was giving three days of out-of-school suspension.

During my first few years are Timberville, students were not allowed to be in the building after school unless they were under

direct supervision of a sponsor. The gates preventing access upstairs were locked daily at 3:30 p.m. It was routine for the vice-principal to come on the intercom system at 3:00 p.m. and direct students to the commons area. Sponsors were asked by the administration to be with their students. During this time, there seemed to be fewer students not involved with school activities in the building after 3:00 p.m.

The present policy appears to be more relaxed. More students are staying after school who are not participants of a school sponsored activity. When a student is asked, "Where is your sponsor? Where are you suppose to be?", the student typcially responds, "I'm waiting for my mom to get off work for a ride," or "I'm doing my homework." The school appears to be more inviting for students to stay after school. But these students who are not involved in an activity are more likely to be unsupervised.

During the time I've been at Timberville, the school district adopted a new policy for dealing with students who were reprimanded for drug and alcohol use at school. There is more consideration and effort to find ways for students-at-risk to stay in school. In th epast if a student had a drug problem and was using drugs at school, the student was suspended for 10 or 20 days. Under the present policy, the same student will be suspended for three days and is required to participate in the school's drug intervention program in order to remain in school.

It also appears that students who are easy to reprimand are the students who are disciplined and who serve detention. The chronic offenders appear to get more breaks, more concurrent detention time, or "get off the hook." It appears that when parents complain loudly, the situation is re-evaluated and deals are made. Some teachers have complained about discipline inconsistencies. Some students say they never have to serve detentions. Also, several female teachers have commented that they do not feel supported by the male administrators when students are written up for discipline matters. Many of these cases are not dealt with quickly and require more than one meeting with the administrator, phone calls back and forth with parents, and a conference with the student before the situation is remedied. A union representative in the building began documenting cases that dealt with how discipline was handled. As one female teacher said, "When I give a detention, I expect the administration to back me up. I don't expect my professional judgment to be questioned to such lengths regarding discpline in the classroom."

End of Issue?

Three days after the meeting with Trent and Mr. Gregory, it appeared this case was over, or was it? Trent didn't receive any

discipline other than speaking with the principals a couple of times while I had to defend my decision not once, but several times. I initially felt I made the right move by asking assistance from the administration. Is it not their job to support teachers and classroom instruction? But once the administration became involved, another set of confrontations emgerged.

I am bothered by the fact that it took so long to work out a solution, and each time another person became involved the situation became more complex. I am not responsible for how trent behaved, and was disappointed with the administration's reaction. Why couldn't the administration understand by position that Trent's leaving class was unacceptable and merited consequences?

If Trent's mom had never called the school and complained, would the outcome have been the same? Would the administration's actions have been the same if Kent "Viking" Hensen, a strong disciplinarian from the P.E. department, had written up Trent instead of me?

Epilogue

It is several months later and I remember the incident clearly. Trent's class continues to be challenging though we have made some valuable educational gains. I rarely write detentions other than for tardies. I feel I have the support of the class if I am consistent and hold them to expectations they believe they can achieve.

Now, when I write a pass for a student, I think momentarily that "one parent counts for thirty teachers" and the consequences that developed. This experience has required me to think about my teaching approach and mannerisms as I deal with conflict and discipline inappropriate classroom behavior.

I have examined my own style of communication more closely and realize that I am a quiet and steady type. I value loyalty, dedication and commitment. I could benefit by being more extroverted in communicating my expectations. I tend to come across to others as a compliant type which is not how I see myself. This is why I felt frustrated with the results of this incident.

I learned a valuable lesson about inviting the administration to handle my classroom discipline. My involving the administration, I was saying I needed help and consequently I lost some control in what the outcome would be.

If I know the student's parents and the parents have a history of siding with their child, then is it worth it to force the issue or do I compromise? Am I choosing to deal with conflicts that are easy and avoid ones that are difficult? Ultimately, what have the student and I gained or lost in terms of education and reputation?

APPENDIX

Background Articles

on Gender Equity Issues

to Accompany Teaching Cases

MYRA SADKER, DAVID SADKER, AND SHARON STEINDAM

Gender Equity and Educational Reform

A review of the literature and a survey of practitioners' views show that the reform movement has done little to promote educational equity or close the gender achievement gap.

The glaring omission of equity concerns, particularly the needs of girls in schools, from reform agendas suggests that the movement itself is in need of reform. We recently assessed the state of reform from the perspectives of policy and practice, undertaking a comprehensive review and analysis of professional literature and, at the same time, conducting a nationwide survey to determine the reactions of practicing educators to the reform reports. Here we discuss the major emphasis of our study: the reform treatment of educational equity, with particular focus on the gender achievement gap.

The Silent Treatment

In our study, to obtain a clearer picture of the professional response to the reform movement, we conducted a line-by-line content analysis of each article on reform appearing between January 1983 and January 1987 in nine professional journals, selected for their prominence in the field.[1] We had trained a team of raters to use the content analysis instrument we had designed, subsequently establishing and maintaining inter-rater reliability at 85 percent agreement.

The 138 articles we analyzed contained 68,660 lines, of which approximately 10 percent addressed the broad topic of equity. Sometimes writers concentrated on this issue, but more often equity was only one of several concerns they raised about reform. Authors worried that the movement was elitist, with too much attention paid to the college-bound and too little effort to help less able students meet the new higher standards. Specifically targeted were the detrimental effects of tracking and the negative impact of competency tests on minority teachers.

Only 1 author out of 183 discussed sex differential treatment in classroom interaction, in athletics, or in the curriculum.

Only 1 percent of article content pertained to gender equity, and even then it was an afterthought. Typically, phrases such as *gender equity*, *sex equity*, or *the needs of girls and women* were tagged on to an article whose main focus was a different topic. Except in one article, no author noted the achievement gender gap as measured by the National Assessment of Education Progress, the Scholastic Aptitude Test, or the Graduate Record Exam. Only 1 author out of 183 discussed sex differential treatment in classroom interaction, in athletics, or in the curriculum.

Containing by far the largest number of articles in our study, *Phi Delta Kappan* was slightly above the equity average with 13 percent of content devoted to the broad issue of equity and 3 percent of this on gender equity. The four articles in *Harvard Educational Review* gave 30 percent of content to equity. Almost 60 percent of the

content of the two articles in *Review of Educational Research* was on equity, and 7 percent of this was on gender equity. Journals that gave the least attention to equity were the *NASSP Bulletin*, *Educational Leadership*, *Journal of Teacher Education*, *Teachers College Record*, and *The Elementary School Journal*.

Women were absent not only from narrative content but from authorship and illustrations as well. Of the total of 183 authors who wrote the 138 articles included in this study, only 38 (21 percent) were female. Of the 685 authors and researchers noted in bibliographic citations, 518 (76 percent) were men.

Sometimes the journals, particularly *Phi Delta Kappan* and *Educational Leadership*, attempted to enhance narrative with drawings and photographs. The 157 photographs we examined included 86 males and 71 females. However, only 12 minority group members were depicted in photos. Further, the drawings, products of an illustrator's mind rather than a snapshot of reality, were far more biased than photos: the drawings depicted nearly twice as many males as females. Amazingly, only three minority group members populated these drawings, and none of the three was female.

Thus, we included that, in the professional dialogue about education reform, gender equity received the silent treatment.

Voices from the Schools

When we found that fewer than 10 percent of the articles analyzed had been authored by teachers or administrators, we deduced that practicing educators had been relegated to a minor role in improving their field. To determine what practitioners thought, we surveyed their reactions to specific reform recommendations and their impressions of the impact of the movement on daily school practices in general and, in particular, on opportunities for females and minorities.

We targeted teachers and administrators in three national organizations to receive questionnaires: National Education Association, National Association of Elementary School Principals, and National Association of Secondary School Principals. Out of the 537 questionnaires mailed to representatives in every state, 304 (57 percent) were completed and returned.

The majority of the respondents reported that the reform movement had done little to increase the academic achievement of females, with 57 percent seeing no increase in their academic performance and 11 percent believing that it has improved. Nor have minorities benefited, according to 65 percent of the respondents. When asked to rank-order the factors that have promoted educational opportunities for females and minorities, these educators cited civil rights legislation and political action; the reform movement was far less often seen as a beneficial influence (see fig. 1).

The reform reports and the professional dialogue they have spawned fail to take into account the substantial body of research concerning different educational experiences and outcomes for boys and girls.

	Percents		
	Yes	No	Don't Know
Has the reform movement increased *female*			
academic achievement?	11	57	32
interest in math and science?	17	52	1
entrance into education administration?	34	60	6
interest in nontraditional careers?	31	37	32
participation in sports?	33	53	14
self-esteem?	24	34	42
retention in school?	7	52	41
Has the reform movement increased *minority*			
academic achievement?	22	65	24
interest in math and science?	14	54	32
entrance into teaching?	11	78	12
entrance into education administration?	16	76	8
entrance into college preparatory programs?	12	49	39
career expectations?	20	41	39
self-esteem?	20	44	36
retention in school?	6	58	36

Fig. 1. Practicing Educators' Perceptions of the Impact of the Reform Movement on Educational Equity

What the World Needs Now: More Women in Mathematics and Science

Joy Wallace

"Expanding Your Horizons in Science and Mathematics" conferences are designed to nurture girls' interest in science and math courses and encourage them to consider nontraditional career options. The conferences were originated in 1976 by the Math/Science Network in Berkeley, California; since then, more than 142,000 students and 21,200 parents and educators have participated. Every year about 75 meetings are conducted in 20-25 states.

A typical conference takes place on a Saturday at a college or university and is attended by 200-500 young women from middle schools and high schools. The agenda includes a keynote address encouraging girls to persist in mathematics and science courses and two varieties of workshops. In some of the workshops, role models share career awareness information, including job satisfactions, necessary training, and a description of a typical day on the job. Other workshops feature hands-on activities related to a math or science career; workshop titles include "Designer Genes" (classifying genes using a microscope); "Are There Stars in Your Eyes?" (assembling and using a telescope); and "You've Got to Draw the Line Somewhere!" (designing and drafting a building).

Three major outcomes result from Expanding Your Horizons conferences. First, each participating community establishes a volunteer conference planning committee representing a wide range of community groups. Next, each committee develops an active pool of women who work in math- and science-related careers to serve as role models for these students. In 1988, for example, over 5,500 professional women volunteered as conference planners and career role models. Last and most important, young women take more math and science courses—and begin to think of themselves as future mathematicians and scientists.

The Math/Science Network provides sponsors with technical assistance, conference and planning materials, and support services such as coordinated publicity, public relations posters and buttons, and networking among sites. For information about sponsoring a conference in your community or school, or to receive a list of conference sites, please call the author at (415) 841-MATH or write to her at the address below.

Author's note: See B.G. Davis and S. Humphreys, (1983). *Evaluation Counts* (Berkeley, Calif.: Math/Science Network) for the results of a National Science Foundation longitudinal study that measured the impact of the conferences.

Joy Wallace is Program Director, Math/Science Network, 2727 College Ave., Berkeley, CA 94705.

In the professional dialogue about education reform, gender equity received the silent treatment.

Gender: Our National Blind Spot

The reform reports and the professional dialogue they have spawned fail to take into account the substantial body of research concerning different educational experiences and outcomes for boys and girls. Consider the following:

- Between 1970 and 1984 the National Assessment of Educational Progress conducted three assessments of reading achievement. While girls continue to outperform boys at the 9-, 14-, and 17-year-old levels, the achievement gap between the sexes has narrowed as girls' performance remains stable and boys continue to make achievement gains. A 1985 National Assessment of Educational Progress showed that by ages 21-25, males have caught up with females in reading and literacy proficiency (Mullis 1987).
- Males outperform females substantially on all subsections of the Scholastic Aptitude Test (SAT) and the American College Testing Program Examination (ACT). The largest gap is in the math section of the SAT followed by the ACT natural science reading, the ACT math usage, and the ACT social studies reading (Dauber 1987).
- On the College Board Achievement Tests, which are required for admission to more selective colleges and universities, males outperform females in European history, American history, biology levels 1 and 2, and mathematics (Stanley 1987).
- Girls attain only 36 percent of the National Merit Scholarships (more than 6,000) awarded each year. These awards are based on the higher Preliminary Scholastic Aptitude Test (PSAT) scores attained by boys (PEER 1987).
- On tests for admission to graduate and professional schools, males outperform females on the Graduate Record Exam (GRE), the Medical College Admissions Test (MCAT), and the Graduate Management Admissions Test (GMAT) (Brody 1987).

Girls encounter sex bias in the classroom as well as on the athletic field (Sadker and Sadker 1985). Report card grades, awarded for compliance as well as achievement, mask much of this educational deficit; but other measures, including standardized tests, highlight the need for gender equity in schools. Girls are the only group who enter school scoring ahead and 12 years later leave school scoring behind. The decline of academic achievement experienced by half our population remains an invisible issue.

The Case for Real Reform

To ensure all America's children a window of opportunity in the nation's classrooms, a *reformed* movement

should address the academic deficits of girls and minorities with the same fervor and finances devoted to resolving academic problems that historically plague boys. Low reading achievement, for example, has been addressed with federal programs and funds; this priority has been especially helpful to boys, who have outnumbered girls in these programs at a ratio of more than five to one. The math and science deficits that so frequently trouble females and minorities should receive similar attention and resources.

Although half of America's classrooms are sex segregated—in classroom seating, work groups, and informal interactions—educators and the public seem unaware of this gender line or of its implications. We know that there are boys' areas and girls' areas of the classroom, but we do not know enough about the impact of this informal gender separation (Sadker and Sadker 1986).

In addition, a contradiction exists between national standardized test scores, where boys outperform girls by the secondary school level, and report card grades, where girls outperform boys. The contradictory results of these two assessments need to be examined, as well as bias in the standardized tests and bias in report card grades.

Girls and minorities are shortchanged in the critical currency of classroom interaction. Teachers from grade school to graduate school ask males more questions, give them more precise feedback, criticize them more, and give them more time to respond. Whether the attention is positive, negative, or neutral, the golden rule of the American classroom is that boys get more (Sadker and Sadker 1986). The inequities in teacher-student interactions are reinforced in the curriculum. Females are less likely to be studied in history and read about in literature; and math and science problems are more likely to be framed in male stereotypic terms. Even the illustrations in most textbooks depict a world populated and shaped mostly by males (Klein 1985).

A contradiction exists between national standardized test scores, where boys outperform girls by the secondary school level, and report card grades, where girls outperform boys.

Nor are these the only national blind spots. Steps toward economic improvement for women and minorities have been slow, and persistent economic differences suggest the need to look more closely at academic and career counseling at school. And school itself presents a model of economic inequity, with too few women and minorities in positions of leadership. The educational medium and message combine to form a subtle pattern that slowly takes an academic and psychological toll.

The present reforms, promulgated with little participation from practicing educators and unresponsive to the majority of the nation's children, are indeed a limited blueprint for education in the 21st century. From the classroom to the workplace, real education reform will require well-informed research, policy, and day-to-day action. As practitioners and policymakers, professors and politicians struggle to reform education reform, equity must take the highest priority.□

1. Fifty-eight of the articles were published in *Phi Delta Kappan*, 26 in *Educational Leadership*, 26 in *NASSP* [National Association of Secondary School Principals] *Bulletin*, 8 in *Journal of Teacher Education*, 5 in *The American School Board Journal*, 5 in *Teachers College Record*, 4 in *The Elementary School Journal*, 4 in *Harvard Educational Review*, and 2 in *Review of Educational Research*.

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Authors' note: If you are interested in receiving more information on the studies described in this article, you may write to David and Myra Sadker at the address that follows.

Myra Sadker and **David Sadker** are both Professors, School of Education, American University, Washington, DC 20016. **Sharon Steindam** is Principal, Thomas Jefferson Intermediate School, Arlington, VA 22204, and a doctoral student at American University.

. . . About Girls and Science

By Carol A. Klein

If we are to improve science education for girls and young women, we must begin early. As the assessment tests and the research studies indicate, differences between boys' and girls' achievement, attitudes, and interest begin in the middle elementary school years.

Current research studies and national and state assessment tests show that after the fourth grade, girls are less likely than boys to have an interest in science, to elect a science class, or to experience success in the science classroom. This development contributes to the fact that women represent only 9 to 10 percent of the scientific and engineering work force in the United States, Great Britain, and Canada.

What factors influence the interest and achievement of girls and young women in science? What can educators do to improve the situation?

The summary of research presented below is based on an extensive review of the literature and analysis of assessment tests (see Resources). This review was the first step in a project (partially funded by *The Bush Foundation*, May 1986) designed to provide concrete strategies for teachers to improve science education for girls and young women.

Classroom Experience

The results of the National Assessment Test, the Minnesota Assessment Test, and the British Columbia Assessment Test indicate that girls in grades 4, 8, and 11 have had less direct experience with materials than they would like. Observers in elementary, junior high, and senior high school science classes see progressively less active involvement by girls as their age increases. As early as fourth grade, girls tend to take the role of recorder or passive observer in laboratory activities.

Responses to the "recognition of equipment" questions from the Minnesota Assessment Test reflect the different types of experiences boys and girls have. Fourth-grade boys answered these questions correctly only 1.2 percent more frequently than girls did. By eighth grade, however, the margin grew to 5.6 percent. The increase may be due to boys' tendency toward a more active role in the science classroom and to their participation in a greater number of outside-the-classroom science activities. Eleventh-grade boys recognized equipment 12.5 percent more frequently than did the girls. This may be related to the approximately 5:1 male to female ratio of students enrolled in physics and the 2:1 male to female ratio of students enrolled in chemistry, where students actually work with the equipment.

The Nature of the Test

Areas of the British Columbia Assessment Test showing the greatest differences between girls and boys were examined. At grade four, boys scored better on items related to activities that boys participate in more often than girls, such as using flashlights and batteries and making inferences about the motion of balls struck or thrown. Erickson and Erickson (1984) suggest that although girls also play with balls, they do not do so to the same extent. Thus they have a lesser context of experience in which to place subsequent class discussions about motion. Girls, however, did better on items such as opening a jar, using heat, and recognizing a word as a mirror image, again reflecting relevant experience outside of class. By twelfth grade, there were 34 points difference between the achievement of boys and girls in questions about functions of fuses and circuit breakers and 54 points in questions about carburetors in car engines. Boys scored higher in both cases.

In both the Minnesota Statewide Educational Test in Science and in the

National Assessment Test, the focus of the question influences performance. Boys did better on test items that had to do with mechanics, forces, and model construction. Girls did better on those about plants or health-related topics.

Science as Masculine

Science, particularly physical science, is viewed as "masculine" by many of the girls and boys responding in both the assessment tests investigated and the research studies reviewed.

As girls reach adolescence, the view of science as masculine is most pronounced. At this age, girls have the most intensified interest in sexual identity and the greatest need to conform to what they believe to be the model of "femininity." Physical science is seen as masculine because of its perceived emphasis on industrial and military applications. Biology may be more acceptable because of its involvement with living things and protection of the environment. (In the National Assessment Test results, for example, girls proved more willing than boys to help improve the environment.) Because of these perceptions, fewer girls enroll in science courses in secondary schools.

The image of science as masculine comes from many sources. Studies of textbooks, particularly for physical and Earth science, convey this message through their illustrations and narrative statements. Texts, both at the elementary and secondary level, show many more male than female figures. The males, in most cases, are actively engaged in science with direct hands-on ativities. Females, when shown at all, are usually passive observers or recorders of data. More than one researcher described the males as "doing" and the females as "posing" in the illustrations.

Other masculine images of science come from the idea of "sex-appropriate" toys. Chemistry sets, nechanical toys, models, and puzzles are usually packaged with illustrations of male figures, and the advertising media focus on their use by males. Certainly some exceptions were found, but traditional packaging and advertising continues to send a sex-appropriate message.

Involving girls in science requires direct classroom experience like that pictured above.

Spatial Abilities

Many educators feel that the ability to mentally manipulate or rotate an object in space and the ability to construct three-dimensional models are necessary skills in science. Understanding microscope cross-sections, recognizing a crystalline form in order to identify a rock, and constructing a molecular model as a three-dimensional figure are applications of such skills. There is no consensus among researchers as to the degree and nature of the differences in spatial abilities between boys and girls. The majority of research indicates that spatial ability differences do not appear until age 14 or 15. A few studies suggest these differences are genetically sex-linked and that males have a definite advantage. Most researchers, however, believe that the disparity comes from differences in the in-school and out-of-school activities of boys and girls.

Many studies showed that girls have equal or better spatial abilities than boys do in the early elementary grades. In Piagetian spatial ability tasks, males were superior in block rotation at the ages of 7, 9, and 14, but there were no sex-related differences in mental rotation or shape assembly tasks. In other studies, the spatial abilities of both boys and girls were improved by periods of classroom instruction in model building, working with three-dimensional objects, and solving spatial visualization puzzles. By the beginning of senior high school, boys began to show, on the average, a slight performance advantage in spatial ability skills tasks. Many researchers attribute the advantage to typically male activities, such as constructing models (car, plane, building), map making in Boy Scouts, and using telescopes.

Lack of Role Models

Some studies show that the number of women science teachers influences

enrollment, while other studies show no relationship. However, studies clearly indicate that the lack of role models in the science and engineering professions affects girls' perceptions of those careers. Several studies report that girls don't want science careers because they see science as cold and impersonal, and they believe women scientists are just the same—noncaring people who live "in their own world." The students were not surprised at the small number of women in the science fields; they felt that these women were probably like the stereotype in the preceding description.

As girls move ahead in the school system, they express even less interest in science as a career. Assessment tests show that little career education exists in science courses at any level.

Adult Expectations

If society considers science to be masculine, then parents probably won't encourage their daughters to pursue science in school or as a career. While these factors were relatively difficult to assess in their influence on girls and women, several studies outline the effect of expectations. In Saudi Arabia, for example, where society limits the number of acceptable career choices for women, only 5 percent of women pursue science-related careers. In Poland, societal views differ, and 60 percent of the women go into science. Some studies are in progress where early intervention has occurred and girls have been encouraged in science. These programs focus on early career counseling and active parent involvement. So far, secondary science enrollment has increased, but more time will be needed to find out if college course choices and career plans were affected significantly. The studies show that the schedule structure of many schools also conveys expectation messages to girls about their enrollment in science. In many cases, physics or chemistry classes are scheduled at the same time as advanced language, writing, or art courses. Girls participating in the studies frequently report this forced choice as their reason for not electing chemistry or physics. This

Girls need to take an active role in laboratory activities, not passive observation.

scheduling is not an accident of the computer nor a necessary concession to time constraints. In many instances, the schedule is set this way deliberately because of the perception that it doesn't matter—chemistry and physics are boys' subjects and language and art are girls'.

Many studies have compared achievement in, attitude toward, and perception of science in single-sex schools with that in coeducational schools. The achievement level of girls in single-sex schools was generally better than the achievement level of either boys or girls in coeducational schools. Girls in single-sex schools achieved as well or better than boys in single-sex schools. In single-sex girls' schools, many more students take physical and biological science, and when available, Earth science. More girls in single-sex schools select careers in the sciences. Families of girls in these schools, as well as the school personnel, don't appear to bear any sex-role prejudices, and the career options presented to students clearly include science.

The Classroom Approach

Studies indicate that a problem-solving approach is used most often in physics and chemistry, with more of a lecture and directed laboratory approach in biology. For the most part, the girls in the studies liked the more directed approach and "felt intimidated" by the more open-ended process approach. Some researchers suggest that physical science formats should be made less open-ended to appeal to girls, while others thought it important for girls to learn to approach science as problem solving. Many studies also suggested that the problem-solving approach intimidates girls not because of their inability to do it, but because of their lack of confidence in science.

This lack of confidence and reluctance at problem solving is not apparent on the part of girls in elementary school. In the 1981-82 National Assess-

mer Test, 65 percent of the girls answered that they would rather find out an answer themselves than have it told to them, compared with 57 percent of the boys. It is after grade four that other factors have an influence on this skill.

What We Can Do About It

The following strategies should help improve the interest, achievement, and attitudes of girls and young women in science if started in the early elementary grades and continuing through high school.

Increase direct experience in the classroom. Provide more hands-on experience for girls by doing science in single-sex groups. This should begin in the elementary school and continue until girls have had enough experience to be confident in taking the active role in laboratory experiences. Before using new equipment, such as batteries and bulbs, allow students time to become familiar with it. Do this particularly in areas that are traditionally male or where boys have more experience, such as using a compass.

Take the bias out of assessment tests. Work through local and state science organizations or professional teacher organizations to apply political pressure to testmakers. The questions need to be balanced between traditional boys' and girls' activities or be gender-neutral. Work with groups who are assessing standardized tests for sex-bias.

