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A Comparison of Girls' Achievement in Unisexual and Bisexual Physics Classes

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Introduction

A battle cry heard for the past few years is, "Why have physics enrollments not increased?" There have been many possible solutions to the problem, and many of them have had some success. For example, the Physical Science Study Committee and Harvard Project Physics have done much in creating interest in physics and thus have helped to increase physics enrollment. Also, the emphasis on laboratory experiences and the increase in audiovisual aids have contributed in making the physics classroom more enticing. It is the writer's opinion that a possible source of physics students might come from those of the female sex. It is the accepted opinion that high school physics, college physics and the profession of physics are largely male-oriented. The National Register of Scientific and Technical Personnel showed that only two percent of physics registrants were women. At the high-school level this percentage is somewhat larger. The following table from the U.S. Department of Health, Education and Welfare shows the type of students that enroll in physical science as compared to other areas. Thirty-five percent of the girls enroll in a physical science course.

TABLE 1

Percentage of High School Graduates who have Earned Credits in Selected Areas

<i>Ability</i>	<i>Physical Science</i>		<i>Biological Science</i>		<i>Modern Language</i>	
	<i>Boys</i>	<i>Girls</i>	<i>Boys</i>	<i>Girls</i>	<i>Boys</i>	<i>Girls</i>
Upper 5%	92%	61%	80%	82%	82%	81%
Upper 15%	86	53	79	82	73	75
Upper 25%	80	51	79	81	67	73
Middle 50%	53	26	76	77	36	47
Lower 25%	33	17	73	74	18	28
All pupils	61	35	77	78	46	54

It would be expected that for a physics class the ratio of number of boys to girls would be even larger, since physics attracts the higher-ability students. Why then do not girls enroll in physics at West High? There are a number of possible answers. Girls just are not interested in physics. Girls do not have the past experiences to do well in physics. Girls are afraid of being "shown up" by the boys. Girls may not be informed of opportunities in physics.

The Problem

It has been the writer's observation that in a general physics class the girls usually started much slower than the boys. Most of these girls caught up with the boys by the end of the first nine weeks. However, it must be noted that there is a certain percentage of girls that never achieve to their predicted level in physics. It is the purpose of this paper to determine if there is a significant difference between the achievement of girls in a mixed physics class compared to that of the female class.

The Method

The study was made at West High School in Waterloo, Iowa. West High, with an enrollment of 2,150 in grades 10 through 12, offers physics at each grade level. However, the majority of the students electing to enroll in physics, do so in the eleventh grade, after they have had biology and before they take chemistry. At the time of the study, there were six classes of physics with a total enrollment of 155. Of this enrollment, there were 35 girls which were divided into two groups. The experimental group became the all-girl physics class while the control group was mixed with boys. Since it was desirable to place all girls involved in the experiment under the same teacher, the control group was put in three different classes. It should be noted that this left two classes which consisted of all boys. These classes were taught by the other physics teacher, Mr. Wayne Folks, and no attempt was made to measure their achievement in comparison to the girls.

Care was taken to insure that both groups, the control and the experimental, had the same average academic ability. To do this, the girls were ranked on the following: intelligence quotient; quantitative thinking subtest of the Iowa Test of Educational Development; previous science grades; and geometry grades. The girls' total rank was determined by finding the sum of the ranks. The final step was then to pick every other girl on the rank list for the experimental group.

The physics course that was taught to the groups was Harvard Project Physics. This was the first year this course was taught at West High; consequently, an earnest attempt was made to make sure all classes involved in the experiment were taught and graded in the same way and at the same time. Since Harvard Project Physics was the course to be taught, the testing instrument that was used in the experiment was the same that Harvard Project

Physics used in evaluating the project. It is the PAT test and was used as a pre- and posttest. The following table shows the mean scores of the test.

Results

The experimental group showed a growth of 5.5 points on the PAT test, while the control group showed a growth of 6.1 on the same test.

TABLE 2
PAT Test Results

		Mean Score	Standard Deviation
Pretest	Experimental	20.5	3.4
	Control	18.0	2.4
Posttest	Experimental	26.0	5.15
	Control	24.1	4.71
Growth	Experimental	5.5	
	Control	6.1	

Conclusion and Discussion

The conclusion of this experiment is that girls do not realize better achievement in physics when they are alone than when they are mixed. This was confirmed by an independent study by Dr. Carol Fuchs, using covariant analysis with the same data. It is recommended that this study be continued or tried elsewhere. The small sample (35) used in the experiment makes the validity low. There were problems encountered during the year which tended to decrease the sample. For example, students moved away, one became pregnant and one dropped the course. Sickness and schedule changing also prevented the sample from being larger.

There are some observations that were made during the year that should be noted. There seemed to be a feeling of unity among the girls. Anything they wanted to do, they seemed to want to do as a whole class. Some examples of this are bringing in a research physicist, renting and charging admission for the film, "Mystery of Stonehenge," and collecting potato chip bags so the school could receive a lunar