Change the perception of science as masculine. Evaluate text and curriculum material for sex-bias both in the illustrations and narrative sections of elementary and secondary science materials. Refuse to use those that are sex-biased. Enlist local, state, and national organizations in education to apply political pressure to the publishers. Get together with the entire faculty and administration to plan a strategy to eliminate sex-bias from the curriculum.

Correct disparity in spatial abilities. Beginning with grade one, implement programs devised to improve spatial abilities. Understand how spatial abilities are developed and use appropriate strategies for different developmental levels.

Make up for lack of role models and mistaken expectations. Implement a K-12 plan for career education in science. Devise a scheduling plan that does not force choices between arts and language and science.

Adjust your classroom approach. Focus on inquiry skill development in the elementary school. Incorporate single-sex laboratory groups.

In Conclusion

Numerous factors influence the achievement of girls and young women in science, their interest in science, and their attitudes toward science. Now that research has isolated the negative factors, we can at least begin the task of eliminating them. If girls and young women are not to remain the "disadvantaged majority" (Kahle 1982), then a commitment to improve their science education must become a joint effort for all of us. Since many negative factors come from society at large, people—including parents, guardians, and people in business and industry—need to become more actively involved. In addition, college and university faculties who work in science education for preservice teachers must concern themselves with answering the special needs of girls and young women. This goes for those leading inservice workshops as well. Once taken, these steps should result in a much needed increase in the number of girls in science.

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Carol A. Klein is a professor of education at The College of St. Catherine, St. Paul, Minnesota. Photographs by Maria R. Bastone, courtesy of the Girls Club of America, Operation SMART, New York, New York.

The guest editor of a *Kappan* special section on women in education asserts that females are still accorded neither equality of treatment nor equality of outcome in most schools. The situation qualifies as a major crisis in education, asserts Ms. Shakeshaft.

A GENDER AT RISK

by Charol Shakeshaft

SINCE THE CALL for excellence was first sounded in 1983 in *A Nation at Risk*, a lot of loose talk has blamed the so-called lack of excellence in the schools on the pursuit of equity. In retrospect, it appears that the release of *A Nation at Risk* was the event that those who are ideologically opposed to equality of education were awaiting to launch their attack.

President Reagan, for instance, claimed that one reason that the schools were failing was the attention that had been focused on female, minority, and handicapped students. He asserted that, if the federal government and educators had not been so preoccupied with the needs of these special groups of students, education in the U.S. might not have succumbed to the "rising tide of mediocrity." What the President failed to note is that, if these three groups of students are eliminated, only about 15% of the school population remains.

As troubling as it is to hear political and educational leaders falsely blaming the mediocrity of the school system on those who seek a system that offers women, people of color, and handicapped students a fair shake, it is even more disturbing to chart the failure of the public to see the reliance of excellence on equity. At best, the two are described as "twin goals"; at worst, the importance of equitable practices to excellence in education is flatly denied. By failing to articulate the relationship of equity to excellence or by perpetuating the myth that the two are unrelated (or, as the President and Secretary of Education William Bennett would have it, opposed), we make it easier to disregard equity as a national concern.

The rhetoric of both President Reagan and Secretary Bennett has created a false and dangerous dichotomy. The logic behind the attack on equity goes something like this: excellence and equity are different; equity threatens to take resources away from excellence; therefore, let's abandon equity as a national concern so as to pursue excellence exclusively.

Not surprisingly, this is precisely what has happened. Funding and support for equity-related issues have nearly disappeared at the federal and state levels. Equity is not merely out of fashion in the Department of Education — it has been declared an enemy.

The reality is that excellence cannot be achieved without equity. Although an equitable system might not be an excellent one, true excellence in education cannot exist without

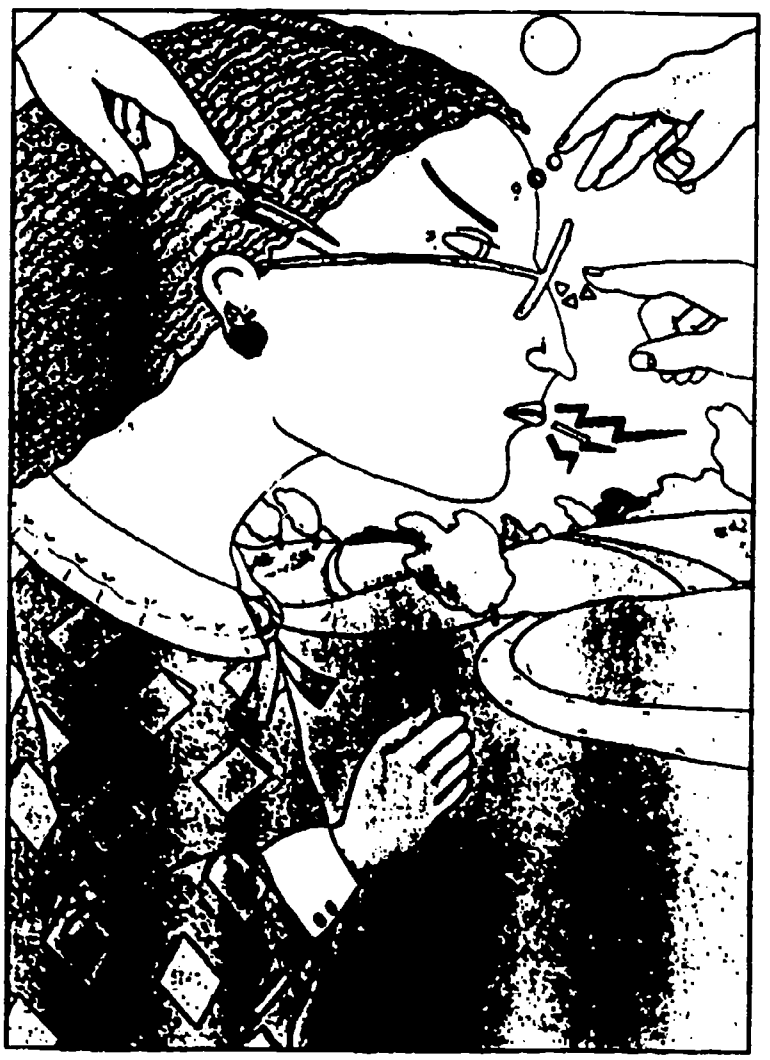

Illustration by Andrea Eberbach

CHAROL SHAKESHAFT is an associate professor and directs the doctoral program in Administration and Policy Studies at Hofstra University, Hempstead, N.Y.

equity. The two are not at odds; rather, they are dependent on each other.

Although all equity-related concerns have fared badly in the press, in the Department of Education, and in the reform movement generally, gender equity has been hardest hit. An occasional reference is made to racial or class inequality as a threat to excellence, but nowhere in the reform literature is the matter of gender raised. For example, in an analysis of the school reform reports, Mary Tetreault and Patricia Schmuck point out that "gender was not a relevant category in the analysis of the excellence of schools."[1] Elsewhere, the authors of *A Nation at Risk* inform us that: "All, regardless of race or class or economic status, are entitled to a fair chance and to the tools for developing their individual powers of mind and spirit to the utmost."[2]

Perhaps the failure to include sex between the commas in the preceding quote was more than an oversight. Maybe the writers were influenced by the reality that gender does limit the educational and life choices of females and that many people are satisfied with that situation.

Unfortunately, few schools provide an equitable culture in which all students and faculty members can grow. Most offer white males more options in an environment that is hospitable to their needs. Females and members of minority groups, on the other hand, must obtain their education in systems that are at best indifferent and at worst hostile to them. Women and members of minority groups learn that their concerns, their lives, and their cultures are not the stuff of schooling. They discover that school is not a psychologically or physically safe environment for them and that they are valued neither by the system nor by society. Few schools are equitable, and, not surprisingly, few schools are excellent.

"I think I'm on her hit list."

Although a number of definitions of equity exist, there is no universally agreed-upon approach for achieving it. Some educators favor equality of treatment -- offering each student equal access to programs while ignoring individual differences. Others hope for equality of outcome -- arguing that students' needs and backgrounds differ and that, if they are to leave the system with equal outcomes, they must receive individual treatment.

In attempting to understand the education of females, choosing one or the other definition of equity is largely moot, because females are accorded neither equality of treatment nor equality of outcome in most schools. In this article I will articulate the ways in which an inequitable system results in a poor education for female students, and I will demonstrate that, without gender-equitable schools, excellence will remain ever beyond our reach.

THE CULTURE OF SCHOOLS

There is a myth that the culture of schools is female and that traditional female behavior is rewarded while traditional male behavior is punished. Consequently, some educators have concluded that school is a good place for girls but not for boys. For instance, Theodore Sizer writes, "It is revealing how much less discrimination there is in high schools than in other American institutions. For many young women, the most liberated hours of their week are in school."[3] Sizer's conclusions strike me as shockingly out of touch with the bulk of research on the experiences of females in school. While the truth may be that schools are not good for boys or girls, the evidence shows that they are certainly *not* a nurturing environment for females.

Two messages emerge repeatedly from the research on gender and schooling. First, what is good for males is not necessarily good for females. Second, if a choice must be made, the education establishment will base policy and instruction on that which is good for males.

Goals of education. Most of the time, educators are unaware that a choice is being made and even less aware that they are choosing to perpetuate a male model of schooling. These choices are reflected in everything from what is taught in the classroom to the goals of education in general. For example, an analysis of the purposes of schooling by Jane Roland Martin concludes that schools were created to serve the public purposes of men's lives, not the private purposes of women's.[4] Martin suggests that education should serve both the public and private needs of all individuals, rather than merely the traditional public needs of men. Because schools began in response to what males needed to know in order to become public people, the very nature of schooling is shaped in a male image.

Structure of schools. Not only are the goals of schooling primarily male and public, but the process by which knowledge is transferred in schools is based on male development. Although females mature earlier, are ready for verbal and math skills at a younger age, and have control of small-motor skills sooner than males, the curriculum has been constructed to mirror the development of males. Decisions about the grade in which students should learn long division, read *Huckleberry Finn*, or begin to write essays are based on the developmental patterns of boys (and primarily white boys), not on the developmental patterns of girls (or of minority students). The result is that girls are often ahead of the game in some areas and never in the game in others. Some grow bored, others give up, but most learn to hold back, be quiet, and smile.

Even the very composition of schools shows more concern for male development. There is strong evidence that girls learn and grow better in all-female environments, while for boys the opposite is true. Academically, boys do equally well in single-sex and coeducational schools, but coeducational schools provide a secondary curriculum in social behavior for boys. Thus the best environment for a boy is one in which both male and female students are represented. For girls, a single-sex school provides more positive academic and growth experiences. In single-sex schools, girls exhibit higher self-esteem, more involvement with academic life, and increased participation in a range of social and leadership activities. And yet, when decisions about coeducation are made, one very seldom hears the question, "How will this affect female students?" Coeducation is a good thing for males, but not for females. Nevertheless, it is what we have in most public schools.

Instructional techniques. Teaching techniques also reflect the pattern of male needs. An examination of the use of competition as a learning style provides an illustration of the ways in which male development guides instructional style. From the bluebirds against the cardinals in a spelling bee to the boys against the girls in a game of math facts, pitting student against student in a win/lose contest is a common and accepted means of instruction in U.S. schools. Students learn not only how to compete but that competition is a worthy endeavor.

This "I win, you lose" philosophy is seldom questioned, is constantly reinforced in classrooms and on playing fields, and, according to Carol Gilligan, is not the best learning environment for girls. Gilligan found that boys gravitate toward competition while girls prefer connection.[5] For girls, "I win, you lose" is a problematic stance, since it is potentially divisive and threatens connections between group members.

The implications of this dilemma for girls are illustrated in the different ways in which girls and boys respond to conflict during a game. Janet Lever, confirming the observations of Jean Piaget, studied how children play and found that in games "boys were seen quarrelling all the time, but not once was a game terminated because of a quarrel."[6] Girls, on the other hand, tended to end a game when a dispute arose.

These two approaches reflect two moral ideologies that Gilligan labels the ethic of rights and the ethic of care. Schools are primarily organized around the ethic of rights – a morality more often comfortable for males than for females. The female morality of response and care is not highly valued, nor is it the basis of many teaching and learning strategies used in the schools. If we were to base instruction on Gilligan's research, we might change the learning environment in schools to make more use of cooperative approaches to learning.

In addition to the inherent value of Gilligan's work for education, it reminds us that much of educational and psychological research has been conducted using males – particularly white males – as subjects. Male behavior has all too often been generalized to all students. Gilligan's initial work was in reaction to Lawrence Kohlberg's research on moral development. Kohlberg studied males but generalized to both sexes. When female behavior failed to conform to his model, Kohlberg reasoned that females were deficient in moral reasoning, rather than that his model was inaccurate. Unfortunately, Kohlberg's methods are not unusual. The majority of what we supposedly know from social science research stems from studies of white males.

Teacher/student interactions. If instructional methods aren't enough to alienate female students, then the interactions between teachers and students trumpet the message that girls are not as important as boys. A number of researchers have studied teacher/student interaction patterns and have found behavior similar to that described elsewhere in this *Kappan* by Myra Sadker and David Sadker.

In the classroom, male students receive more attention from teachers than female students do. They are more likely to be praised, but they are also more likely to be reprimanded. Teachers instruct male students in performing a task, but they often do the task for female students. Teachers allow more opportunities for boys to respond – to answer questions, engage in activities, give opinions, help out, etc. The result is a classroom in which boys dominate. They talk more, interact more, receive more teacher time, and have more opportunities to learn. Boys learn to handle criticism because they have opportunities to respond that allow them to grow. Boys also have more opportunities to build self-esteem because they speak more and are more often praised and told that they have ability.

The average female is ignored – neither reprimanded nor praised. The high-achieving female receives the least attention of all students. Both majority and minority girls learn that their opinions are not valued, that their responses to questions are not worthy of attention. Consequently, female students come to believe that they are not smart or important. They learn that, if they do well in school, it is because they are lucky or work hard, not because they are smart or capable. The interactions of teachers with students reinforce the societal message that females are inferior.

Curriculum materials. Girls are further distanced from school life through the curriculum materials they encounter. Bias in books, movies, and handouts takes many forms, including the invisibility of female characters, blatant or subtle stereotyping, selectivity, unreality, fragmentation, and male-exclusive language. Whether it is the portrayal of doctors as males or the assignment of *A Portrait of the Artist as a Young Man*, female students are told repeatedly that their identities and experiences are not the stuff of literature or history.

Both majority and minority girls learn that their opinions are not valued, that their responses to questions are not worthy of attention.

Although a unit on women's history in a social studies class may deliver the message that women have a place in history too, it also announces that there are two kinds of history: American history, which is important and about men, and women's history, which is peripheral. Certainly teaching a section on women's history is better than not teaching anything about women at all. However, the failure to integrate female experiences into the general curriculum drives home the message that girls and their experiences are somehow "other," that they are not part of general literature and history. And if girls in general feel left out of the curriculum, minority females receive even less attention in the instructional materials used in most classrooms.

Female students are also ignored in textbooks and instructional materials through the use of male-exclusive language – language that is also used by most educators. Studies of language demonstrate that the generic "he" and other kinds of male-exclusive language are coded by both males and females to mean males only. For example, in one study in which young children were asked to draw a picture of a caveman, they drew pictures of a man. When they were asked to draw cave people, they included women and children.[7] Male-exclusive language in the classroom relentlessly chips away at female self-esteem. If a girl always hears that "he" means everyone, while "she" means females only, that girl is learning that females are less important than males. Those who argue that gender-exclusive language is unimportant should change all their "he's" to "she's" and see how important it really is. If the issue of language were truly irrelevant, there would be little resistance to changing it.

Remediation. As Selma Greenberg has pointed out, schools remediate the deficiencies of boys.[8] Remediation is largely a male business; the majority of students in special education and in remedial reading and mathematics programs are males. But this is not because females do not have problems. Unfortunately, girls' problems are left unattended in schools. If they are addressed at all, they are dealt with when the female becomes an adult – at her own expense and usually for the profit of some male who had his remediation at public expense when he was much younger.

Safety. School life for a girl often includes many kinds of abuse. Whether it is a male student calling her a bitch or a male heterosexual teacher propositioning her, a female student is always a potential target, just because she is female. Awareness of racism and anti-Semitism in schools has enabled administrators and teachers to demand that racist or anti-Semitic words be eliminated. Most administrators will take action when a racist or anti-Semitic word is spray-painted on a school wall, and few teachers will allow a racist insult to pass unnoticed in a classroom. Such slurs set off alarms for most educators.

And yet, when a sexist word is scrawled across the lockers or when a male student uses sexist language, the silence can be deafening. Few teachers even code it as a problem, and many of the insults and put-downs of girls come from teachers and administrators themselves. After all, boys will be boys, and girls will continue to receive their schooling in a hostile environment.

THE SCHOOL AS WORKPLACE

Not only are the needs of female students ignored in discussions of excellence, but the contributions of women teachers and administrators to excellent schools are also invisible. Perhaps even more dangerous, the suggestions that have been made for upgrading the profession of teaching are aimed at the needs and values of male teachers and administrators, not female professionals.

Studies of male and female teachers and administrators indicate that for a number of reasons (socialization, discrimination that has kept capable women in teaching but allowed capable men to enter other professions), women teachers and administrators are more likely to exhibit behaviors conducive to good schooling.

Teaching is often acknowledged as the ideal profession for a female. But is this really so? In this *Kappan*, Sari Biklen points out that female teachers view the teaching profession differently from male teachers. The research on women in administration finds similar differences.

The unwelcoming environment that female students experience also surrounds female teachers and administrators. A not uncommon illustration of female marginality occurred two years ago in a Long Island, New York, school district in which the male teachers pasted a nude centerfold over a poster announcing Women's History Week. The message was not only that Women's History Week is unimportant, but also that it is acceptable and humorous to equate Women's History Week with the viewing of women as sex objects. Women teachers were told that they lacked a sense of humor if they didn't laugh. Female students learned that women's history is a joke. Sadder still, the teachers who organized the events for Women's History Week were unsure whether they would make themselves so vulnerable in the future. If a similar insult had been made to Black History Week or to a commemoration of the Holocaust, school administrators and teachers would have been outraged, and they would have responded immediately, whether or not they were racist or anti-Semitic themselves.

This same environment encourages women to remain as teachers and discourages them from seeking to become administrators. This sex-structuring of the career ladder in education harms women students, women educators, and the educational system at large. It leads to a system that teaches students that positions of formal leadership belong to men, and it deprives education of some of its most capable leaders.

There is overwhelming evidence in the research literature that women do not become school administrators because of sex discrimination that devalues women. The primary reason that women are not hired or promoted into administrative positions is solely the fact that they are female. Literally hundreds of studies have documented direct discrimination against women, whether from negative attitudes toward women or from behavior that is harmful to them.[9] A comment from an aspiring school administrator reflects the sexism that controls the staffing of schools: "Silly as it seems, the fact that I was a woman seemed to be my biggest obstacle. My training is as good as many men's. My track record in school positions is good."[10] Interestingly, "competent" is an adjective used to describe acceptable women and minority candidates for administrative positions, but seldom white male aspirants. Only the Marines are looking for *a few good men*; school district personnel are notorious for looking for lots of white men and *a few good women and minorities*.

EXCELLENCE DEMANDS EQUITY

A school culture that is hostile to female students, teachers, and administrators is not a place that is conducive to their best efforts. If schools are to be hallmarks of excellence, they must pro-

A school culture that is hostile to female administrators, teachers, and students is not a place that is conducive to their best efforts.

vide environments that allow female students and professionals room to grow, to achieve, and to develop self-esteem.

The work of the Sadkers and of others demonstrates that teacher behavior can be changed and that these changes directly benefit students. There is a real relationship between a supportive, nonsexist environment and the productivity of students.

The same is true of female professionals. Studies indicate that — when female values and behaviors are allowed to dominate in schools — teachers, administrators, and students benefit. In schools and districts with female administrators, research tells us that achievement in reading and math is higher, that there is less violence, and that student and staff morale are higher. Studies of men and women administrators have found differences in the ways they approach the job and in the climate they create.[11] For example, in schools and districts with female administrators, the following things tend to occur:

1. *Relationships with others become central.* Women spend more time with people, communicate more, care more about individual differences, are more concerned with other teachers and with marginal students, and are better motivators than men. Not surprisingly, the staffs of women administrators are more productive, have higher morale, and rate women higher. Students in schools with women principals also have higher morale and are more involved in student activities. Furthermore, parents are more favorably disposed toward schools and districts run by women and are more involved in school life.

2. *Teaching and learning are the major interests of women teachers and administrators.* Women teachers and administrators are more instrumental in instruction than are men, and they exhibit greater knowledge of teaching methods and techniques. Women administrators not only emphasize achievement, but also coordinate instructional programs and evaluate student progress. Women administrators know their teachers, and they know the academic progress of their students. Women administrators are more likely to help new teachers and to directly supervise all teachers. Women administrators also create a school climate more conducive to learning — one that is more orderly, safer, and quieter. Not surprisingly, academic achievement is higher in schools in which women are principals.

3. *Building community is an essential part of a woman administrator's style.* From speech patterns to decision-making styles, women exhibit a more democratic, participatory style of leadership than men, a style that encourages inclusiveness rather than exclusiveness in schools.

Women involve themselves more with staff and students, ask for and receive more participation, and maintain more closely knit organizations. Staffs of female principals have higher job satisfaction and are more engaged in their work than those of male administrators. Staff members who work under female principals are also more aware of and committed to the goals of learning, and they share more professional goals with one another. In schools and districts with female administrators, teachers receive a great deal of administrative support. These are also districts and schools in which achievement is emphasized. Selma Greenberg describes the world of the female-administered school: "Whatever its failures, it is more cooperative than competitive, it is more experiential than abstract, it takes a broad view of the curriculum and has always addressed 'the whole child.' "[12]

The descriptions of schools headed by women tend to sound very similar to the descriptions of excellent schools. And yet very little has been done to examine why women tend to be more likely to promote and exhibit such behaviors. The link between female socialization and styles of effective leadership is ignored in the literature on school improvement. If one studies the culture of female educators, one begins to question whether the strategies proposed to encourage top-flight professionals to choose and remain in education are methods that will retain women. Studies of women educators find that higher salaries, though always welcome, and more levels in the hierarchy are not motivators for women. For women, less hierarchy and more emphasis on educational content and the development of a cooperative culture that validates both public and private values are what draws them into education. The solutions to the problem of the flight of the best and the brightest from education are currently solutions that target male, not female, teachers and administrators.

Excellence means providing a supportive environment for all students and staff members, including females. Educators have not taken sexism and its effects seriously enough, and, until we do, we cannot begin to change the culture of schools from one that is hostile to females to one that is educationally sound for everyone.

Paraphrasing the introduction to *A Nation at Risk*, one might characterize the environment for female students and staff members in public schools as a major crisis. If an unfriendly foreign power had attempted to impose on males the limiting and harmful education that exists for females today, we might all have viewed it as an act of war. In American schools today, females are truly a gender at risk.

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Finding Reality Among the Myths:

Why What You Thought About Sex Equity in Education Isn't So

IN THIS ERA of education reform, we often hear that inequitable education is a problem of the past, having been laid to rest in the Sixties and Seventies. Now it is time, the argument runs, to turn our national attention to achieving excellence rather than equity.

Is this an accurate portrayal of the reality of education as it is experienced by women and girls in the U.S.? Have we actually achieved sex equity in education in just two decades? Are females now receiving the same educational opportunities and services as males? And must we, therefore, assume that persistent disparities between the sexes are explained by individual differences and preferences?

Recently, many people have begun to answer these questions in the affirmative, pointing to such statistical evidence as higher rates of female enrollment in postsecondary education and increased numbers of advanced degrees earned by women. But do these figures provide a reliable picture of the educa-

GLEN HARVEY is director of planning and communication for the Regional Laboratory for Educational Improvement of the Northeast and Islands, at the NETWORK, Inc., Andover, Mass.

by Glen Harvey

Today we often hear that inequitable education has been laid to rest. Has it? Ms. Harvey explores a number of myths that cloud the discussion of this crucial issue. Equity and excellence can be achieved, she argues.

Illustration by Lev Kubernik

tional experiences of females or are they a hall of mirrors, seemingly valid but reflecting only widespread belief in persistent myths about sex equity in education?

To provide a reality-based appraisal of the educational condition of women and girls, 17 researchers and educators from across the U.S. were invited to a symposium on "Changing Myths About Sex Equity in Education" at the 11th Annual Research on Women in Education Conference, held in October 1985 in Boston.[1] From this session emerged a clearer understanding both of the myths that influence thinking and decision making about the education of females and of the reality that such myths disguise and distort.

Academic performance and student achievement provide the foundation for one of the most prevalent myths about sex equity in education. This myth can be stated simply: girls outperform boys in subjects that require verbal ability; boys outperform girls in mathematics and related subjects. As is the case with many of the myths associated with sex equity, a grain of truth lies behind this myth and enables it to persist. But the myth disregards recent contradictory evidence and reflects a distorted and oversimplified version of the truth.

Data from the National Center for Education Statistics (NCES) show that achievement test scores of high school seniors in 1972 support the relationship between females and verbal ability and males and mathematical ability. Boys achieved higher scores in mathematics, girls in reading and vocabulary. By 1980, however, a different picture was emerging. Between 1972 and 1980 the advantage of females over males in reading was all but eliminated. Boys actually outperformed girls in vocabulary in 1980, and they continued to maintain their edge over girls in mathematics.[2]

Scores on the Scholastic Aptitude Test (SAT) reflect a similar pattern of increasing disadvantage for females. Since 1972 females have had lower verbal and quantitative scores on the SAT than males. The male advantage over females in verbal ability amounted to only two points in 1972, but it grew to 12 points in 1985. Boys outperformed girls in math by 44 points in 1972 and by 47 points in 1985.

These data are supported by an NCES longitudinal study of high school achievement, which found that female sophomores and seniors had lower test scores than their male counterparts in vocabulary, reading, math, and science. Only in writing did females test higher than males. And, again with the exception of writing, between 1980 and 1982 it has been males rather than females who have made more progress.[3]

By contrast, the results of the National Assessment of Educational Progress (NAEP) have consistently shown that females outperform males in reading ability, though that gap narrowed slightly between 1971 and 1980. Grade-point averages present another contradiction. Although males often test higher than females on standardized tests, females receive higher grades than boys in all subjects, including math and science.

Obviously, then, the relationship between student achievement and gender is anything but clear. The data are complex and even somewhat contradictory. What is evident, however, is that verbal and mathematical performance cannot be predicted by — or even tightly associated with — a student's sex. This is a myth that is wholly unsupported by the facts.

However, the recent facts do raise two warning flags: when there is evidence of an achievement decline, the scores of females have tended to decline more than those of males; when there is evidence of a gain, males have generally exhibited greater gains than females. These facts raise serious questions about the current educational experiences of females and the causes of their achievement declines.

MISPERCEPTIONS OF female and male achievement reflect but one type of myth about sex equity in education. An entire mythology also surrounds the curriculum and instruction to which students are exposed and the environment in which they are educated. One dominant myth about the early educational environment of girls and boys — a myth shared by parents and educators alike — is that elementary schools are hospitable to girls and hostile to boys. However, it is typically the academic and behavioral problems of boys, not those of girls, that are the primary focus of the school's energy and resources. Thus what is perceived to be a supportive environment for girls is in reality one that ignores female learning deficits. What is perceived to be hostile to boys is really an emphasis on early identification of and attention to male learning deficits.

The educational services provided to students with special needs are good examples of the inaccuracy of the perception that elementary schools are hospitable to girls. At the same time, they are the source of another myth about sex equity in education. The predominant myth runs as follows: the low percentage of females enrolled in special education programs reflects the fact that females do not need specialized programs to succeed in school and in the workplace to the same extent as males. Girls constitute only 33% of the elementary and secondary students identified as needing special educational services. The greatest differences in the rates of identification for males and females are in the categories of learning disabled and emotionally disturbed — both areas in which subjective judgments are particularly influential. Boys are referred for possible program placement as a result of academic or behavioral problems far more often than girls. In addition, female referrals tend to occur when students are older, when they are further behind in academic work, and when the problem is more pronounced than is the case in typical male referrals.[4]

In the classroom, boys actually receive more instructional attention than girls do; they also receive more praise and criticism.

Another myth integrally linked with misperceptions of the educational environment and the education of students with special needs is that male and female students receive equal instructional treatment in classrooms. During the last two decades, considerable emphasis has been placed on generating an awareness of instructional inequities and on creating instructional environments for female and minority students that are as supportive as those provided for males. As a result, educators and parents have come to believe that inequities in classroom instruction have been eliminated.

Although this may seem to be a logical conclusion, an extensive body of research disputes it.[5] In the classroom, boys actually receive more instructional attention than girls do; they also receive

more praise and criticism. In addition, boys are more likely to be given detailed instructions, while girls learn to become "helpless" as teachers solve problems for them. Minority females receive the least attention from teachers. Moreover, the problem is compounded by the fact that most teachers appear to be unaware that they treat students differently according to sex.

A variety of widely held myths deal with subject matter. As Patricia Campbell argues in this *Kappan*, misperceptions about females' interest and ability in math and science have severely limited the opportunities for women and girls in these fields. The related myth that females are necessarily less interested and less proficient in using computers than males persists despite evidence to the contrary. Research suggests that computer learning environments tend to favor males for a variety of reasons, but strategies that alter the environments to meet the needs of female students have successfully increased females' use of computers and their interest in them. For example, female enrollment in computer classes increased from 20% in 1979 to 47% in 1984 in schools that participated in EQUALS, a program that trains teachers to encourage females and minorities to enroll in math and computer courses.[6]

In higher education, the mythology of sex equity is particularly widespread. Now that women constitute the majority of undergraduate students in institutions of higher education, the prevailing view is that they have achieved parity with men in enrollment patterns, financial aid, classroom participation, and postgraduate education. However, despite the fact that women now earn half the bachelor's and master's degrees awarded in the U.S. each year, their areas of specialization tend to be in fields that have lower status, pay lower salaries, and have traditionally been dominated by females. In disciplines with strong scientific and technical requirements, such as mathematics and engineering, women remain exceedingly underrepresented. For example, less than 14% of doctoral degrees in the physical sciences and mathematics were awarded to women in 1981-82.[7]

Women also receive less financial aid from public sources than men,[8] and they are more likely to be enrolled in public institutions and in community and junior colleges. Men continue to outnumber women in prestigious liberal arts colleges, in research universities, and in graduate and professional schools. Studies also indicate that the classroom environment experienced by female students discourages their classroom participation, lowers their self-esteem, and has a negative influence on their course and career choices.[9]

MYTHS ABOUT sex equity in education are by no means limited to students. Professional educators are also the subjects of many misconceptions. One particularly pervasive myth involves the unsubstantiated belief that women now have access to the same professional opportunities as their white male counterparts and that, in this respect at least, sex equity has been achieved within the education profession. In fact, only 10% of secondary school principals are female – a smaller proportion than in the 1950s. At the elementary level, where females make up more than 80% of the teaching force, fewer than a quarter of the principals are women; in 1928 women accounted for more than 50% of the nation's elementary school principals.[10]

There is no apparent justification for the underrepresentation of women in the administrative ranks of education. Many studies have found that female administrators perform as well as or better than their male colleagues. Schools with female principals have been shown to have fewer discipline problems, higher faculty and student morale, and higher student achievement.[11]

Opportunities for professional women in physical education and athletics exhibit a pattern similar to that found in administration. In the early 1970s most women's intercollegiate teams were coached by females; in 1984 more than 50% of the NCAA Division I women's teams and most of the men's teams were coached by males. The status of female coaches in Idaho illustrates this downward trend: in 1974, 79% of women's sports were coached by women; by 1984 that percentage had shrunk to an alarming 43%.

"I found out today that the ABC's don't end with C."

One final overarching myth has helped to move recent decisions about education reform away from the realities of sex equity in education. This is the educational myth of the 1980s which claims that educational excellence and equity in education are not compatible. In other words, one is achieved only at the expense of the other. Those who espouse this erroneous belief find themselves forced to choose between achieving excellence or equity in education.

> The problem is compounded by the fact that most teachers appear to be unaware that they treat students differently according to sex.

It is certainly true that achieving any educational goal – be it excellence, equity, or anything else – requires difficult choices and tradeoffs, particularly in the allocation of resources. But it is not true that equity and excellence must necessarily be achieved at one another's expense. There is ample evidence to support the view that both equity and excellence can be achieved when energy is directed toward making education more effective for all students in ways that promote these dual goals. Similarly, there are sound arguments for the view that labeling as "excellent" an education that is inequitable is an abuse of the term.

Inequities can be reduced in ways that raise the quality of education for all, not just for some, students. For example, cooperative learning approaches have been shown to raise achievement levels of students across the lines of gender, race, ethnicity, and ability; to break down racial and ethnic barriers to friendship; and to positively affect self-

esteem, attitudes toward school, and concern for others. Similarly, equity-oriented techniques for training teachers have also been shown to result in more equitable and effective teaching (e.g., more time on academic issues, more precise and clear responses to student comments). Thus the choice is not between an excellent and an equitable education, but between demanding that education be both excellent and equitable and agreeing to accept less.

To be both excellent and equitable requires educators, parents, and researchers to identify the educational reality experienced by all students and to dispel the myths that have distracted attention from providing every student with the best education possible. This is, after all, what our system of education should be designed to achieve.

1. This symposium was organized by Susan S. Klein. Presenters of myths referred to in this article include: Ruth Ekstrom (student performance and achievement), Selma Greenberg (elementary school environment), Susan Bailey (special education), David Sadker (instruction), Jane Schubert (technology), Karen Bogart (higher education), Charol Shakeshaft (school administrators), Myra Sadker (educational administration), Christine Shelton-Walters (professional opportunities for women in athletics), and Glen Harvey (excellence versus equity).

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Sexism in the Classroom: From Grade School to Graduate School

by Myra Sadker and David Sadker

Classrooms at all levels are characterized by a general environment of inequity, say the Sadkers, and bias in classroom interaction inhibits student achievement. The tools to solve these problems have been forged.

FROM GRADE school to graduate school to the world of work, males and females are separated by a common language. This communications gender gap affects self-esteem, educational attainment, career choice, and income. But its hidden lessons generally go unnoticed.

For the past six years we have conducted research on classroom interactions in elementary and secondary schools and in institutions of higher education. In this article, we will discuss four conclusions of our research.

- Male students receive more attention from teachers and are given more time to talk in classrooms.
- Educators are generally unaware of the presence or the impact of this bias.
- Brief but focused training can reduce or eliminate sex bias from classroom interaction.
- Increasing equity in classroom interaction increases the effectiveness of the teacher as well. Equity and effectiveness are not competing concerns; they are complementary.

MYRA SADKER and DAVID SADKER (Harvard University Chapter) are professors of education at American University, Washington, D.C.

Our first study of classroom interaction was conducted from 1980 to 1984. With funding from the National Institute of Education (NIE), researchers trained in the INTERSECT Observation System collected data in more than 100 fourth-, sixth-, and eighth-grade classrooms in four states and the District of Columbia. The sample included urban, suburban, and rural classes; classes that were predominantly white, predominantly black, and predominantly integrated. The teachers observed in this study were both male and female; they represented both white and minority groups; they taught in the areas of language arts, social studies, and mathematics. While the sample reflected the diversity of American students and teachers, the observations revealed the pervasiveness of sex bias.[1]

At all three grade levels and in all subjects, we found that male students were involved in more interactions than female students. It did not matter whether the teacher was black or white, female or male; the pattern remained the same. Male students received more attention from teachers.

But the matter was not as simple as boys winning and girls losing the battle for the attention of the teacher. Class-

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The School Experiences of Black Girls:

The Interaction of Gender, Race, and Socioeconomic Status

by Diane Scott-Jones and Maxine L. Clark

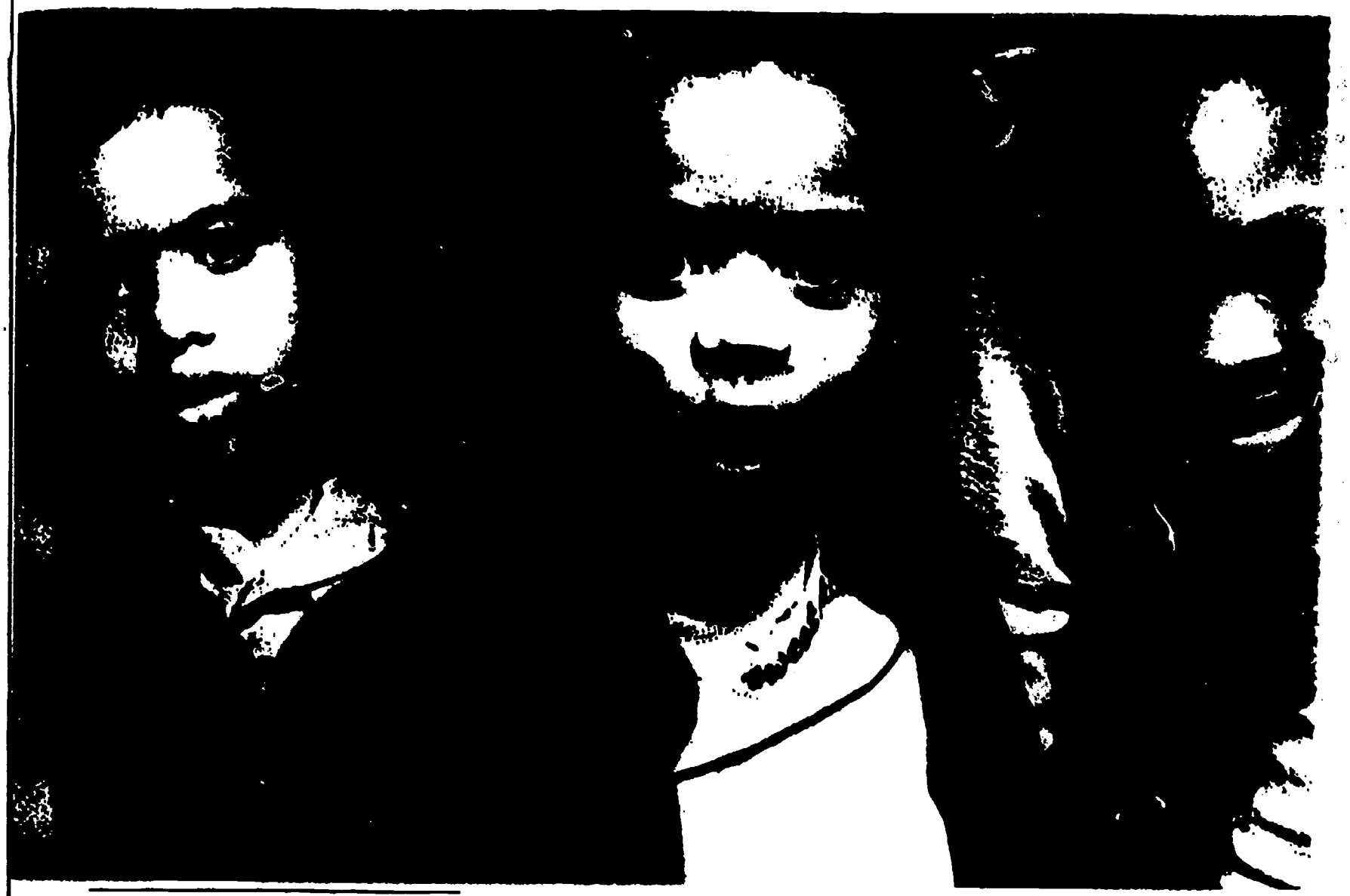
Girls who belong to "caste-like minorities" experience discrimination at several levels, say the authors, who outline the research on this thorny issue.

WE INTEND to examine in this article the academic, social, and motivational experiences of black females in the schools. Clearly, girls who belong to caste-like minorities experience discrimination at several levels. Since black males also experience discrimination, the relationship of black females to their male counterparts is not the same as the relationship of white females to white males. Likewise, the pattern of sex differences among blacks may differ from that among whites.

Few research studies have focused on both race and gender; moreover, researchers have frequently confounded socioeconomic status with minority-group membership. Though hampered by these realities, we will review in this article the findings that are available on the achievement of black females in science and mathematics and in verbal skills. We will discuss the educational expectations, aspirations, and motivations of black females and examine their educational and occupational attainments. We will describe the ways in which parental methods of socialization, teacher/student interactions, and peer interactions correlate with academic achievement. We will also suggest the directions in which research and practice ought to be moving.

Space does not permit us to examine the school experiences of females who belong to other minority groups. Moreover, less data are available on many of these groups than on blacks. We do know that, with the exception of a few Asian-American groups that achieve well in school, minorities share somewhat similar patterns of low school achievement. We know, as well, that minorities differ. It is important that we consider the school experiences of all minority groups; therefore, future research — especially major national studies — should focus on collecting adequate data from which to draw conclusions about such groups.

DIANE SCOTT-JONES is an assistant professor of psychology at North Carolina State University, Raleigh, and MAXINE L. CLARK is an associate professor of psychology at Wake Forest University, Winston-Salem, N.C.



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MATH/SCIENCE ACHIEVEMENT

High achievement in mathematics and science is a prerequisite for lucrative careers that have traditionally been closed to women and minorities. General agreement exists that blacks, females, and disadvantaged students achieve less well in science and mathematics than do white middle-class male students. However, information is not readily available on how the variables of race, gender, and socioeconomic status might interact to produce this outcome.

Herbert Ginsburg and Robert Russell found few social-class or racial differences in the mathematical thinking of preschoolers and kindergartners, as measured by a variety of tasks. The sample for their study included both boys and girls, but they reported no analyses for sex differences.[1] Meanwhile, a review of the research on sex differences found that differences in mathematical thinking that favor males do not appear consistently until 10th grade; even then, the differences are usually not large, and they are not found invariably.[2]

A study of black eighth-graders in an inner-city school found no sex differences in mathematics and science achievement. However, boys scored significantly higher than girls on a measure of science self-concept, and, when forced to choose between paired occupations, they were significantly more likely than girls to choose a science-related occupation over a non-science-related occupation.[3]

A meta-analysis of the characteristics and science performance of kindergartners through 12th-graders indicated that, of all the variables considered, gender had the weakest relationship to the three performance measures employed.[4] Males scored slightly higher than females on cognitive and achievement measures, and the difference was greater in middle school than in elementary school or in high school. Gender differences in attitudes toward science showed the opposite pattern: in elementary school and in high school, males had more positive attitudes toward science than females, but the reverse was true in middle school. On cognitive and achievement measures, the effects attributable to race were almost three times as great as those attributable to gender. Whites scored higher than blacks across grade levels. Whites in elementary school also had more favorable attitudes toward science than blacks, but this difference disappeared at the middle school and high school levels.

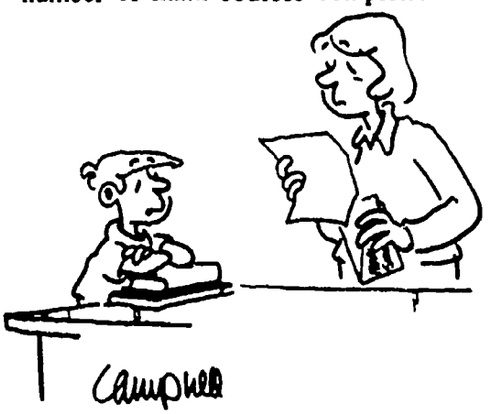
Socioeconomic status correlated significantly with the three performance measures. The relationship of socioeconomic status to cognitive measures was constant across grade levels. The effect of socioeconomic status on achievement increased with grade level. The relationship of socioeconomic status to attitudes toward science was relatively small, disappearing by high school. However, Lynette Fleming and Mark Malone, who conducted the meta-analysis, pointed out that the variables of socioeconomic status and race are likely to be confounded, since the studies that they included in the racial comparisons generally failed to report the subjects' socioeconomic status. Thus, as is true in much psychological and educational research, the findings that Fleming and Malone labeled racial differences may

actually be differences related to socioeconomic status instead. Although sex differences for blacks were not analyzed, the findings of this meta-analysis suggest that the science performance of black females is more likely to resemble the science performance of black males than that of white females.

Meanwhile, the National Assessment of Educational Progress (NAEP) showed that, at age 13, black females and black males did not differ in their mathematics achievement. The NAEP also found no sex differences for white 13-year-olds. However, the performance of white youngsters was substantially higher than that of blacks. Socioeconomic factors, such as parents' educational and occupational status, were related to students' performance.

By age 17, significant sex differences favoring males showed up for both blacks and whites. But the difference between the two racial groups was five times as large as the sex differences within the races. For males and females of both races combined, the best predictor of mathematics achievement at age 17 was the number of mathematics courses completed. On the average, students who had taken two years of algebra and a year of geometry answered 82% of the test items correctly, whereas students who had taken none of these courses answered only 47% of the items correctly.[5]

When the groups are equated for the number of mathematics courses completed, black females (and black males and white females, as well) may equal the mathematics performance of white males. The High School and Beyond Project, sponsored by the National Center for Education Statistics, found no race or sex differences in the mathematics achievement test scores of high school seniors, when two variables – sophomore achievement test scores and number of math courses completed – were controlled.[6] The mathematics achievement tests assessed a variety of skills, including computation, arithmetic, reasoning, graph reading, algebra, and geometry. Some research has found that girls outperform boys in certain areas, such as computation, and that boys outperform girls in other areas, such as reasoning.[7] Thus the breadth of these tests is important. The findings of the High School and Beyond Project suggest that race and sex differences in mathematics achievement could be eliminated by encouraging black females, black males, and white females to enroll in appropriate math courses.



"I don't know why she got so mad. I had an excuse based on a true story."

Although the performance of blacks of both sexes in mathematics and science remains below that of whites (especially white males), the performance gap appears to be decreasing somewhat.[8] The mathematics performance of black 9-, 13-, and 17-year-olds on the NAEP improved between 1978 and 1982 – and, for 13-year-olds, the gain of 6.5 percentage points was statistically significant. During the same interval, the science achievement of black females increased among 9-year-olds, remained approximately the same among 13-year-olds, and declined slightly among 17-year-olds. The scores of the black females were approximately equal to those of black males except among 17-year-olds, where males performed slightly better. In the part of the NAEP science assessment that covered inquiry, the performance of blacks of both sexes declined only slightly, while the performance of whites of both sexes declined significantly.

Computer literacy is a related area of concern. Although studies have been conducted to assess the availability of computers in schools and the extent to which students use them, this research has not focused on the situation of black students per se. Linnda Caporael and Warren Thorngate have suggested that computer technology may intensify existing social roles.[9] Clearly, there is a need for research that examines the computer literacy of black females, black males, and children of the poor.

VERBAL SKILLS

The general belief is that females outperform males in verbal skills, but research suggests instead a complex pattern of differential performance. Sex differences in verbal skills are rarely found among children younger than 10. However, males are more often identified as problem readers in the elementary grades. Among older children, females perform better than males on many verbal measures, but males outperform females in vocabulary and some higher-level verbal skills. When sex differences are found, they are often small, with much overlap in performance between males and females. Sex differences in verbal skills may be larger for low-ability students than for others.[10] Black children score lower on reading skills in the NAEP than do white children, but the gap has decreased steadily.[11]

EXPECTATIONS, ASPIRATIONS, AND MOTIVATIONS

A study of fourth- through eighth-graders showed that black children were no more likely than whites or Hispanics to attribute their successes or failures in mathematics to external factors, such as luck or low ability. However, those black children who did behave in this fashion were predominantly female and were not achieving well in mathematics.[12]

A study of male and female adolescents in rural schools in the South, which examined both blacks and whites, found that black males and females have high educational and career aspirations.[13] Moreover, the sex differences that the investigators found among white adolescents with regard to aspirations did not show up among blacks. The researchers suggested two possible explanations for this finding: 1) the experience of being black may be more salient than gender to black adolescents themselves and to others, and 2) similar labor market opportunities for black adults of both sexes may cause black adolescents and their parents to devalue traditional definitions of female work roles.

Research conducted in the 1970s[14] produced similar findings: at the high school level, black females have educational and occupational aspirations as high as or higher than those of black males or white females. But this research also showed that, at the college level, the aspirations of black females drop below those of black males. Like their white counterparts, black females of college age tend to adhere to sex-role stereotypes in their educational and occupational goals and choices. Indeed, gender influences such things as the expectation of obtaining a doctorate (rather than a master's degree), grade-point average, and score on the Graduate Record Examination. However, black

females differ from white females in their motivations for working outside the home. Black females tend to be concerned about contributing to the economic support of their families, while the motivations of white females focus on self-fulfillment.

The social environment in which learning takes place can enhance or diminish the behaviors that lead to achievement.

EDUCATIONAL AND OCCUPATIONAL ATTAINMENT

Both educational and occupational attainment are gauges by which to measure the success of earlier school experiences. Moreover, the level of education and the level of occupation typically attained by adult black females may influence the aspirations and expectations of young black females.

The proportion of blacks who did not graduate from high school declined substantially between 1970 and 1982. The number of black females who left school without graduating dropped from 65.2% to 45.7% during that interval, while the number of black males who dropped out fell from 67.5% to 44.3%. For whites of both sexes, the comparable decline was from about 42% to about 27%. Among all races and genders, older individuals are now more likely than younger ones to have ended their schooling before graduation.[15]

In the High School and Beyond study of 1980 high school sophomores, the dropout rate was 14.1% for black females, 20.3% for black males, 13% for white males, and 11.5% for white females. The reasons that students gave for dropping out varied somewhat by race and gender. Male and female blacks, Hispanics, and American Indians as a group cited poor grades most frequently (30%). Among minority females, the reasons most often given were pregnancy (29.2%), dislike of school (24.9%), and marriage (19.2%). White females most often mentioned marriage (36.4%), dislike of school (34.1%), poor grades (30%), and pregnancy (20.5%). White males cited dislike of school (45.6%), and minority males cited poor grades (31.2%).[16] Because students could give more than one reason for dropping out, these findings are difficult to interpret.

Census Bureau data for 1981 show lower dropout rates than those reported in the High School and Beyond study. According to the Census Bureau, the dropout rates among 16- and 17-year-olds were 7.2% for black males, 8.7% for black females, 8.1% for white males, and 7.5% for white females. Once again, the dropout rates were lower for younger teens and higher for older teens.[17] However, some urban areas report dropout rates much higher than those found by the Census Bureau.

In higher education, female enrollment has increased and male enrollment has remained stable. Thus by 1982 a majority of college students (52%) were female. That same year, females earned a majority of the bachelor's and master's degrees, one-third of all doctoral degrees, and more than one-fourth of all professional degrees. By contrast, the enrollment of blacks and other minorities and the proportion of all degrees granted to them have remained stable or have shown only slight gains.[18]

In 1980 black females made up 5.3% of the total enrollment in higher education; that same year, black males accounted for only 3.8% of the total. During the 1980-81 school year 3.9% of all bachelor's degrees went to black females, and 2.6% of all bachelor's degrees went to black males. Black females received 6.4% of all bachelor's degrees awarded in education, but only .5% of all bachelor's degrees awarded in engineering. Black males, by contrast, received 2.4% of all education degrees and 2.7% of all engineering degrees.

Black females received 3.7% of all master's degrees awarded during the 1980-81 school year, while black males received 2.1%. Once again, black females received 6.7% of all master's degrees awarded in education but only .2% of all master's degrees awarded in engineering. Black males, by contrast, received 2.1% of all master's degrees in education and 1.4% of all master's degrees in engineering.

Black females earned 1.7% of all doctorates awarded during the 1980-81 school year, while black males earned 2.1%. Black females earned 4.1% of all doctorates awarded in education; black males earned 3.7%. In engineering, black males received .9% of all doctoral degrees, and black women received .03%.[19]

In a study of black eighth-graders in an inner city, sex proved to be a better predictor of preference for a career in science than mathematics achievement, science achievement, or children's perceptions of their ability in science. (However, the other three variables were also significantly linked to such a career preference.[20]) In this particular study, career preference was assessed by forced choices between science-related and non-science-related occupations that may not have reflected students' actual career goals accurately. In other words, students may not have wanted — or expected — to work toward either of the careers in the pairs presented to them. If none of the careers that were presented (e.g., biochemist, aerospace engineer, lawyer, city planner) seemed personally appropriate to the inner-city students in this sample, they may have allowed sex-role stereotypes, rather than their own abilities and interests, to determine their choices.

ACADEMIC achievement is dependent on more than individual abilities and aspirations. The social environment in which learning takes place can enhance or diminish the behaviors that lead to achievement.

The school is a microcosm of the society. Therefore, the racial and sex-role stereotypes and biases prevalent in the society find their way into the school. The school environment reflects the fact that the society values males over fe-

Photo by Carl Pope

males and whites over nonwhites. Thus students who are members of minority groups must adjust to teachers and peers as well as to schoolwork; in other words, they must live a bicultural existence.[21]

SOCIALIZATION BY PARENTS

Families influence their children's cognitive development and school achievement in a variety of ways.[22] The widely accepted perception of black families as matriarchal and thus emasculating is not supported by contemporary theory or research. Indeed, the socialization practices of black families are relatively egalitarian.[23]

The myth that black mothers encourage their daughters' academic achievement at the expense of their sons' achievement may persist, but it is not supported by research.[24] The myth may have arisen because of the strong sex-role stereotypes regarding educational and occupational attainment to which white families adhered until recently. Whites may have interpreted the lack of strict differentiation by gender of educational and occupational roles among blacks as inappropriate encouragement of black females.

In black families, a great deal of overlap exists between the characteristics that are considered appropriate for males and those that are considered appropriate for females. Black children of both sexes are socialized to be independent and to achieve.[25]

In a study of second-graders, by contrast, middle-class white parents expected their sons to earn higher grades than their daughters in mathematics (even though actual grades for the two groups did not differ). Working-class parents, both white and black, expected higher grades for their daughters than for their sons in both mathematics and reading, however.[26]

TEACHER/STUDENT INTERACTIONS

Research has solidly established the fact that teachers' expectations of students vary as a function of the students' race. Teachers look for and reinforce achievement-oriented behaviors in white students more often than in black students. Teachers also attribute the achievement-oriented behaviors of white students to such internal factors as effort or motivation, while they attribute the achievement-oriented behaviors of black students to factors that students cannot control, such as parental encouragement or heredity.[27] Teachers are more likely to give white students praise and attention, and they have higher performance standards for white students than for black students. When teachers praise black students for their academic performance, the praise is often qualified: "This is a good paper; it is better than yesterday's." Teachers tend to praise white students who have been labeled as gifted but to criticize black students who have been similarly labeled. This differential treatment may occur because teachers do not expect intellectual competence in black students.[28]

The data supporting the fact that teachers treat boys and girls differently are just as solid as those supporting the fact that teacher expectations vary according to the race of a student. Male students receive more attention, praise, encouragement, and criticism from teachers than do their female counterparts.[29] Boys have more contacts with teachers overall than do girls, and those contacts are more likely to relate to their academic work or classroom behavior.[30] Teachers have more contacts with female students during reading periods and more contacts with male students during math classes.[31]

However, the relationship between teacher expectations and gender of students is not clear and depends on a variety of factors, such as grade level and content area. Elementary teachers have higher expectations for females than for males.[32] This pattern is rarely duplicated in high school, however.[33] With regard to expectations for abstract or mathematical reasoning skills, Barbara Simmons failed to find a bias among teachers in favor of male students.[34] Some researchers have concluded that teacher expectations for academic achievement are not related to the gender of students, although teacher expectations for students' behavior and adjustment are weakly related to students' gender.[35]

Several studies have investigated the degree to which teacher expectations for achievement vary as a function of the students' social class. When significant differences were found, the teachers expected higher achievement from middle-class students than from lower-class students.[36]

A few studies have also tried to determine whether race and social class interact in determining teacher expectations. However, the results of these studies have been inconclusive.[37]

Two questions arise regarding the teacher's role in the achievement of black females: Do teachers encourage black females to achieve academically? And what is the nature of the interaction between black females and their teachers?

Attending to inequities caused by race and social class is at least as important as attending to inequities fostered by sex bias.

In response to the first question, research suggests that black females do not receive – at least, in the early grades – the same kind of academic encouragement that whites of both sexes experience. In an ethnographic study of first-graders, Linda Grant found that teachers were more likely to perceive black female students as socially mature and white female students as intellectually competent. Teachers encouraged the social competence of black girls by seeking their help in nonacademic matters. Black females often served as "rule enforcers" and as "go-betweens," bringing messages from other students to the teacher. Meanwhile, teachers gave white girls intellectual encouragement and sought their help in academic matters. They assigned tasks involving high degrees of responsibility to white girls more often than to black girls or to boys of either race. This increased the likelihood that white girls would be perceived by their peers as intellectually competent.[38]

Most teachers praised academic performance more often than they praised social behavior. However, black females received more praise for behavior than any other subgroup of students. Black males received the least praise for, and the most criticism of, their behavior. White males received the largest number of teacher comments related to academics, and black females received the largest number of teacher comments related to nonacademic matters. These findings show that black children of both sexes were denied the degree of intellectual encouragement given to their white counterparts.[39] Further research is needed to determine whether these patterns remain consistent throughout the school years.

With regard to the *quality* of stu-

dent/teacher interactions, Grant found that black girls approached the teacher only when necessary. Their contacts were usually brief, task-oriented, and conducted on behalf of a peer. White girls, by contrast, had more prolonged contact with teachers and were likely to converse about personal matters in addition to school-related issues. Black males had the fewest contacts with teachers and the most contacts with peers of all the subgroups studied.[40]

Peter Woolridge and Charles Richman[41] studied teachers' responses to hypothetical descriptions of lent misbehaviors. For fighting, te were just as likely to prescribe punishments for black females as for black males. There were significant differences in their treatments of white males and white females, however. The teachers were less likely to prescribe severe punishments for white females than for white males. (They prescribed severe punishments slightly more often for white males than for blacks.)

Teachers' perceptions of students are presumed to be the factors determining the quality of teacher/student interactions. Valora Washington found that both black teachers and white teachers evaluated white girls more positively than they evaluated black girls or boys of either race. The teachers evaluated black males and black females similarly, but they evaluated white males more negatively than white females.[42] Similarly, Diane Pollard found that teachers rated white females higher than white males or blacks of either sex in the areas of responsibility, compliance, persistence, performance/ability, and relations with peers and teachers.[43] In other words, in evaluating their students, teachers make gender distinctions among white children more often than among black children.

Black teachers may be more inclined than white teachers to criticize black students, however. Robert Byalick and Donald Bersoff found that teachers reinforce children of other races more frequently than they reinforce children of their own race. In their study, black females were the group of students who received the least reinforcement – especially in the classrooms of black female teachers, who reinforced males of both races more frequently than they reinforced girls of either race.[44] Washington found that black teachers in integrated classrooms were most critical of black girls, whereas white teachers in integrated settings were most critical of white boys.[45]

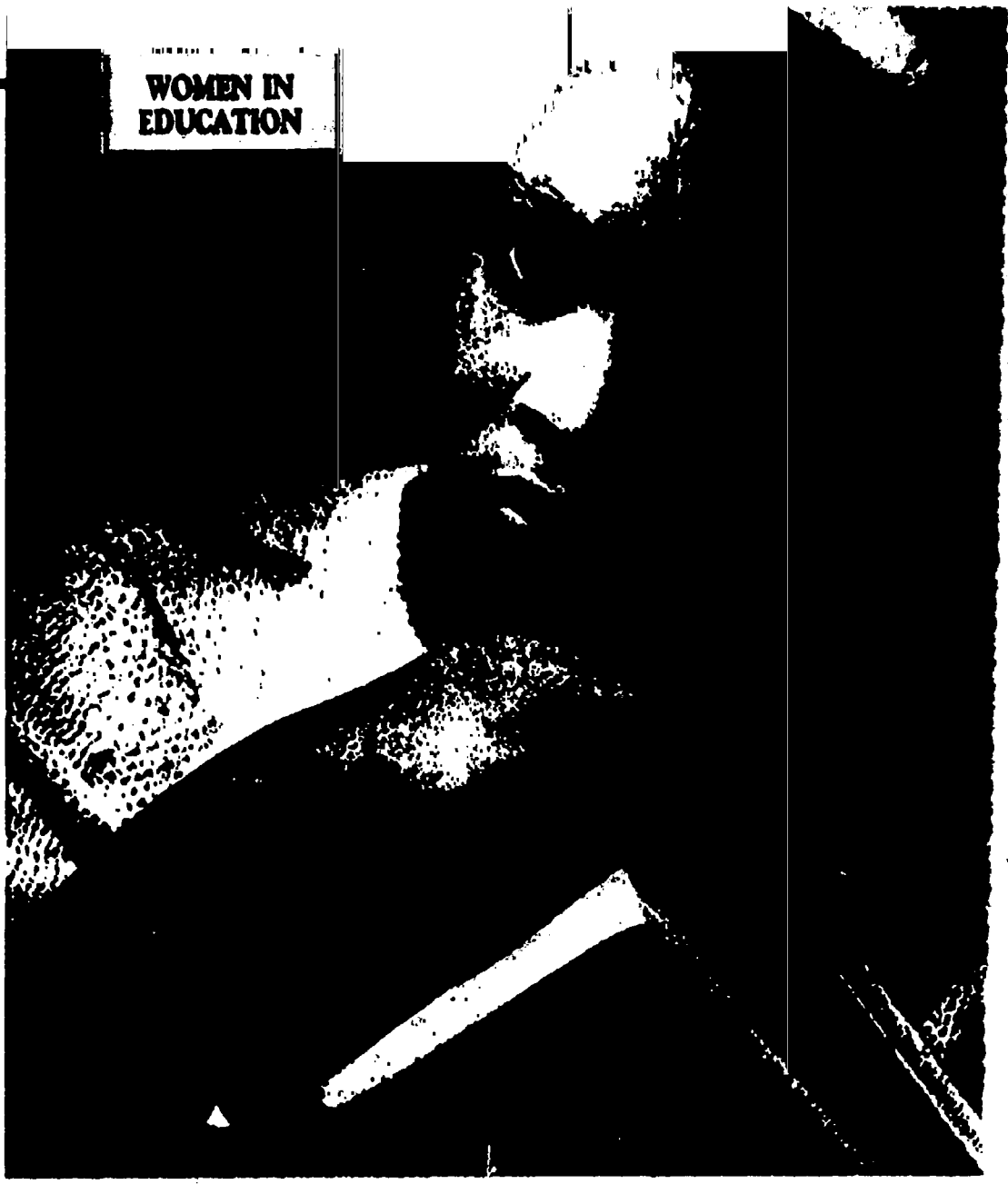


Photo by Cari Pope

PEER INTERACTIONS

The influence of peer interactions is more variable than that of teacher/student interactions on academic achievement. In some studies, academic performance has correlated positively with acceptance by peers and positive peer interactions.[46] Ralph Lewis and Nancy St. John found that popularity with white girls was a significant predictor of black girls' grade-point averages.[47] However, Martin Patchen and his colleagues found that interracial contact had little impact on the academic performance of black students.[48]

Are black females more likely than black males to experience peer acceptance in ethnically mixed classes? The answer is not clear. Some researchers have described black females in biracial junior high and high school classrooms as social isolates. Black females also tend to be more ethnocentric than black males in their friendship choices and peer interactions. In predominantly white classrooms, however, black students of both sexes make more cross-race friendship choices than do white students (though these choices are rarely reciprocated).[49]

A different pattern of peer interactions seems to exist among first-graders. Linda Grant found that black female first-graders had more extensive peer interactions than any other racial or gender-based subgroup. In their interactions, they crossed race and gender lines more often than other children. But these peer relationships were generally weak and one-sided, not strong and reciprocal. Meanwhile, black girls and black boys helped one another in both academic and nonacademic matters, while white girls gave white boys more help than they received in return.[50]

Sometimes black females must cope with a disproportionate number of racist remarks. In Grant's study, the racist remarks, which were generally made by white males, tended to come after the teacher praised a black girl's academic performance. Grant suggested that white males may have used the racist remarks for self-enhancement, since the remarks were intended to emphasize the lower status of black females.

When it comes to schooling, black males do not enjoy a "male advantage." Blacks of both sexes – especially those from low-income families – tend to

achieve at lower levels than whites. For black females, then, attending to inequities caused by race and social class is at least as important as attending to inequities fostered by sex bias. However, blacks do encounter some sex-role stereotyping. Therefore, attending to sex equity would probably enhance the educational attainment of blacks of both sexes.

Where appropriate, future research studies should cover all three variables of race, gender, and socioeconomic status. Researchers should adequately describe their subjects in terms of these three characteristics. And finally, researchers must seek to avoid confounding the variables of race and socioeconomic status.

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odds with the ideas of some teachers or parents or the central office. And then what?"

"I guess I don't telegraph my vision because of a feeling of powerlessness, lack of credibility — perhaps fear that no one would take it seriously, especially outside the building," said a third. "It's pretentious. After all, I don't have the authority or national stature of a Boyer or a Goodlad."

"It's because so many of us see ourselves as middle managers whose responsibility it is to transmit the ideas, goals, and visions of those above us," one principal explained. "It's inappropriate to introduce my own ideas about school reform into the formula. It's not wanted and not needed."

"I *have* a pretty clear vision of how I would like my school to be in, say, five years," commented another. "But, strategically, it is unwise to put all my cards out at once. Better to unveil portions of my vision, incrementally. The total idea would startle, threaten, or offend others. After five years, it will all be visible."

Finally, one principal noted, "I am working on a vision — but to be worth a damn it has to be a vision that comes from the school community. It's a very complicated process to try and find a consensus where at the moment none exists. If we find that consensus, I'll be the first to engrave it over the door of the school."

These comments implicitly identify formidable obstacles to the development of a school-based vision and a school-based plan for improvement. I believe that, under certain conditions, schoolpeople *will* think through for themselves what they want their schools to become and then set out with conviction to make their visions a reality. The current reports will help there. And I think that trying to find these conditions holds as much promise of improving elementary and secondary schools in the U.S. as does trying to work through the resistance that accompanies attempts to impose an orthodoxy from without.

Ultimately, there are probably two workable strategies for improving the schools: 1) somehow get teachers and principals to work on closing the gap between the way their schools are and the way people outside these schools would have them be or 2) work toward closing the gap between the way the schools are and the way those within the schools would like them to be. Both paths raise questions and problems. I think that the greater promise for school reform — and sufficient resources to achieve it — now resides within the schools. Most changes in schools may be initiated from without, but the most lasting changes will come from within. □

Is the O.K. Classroom O.K.?

by David Sadker and Myra Sadker

Critics may have overstated the case for harsh and punitive schools, but the bland and biased classrooms of today provide cause for concern, say the Sadkers.

THE TITLE of Theodore Sizer's book, *Horace's Compromise*, is a stunning metaphor for the silent bargain between teachers and students to expect very little from one another. After five years of field research, Sizer described what these compromised classrooms look like:

> [G]enial, orderly, limited, vacuous. [Brody] signaled to the students what the minima . . . were; all tenth- and eleventh-graders could master these with absurdly little difficulty. The youngsters picked up the signal and kept their part of the bargain by being friendly and orderly. They did not push Brody, and he did not push them. The classroom was tranquil and bland.[1]

John Goodlad's Study of Schooling, extending throughout a decade and based on observations in more than 1,000 classrooms, reports the same landscape of educational blandness. Goodlad writes:

> The emotional tone is neither harsh and punitive nor warm and joyful; it might be described most accurately as flat. . . . [T]he classes in our sample, at all levels, tended not to be marked with exuberance, joy, laughter, abrasiveness, praise and corrective support of individual student performance, punitive teacher behavior, or high interpersonal tension.[2]

These uninspiring descriptions of school life appeared in print just as we completed a three-year study of classroom interaction for the National Institute of Education. Our findings not only support the bleak portraits drawn by Sizer and Goodlad, but they provide additional detail and a new perspective.

We conducted systematic observations in more than 100 classrooms in four states and the District of Columbia. We were investigating how teachers called on students and how they responded to student comments. We were especially interested in sex differences in classroom interaction, but we discovered a great deal more.

THE O.K. CLASSROOM

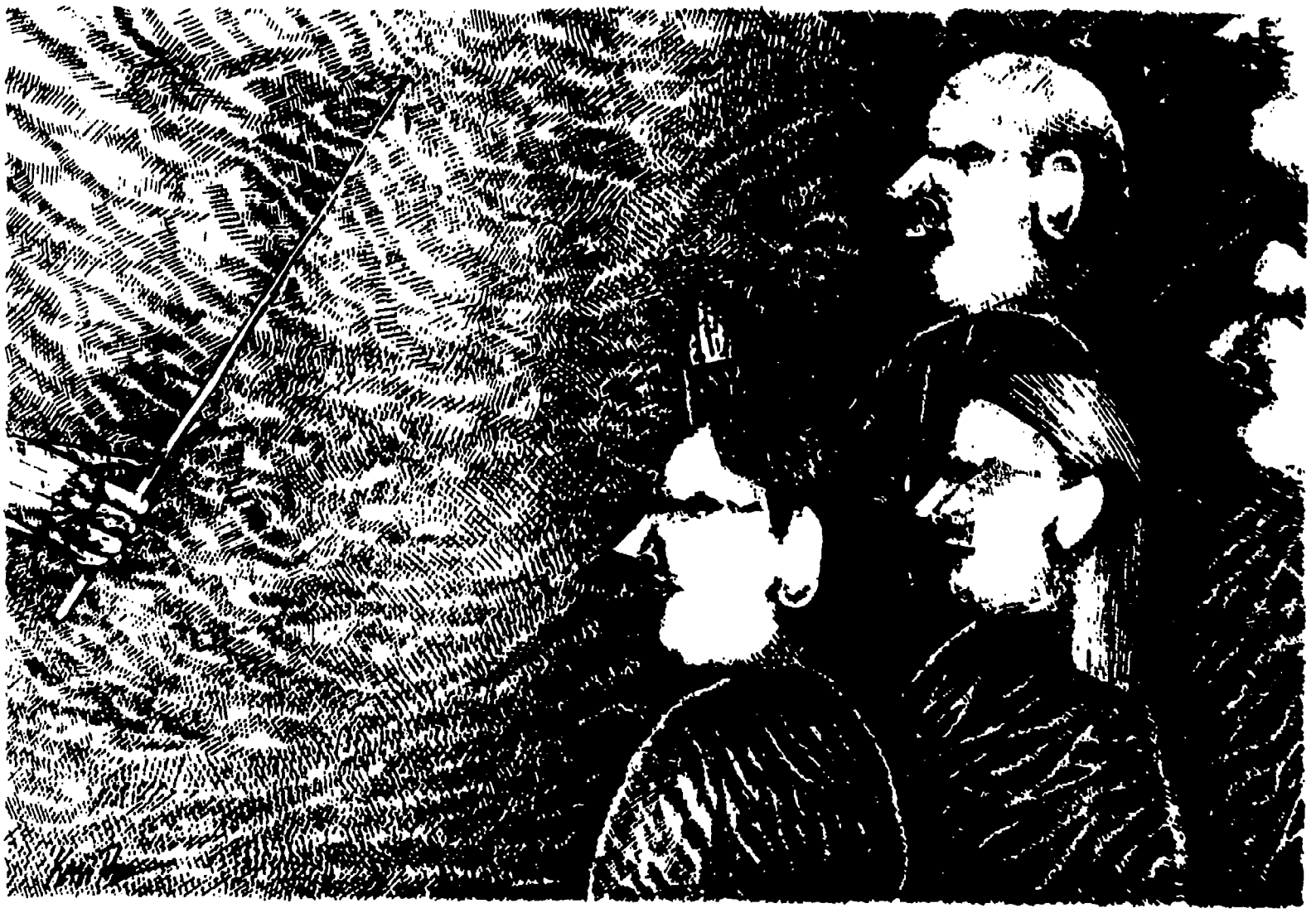
Mr. Gibbs began the class by discussing the reasons for the early exploration of North America.

"When did Columbus come to America?" he asked.

"1942," shouted Andy, more energetic than accurate.

"Close," Mr. Gibbs responded, evidently not wanting to damage a vulner-

DAVID SADKER (Harvard University Chapter) and MYRA SADKER are professors of education at American University, Washington, D.C.



able ego. "All the numbers are correct, but who can get them in the right order?"

"1492," replied half a dozen students in unison.

"O.K.," Mr. Gibbs continued. "And why did these explorers come?"

"By accident," answered Scott, always a bit of a wise guy.

"O.K.," said Mr. Gibbs.

"For shorter trade routes," Andy piped in again.

"That's good. And why were shorter trade routes important?"

"To save time," Andy responded.

"Any other reasons?"

"It would probably be cheaper, and the traders would make a bigger profit," volunteered Martha.

"Uh-huh," Mr. Gibbs appeared to concur. "Was it their intention to find new lands?"

"No," said Jane.

"Then they must have been surprised when they came upon America."

"Not really," answered Steve. "They didn't know that it was a new land."

"O.K.," said Mr. Gibbs. "Some historians think that other explorers actually discovered this new land hundreds or thousands of years before Columbus. Why don't we know the names of these earlier explorers?"

(Silence)

"Well, that's O.K. for now. We'll examine these issues a bit more tomorrow."

Back in the 1960s and early 1970s, such critics as Jonathan Kozol, in *Death at an Early Age*, sounded warnings about the harsh and punitive schools in which our children were being squelched by uncaring teachers. Either these portraits were inaccurate from the start, or the authors were confusing uninspired schools with harsh ones, or the educational system in this country has done a complete turnaround. Indeed, criticism of students – even of the mildest sort – is an unusual occurrence; in many classrooms it is altogether nonexistent.

Those who are concerned that praise is too easy to come by in today's classrooms can also stop worrying. Although it is not as rare as criticism, praise is also used infrequently in classrooms.

Instead, "O.K. Gibbs" seems to be the norm. In analyzing thousands of teacher reactions, the "O.K." or the "uh-huh" type of response was far and away the most common. What follows is a brief review of our study and a summary of our findings.

THE STUDY

The sample for our study consisted of more than 100 fourth-, sixth-, and eighth-grade classrooms in New England, Washington, D.C., and the Baltimore metropolitan area. The classrooms represented a wide spectrum of communities: urban, suburban, and rural, some virtually all white, others virtually all minority, and still others integrated. Approximately half of the classrooms were language arts and English classrooms, while the other half were mathematics and science classrooms. The sample included black teachers and white teachers, males and females.

In order to capture the range of teacher reactions, we spent almost a year in the classrooms, field-testing our instruments and listening to the interactions. When we began field-testing our observation instruments, we decided to categorize teacher responses as either praise or criticism. The first pilot test lasted about 15 minutes, but we were unable to code *anything*. There was no praising or criticizing going on. We were simply not prepared to analyze the flatness of the typical teacher's response to students. Our final observation instrument covered the following range of evaluative responses.

- *Praise* included comments that explicitly and positively commented on student performance. (Examples include: "Excellent!" "Good!" "You've done a superb job of integrating your research material.")

Illustration by Kevin Pope

• *Acceptance* included teacher comments that implied that student performance was correct and appropriate. However, these comments were not stated clearly and strongly enough to be categorized as praise. (Examples include: "O.K.," "uh-huh," "I see," or simply teacher silence.)

• *Remediation* included probing questions and teacher comments that encouraged or cued a more acceptable or more accurate student response. Remediation comments *implied* a deficiency in student performance and suggested a corrective action. (Examples include: "Check your addition." "Read the topic sentence again, then give me the main idea." "What led you to that conclusion?")

• *Criticism* referred to explicitly negative teacher comments. A criticism statement was one in which the teacher clearly told a student that an answer was inaccurate or that a behavior was inappropriate. It could include harsh outbursts, as, for example, a teacher who might yell, "If you don't start studying, you're going to fail this course!" However, criticism also included more moderate comments, as, for example, a teacher who might state quietly, "Your answer to number 4 is wrong."

The data from three rounds of classroom observations, conducted in the fall and winter by trained observers, were coded and analyzed. We gathered descriptive statistics and conducted tests for statistical significance. We conducted univariate and multivariate analyses using grade level, subject matter, and treatment (comparing classrooms in which teachers had received special training in interaction and control classrooms in which teachers had received no such training). After extensive statistical analyses, the following picture of classroom life emerged.[3] Here are the main patterns that characterize teacher/student interaction.

• Of the four evaluative reactions (praise, acceptance, remediation, and criticism), criticism occurred least often and in the fewest classrooms. In two-thirds of the classrooms observed, teachers never clearly indicated that a student answer was incorrect. In those classrooms in which criticism did occur, it accounted for only 5% of the teacher/student interactions.

• Praise accounted for only 11% of classroom interactions. In more than one-fourth of the classrooms, teachers *never* praised student answers.

• Remediation occurred in 99% of the classrooms observed, averaging almost one remedial interaction per minute. It was the second most frequent teacher response, accounting for approximately one-third of all classroom interactions.

• Acceptance was the most frequent teacher response. Teachers gave acceptance responses in all classrooms at an average rate of one per minute. Acceptance accounted for more than half of all classroom interactions — more than praise, criticism, and remediation combined.

• The frequency of classroom interaction decreased as the grade level increased and as the school year progressed. On the average, there were slightly more than two teacher/student interactions per minute in all classrooms observed. Approximately three out of four classroom interactions focused on academic content.

• In approximately 90% of classrooms, teachers reacted to student conduct. The most frequent reaction was remediation of conduct; the least frequent was praise.

• In approximately half of all classrooms, a few students — identified as salient — received more than three times their proportional share of classroom interactions. These few salient students received more than 20% of all classroom interactions. By contrast, approximately 25% of all students in all classes did not participate in any classroom interaction.

As we reviewed our data from this study, we were particularly surprised by the large number of acceptance responses in what we came to call the "O.K. classroom." Certainly we don't question the value of accepting student comments; acceptance is a legitimate reaction and sometimes the most appropriate one a teacher can give. As most counselors will readily attest, acceptance is an extremely valuable professional response, especially when dealing with affective issues.

Our concern lies in the potential overuse of acceptance responses, particularly in classroom interactions that focus on academic content. Recent research on teacher effectiveness has suggested that specific feedback is important for student achievement. David Berliner notes:

> Substantial use of corrective feedback in the academic areas, contingent praise for correct or proper behavior, and the use of students' ideas as a way of letting students know that their contributions are valued, all show positive relations to achievement and attitude. . . . Criticism, as a form of feedback, if emotionally neutral, has been found to be accepted by students, but it has long been recognized that sarcasm and personal attacks are negatively related to achievement and should not be used as feedback for inappropriate behavior.[4]

John Goodlad concurs. He writes that "learning appears to be enhanced when students understand what is expected of them, get recognition for their work, learn quickly about their errors, and receive guidance in improving their performances." But Goodlad found that about 20% of students at both the elementary and secondary levels felt that they were neither informed nor corrected when they made mistakes.[5]

In addition to being the most common teacher reaction, acceptance is also the most diffuse and least specific. If a student answers a question and the teacher says, "Uh-huh," what is the student to conclude? Is the answer a good one? Does it need to be sharpened a bit? Is it barely passable? Is the teacher listening at all? The fact that more than half of teacher responses fall into this bland and uninformative category leads us to wonder

"Please, Jamie — just drop the scrap paper in the basket. Don't slam dunk it!"

Praise accounted for only 11% of classroom interactions. In more than one-fourth of the classrooms, teachers never praised student answers.

whether the O.K. classroom is all that O.K.

SEX BIAS: A REPORT CARD

We were also concerned that so many students — approximately one-fourth of our sample — treated classroom discussion as a spectator sport and did not get involved in any interaction with teachers. Moreover, certain groups of students seemed to fall into categories of "interaction-rich" and "interaction-poor." For example, in all four of the response categories that we analyzed, female students received less teacher attention than male students. Although girls received less than their share in all categories, acceptance — the category that may have the least educational value — was the most equitably distributed category.

Often, boys received additional attention by asserting themselves and literally calling out for attention; boys were almost eight times as likely as girls to call out in class. When girls did call out, they were far more likely to be squelched by teachers who remediated their conduct by saying such things as, "You're supposed to raise your hand before you talk in this class."

Although we have researched issues related to sex equity for more than a decade, we were still surprised by the high degree of sex segregation we found in today's classrooms. Fully half of the typical fourth-, sixth-, and eighth-grade classrooms were marked by significant sex segregation in seating arrangements and in group work. Teachers would hardly tolerate such segregation if it were based on race; based on sex, they seem unable to recognize it.

Minority students, while not as interaction-poor as female students, were also involved in fewer interactions with teachers than majority students. Minority females were involved in the fewest interactions with teachers of any student group. In general, when teachers initiated an interaction, they continued to interact with children of the same sex as themselves. This tendency was more pronounced for male students. These patterns of sex differences in student/teacher interactions held whether the teacher was black, white, male, or female and whether the academic content was language arts, mathematics, or science.

OUR DATA SUGGEST that classroom interactions between teachers and students are short on both quality and equality. Critics have offered many reasons why this is so. Some claim that the talent pool from which our nation's teachers are drawn is depleted. Others point to the unrealistic demands of burdensome schedules and heavy student loads.

However, a follow-up study of interactions at the postsecondary level, conducted by Dawn Thomas, suggests that these explanations are inadequate. Professors are presumably drawn from an elite talent pool; they typically teach nine hours a week and enjoy a more relaxed schedule than do teachers in elementary and secondary schools.

The follow-up study analyzed interactions in 34 postsecondary literature and mathematics classrooms and found that university classrooms are less interactive than elementary or secondary classrooms. Furthermore, while slightly less sex bias existed in postsecondary classroom interactions, the university professors used even more acceptance reactions than teachers in the elementary or secondary grades.[6] From hundreds of hours of classroom observation, Thomas concluded that postsecondary classrooms are bland places in which to learn. So it appears that sex bias and overall blandness are not problems of K-12 education exclusively. Nor are they simply a function of the teacher talent pool or of the nature of the teaching schedule.

From our experience in conducting workshops and training sessions across the U.S., we have become convinced that teachers simply have very little insight into their own patterns of responding to students. Most teachers are surprised to learn that male students receive more attention than female students. When alerted to this disparity, they want to change their teaching so that it becomes more equitable.

When they are asked how they usually react to student answers, many teachers say that they criticize too much and that they should try to be more lenient with students. They are amazed to learn how infrequently they praise or criticize. One teacher speculated in a discussion group of fellow teachers about why she didn't praise students. "No one ever praises *me*," she said. "Maybe that's why I don't feel like praising students." Initially, the group seemed startled by this notion; however, after some discussion, many other teachers admitted sharing similar feelings.

TEACHERS CLEARLY need to know more about research on classroom interactions. They also need training to develop their interaction skills, and they need supervision to help them maintain and use these skills.

As part of our study, teachers in 67 classrooms received four days of training focused on equity in classroom interactions. Our data analysis indicates that training can eliminate inequitable interactions and enable female students to participate at the same rate as their male peers. It is interesting that training teachers in equitable interactions had a positive effect on the quality of *all* classroom interactions. In classrooms of teachers who received the training, the frequency of acceptance interactions decreased, while the frequency of praise, criticism, and remediation increased. Indeed, training through a structured microteaching format virtually eliminated bias, increased the number of intellectual interactions, and increased the precision of teacher reactions.

The critics of the 1960s and 1970s may have overstated the case for harsh and punitive schools, but the bland and biased classrooms of today do provide cause for concern. Most teachers remain not only untrained in the skills of interaction, but unaware of the importance of precise reactions, equitably delivered. They need appropriate inservice and preservice training. When they are made aware of the problems and given the means to overcome them, they can hone their interaction skills so that our classrooms can go beyond "O.K." and become excellent places in which to learn.

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Sexism in the Classroom: From Grade School to Graduate School

by Myra Sadker and David Sadker

Classrooms at all levels are characterized by a general environment of inequity, say the Sadkers, and bias in classroom interaction inhibits student achievement. The tools to solve these problems have been forged.

FROM GRADE school to graduate school to the world of work, males and females are separated by a common language. This communications gender gap affects self-esteem, educational attainment, career choice, and income. But its hidden lessons generally go unnoticed.

For the past six years we have conducted research on classroom interactions in elementary and secondary schools and in institutions of higher education. In this article, we will discuss four conclusions of our research.

- Male students receive more attention from teachers and are given more time to talk in classrooms.
- Educators are generally unaware of the presence or the impact of this bias.
- Brief but focused training can reduce or eliminate sex bias from classroom interaction.
- Increasing equity in classroom interaction increases the effectiveness of the teacher as well. Equity and effectiveness are not competing concerns; they are complementary.

MYRA SADKER and DAVID SADKER (Harvard University Chapter) are professors of education at American University, Washington, D.C. ©1986, Myra Sadker and David Sadker.

Our first study of classroom interaction was conducted from 1980 to 1984. With funding from the National Institute of Education (NIE), researchers trained in the INTERSECT Observation System collected data in more than 100 fourth-, sixth-, and eighth-grade classrooms in four states and the District of Columbia. The sample included urban, suburban, and rural classes; classes that were predominantly white, predominantly black, and predominantly integrated. The teachers observed in this study were both male and female; they represented both white and minority groups; they taught in the areas of language arts, social studies, and mathematics. While the sample reflected the diversity of American students and teachers, the observations revealed the pervasiveness of sex bias.[1]

At all three grade levels and in all subjects, we found that male students were involved in more interactions than female students. It did not matter whether the teacher was black or white, female or male; the pattern remained the same. Male students received more attention from teachers.

But the matter was not as simple as boys winning and girls losing the battle for the attention of the teacher. Classrooms were characterized by a more general environment of inequity; there were the "haves" and the "have nots" of teacher attention. Students in the same classroom, with the same teacher, studying the same material were experiencing very different educational environments.

About a quarter of the elementary and secondary students typically did not interact with the teacher at all during class. These were the silent ones, spectators of classroom interaction. A second group was involved in a nominal level of interaction – typically one interaction per class session. The majority of students fell within this group. The final category consisted of interaction-rich students who participated in more than three times their fair share of interactions with the teacher. Only a few students (typically less than 10%) fell into this category; these were the stars, the salient students.

The quality as well as the quantity of classroom interaction is also distributed inequitably. Teacher interactions involving precise feedback were more likely to be directed to male students. We identified three types of precise teacher reactions: praise (positive reactions to a student's comment or work), criticism (explicit statements that an answer is incorrect), and remediation (helping students to correct or improve their responses). A fourth, less-specific teacher reaction consisted of simple acceptance of student comments, including such teacher comments as "okay" or "uh-huh." More than half of the teachers' comments fell into this category. This high rate of acceptance responses created classroom environments best characterized as flat, bland, and unexciting.

When teachers' reactions were more precise, remediation comments designed to correct or improve students' answers were the most common. These accounted for about one-third of all teacher comments. Praise constituted approximately 10% and criticism 5% of teacher interactions. Male students received significantly more remediation, criticism, and praise than female students. There was more equity in the distribution of acceptance responses – the ones that pack the least educational wallop.

Although our research has made the inequities of classroom interaction more apparent, the reasons why males capture more and better teacher attention remain less clear. Sex segregation may be part of the problem. The majority of classrooms in our study were sex-segregated, and teachers tended to gravitate to the boys' sections, where they spent more of their time and attention.

Another explanation is that boys demand more attention. Our research shows that boys in elementary and secondary schools are eight times as likely as girls to call out and demand a teacher's attention. However, this is not the whole story; teachers behave differently depending on whether the student calling out is a boy or a girl. When boys call out, teachers tend to accept their answers. When girls call out, teachers remediate their behavior and advise them to raise their hands. Boys are being trained to be assertive; girls are being trained to be passive – spectators relegated to the sidelines of classroom discussion.

These findings cannot be dismissed as a mechanistic and irrelevant game of counting who talks more often. National measures of academic progress support the thesis that girls and boys are experiencing different educational environments. In the early grades, girls' scores on standardized tests are generally equal to or better than boys' scores. However, by the end of high school, boys are scoring higher on such measures as the National Assessment of Educational Progress and the Scholastic Aptitude Test.

Given our findings about classroom interaction, common sense suggests that this is what should happen. The most valuable resource in a classroom is the teacher's attention. If the teacher is giving more of that valuable resource to one group, it should come as no surprise that that group shows greater educational gains. The only real surprise is that it has taken us so long to see the problem.

Nor is bias in classroom interaction confined to schools in the U.S. Recently we returned from Great Britain, where we had been discussing sexism in classroom instruction. Unlike American educators, who are often taken aback by the subtle but significant bias in teacher/student interaction, British educators were not surprised by evidence of bias in the classroom. Indeed, over the past few years debate in Britain has focused on strengthening girls' schools as a way of avoiding this bias. Such a separate-but-equal approach would be far less palatable in the U.S., where the memory of struggles to end racial segregation is still fresh.

Following completion of our three-year NIE study of elementary and secondary schools, we received support from the Fund for the Improvement of Postsecondary Education (FIPSE) to train college faculty members in equity and excellence in classroom instruction.[3] Joan Long conducted a doctoral dissertation study of this two-year project.[3]

Field researchers, who had been trained in a postsecondary version of the INTERSECT Observation System, collected data in 46 classes in a wide range of academic and professional disciplines at American University. The data indicate that the patterns established in elementary and secondary school continue in higher education. Male students receive significantly more attention, and sex bias persists.

The need for teacher training at the college level is evident. The data from the observations of college classrooms showed that the overall amount of interaction decreased and that the number of silent students increased. In fourth-, sixth-, and eighth-grade classes, 25% of the students did not interact with the teacher at all; in college classes this number rose to half. The "okay" classroom was prevalent at the university level. There was more acceptance than praise, criticism, and remediation combined.

Research also shows that college women experience a decline in self-esteem as they progress through college.[4] It is likely that a key factor in this decline is the inequitable communication women experience inside and outside the college classroom.[5]

TRAINING THAT WORKS

For both our NIE and our FIPSE projects, we designed and evaluated intensive four-day programs of training for teachers. At the elementary and secondary levels, more than 40 teachers from several states have participated in the training.

Initially, many of these teachers were skeptical. Some said, "Girls get better grades on their report cards. What's the problem?" Others felt that boys did receive more attention but that this was true in some other teachers' classrooms, not in their own. One teacher who was an active member of the National Organization for Women (NOW) said, "I'm delighted that you're doing this project. Of course, I won't have to change anything I do in the classroom. This is an issue I've been concerned about for years." But, as these teachers became more involved in the training, their perceptions of and attitudes toward classroom interaction underwent substantial change.

In the training session, the teachers viewed videotapes and films that demonstrated the research findings about bias in student/teacher interaction. In a modified microteaching setting, the teachers practiced equitable teaching skills, received feedback on their performance, and practiced again. They were surprised to look at videotapes showing, irrefutably, their own bias in classroom interaction. The teacher who was also a NOW member was stunned. But all the teachers saw the need for change.

Changing instructional patterns in the college classroom was a more difficult challenge because inservice training in postsecondary institutions rarely addresses specific teaching skills (nor does preservice training, for that matter). When we proposed our microteaching design, many K-12 educators expressed serious reservations. "Professors will talk about teaching," they said, "but they'll never be willing to have their teaching observed, videotaped, and critiqued by their colleagues."

Nevertheless, we were able to recruit American University professors from a wide range of academic disciplines – from anthropology to computer science, from biology to economics, from chemistry to community studies. We did not find aversion to clinical training, but rather a thirst for it. For many experienced professors, this project was the first opportunity in their professional lives to systematically analyze and improve their teaching skills. Some professors, who had lectured (and only lectured) all their lives, had to learn questioning skills. Others, who had received awards for their teaching skills, were surprised to see videotapes showing that half of their students didn't receive a fair share of teacher time. These professors, committed as they were to good teaching, also wanted to change.

In both of these studies, trained teachers and professors were matched with control groups, and the performance of the two groups was evaluated. The trained instructors at all levels achieved equity in verbal distribution; they included male and female students in numbers that reflected their distribution in the classroom. The differences between the trained groups and the control groups were statistically significant. Moreover, the trained instructors had higher rates of interaction, more precise reactions, more academic contacts, and a greater number of student-initiated comments. In short, the training resulted in more intentional and more direct teaching. Developing equity in teaching had promoted excellence as well.

LANGUAGE OF MEETINGS

But sex bias in communication does not stop at the classroom door. Many studies have found key sex differences in how men and women communicate in meetings and other professional settings. Males exhibit more powerful behaviors and are more likely to influence the group discussion. Women's comments are more likely to be ignored. This gender gap in communication leads to ineffective discussions and can put female administrators and teachers at a disadvantage in seeing that their ideas are heard and implemented.

Despite the stereotypical image of women as garrulous, studies consistently show that men talk more than their fair share of the time.[6] In mixed groups, sex is a status characteristic, and men talk more than women. They emerge as group leaders,[7] and they are more successful at influencing groups to accept new ideas.[8]

One of the ways that men dominate professional meetings is through interruptions. When men and women talk with one another, almost all interruptions are by male speakers. Males interrupt females more frequently than they interrupt other males. Men also gain verbal dominance by answering questions that are not addressed to them.

Women, even female administrators and managers, often collaborate with men in this game of verbal domination of professional communication. When women are interrupted, they typically do not assert themselves in an effort to hold the floor. Rather, following an interruption, women are usually quiet for an extended period. They are more likely to ask questions and to do the housekeeping chores of keeping conversations going by making encouraging and supportive remarks. In one study, over 96% of the topics men introduced were developed in the discussion. Only 36% of those introduced by women were similarly developed.[9]

Women are aware that the dynamics of group interaction can constitute a barrier to their influence and advancement. In a recent study of problems facing professional women, 43% of respondents identified their own failure to speak up in mixed groups as their greatest problem. Another 22% said that their greatest problem in group meetings was interruptions by males.[10] Minority women appear to face an even greater challenge in seeing that their contributions are heard. The socialization of 12, 16, or more years of schooling is not easily shed.

PRINCIPALS CAN HELP, TOO

With support from the Women's Educational Equity Act, we have created the Principal Effectiveness-Pupil Achievement (PEPA) Project, through which we are currently developing a model program to improve the equity and effectiveness of classroom interaction and professional communication. The project does not focus directly on the classroom teacher, but rather on principals in their role as instructional leaders.

The initial group of principals to be trained in the PEPA Program will be selected from the Mid-Atlantic region. After this pilot testing, the PEPA Program and materials will be made available to principals nationwide. Principals involved in PEPA will acquire the skills to analyze both classroom interaction and professional communication. Through the use of videotapes, a trainer's manual, and micro-supervision, the PEPA Program will give principals the skills they need to lead the improvement of instructional equity and effectiveness in their schools.

The experience of female students in U.S. schools is unique. What other group starts out ahead — in reading, in writing, and even in math — and 12 years later finds itself behind? We have compensatory education for those who enter school at a disadvantage; it is time that we recognize the problems of those who lose ground as a result of their years of schooling.

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Even though there has been a 500% increase in the past 10 years, women still constitute less than 5% of the practicing engineers.

Of the nation's 2.7 million scientists, only 5% are female and 1.5% are black.

What's a Nice Girl Like You Doing In a Math Class?

by Patricia B. Campbell

A great deal of evidence indicates that differing treatment of groups of students and differing expectations have an impact on achievement. Ms. Campbell reviews the evidence and suggests some effective means of counteracting problems.

IN THE PAST few years a great deal of discussion has focused on the problems illustrated by the two statistics above. Such organizations as the National Science Foundation, the National Council of Teachers of Mathematics, and the National Science Teachers Association all decry the mathematical and scientific illiteracy of the youth of the U.S. and express concerns about the diminishing pool from which the scientists and technologically literate citizens of tomorrow will be drawn.[1]

That pool contains few women and girls and even fewer minority students of either sex. Girls take fewer math courses than boys and are more apt to be found in introductory and lower-level courses than in advanced courses. A similar pattern is found in both science and computer courses. Young women often choose to avoid the "science track" in high school and so restrict their science and mathematics courses to the minimum required for graduation. Black and Hispanic students take fewer math and science courses than do white or Asian students, and they are clustered at the lower levels.[2]

As might be expected, when one student takes an advanced math course and another does not, the first student's knowledge of math will be greater – even when the students had previously achieved at the same level. In part because of patterns of course-taking, differences in the math and science achievement of sex and ethnic groups have been found.[3]

A number of studies have collected the standardized test scores of large numbers of students and compared them by ethnic background and by sex. Overall, these studies have concluded:

- In the elementary years, similarities between the sexes in math achievement are found more frequently than differences. When sex differences are found, they tend to favor girls.
- In the junior high school years, approximately half of the few sex differences found in mathematics favor girls.
- In high school and beyond, the many sex differences found in mathematics achievement favor boys.
- From the middle of elementary school on, the mathematics test scores of whites are higher than those of blacks and Hispanics; Asian students score the highest of all ethnic groups.
- Differences between females and males are smaller than differences between whites and blacks or Hispanics.

Although the amount of research in science achievement has been much more limited, similar conclusions have been reached. Minimal differences between the sexes and ethnic groups in science achievement have been found in the elementary years, but these differences increase in the middle and secondary grades.[4]

Controlling for the number of math courses taken does not eliminate ethnic and sex differences in mathematics achievement, but it does significantly reduce them.[5] The specific courses that students have taken affect the results of studies of sex and ethnic differences, as does the test being used in the research. Different tests find different degrees of sex differences. For example, a study of the mathematics achievement of young adolescents would be more likely to find sex-related differences if the mathematics section of the Scholastic Aptitude Test (SAT) were used, but much less apt to find differences if the quantitative portion of the School and College Aptitude Test were used.[6]

The socioeconomic background of the students is also a factor. Although not all white students are rich and not all minority students are poor, a higher proportion of black and Hispanic students come from low-income families. Most studies of achievement in math/science/technology do not take into account possible socioeconomic differences between their white and minority subjects.

Controlling for courses taken, for students' socioeconomic background, and for the test used in a given study are areas over which school administrators have little or no control. However, it is important to consider the effects of such factors when reading research studies or hearing researchers draw conclusions about the "superior male mathematical ability."[7]

Sex differences found in such math areas as problem solving and spatial skills are relatively small – of statistical significance but of questionable practical significance. Indeed, differences in ability within groups of girls or groups of boys are much greater than differences between the "average girl" and the

PATRICIA B. CAMPBELL is director of Campbell-Kidder Associates, Groton, Mass.

"average boy." Many girls have higher math skills than most boys, and many boys have lower math skills than most girls. Though math differences between ethnic groups are larger than differences between the sexes, the within-group differences are still greater than the differences between groups.[8]

Above all, it is important to remember that, regardless of what is concluded, relationships between sex or ethnic background and achievement are correlational, not causal. Based on a finding of differences, one may *not* conclude that being black, Hispanic, or female *causes* any differences. The different backgrounds and experiences of girls and minorities and of boys and white students can – and most likely do – affect achievement.

It is a hoary but dangerous assumption that sex and ethnic differences in math and science achievement are "natural," that brain structure, genes, or some other biological factors cause the differences in scores. In the 19th and early 20th centuries, such assumptions about women and minorities led to conclusions, by eminent researchers, that we now see as absurd:

> The grown-up Negro [male] partakes as regards his intellectual faculties, of the nature of the child, the female, and the senile white.
>
> – Carl Vogt[9]

> The woman who uses her brain, loses her mammary function first and has little hope to be other than a moral and medical freak.
>
> – G. Stanley Hall[10]

Today, such assumptions do not lead to such obviously racist or misogynist conclusions. Yet researcher Camilla Benbow has been led to conclude that women would be "better off accepting their differences [in mathematical ability]."[11] At this point there is no evidence that the differences in math and science have a genetic or biological basis. There is, however, a great deal of evidence that different treatment of groups of students and different expectations about math and science achievement can and do have an impact on achievement.

Rather than accept differences, educators can (and should) learn more about the negative influences that work on female and minority students and about ways to counteract those influences.

DIFFERENT TREATMENT

Consider the following three statements:

- You don't need to study any more mathematics.
- Engineering is a dirty/hard man's field.
- You're too pretty to be a mathematician.

These statements have been used almost as often and are about as accurate as "I'll respect you in the morning." Even today, within the same classes, students may have different math/science experiences. One still finds such obvious examples as the math teacher who, in the summer of 1985, assigned a boy who spoke very little English the task of correcting the girls' classwork, while she corrected the boys' work and gave them individual feedback. More subtle examples also exist. Consider the teacher who assumed that a female student's skill in reading meant that she was a "reading and writing" person rather than a "math and science" person. These anecdotes are not isolated incidents; they are supported by research.

At both the elementary and secondary levels, when teaching math, teachers initiate more academic contact with boys – even when girls and boys initiate the same amount of teacher contact. In addition, high school math teachers give boys more attention and provide students with different feedback for wrong answers. Male students are told to try harder, while female students are praised simply for trying.[12]

There appear to be differences in how white and minority students are treated, as well. For example, an analysis of data from the National Assessment of Educational Progress found that the more math courses black students and white students had taken, the greater were the achievement differences between them. Thus the course experiences of black students and white students appeared to be quite different. Different, too, were the math experiences of black students in segregated schools. Even though black students in segregated schools took more math courses than did black students in integrated schools, their achievement was lower.[13]

Different treatment of students also takes place in the home. Parents buy their sons more math- and science-related toys and more computers than they buy their daughters. Parents also have higher expectations for their sons' achievement in math than for their daughters' and are apt to see math as both more difficult and less important for their daughters. Sons are more strongly encouraged to take math

Photo by Catherine McCliment-Horvath

Effective programs that increase the math and science achievement of girls and of minority boys are already in place.

courses and to enroll in after-school and outside-of-school science and technology programs.[14]

DIFFERENT EXPECTATIONS

In learning mathematics, confidence – the belief that one can learn and perform well – is a most important affective variable. Elizabeth Fennema has found that confidence is positively correlated with both math achievement and course selection. Even when there are no sex differences in their math performance, girls tend to feel less adequate in math, to have a greater tendency to underestimate their abilities, and to have less confidence in their abilities than do boys.[15]

As both female and male students pass through junior high school, studies have shown that students' expectations for girls to do less well in math increase and their feelings about female success in math become less positive. Girls' decreased confidence in their math skills and decreased expectations of female success in math on the part of both sexes were found to *precede*, rather than follow, the decline in math achievement by girls.[16]

The degree to which girls perceive mathematics as a masculine activity has been found to be related to their math achievement. Girls who see math as a male activity do less well in math than other girls, while girls in schools in which math is not seen as solely a male province have been found to be better problem solvers.[17] The view that math and science are "white" activities might have a similar effect on members of minority groups, but very little research has been done in this area.

While on the subject of areas in which there has been little research, another should be mentioned. A great deal has been written about ethnic background and sex and their influence on achievement. But very little research has been done on how these two factors interact. Studies of sex differences rarely pay attention to the race of the subjects (usually white), and studies of race usually ignore the sex of the subjects.

EFFECTIVE PROGRAMS

Effective programs that increase the math and science achievement of girls and of minority boys are already in place. Some of these programs focus on increasing the interest, motivation, and achievement of individual students. Others work to improve teachers, to strengthen specific science and math classes, or to change whole schools. The following are summaries of some different types of effective programs.

- *Southeastern Consortium for Minorities in Engineering* (SECME), Georgia Institute of Technology, Atlanta. The SECME program has worked with more than 10,000 black girls and boys in the Southeast. Through the program, students with aptitude in math and science are identified as early as grade 6 and encouraged to continue to study math and science. The program also works with teachers to strengthen courses and to expose students to appropriate courses. SECME uses contests, awards, and teacher training to provide students and teachers with recognition and support.

After participating in SECME programs, 80% of SECME students plan to attend college, whereas only 50% of black high school students nationwide plan to attend college. Forty-one percent of SECME students plan to major in math, science, or engineering. Overall, SECME students outperform the national average for blacks on the SAT by 140 points.[18]

- *Project SEED* (Special Elementary Education for the Disadvantaged), Berkeley, California. Under Project SEED, mathematicians and scientists go into elementary schools serving disadvantaged children and teach each day. They provide students with knowledge and appreciation of mathematics as they demonstrate effective instructional strategies for teachers. SEED evaluations have found students achieving more than two months' growth in arithmetic for every one month they spend in the program.[19]
- *EQUALS*, Lawrence Hall of Science, University of California, Berkeley. EQUALS is an inservice training program for elementary and secondary educators. In either 10 or 30 one-hour workshops, educators learn to use materials and activities that increase the participation and achievement in math of girls and minority boys. Evaluation of the program has found that most participants continue to use the materials for years after attending the inservice training and that "there is indication that increased participation of girls has been associated with EQUALS activity by teachers in some schools."[20]
- *Expanding Your Horizons*, Math/Science Network, Mills College, Oakland, California. These one-day sessions introduce girls to careers in math and science, as well as providing them with hands-on experiences, access to role models, and information about the link between math and careers. Evaluation of the program has found students increasing the number of math, science, and computer courses they plan to take. Follow-ups have shown that students ultimately enrolled in at least as many math courses as they had said they planned to take after being exposed to the workshop.[21]

These are not expensive programs that cater to gifted students. They are structured to influence large numbers of average and above-average students. Neither are the programs costly. Indeed, the overall per-student cost of SECME is about $30. Although it may not be possible to incorporate complete programs such as these into every school, many of the components of individual programs – and certainly the attitudes that underlie them – could become a part of all schools.

WHAT CAN BE DONE?

The first thing readers can do to improve the situation for girls and minority boys in their schools is to determine whether or not their schools have a problem in this area. Look at enrollments in math, science, and computer courses, and look at the dropout figures as well. Are girls and minority boys enrolling in these courses in proportion to their representation in the student body? Are they more apt to drop out of math, science, or computer courses or not to continue on to more advanced levels? If the number of girls and minority boys is disproportionately low in these courses, then your school has a problem and should take some of the steps suggested below. If enrollments in advanced courses are low for *all* groups, then your school still has a problem and

should try some of the following strategies as well.[22]

Define math and science as being for everyone. We must start with the mindset that math and science are not what gifted students do, but what all students do. From the beginning, all students should receive the message that they are expected to take as much math and science as possible. By junior high school, students should feel that it is not a question of *whether* they take geometry or chemistry but *when*. One teacher found that using this technique increased enrollment in high school calculus to include "every one of my junior girls and boys who had a reasonable chance of passing."[23]

We must start with the mindset that math and science are not what gifted students do, but what all students do.

Encourage those who have not been encouraged in the past. This generally means getting downright pushy. Counselors and math and science teachers should actively recruit students (particularly girls and minority boys) and encourage them to continue taking courses in math and science. Educators should not take no for an answer – or at least not a first answer. Students need to be pushed a little, asked "Why not try?," and reminded that *you* think that they can do the work. Schools should also make some efforts not to penalize grade-conscious students for taking advanced math and science courses.

Give students a wider view of math and science. There are many simple things that teachers at all levels can do to expand students' view of science and mathematics, including:

- inviting female high school students to present science demonstrations to younger students;
- inviting minority and/or female scientists to visit classes (local universities and industries can help locate scientists);
- asking students who they think can be scientists or mathematicians and discussing any stereotypes they may hold;
- having students study the work of female and minority scientists and mathematicians, such as astronaut Sally Ride, nuclear scientist Chien-siung Wu, and time/motion researcher Lillian Gilbreth; and
- referring to scientists and mathematicians in general as "she" and as "he."[24]

Encourage equal treatment. Most teachers really believe that they don't treat girls and boys differently in math and science classes. However, whether they are aware of it or not, a great many teachers do treat boys and girls differently. Teachers should check their treatment of students. They can do this in a number of ways, ranging from having classes videotaped, observed, or audiotaped to having a student make a list of the students called on during class.

Push the link between math and careers. There is a very strong correlation between the math courses a student takes and the careers open to her or him. Although most teachers and administrators are aware of this link, many students are not. Careers in such diverse fields as economics, psychology, computer science, and even naval ROTC require a minimum of three years of high school math.[25] Providing all students with information on the math requirements of various careers and college majors in an interesting, easy-to-read format can open a lot of eyes. In addition, since many students ask math and science teachers questions that relate to careers in science and engineering, those teachers need to have up-to-date career information.

Review course content. In schools in which large numbers of students are not succeeding in math and science, courses should be reviewed for both content and method of instruction. The finding that taking more math courses actually increases the achievement gap between black students and white students could mean that the same amount of content and skill development is not being provided in courses with the same title. Courses must be examined to see whether they are offering all students the background in math and science that they will need to continue to take work in these fields.

Adopt teaching techniques found to improve the math and science achievement of girls and minority boys. Some students, typically girls, come to math and science classes with little experience either inside school or elsewhere in tinkering, using spatial skills, or having general hands-on experiences. Beginning in preschool, teachers need to provide all students with more hands-on experiences, particularly in activities that develop and improve spatial skills. Girls – indeed, all students who lack confidence – need to be encouraged and praised. The praise, however, must be appropriate. Too much praise or praise for minimal performance has been found to discourage student problem solving and student performance in science.[26]

Check to see whether the techniques are working. Examine the data on enrollments in math, science, and computer courses annually to determine whether the numbers of girls and minority boys are increasing. If they are, keep up the good work. If they are not, check how and how well the techniques you are using to increase their enrollment are being applied, and consider working with some of the proven programs that promote equity in math and science classrooms.

We know that a problem exists and that effective techniques to minimize its effects exist as well. With a little effort and planning on our part, such questions as "What's a nice girl like you doing here?" will never be asked again.

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The School Experiences of Black Girls:
The Interaction of Gender, Race, and Socioeconomic Status

by Diane Scott-Jones and Maxine L. Clark

Girls who belong to "caste-like minorities" experience discrimination at several levels, say the authors, who outline the research on this thorny issue.

WE INTEND to examine in this article the academic, social, and motivational experiences of black females in the schools. Clearly, girls who belong to caste-like minorities experience discrimination at several levels. Since black males also experience discrimination, the relationship of black females to their male counterparts is not the same as the relationship of white females to white males. Likewise, the pattern of sex differences among blacks may differ from that among whites.

Few research studies have focused on both race and gender; moreover, researchers have frequently confounded socioeconomic status with minority-group membership. Though hampered by these realities, we will review in this article the findings that are available on the achievement of black females in science and mathematics and in verbal skills. We will discuss the educational expectations, aspirations, and motivations of black females and examine their educational and occupational attainments. We will describe the ways in which parental methods of socialization, teacher/student interactions, and peer interactions correlate with academic achievement. We will also suggest the directions in which research and practice ought to be moving.

Space does not permit us to examine the school experiences of females who belong to other minority groups. Moreover, less data are available on many of these groups than on blacks. We do know that, with the exception of a few Asian-American groups that achieve well in school, minorities share somewhat similar patterns of low school achievement. We know, as well, that minorities differ. It is important that we consider the school experiences of all minority groups; therefore, future research – especially major national studies – should focus on collecting adequate data from which to draw conclusions about such groups.

DIANE SCOTT-JONES is an assistant professor of psychology at North Carolina State University, Raleigh, and MAXINE L. CLARK is an associate professor of psychology at Wake Forest University, Winston-Salem, N.C.

SEXISM IN OUR SCHOOLS:

TRAINING GIRLS FOR FAILURE?

By Mary Conroy

The first day of school began with a simple request. The boys were asked to sit in the front of the room; the girls were assigned desks out in the hall. Then the teacher closed the door on them and started class.

The case may be fictional, but the pattern is not. For all the attention girls receive in school, they might as well be confined to the hallway.

According to education professors Myra and David Sadker of American University, teachers interact more with boys at every grade level. It doesn't matter whether the teacher is male or female: classroom scales tilt firmly in favor of the boys. Over time, that imbalance could put your daughter at real risk.

What difference does it make?

The result of this sex bias isn't surprising, Myra Sadker says. "It's like flowers in a garden. If you don't water them and nurture them, they don't grow well."

Girls start school with higher achievement. But by high school graduation, boys outperform them on most standardized tests, even in so-called "female" areas like English.

Such test scores make a big difference: girls are less likely to be accepted by prestigious colleges. Those who do get in lose out on scholarships. In New York, for instance, 67 percent of Empire State Scholarships go to boys and 27 percent go to girls, according to FairTest, the National Center for Fair and Open Testing. (Names for the other 6 percent could have been male or female, so FairTest didn't include them.)

When bright girls get locked out of college, the whole nation suffers, David Sadker says. "Sometimes I think that if the cure for cancer is in the mind of a girl, there's a good chance we'll never get it."

Schools have tried to shake sexism: girls now compete in sports that once were closed to them. But new studies show that girls get cheated from kindergarten to college.

DUMBER BY DEGREES

Sexism doesn't stop at the grade school door, according to recent studies. Here's what happens as girls move through school.

- Girls start school with higher test scores than boys. But by the time they take the SAT, girls trail boys by 57 points.
- In coed schools, women speak 2½ times less often in class than their male college classmates.
- After the first year of college, women show sharper drops in self-confidence than men do. The longer women stay in school, the lower their self-confidence.
- Women get less than 17 percent of all doctorates in math and physics.
- A mere 10 percent of all high school principals are women—a smaller percentage than in the 1950s.
- Only 11 percent of all full professors are women.

Sources: University of Illinois, College Board, National Center for Education Statistics, Women's Research and Equity Institute, Harvard University, Mid-Atlantic Center for Sex Equity.

How does it happen?

It's not that teachers deliberately exclude girls, says Dr. Barbara Kerr of the University of Iowa, author of *Smart Girls, Gifted Women*. "Teachers are making a great effort to overcome sexism," she says. Most teachers aren't aware that they treat boys and girls differently, according to Kerr.

Yet studies clearly show that they do. Here's what research reveals:

Feedback. Teachers praise boys far more than girls, the Sadkers say. Boys also receive more criticism. The benefits: Boys get more encouragement and more chances to improve. They also learn how to handle criticism.

Attention. The Sadkers found that boys call out for teacher attention eight times more than girls. And boys get it: when they speak out of turn in discussions, teachers accept the remarks as contributions. When girls do the same, teachers tell them to raise their hands.

Instruction. When students need help, teachers give the boys more detailed directions, but actually do the work for the girls. Thus, boys learn to be competent and girls learn to be helpless, say the Sadkers.

Literature. Children's books still portray a lopsided view of the world. In those that have won the prestigious Caldicott Medal, 10 boys are pictured for every girl.

Other research complements the Sadkers' findings:

Course selection. Schools still discourage girls from taking math, science, computer, and vocational classes, according to the Project on Equal Education Rights of the Legal Defense and

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Education Fund of the National Organization for Women.

Remedial assistance. Girls don't get special help for learning or behavior disorders until they are older and further behind in school than boys with similar disabilities, according to Dr. Jane Mercer of the University of California at Riverside.

What can parents do?

With so much stacked against her, will your daughter ever do well? Yes, educators say—that is, if you work with her school. Here's what you can do:

Observe her class. Spend a day at school. Keep a tally of how many times boys and girls get to answer questions. If the class is fairly evenly divided between boys and girls, they should answer roughly the same number. Meet with the teacher and tactfully discuss the results.

Pay attention to the seating and grouping. When students choose their own seats, the girls cluster together and just don't learn to work with boys. Many teachers also pit boys against girls for competitive games. "When I taught seventh grade, I used to hold spelling bees with the girls against the boys," Myra Sadker says. "But I would never go into a class and say, 'It's going to be blacks against whites, or Jews against Christians,'" she adds.

Check the bulletin boards. "Very often a teacher with no intention of being unfair uses pictures of male athletes and male political figures," says Myra Sadker. If all the posters show heroic men, girls get the message that only men can be winners.

Examine the textbooks. Count the number of women pictured in a history book; compare with the number of men. Petition the school board to change books if you're not satisfied. If no textbook is satisfactory, ask the teacher to consider assigning a biography of a successful woman.

Urge the school board to hire female administrators. When girls always see female teachers and male principals, they learn that caring is only for women and leading is only for men, Kerr says. Ask your board to recruit administrators from the large pool of already qualified women.

Ask the school principal to offer retraining workshops. The Sadkers found that only a few days of intensive training can dramatically change teachers' habits. Ask your principal to use teacher workshop days for training in nonsexist teaching techniques.

Helping girls at home

Not all sexism can be blamed on teachers. Much of it begins at home. Here's how you can avoid sexism:

Use a "can-do attitude. Daughters especially tend to imitate their mothers. If you say, "This is a hard problem, but I bet I can solve it," instead of "Math just isn't my thing," your daughter will notice and follow your example.

Teach your daughter to give herself credit. Studies at Georgia State University show that most girls don't credit themselves for their own success. When they do well, they say they were lucky. That only makes them feel more helpless. When your daughter does well, help her say, "I got that grade because I'm smart."

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SEXISM IN OUR SCHOOLS

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Recognise your girl's math ability. Dr. Jacquelynne Eccles of the University of Michigan says that parents underestimate their daughters' math talents and overestimate their sons' ability, even when both bring home the same grades. When a girl earns good grades in math, parents credit the marks to hard work; when a boy does the same, parents call him gifted.

Eccles also found that in time, girls pick up on their parents' misconceptions. As a result, they underestimate their own ability in math and science, even when they get good grades. If your daughter does well in science and math, recognise her talent for what it is—and let her know she's gifted.

What about all-girl schools?

The best time for girls to learn to work and play with boys is in grade school. By playing with boys, girls learn to explore. Iowa's Dr. Kerr recommends such groups as coed soccer teams, which teach achievement, unlike girls' groups that teach nurturing.

However, your adolescent may be better off in a girls' school, according to many educators. At that age, peer pressure to conform combines with the need to be popular. Even assertive girls fear that showing their intelligence will repel boys.

But girls' schools remove these pressures. Free to take risks, young women develop leadership skills that carry over to adult life, according to studies from the Women's College Coalition and George Washington University's Dr. Elizabeth Tidball.

In fact, new studies show that today's graduates of women's colleges are tomorrow's leaders:

In adolescence, peer pressure takes its toll. Even assertive girls act demure, afraid that their intelligence will repel boys.

- They are two to three times more likely to be high career achievers than women graduates of coed schools.
- They are represented in Congress and on the boards of Fortune 500 companies at a rate six times higher than could be predicted by chance.
- They are twice as likely to earn doctorate degrees as other women graduates of coed colleges.
- They appear on Business Week's 1987 list of top corporate women at a rate six times beyond their numbers in the population.

"When girls go to single-sex schools, they stop being the audience and become players," Myra Sadker says. Will your daughter be a winner? It all depends on how she plays the game.

For more information

To learn more about how sexism affects girls, read *Smart Girls, Gifted Women* by Barbara Kerr. (Ohio Psychology Press, $15.35.)

To learn how it affects boys, read *Ties that Bind.* Send $2 to PEER, 1333 H St., NW, 11th Floor, Dept. BHG, Washington, DC 20005.

To read more, watch for the Sadkers *How to Raise a Successful Daughter*, to be released later this year.

clip. sex equity/ mathematics

Girls: Drawbacks of Early Success?

Jane enters the classroom and goes straight to the teacher to show her a picture she drew last night. She remains at Ms. Gallo's side for as long as possible, engaging diligently in whatever activity is at hand, and—whenever the opportunity presents itself—helping to pass out papers or pencils, collect milk money, or even resolve a conflict between two classmates.

A girl who suffers from overcontrol may not be seen as having a problem.

Dennis enters the classroom engaged in a shoving match with Joey. They are racing to see who can get to the block corner first. Dennis makes a face at Jane as she passes out the handwriting assignment, then reluctantly picks up a pencil, and within seconds has jumped up to head toward the pencil sharpener brandishing his broken point.

Stereotypes? To be sure. Most girls are not the teacher's pet, and most boys are not Dennis the Menace. But it does seem true that, in the early years of school, boys are more likely to end up in the principal's office and girls on the honor roll. Teachers and observers consistently note a sex-typed pattern of adjustment, with girls generally finding it easier to conform to the routines and expectations of the classroom.

But this does not mean that a classroom environment is good for girls and bad for boys. Ironically, the more closely girls resemble Jane, the more disadvantaged they may be. For example, it is evident to Ms. Gallo that Dennis has a problem controlling his impulses, and she reminds, instructs, and scolds him accordingly. Meanwhile, Jane may suffer from overcontrol, but she is not seen as having a problem. If anything, she is rewarded for her behavior, even though in the long run it may hamper her development of independence and self-esteem.

The very structure of the school day—with its division into required and free play segments—helps to determine whose deficits are noticed and addressed, points out Selma Greenburg of Hofstra University. Whether he wants to or not, Dennis has to participate in such verbal pursuits as show and tell, and in activities like cutting or painting that work on small muscle development. But Jane can avoid activities that might help her develop new strengths.

For example, activities that develop gross motor, exploratory, and spatial skills—like building with blocks, or catching insects for a terrarium, or playing cops and robbers on the playground—are often left to "choice time" or recess. Not surprisingly, when participation is voluntary, many children fall back on traditional sex-role patterns. As Greenburg notes, this situation involves double jeopardy for girls. The school does not require that they work on these skills, and they are blamed for not taking advantage of opportunities to do so.

A similar logic may help to explain why girls who start out doing much better than boys in math do not maintain this advantage. Comparing the patterns of math achievement and errors of boys and girls over a three-year period, Sandra Marshall and Julie Smith of San Diego State University found that as early as third grade many girls demonstrated well-developed and automatic rules for arithmetic operations. Boys, in contrast, often made mistakes in their application of rules and also tended to make errors from lack of attention to details.

While sixth-grade girls continued to excel in many arithmetic skills, boys had caught up or surpassed them in math achievement. In particular, girls had lost ground in solving problems that required an understanding of when to apply the skills at which they were proficient.

To explain this pattern, the researchers developed the following hypothesis: because the mistakes made by the third-grade boys were highly visible, teachers may have given them additional instruction and information—explaining not only the particular rule or procedure to use in that type of problem but also why and when that procedure might be used. The third-grade girls, meanwhile, got correct answers more often and more quickly than the boys. Thus their deficiencies (such as automatically applying a rule to a problem without necessarily undertanding the conceptual relations involved) went unnoticed and uncorrected.

The mistakes made by third-grade boys were highly visible.

This study, like Greenburg's work, spotlights an often overlooked population of students—the "Janes" who begin school most able to meet institutional expectations. It is important to ask whether their apparent strengths mask areas where they could use attention and help.

For Further Information

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Research Matters . . . To The Science Teacher

ENCOURAGING GIRLS IN SCIENCE COURSES AND CAREERS

By Jane Butler Kahle

In the United States women comprise approximately 50% of the work force, yet only 9% are employed as scientists and engineers. Factors contributing to this situation have been analyzed in research studies. Explanations have ranged from differences in spatial ability related to a sex-linked gene to differences in early childhood toys and games. One study reported a dramatic decline in positive attitudes toward science as girls mature. The authors attribute this decline to startling inequities in the number of science activities experienced by males and females in elementary and secondary classrooms. In addition, the analysis of the results from the 1981-82 National Assessment of Educational Progress science study indicate that girls continue to score below the national mean on all science achievement items and to express negative attitudes toward science. Although societal, educational, and personal factors are all involved, differences within the science classroom may be a contributing factor to low interest of women in science and scientific careers.

However some girls like science and continue to study science. In order to determine what motivates these girls to pursue science courses and careers, a group of researchers conducted nationwide surveys to identify teachers who have motivated high school girls to continue in science. In addition to assessing instructional techniques, classroom climate, and teacher-student interactions, a selected sample of students (former and current) responded to questionnaires which assessed attitudes, intellectual and socio-cultural variables.

Two types of research, observational and survey, were used to gather data for this project. The case studies, which were the observational part of this project, provided information about the student-teacher and student-student interactions. Case studies are limited in the extent to which they may produce generalizations applicable to other situations. Therefore, they were supplemented with survey data, describing the abilities, activities, and aspirations of the involved students and teachers. These research efforts led to the following conclusions.

Teachers who successfully *encourage* girls in science:

- Maintain well-equipped, organized, and perceptually stimulating classrooms.
- Are supported in their teaching activities by the parents of their students and are respected by current and former students.
- Use non-sexist language and examples and include

- Use laboratories, discussions, and weekly quizzes as their primary modes of instruction and supplement those activities with field trips and guest speakers.
- Stress creativity and basic skills and provide career information.

Factors which *discourage* girls in science:

- High school counselors who do *not* encourage further courses in science and mathematics.
- Lack of information about science-related career opportunities and their prerequisites.
- Sex-stereotyped views of science and scientists which are projected by texts, media, and many adults.
- Lack of development of spatial ability skills (which could be fostered in shop and mechanical drawing classes).
- Fewer experiences with science activities and equipment which are stereotyped as masculine (mechanics, electricity, astronomy).

The teachers, both male and female, who were successful in motivating girls to continue to study science practiced "directed intervention." That is, girls were asked to assist with demonstrations; were required to perform, not merely record, in the laboratories; and were encouraged to participate in science-related field trips. In addition, teachers stressed the utility of math and science for future careers.

Both male and female students in the schools identified as "positive toward girls in science" were questioned about their attitudes toward science and science careers. When compared with a national sample, the students in these schools had a much more positive outlook. This difference was especially pronounced among girls. When asked how frequently they like to attend science class, 67% of the girls responded "often," compared with 32% of the girls in the national sample. And when asked if they would like to pursue a science-related job, 65% of the girls said "yes," compared with 32% of the girls in the national sample.

This research suggests that teaching styles and other school-related factors are important in encouraging girls as well as boys to continue in science courses and careers. The path to a scientific career begins in high school and requires skilled and sensitive teachers. This research identified the following "Do's" and "Don't's" for teachers who want to foster equity in science classrooms.

DO

- use laboratory and discussion activities
- provide career information
- directly involve girls in science activities
- provide informal academic counseling
- demonstrate unisex treatment in science classrooms

DON'T

- use sex-stereotyped examples
- distribute sexist classroom materials
- allow boys to dominate discussions or activities
- allow girls to passively resist

Dr. Jane Butler Kahle is Professor of Biological Sciences and Education and Associate Dean of the Graduate School at Purdue University, West Lafayette, Indiana. She is a member of the National Association for Research in Science Teaching, an organization that seeks to improve science teaching through research.

This research is described in a monograph available from the author and in a book, *Women in Science: A Report From the Field*, Falmer Press, available summer 1985. For further information contact: Dr. J.B. Kahle, 221 CHEM, Purdue University, W. Lafayette, Indiana 47907.

Guest Comment: Are there innate cognitive gender differences? Some comments on the evidence in response to a letter from M. Levin

In a recent letter, Professor Michael Levin[1] states that "It is *not disputed* that males outperform females on tests of mathematical ability" [my emphasis] and further attributes this phenomenon to innate (i.e., biological) gender differences. In fact, the only element in his assertions that is not strongly disputed is that in *North America* the *average* of boys' scores exceeds that of girls' on the math SAT and similar standardized tests, such as the ACT. However, as discussed below, this disparity does not necessarily persist when other types of math tests are used, nor is it uniform across cultures. Moreover, no less prestigious a scientific body than the British Royal Society[2] (hardly a bastion of radical feminist theory) concluded after thorough study that there was *no convincing evidence* for innate gender difference in mathematical ability.

Because of the widespread belief that boys do outperform girls on most mathematics tests, it is worth emphasizing that the actual picture is far more complex. A number of studies[3–7] have shown that girls perform as well as boys on some types of mathematical tests. Two studies, one using an advanced high-school mathematics class[6] and another using entering freshmen at American University,[7] showed no significant gender differences on achievement tests despite lower math SAT scores for females in both groups. The results of over 100 studies were analyzed by Hyde *et al.*[5,8] who found that the math SAT produced a substantially larger gender difference than their "meta-analysis" of other mathematics tests. Moreover, the size of the gender gap varies with ethnic subgroup.[8,9] One study[8] reported that the gap is largest for Hispanics and smallest for Afro-Americans. Finally, it also worth emphasizing that, as Levin admits, gender differences in math scores do not generally emerge until the early teens.[5]

Levin buttresses his assertions by reference to the widely publicized work of Benbow and Stanley[10] based upon studies of "mathematically precocious youth" (SMPY) emanating from Johns Hopkins University. The journal *Behavioral and Brain Sciences* published a lengthy review[9] (by Benbow) of this work, accompanied by over 40 critiques and a rebuttal by Benbow. The assertion that their work is "... especially notable for controlling for the socialization variables...," which Levin makes in his letter, has been so widely debated[9,11,12] that it hardly merits further discussion. Let me only suggest that anyone inclined to take this claim seriously read the critiques accompanying Benbow's review. There are, however, some less publicized aspects of the Benbow–Stanley work worthy of comment.

A noteworthy omission from Benbow's report[9] is the fact that, *before* the young (typically, seventh grade) children take the exam, Stanley's center at Hopkins sends them a brochure[13,14] containing the information that boys outperform girls on the math SAT. In addition to the very real possibility that it could bias their results, this transgression represents such a serious and fundamental error in experimental design as to cast doubt upon the validity of their entire enterprise. In a related vein, Eccles and Jacobs[15] observed that widespread news reports of Benbow and Stanley's assertions have lowered parents' perceptions of their daughters' mathematics ability. Thus it appears likely that Benbow and Stanley may now be contributing to the very effect they purport to measure.

It should also be pointed out that Benbow and Stanley attach considerable importance to a rather nonstandard statistic, the male:female ratio for high scorers (who constitute much less than 1% of their sample). In discussing the question of whether the gender gap is decreasing in time, Benbow[9] asserted that this ratio "has remained relatively constant over...15 years [1972–86]" at about 12:1 for scores >700. Something unusual must have happened in 1988; Hopkins' own data[14,16] give ratios[17] of about 4:1 for 1988, and 8:1 for 1989. Finally, it should be emphasized that, lower math SAT scores notwithstanding, the girls Benbow and Stanley tested in junior high subsequently outperformed boys by receiving *higher* grades in high-school math courses![9]

Although the SAT does not appear to have been systematically studied across cultures in other countries, the International Association for the Evaluation of Educational Achievement gave a different battery of tests to eighth-grade children in 20 different countries in 5 different subject areas of mathematics. These data were subsequently analyzed for gender differences by Hanna[3,4] who found that in some countries and subjects girls outperformed boys; in others, the reverse. In all cases, the *differences between countries were much larger* than the differences between the sexes. In three subjects (algebra, arithmetic, and statistics) there were *no significant overall sex differences*; however, there were small differences favoring boys in measurement and geometry. In view of the latter's possible connection to alleged differences in spatial ability, the results in this area were analyzed further. With a few exceptions, the difference between the sexes was *not* statistically significant in those countries with high geometry scores, whereas it was significant in those countries (including the US) with low scores. In fact, the average scores for American boys and girls were 39.7 and 37.9, respectively; the "gender gap" of 1.8 pales in comparison to the abyss between American students and those of top-scoring Hungary and Japan, in which all subgroups had averages in the 55–60 range. While the nature of the study does not allow any definitive rankings between countries, the size of the gaps clearly demonstrates that cultural factors and educational systems are far more important than gender.

Levin's assertion of gender differences in spatial ability might appear to be on firmer ground. However, careful examination of the evidence again gives a less convincing picture. In 1985, Caplan, *et al.*[18] surveyed the literature on the subject and found serious inconsistencies, a lack of conclusive evidence, and difficulties with the construct itself. Their description of one widely cited set of experiments is worth repeating.

> Porteus (1965) has reported that in 99 out of 105 studies males obtained higher test scores than females on his test in which examinees are asked to draw their way through line mazes. These figures are impressive, but a closer examination...reveals serious flaws.
>
> Porteus himself reported that in only 18 of the 105 studies were *t* tests done, and in only 4 of those did they reach statistical significance. Accordingly, he then questioned the reliability of the *t* test as a tool to detect significant differences. He reported no other statistical tests

from any of the 105 studies.

Caplan *et al.*[18] further report that, although a significant sex difference was thus demonstrated in only 4 out of 105 studies, these results have been widely cited as attesting to male superiority in spatial ability with some reviewers implying that significant differences were actually found in 99 of the studies.

It is also worth noting that the size of the gap varies with the testing procedures used.[18] Indeed, the types of tests used to measure spatial and verbal ability raise some questions. For example, *The New York Times* gave front-page publicity to a study which asserted that women's verbal and spatial abilities fluctuated with the level of estrogen in their bodies.[19] Verbal ability was reportedly tested by timing how fast the women could say "A box of mixed biscuits in a biscuit mixer" five times in succession.

Levin's suggestion that MIT's admissions policy reflects lower standards for women should not go unchallenged. I discussed his assertions with representatives of the admissions office and one member of the physics faculty. While it is true that the average math SAT scores of the women admitted to MIT are slightly lower than those of the men, all those I contacted emphasized that this did *not* result in a lowering of standards.[20] On the contrary, their policy results in a student body in which women perform, as measured by college grades, as well as men at MIT. Moreover, on average, women do as well as men across departments (including physics) so that their success cannot be attributed to any preference for "softer" courses as alleged by Levin.

In addition, almost all of MIT's students score above 700 on the math SAT; and the College Board's own guidelines imply that one cannot draw conclusions about the relative ability of students whose scores differ by as much as 70 points.[21] MIT's policy is also consistent with both the College Board's strong recommendation that SAT scores not be used as the *sole* basis for admission[22] and with a number of studies showing that other factors, such as high-school grades, may correlate better with college math performance than the SAT.[21,23] As noted above, Benbow and Stanley themselves report[9] that, lower math SAT scores notwithstanding, the girls in their SMPY study *subsequently* outperformed the boys in mathematics courses.

Levin distorts Professor Janice Button-Shafer's argument[24] when he suggests that she necessarily finds a 50/50 ratio for male and female physicists intrinsically optimal. Her thesis (amply supported by data from government agencies and professional societies)[25–28] is that the current percentage of women in physics is much lower than the percentages in mathematics and other areas of science and engineering which require the same type of skills and abilities as physics. Furthermore, a number of other countries, including Belgium, France, Israel, Spain, Poland, and China, have far more women physicists in high-level positions than the US.[29] In the US, even girls in advanced math classes are much less likely to study high-school physics than boys at the same level of mathematical ability; according to American Institute of Physics data,[25] 80% of such boys study physics, but only 60% of girls. The point is not that, in a perfect world, a 50/50 ratio would be either inevitable or desirable, but that many capable women do not pursue careers in the physical sciences, often making critical decisions at a rather young age.

I do agree with Levin that a complete absence of innate gender differences has also not been established, but find that of little importance. None of the tests measure large gender differences, and there is substantial evidence that at least some of those differences can be attributed to culture, education, and social factors. Therefore, any reasonable interpretation of the data gives evidence for, at most, a very small *average* gender difference in ability, yielding a substantial cohort of women quite capable of successful careers in science and engineering. Unfortunately, even these women may be discouraged by the publicity and distortions. Indeed, it is not uncommon for girls at the very top of the distribution (e.g., first in a math class) to be told that *they* cannot be scientists because girls (in general) aren't as good as boys. (My own experience was that such comments are most likely to come from nonscientists; however, other women scientists have reported differently.) Nor is there much evidence for Levin's assertion that parents who encourage sons in math more than daughters are reflecting their children's performance. On the contrary, Eccles *et al.*[30] have found that parents often deny their daughters' math ability even when they perform well, and that this phenomenon has been exacerbated by the publicity given to assertions of innate gender differences.[15]

It is worth observing that the same forces that discourage capable women from scientific careers often simultaneously encourage boys with mediocre talent. There is evidence that female students generally receive higher grades in calculus than male students. For example, Hughes[31] reported the results of a survey in which 31% of women vs 20% of men received *A*; 34% of women vs 27% of men received *B*; but only 15% of women vs 25% of men received *D* or *F*. Because fewer women choose to study calculus, such differences say little about relative ability, but they do say something sobering about the caliber of students pursuing various career paths. My own experience, which I suspect is typical, suggests that the picture is even more distorted than the data indicate. Women who receive calculus grades of C, or even low B, rarely pursue careers in science or engineering; however, I have frequently encountered men who intend to become engineers despite repeated calculus grades at the D or low C level. Thus it appears our society's propensity to encourage children on the basis of gender stereotypes rather than achievement may actually serve to *lower* standards.

Furthermore, there are several examples of high-quality educational environments in which males and females perform equally well.[32] This leads me to speculate that some of the gender gap observed in North America may be the result of deficiencies in our educational system, and to hope that improved math and science education would diminish the sex differential. Real reform will require an enormous investment in both personnel and resources, as well as changes in attitude. I believe such efforts are worth the price, and will reduce the gender gap; in any case, the worst that could happen is that we would have better male scientists.

As a physical scientist, accustomed to quantitative reasoning and objective, reproducible experiments, I found reading some of the literature on this subject, particularly the reviews by Benbow[9] and Caplan *et al.*,[18] to be almost surreal at times. Most of the respondents to Benbow's review[9] were identified as affiliated with psychology departments; a few with education or biosciences (e.g., neurophysiology); but not one from a department of mathematics, statistics, or physical science. Although many of these respondents gave very cogent critiques, I missed the voice of

a statistician and regret the consequent lack of a serious critique about the reliability of inferences obtained from data in the tail of a curve. It is understandable that experiments in psychology and education do not meet the same standards of rigor and objectivity as those in a physics laboratory. However, that is no excuse for presenting speculation based upon dubious data to the news media and general public as if it were scientific fact.

It may be useful for physicists to compare the gender difference controversy with the recent suggestion of a "fifth force" or other modification to Newton's law of gravity.[33] In both cases, individual experiments, some of them carefully done, seem to provide strong support for a particular hypothesis. However, other experiments suggest the opposite. While physicists may not have been entirely satisfied with the coverage of the "fifth force" controversy in the news media, they did at least report the existence of contradictory data. By contrast, the news media frequently report speculative work alleging a gender difference as if it were scientific fact, but give scant attention to those who find otherwise.

It is unfortunate that the continued need to rebut assertions of sex-based differences in mathematical ability diverts attention away from related serious issues—namely, the need to find ways to counter the cultural factors that still deter women from studying the physical sciences, the need to substantially improve mathematics and science education for children of *both* sexes in the United States, and the need to find ways to encourage children of both sexes and all races to aspire to excellence and choose careers on the basis of interests and ability rather than sexual, ethnic, and racial stereotypes.

My own views on some of these matters have been expressed elsewhere.[34] I hope that other readers will accept Editor Romer's invitation to use this Journal as a forum for further discussion of how to meet this challenge.

I am grateful to many people, including Professor Richard Dudley, Professor Gila Hanna, Allyn Jackson, and Dr. Barbara Peskin, for helpful information, discussions, and comments on an early draft of this manuscript. Needless to say, both the opinions expressed here and the responsibility for the accuracy of the citations are entirely my own.

Mary Beth Ruskai
Department of Mathematics
University of Lowell
Lowell, MA 01854

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THE SCIENTIFIC METHOD: DOING ONE'S DAMNEDEST WITH ONE'S MIND, NO HOLDS BARRED

It seems to me that there is a good deal of ballyhoo about scientific method. I venture to think that the people who talk most about it are the people who do least about it. Scientific method is what working scientists do, not what other people or even they themselves may say about it.... I think that the objectives of all scientists have this in common—that they are all trying to get the correct answer to the particular problem in hand. This may be expressed in more pretentious language as the pursuit of truth.... All these things together give that "objectivity" to science which is often thought to be the essence of the scientific method. But to the working scientist himself all this appears obvious and trite. What appears to him as the essence of the situation is that he is not consciously following any prescribed course of action, but feels complete freedom to utilize any method or device which in the particular situation before him seems likely to yield the correct answer. In his attack on his specific problem he suffers no inhibitions of precedent or authority, but is completely free to adopt any course that his ingenuity is capable of suggesting to him. No one standing on the outside can predict what the individual scientist will do or what method he will follow. In short, science is what scientists do, and there are as many scientific methods as there are individual scientists.

Percy W. Bridgman, *Reflections of a Physicist* (Philosophical Library, New York, 1955), 2nd ed., pp. 81–83.

Sexism in the Classroom

Robin Huntington

An earlier version of this article appeared in our last issue, but, while printing the correct photograph, we listed the wrong person as the article's author. To rectify our error, we are printing a revised version, this time taking care to give credit where credit is due.

Today women comprise more than half of the American undergraduate student population, a proportion suggesting that women are finally attaining the equality they've so earnestly sought. But according to Hall (1982), there are grounds for challenging the assumption that women and men attending the same classes are receiving the same education. Furthermore, while more women have gained access to higher education, they are not continuing through college, graduate school, and professional positions in the same proportions as men.

Perhaps something about the college experience encourages men far more than women to continue through graduate school and on to successful careers. Although men and women receive essentially equivalent grades, they differ with respect to what they learn about their own value as classroom participants. In judging their own value and career potential, students place great weight upon the way professors respond to their participation and upon the attitudes professors express toward them and toward their same-sex peers.

In a survey of students in six different eastern colleges that bears on this point, Hall (1982) found that many students believed that more recognition and encouragement were given to men in the classroom than to women. They believed that men were called on more often than women, and that teachers gave men more positive responses, for example by making and maintaining more eye-contact with them. Recall that grades show that such differences in encouragement are *not* based on differences in course content mastery.

The study just cited focused upon *opinions*. And though many researchers have observed teacher-pupil interactions in elementary school, parallel studies of college classrooms could not be located. This article reports the author's efforts to collect such data to determine whether, as she hypothesized, observational data would support and explain Hall's conclusions.

> The greatest relative disadvantage for women occurred in small classes taught by men.

Study Design

Specifically, she arranged for 11 University of Delaware students to monitor one session of each of their courses in a designated week. For each class, each student was asked to record the general disciplinary area of the course, the size of the class, the instructor's gender, the number of male and female students attending class that day, the number of males and females who spoke during class, the length of each student's contribution, the instructor's feedback to the speaker (positive, neutral, or negative), and any other significant characteristics of the classroom interaction.

A total of forty classes were observed. Table One shows how these classrooms compared with respect to class size, instructor gender, and course content. With few exceptions all students observed were white, middle-class males and females between 18 and 25 years old. For each gender, participation scores, mean percentage length scores, and mean percentage feedback scores were calculated (see box).

Results

Men participated more than women. The mean classroom participation scores were 49 for men and 31 for women. Male participation scores exceeded those of females in classes taught by both men and women. However, the advantage to male students was greater in classes taught by men than those taught by women; thus in classes taught by men, the participation scores were 44 for men and 21 for women—a 2-to-1 ratio—while in classes taught by women, these scores were 55 for men and 42 for women—only a 1.3-to-1 ration.

The class size data support the common sense proposition that smaller classes elicit greater amounts of student participation. Specifically, participation scores in smaller, medium-sized, and large classes averaged 76, 21, and 8, respectively.

The greatest relative disadvantage for women occurred in small classes taught by men. In these classes, the

male participation score was 105; virtually all male students participated, and many spoke more than once. However, in these same classes, the female participation score was only 42. In contrast, small classes taught by women showed a smaller disadvantage for women students. Participation scores were 87 for men, compared to 69 for women.

Another instructor gender difference showed up in medium-sized classes. Men seemed to treat medium-sized classes like *large* classes; they elicited relatively little student participation (The gender participation scores averaged 12). In contrast, women appeared to treat their medium-sized classes like *small* classes (The gender participation scores averaged 33). This was not due to difference in actual class sizes, which averaged 49 students for male instructors and 47 for women.

A second index of teachers' recognition and encouragement of students is the relative length of students' class contributions. Thinking and idea questions or comments take longer to express and explain. Matters of fact or clarification can be stated more briefly. The data show that virtually all student contributions in all classes were short; overall, only six percent were long. To the extent that gender differences appeared, however, they again favored men over women. Over all classes, nine percent of men's contributions were long, compared to only three percent of women's.

The male students' advantage appeared in large and medium-sized classes taught by both men and women, and also in small classes taught by men. The single category in which women offered more lengthly contributions than men (ten vs. five percent) was in small classes taught by women. This finding suggests that the relative lack of participation and lower rates of lengthy contributions of women are *not* due to lack of interest. Given the favorable combination of a small class and a woman teacher, their interest becomes manifest.

Table One: Sample Classrooms by Size, Instructor Gender, and Course Content

	Below 30 Students		Between 30 and 100 Students		Over 100 Students	
	F	M	F	M	F	M
Natural Science	0	2	0	2	0	0
Social Science	2	1	4	6	2	4
Humanities	4	3	2	1	0	0
Business	1	2	2	1	0	1
Total	15		18		7	

How Scores Were Calculated

The women's participation score in a class was calculated by dividing the total number of female contributions to the class by the total number of women in the class and multiplying the quotient by 100; the men's participation score was calculated the same way. Thus in a class of ten men and ten women, if eight men and six women each spoke once, the respective scores would be 80 for men and 60 for women.

In some small classes, especially those meeting in a three-hour seminar, some students spoke more than once. Since the number of *contributions* was counted as opposed to the number of particular individuals who spoke, some of the scores were greater than 100. For example, if during a class containing ten men three spoke once, three others spoke twice, and two others spoke three times, the participation score for men in that class would be $[(3+6+6)/10] \times 100 = 150$. The women's percentage of long or short contributions was determined by dividing the total number of long or short contributions from women in a class by the total number of female contributions in that class. Similarly, the women's percentage of positive, neutral, or negative feedback was determined by dividing the number of contributions from women that received each type of feedback by the total number of female contributions. The percentages were then averaged across classes, yielding mean percentage scores per classroom of teacher-student interaction. Both mean percentages were also calculated for men.

A final aspect involves the kind of feedback given to students who *do* participate. Feedback in this study—both verbal and nonverbal—was classified as positive, neutral, or negative. The data showed that virtually all teacher feedback was either positive or neutral. There were no systematic differences between men and women in receiving positive or neutral feedback in any size class from either male or female teachers. However, there was a systematic difference between men and women students in the amounts of negative feedback received. Women's contributions were more likely to receive negative feedback than men's. The largest difference (14 percent negative feedback to female students vs. 2 percent to males) came in middle-sized classes taught by women.

Part of the difference in male and female participation scores could have been due to the fact that greater percentages of men than women raised their hands to speak in class. For example, in a small class, eight of ten men might raise their hands but only six of ten women. However, the difference in hand-raising rates did not account for the difference in participation scores. In such situations, the typical teacher might call upon six of the eight men, but only three of the six women. In addition, especially

in small classes, many men, but only a few women, simply spoke up without raising their hands or being called on.

In speaking out, the trend was for women to express their contributions in question form, ending with an upward inflection of the voice, even if the contribution was actually a comment rather than a question. For instance, they frequently began, "Don't you think," while men would begin, "I've found that."

Fifty percent of the male instructors engaged in unambiguously sexist behaviors, such as using sexist language, favoring male contributions, or making jokes about women. For example when explaining why Lady MacBeth didn't kill Duncan herself, one male instructor said, "She just didn't have the balls—literally." Eight percent of the men were actively nonsexist, using nonsexist language and examples throughout their lectures. For the remaining 42 percent, there was no basis for judgement, as they either spoke in specifics, or did not interact much with the class.

Of the female instructors, 36 percent showed signs of sexism by favoring male contributions, engaging in "flirtatious" behavior when interacting with males, or by using sexist language. Nine percent of the female instructors were actively nonsexist, using nonsexist language and examples, and the remaining 55 percent gave the observers no basis for judgement.

A trend found in a few classes taught by women was for male students to interrupt them by calling out while they were speaking. In one social science course, two men were observed repeatedly interrupting the female instructor. One man corrected her pronunciation of a scientist's name, after which she said that it could be pronounced either way. Later in the class the same man spelled out a word for her as she wrote on the board. She hadn't hesitated or asked for help, and she didn't thank him. Behaviors such as these were observed in three of the classes taught by women. They were observed in only one class taught by a man.

In one of the math classes, which happened to be taught by a man, the self-chosen seating arrangement resulted in 80 percent of the women sitting in the back three-fifths of the room, and 69 percent of the men sitting in the front two-fifths of the room.

Discussion

The fact that women comprise 56.5 percent of the University of Delaware's undergraduate population but only 23.1 percent of its faculty warrants comment. Geis, Carter and Butler (1982) stated that later career achievements of women are directly related to the percentage of women faculty members at their colleges. Identity theory posits that the higher the number of successful women with whom a woman interacts, the greater the likelihood that she will become a successful woman herself. This hypothesis is supported by the finding that the smallest difference between male and female students' behaviors were found in classes taught by women.

Women offered more lengthy contributions than men in small classes taught by women.

It is important to note that most instructors do not consciously treat men and women differently (although there have been examples such as the biology teacher telling his students that he didn't like having nursing students in his class), and most would claim that they aren't sexist. Bem and Bem (1970) describe a pattern in which individuals overtly reject gender-based stereotypes and traditional definitions of masculinity and femininity but inadvertantly allow them to influence their everyday behaviors. For example, an instructor may tell jokes whose "humor" relies on traditional female stereotypes.

This pattern is found not only in instructors, but also in students. Male students who are patronizing to female instructors are revealing a basic ideology about the inferiority of women; furthermore, the more the behavior is explicitly sexist, the lower the likelihood that the beliefs are subconscious.

The differences observed in this study—the rates of participation, the length of class contributions, and the tone of classroom feedback—have their source and origin in cultural stereotypes about men and women. By the time students get to college, they have a long history of academic experience, as well as of the rewards and punishments it can bring them.

Tavris and Offir (1977) report that in studies of teacher-pupil interaction in elementary school, boys and girls are treated differently. Teachers praise boys for academic successes and criticize them for non-academic matters (e.g., sloppy work or disruptive behavior). In contrast, while little girls receive praise for non-academic matters—neatness, being thoughtful of others, and "looking pretty"—their academic successes go unnoted (perhaps they are taken for granted), and their academic failures bring explicit criticism and reprimand.

This pattern is likely to teach males that academic success brings rewards but that failure brings little or no punishment. In contrast, it is likely to teach females that academic successes bring no rewards, but failures bring punishment. Such a difference in expectations could explain why males are more willing than females to take the risks of class participation. Then, since practice not only improves skills, but also builds self-confidence, the difference in male and female participation rates would *increase* over time. Thus, college teachers, who see only the results of this process, come to believe that male students are more "interested and capable" than females. Of course, such

conclusions simply perpetuate the stereotypes.

Campbell's theory of stereotyping (Geis, Carter & Butler, 1982) describes different ways in which stereotypes lead to error. For one, labels tend to distort actual perceptions, so that they fit the stereotype. Thus when an instructor hears a male's comment, his or her stereotype of the competent, intellectual male may cause him to perceive the contribution as more valuable or insightful than it really is. Likewise, a female's comment, due to a stereotype of the incompetent, emotional female, may be perceived as less valuable or insightful than it actually is. Hagen and Kahn (1975) found that men liked competent women best when they did not have to interact with them. Perhaps they were trying to avoid seeing something that didn't agree with their label.

Also, according to Campbell, stereotypes cause us to assume biological causality, and to ignore environmental factors. The argument might then be, "Why bother trying to teach women math when they will never be as good as men anyway?" Finally, Campbell asserts that stereotyping leads us into developing justifications for discriminatory actions. Thus instructors who call on men rather than women may hold the stereotype that men are more intellectual, and may justify calling on the male by rationalizing that the male probably has more to contribute.

Psychological oppression is a process by which a minority group internalizes the norms and definitions of the dominant group. It is a process that can explain why some women discriminate against other women. Probably subconciously, they have internalized male-defined values and norms, which results in their behaving in a way that is detrimental to their own gender. Psychological oppression may also explain why no female student ever objected to the use of sexist language or jokes. They hold the same values as the perpetrators. They reflect these values in class through such behaviors as using deferent tones of voice and putting comments into question form (Frieze, 1976).

Stereotyping and psychological oppression are both relevant to the effect of class size on the difference between men's and women's class participation rates. Although there was more class discussion in small classes, it was in such classes that the ratio of the percent of women speaking to that of men was the lowest. Apparently, the greater the opportunity for class participation, the greater the relative disadvantage for women. This difference in opportunity was most striking in small classes taught by men. If women believe that their contributions are less valuable than those of men, they are more likely to refrain from talking. The presence of a male authority figure may reinforce the belief in male superiority, thereby increasing the influence of this self-censori[illegible] dynamic. Another concept that might explain the behavior of women is Fear of Success (Horner, 1972). For some, "success" and "femininity" appear to be desirable but mutually exclusive traits. The woman who is in a position to attain success may experience a great deal of anxiety because she fears that she will be jeopardizing her femininity.

Women's contributions were more likely to receive negative feedback than men's.

Shapiro (1979) argued that it was not success in general that women feared, but success in traditionally masculine areas that is perceived to be incompatible with the concept of "femininity." Perhaps an anxiety about being successful in a traditionally masculine field may explain why women sat in the back of the math class, a location that presumably would decrease instructor demands for involvement. Unfortunately, this seating arrangement also places women at a relative disadvantage with respect to note-taking, asking and answering questions, and getting to know the instructor.

Colette Dowing (1981) calls the conflict between being successful in a traditionally masculine area while trying to retain one's femininity may entail too much stress for many women to deal with. Dowing calls this conflict "gender panic," and Feather and Simon (1975) appear to have found a basis for it. In particular, they found that when people succeeded, they were viewed as more powerful and less feminine than when they failed. Some writers (e.g., Tavris and Offir, 1977) claim that it is not "success" itself that women fear, but rather the very real punishments (e.g., hostility and social rejection) that were often heaped on women who stepped "out of place" by presuming to demand the privileges such as high status or high salaries that are traditionally associated with "male" occupations.

Until both men and women acknowledge and work on eliminating their biases and stereotypes, discrimination will be perpetuated. And until women develop their own definitions of what it means to be "feminine," they will have a hard time dealing with success. However, as long as instructors encourage only half of their students, few women will have a chance to try.

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INTEGRATING the Sciences

by Sue Berryman

American women and certain minorities are more likely than men, whites and Asian Americans to leave school without the mathematical or scientific training required to obtain the increasing number of technical, higher wage jobs in the economy. Since differential representation in higher paying jobs accounts for a substantial share of the income differences among subgroups, the underrepresentation of women and minorities in the scientific and engineering labor force has appropriately become a public issue.

Parties to the public debate generally appreciate the connection between educational investments in quantitatively-based fields[1] and job opportunities in these fields. On the basis of this understanding they often presume that it is the university itself that can achieve fuller subgroup representation in the quantitative disciplines, either through enhanced recruitment efforts, affirmative action programs, or other academic policy initiatives aimed at attracting larger numbers of women and minorities. However, increasing evidence suggests that this strategy will affect subgroup imbalances only minimally. This evidence pertains to the processes by which subgroup differences in mathematical educational investments occur, the reasons that they occur, and the subgroup variations in these reasons. It highlights the complexity of the subgroup imbalance problem, and we cannot effectively address the underrepresentation of women and minorities in the scientific and engineering labor force without taking it into account.

Toward that objective, this article focuses on three questions. What is the representation of different subgroups among quantitatively-based degrees? By what process do the subgroup differences that we observe emerge? What factors produce these differences, and how do they differ by subgroup?

As of 1978–79, relative to their shares of the age-relevant population, blacks, Hispanics, and American Indians were underrepresented at the associate, B.A., M.A., and Ph.D. degree levels in three ways:

- among the total degrees awarded at each level—both quantitative and non-quantitative;
- among the quantitative degrees, awarded at each level, controlling for the subgroup's share of total degrees; and
- among the quantitative degrees awarded at each level, without controlling for the subgroup's share of total degrees.

For example, relative to a randomly selected white from the appropriate age group, a randomly selected black in 1978–79 was only 50 percent as likely to receive a B.A. degree in any field; only 60 percent as likely to receive the B.A. degree in a quantitative field; and only 30 percent as likely to receive a quantitatively-based B.A. degree. On the other hand, whites and Asian Americans were overrepresented on all three grounds at all degree levels.

When we look at professional degrees, blacks, Hispanics, and American Indians were underrepresented among the total professional degrees awarded. However, their shares of the biologically- or physically-based professional degrees[2] were about equal to their shares of these degrees in total.

Blacks, Hispanics and American Indians are more underrepresented relative to Asian Americans than to whites. For example,

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Sue E. Berryman, a behavioral scientist, is a resident consultant at The Rand Corporation. This article is based on a study, Who Will Do Science, *conducted for and published by The Rockefeller Foundation.*

1. The quantitative disciplines are defined to include the biological sciences, physical sciences, computer sciences, mathematics and engineering.

2. The biologically- and physically-based professional degrees are defined to include medicine, dentistry, optometry, osteopathy, podiatry, veterinary medicine and pharmacy.

Illustrations by Salvador Bru

in 1978–79, relative to a randomly selected black from the appropriate age group:

- a randomly selected white was 3.5 times as likely to have received a quantitatively-based B.A., over five times as likely to have received a quantitatively-based M.A., and seven times as likely to have received a quantitatively-based Ph.D.;
- a randomly selected Asian American was six times as likely to have received a quantitatively-based B.A., 13 times as likely to have received a quantitatively-based M.A., and 17 times as likely to have received a quantitatively-based Ph.D.

In 1979–80, women got about half of the total degrees—quantitative and non-quantitative—awarded at each degree level except at the Ph.D. and professional degree levels. A randomly selected male was over twice as likely to have received a Ph.D. or a professional degree as a randomly selected female of the age-relevant group.

Given that a woman received a B.A., M.A., or Ph.D. in any field, she was no more than half as likely to obtain that degree in a quantitative field as a man who received a degree at the same level. Thus, women's underrepresentation among quantitative B.A. and M.A. degrees reflects their field choice only; their underrepresentation among quantitative Ph.D. degrees, the joint effects of their underrepresentation at the Ph.D. level itself and their field choice at the Ph.D. level. The end result for 1979–80 was that a male randomly selected from the age-relevant population was twice as likely as a randomly selected female to have received a quantitatively-based B.A. or biologically- or physically-based professional degree, and three times as likely to have received a quantitatively-based M.A. or Ph.D.

The policy implications of current representational imbalances depend partly on representational trends. Minorities and women may be changing their representation among quantitative degrees at rates which, projected forward, would gain them proportionate representation in this decade.

Current enrollment data for the underrepresented minority subgroups do not suggest an increase in their future shares of B.A. or graduate degrees greater than increases in their shares of the age-relevant population. The trends for women, however, are strong and positive. In the last decade, women earned an increasing percent of the degrees conferred at every level—associate, B.A., M.A., Ph.D. and professional. They are still underrepresented among Ph.D. and professional degrees, but if their rates of increase continue, by 1990 the percentage of Ph.D. degrees and professional degrees earned by women should approximately equal their representation in the age-relevant population. Women also show increases in their shares of quantitative degrees at each degree level, but growth in these shares is much smaller than that for total degrees.

At any given degree level, a group's share of quantitative degrees reflects persistence in the educational pipeline and field choice. The term "pipeline" refers to the sequence of educational levels and degrees, beginning with grade 1 and concluding with a professional or doctoral degree. Individuals can leave the pipeline at any point, although losses concentrate at degree completion points. "Field choice" refers to the substantive focus of the individual's education, such as an English or a physics major in college.

Understanding how imbalances emerge requires determining the relative contribution of pipeline losses and field choices to each subgroup's representational outcome. All subgroups lose members as they progress through the educational pipeline; the issue is whether, at particular points in the process, a subgroup loses more or fewer members than all other groups.

Underrepresentation of blacks, Hispanics, American Indians and women at the end of the pipeline—among quantitative Ph.D. degrees—is partly attributable to their underrepresentation at the Ph.D. level itself. Interventions that aid retention in the educational process should therefore increase the representation of these groups among quantitative Ph.D.'s. However, the groups have different dropout patterns, indicating dissimilar needs.

For blacks, the losses are dispersed across the pipeline. For Hispanics, they are concentrated at high school graduation and college entry. For American Indians, disproportionately high losses occur at high school graduation, college entry, and the B.A. degree level. However, this subgroup does not show disproportionately high losses after the B.A. degree. For women, the losses are concentrated at the end of the pipeline: at the Ph.D. level.

Field choices also contribute to blacks' underrepresentation among quantitative B.A., M.A. and Ph.D. degrees. Blacks lose "field" ground, just as they lose degree attainment ground, at several points in the process. At the B.A. level, the percent choosing quantitative fields is 60 percent of the national average; at the M.A. level, 40 percent; and at the Ph.D. level, 33 percent.

For American Indians, higher pipeline losses, not field choices, cause their underrepresentation among quantitative B.A. and M.A. degrees. At the Ph.D. level, both factors account for their underrepresentation.

Although higher persistence during the educational process partly explains the overrepresentation of Asian Americans among quantitative B.A., M.A. and Ph.D. degrees, their field choices are the driving force. Relative to whites, they choose

quantitative fields at the rate of 2-to-1 at the B.A. level, 3-to-1 at the M.A. level, and 2-to-1 at the Ph.D. level. For example, in 1980, 60 percent of the Asian American Ph.D. graduates earned their degrees in quantitative fields, relative to 30 percent of white Ph.D. graduates.

The field choice factor for women is startling. The increased percentage of women in quantitative fields at each degree level is *entirely attributable to their greater representation at the degree level itself, not to changes in their field choices.* Unless women begin to change their field preferences, further increases in their shares of quantitative degrees will depend entirely on an increased percent of women at each degree level. It is not clear that we can expect major percentage increases at the lower degree levels.

Quantitative graduates are ultimately derived from a scientific/mathematical talent pool that first appears in elementary school. In the early grades, membership in this talent pool is defined by mathematical or scientific career interests. As cohorts move through school, it is defined increasingly by higher mathematical achievements.

To increase a subgroup's representation among quantitative degrees, policymakers can either try to increase the group's share of the initial mathematical/scientific talent pool or try to reduce attrition along the educational pipeline. In either case, knowing *when* to take action is critical.

The scientific/mathematical talent pool emerges strongly before grade 9, appears to reach its maximum size prior to grade 9, and subsequently declines in size through graduate school. Although the talent pool seems to reach its maximum size before high school, migration *into* the pool continues to occur during grades 9 through 12. However, *after high school migration is almost entirely out of, not into, the pool.* In other words, the probability that an individual not in the pool at the end of high school will enter it during college or graduation is close to zero. This irreversibility coincides with the conclusion of the high school mathematical sequence required for heavily quantitative college majors. Those who obtain quantitative doctorates or have quantitatively-oriented careers a decade after high school come overwhelmingly from the group that had scientific and mathematical career interests and high mathematical achievement scores in grade 12.

These results have two major policy implications. First, strategies to increase the size of the initial scientific/mathematical pool of minorities and women should be targeted *before* and *during high school.* Second, strategies to decrease attrition from the pool can be targeted at any point in the process, since attrition from the pipeline and from quantitative fields occurs at all points.

The probability that an individual not in the mathematical/scientific talent pool at the end of high school will enter it during college is close to zero.

As we have just seen, completion of the high school advanced mathematics sequence is a necessary—although not sufficient—condition for post-secondary study in quantitative fields and employment in quantitative occupations. Thus, understanding the underrepresentation of different subgroups requires an understanding of the factors which predict completion of this sequence.

Available research tells us more about women and blacks than about the other subgroups and more about choices made in grade 12 and college than before grade 10 or after college. However, even our sometimes fragmentary knowledge clearly indicates that different factors underlie the underrepresentation of different subgroups.

For women the pattern is relatively clear. Gender differences in grade 12 mathematics achievement are primarily attributable to differences in boys' and girls' participation in elective mathematics. Since grade 9 boys and girls do not differ significantly in average mathematical achievement, previous achievement does not explain subsequent gender differences in the decision to pursue elective mathematics courses and in resulting mathematical achievements.

The individual's confidence in his or her mathematics ability predicts participation in the high school mathematics sequence. A recent study finds gender differences in mathematics confidence for children with the same objective mathematics ability, boys being more confident than girls. Parents believe that daughters have to work harder than sons to perform well at mathematics, despite the similarity of sons' and daughters' past achievements in mathematics.

Career and educational goals also strongly affect participation in high school elective mathematics courses. The more useful the individual expects mathematics to be, especially in achieving educational and career goals, the more high school mathematics he or she takes.

Since career goals seem to determine educational investments, gender differences in occupational expectations become key to understanding gender differences in high school mathematics participation. An accumulating literature indicates that girls' occupational expectations depend on how they expect to allocate their time between the labor force and the home during

adulthood. Girls who expect more labor force participation have occupational goals that approximate those of their male counterparts. They are more apt to chose traditionally male occupations and ones that require systematic educational investments, such as the elective high school mathematics sequence.

As long as girls expect to assume the major child-rearing responsibilities of their children, they will be less likely than boys to choose quantitative occupations.

The gender differences in career preferences and mathematical achievements at the conclusion of high school unfold in predictable ways to produce post-high school gender differences in educational and occupational attainments. Mathematics ability and career interests strongly predict men's and women's choices of a science major in college and persistence in a science major. High mathematical achievement at grade 12 predicts realization of grade 12 quantitative career plans by age 29, and even those who do not plan a quantitative career at grade 12 but subsequently switch into a quantitative career have high mathematical achievement at grade 12.

In sum, the key for women seems to be their career choices, their investment in the junior and senior high school mathematics and science sequence being dependent on these choices. The career choices themselves seem to reflect how women resolve the conflict between achievement in the labor force and family responsibilities. Studies show that male single parents make occupational and labor force adaptations to parenting that look like the occupational and labor force plans of girls who expect dual family and work responsibilities. As long as girls expect to assume the major child-rearing responsibilities of their children, they will be less likely than boys to choose quantitative occupations that require major educational and labor force commitments.

While boys and girls enter high school with approximately equal average mathematical achievements, racial and ethnic groups differ in their average mathematical achievement at grade 9. These differences strongly influence subsequent participation in the elective high school mathematics sequence required for post-secondary training in the quantitative disciplines. The racial and ethnic differences in mathematical achievements that we observe at grade 9, in fact, appear at grade 1. Blacks, Mexican Americans and Puerto Ricans start school with mean scores on verbal and nonverbal tests of achievement below the national white average. At grade 1, Native Americans score below the national white average on verbal tests and at the national average on nonverbal measures; Asian American children score at the national average on verbal measures and above the national average on nonverbal measures.

Two momentous factors contribute to the relationship between ethnicity and mathematical performance at each educational stage: *culture* and *social class*. Both affect family behavior patterns which in turn powerfully affect children's school performances. Culture and social class interact to produce unique patterns that cannot be predicted by knowing either cultural or social class effects alone.

A study of verbal, reasoning, numeric and spatial achievements among Puerto Rican, Jewish, Chinese and black children at grade 1 shows clear racial and ethnic differences in the patterns of these abilities, and subsequent studies suggest that ethnic differences in ability patterns at grade 1 persist through elementary and secondary school. More important, although social class has important effects on the *level* of abilities of each group, it does not alter the *basic pattern* of abilities associated with each group.

At the same time, the study also shows that social class matters. The scores of middle-class children from the various ethnic groups resemble each other to a greater extent than the scores of the lower-class children from the different groups. In other words, middle-class Chinese, Jewish, black and Puerto Rican children are more like each other in ability scores than lower-class children in each of these groups. Social class has a particularly profound effect on the performance level of black children, lower-class status depressing performance more for these children than for children from the lower classes of other ethnic groups.

Recent research indicates that very young babies develop cognitively far more than had been realized and that the socioeconomic status of the babies' families has profound effects on this early development. As Lewis Lipsitt, director of Brown University's Child Study Center notes, "[T]he socioeconomic index is as powerful a predictor of later intellectual prowess as any variable we've got, but it doesn't operate in a vacuum. It is not simply a matter of economic hardship or nutritional deficiency. It is a representation of the way people live and relate toward each other,and the way they behave toward babies."

Studies of families support this view. Social class seems to be a proxy for *family characteristics* that affect school achievement. For example, an American study showed that characteristics such as parents' achievement pressures on the child, language models in the home, indoor and outdoor activity levels of the family, intellectuality in the home—as represented by the nature and quality of toys, games and hobbies available to the child—and work habits in the family together correlated at 0.80 with chil-

dren's achievement scores. The importance of these or similar variables has been confirmed for samples of English, Australian and Canadian children. These same studies also show that, like social class, culture also seems to be a proxy for family characteristics that affect school achievement. They find that *different* ethnic groups at *similar* socio-ethnic levels differ in their patterns of those family characteristics that predict children's school performance, especially children's verbal and number performances.

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Overall, the literature seems to indicate that, independent of cultural differences among groups, social class predisposes a family to certain patterns that affect the child's school performance. At the same time, some variation in these patterns occurs among families of similar social class but different ethnicities. This variation is greater among lower-class families of different ethnic origins than among their middle-class counterparts. Social class tends to be negatively related to recency of immigration; and recency of immigration, to mainstream acculturation. Thus, middle social class probably marks not only a socio-economic position, but also reduced cultural variations in family behaviors.

In fact, analyses of 1980 American data show that being second-generation college not only increases, but also *equalizes,* choice of quantitative majors across white, black, American Indian, Chicano and Puerto Rican college freshman. An analysis of 1972 data shows that higher family socio-economic status increases blacks' choices of and persistence in a science major, the effect operating by increasing high school mathematical achievement and the mother's educational aspirations for the student. *When this analysis equated whites and blacks on the intervening variables, blacks had a higher probability of choosing a science major than whites.*

In sum, this set of findings implies that changes in family behaviors, frequently associated with changes in socio-economic status, will change the representation of non-Asian American minority groups in quantitative fields. However, the Asian American case argues that different ethnic groups produce different achievement predispositions among their children, *independent of social class.*

While our knowledge is far from complete, it is increasingly clear that minority and female underrepresentation among quantitative degrees is tightly fused to some of the most deep-seated questions that a society can pose. For example, what starts as a fairly simple question about women's representation among quantitative degrees ends as a series of profound questions about family responsibilities, child care and the economic independence of women.

Society and biology dictate the conflicts that women face, requiring that major educational, career and child-rearing investments occur in approximately the same two decades of the life cycle. However, as women's average life expectancy increases to 78 years and the average retirement age for male and female workers edges toward the seventh decade of life, even women who devote several years primarily to child rearing have several productive decades after their children leave home. Social arrangements, if not biological clocks, are not inflexible. It is not clear that we have to cram the most important commitments that individuals make—post-secondary education, career investments and child rearing—into the same two decades of life.

Minority underrepresentation would be a simpler problem if it arose primarily out of discriminatory practices in universities and the work place. It does not, and it is difficult to devise strategies appropriate to the different stages of the process by which minority representational outcomes occur, especially when that process starts in earliest childhood and is tangled with much larger questions of class and culture.

Each of us confronts a social reality. It derives from our place in the life cycle our native talents, and the resources and horizons that institutions—such as family, school, church, ethnic community, or political parties—allocate to us. We tend to experience this reality as a definition of our choices. Political and religious groups, for example, are currently fighting for the hearts and minds of American women. If traditional values gain influence, women will perceive a more traditional set of choices. Their educational attainments and representation in quantitative fields and jobs should subsequently decline relative to what they would have been in the absence of this value change.

At the same time, in a free society realities are in fact broadly defined, and permit a wide range of choices. The individual and groups such as families are the ultimate source of action. As such, people have a choice—they can accept externally defined realities or harness their talents and opportunities to create alternatives. ¤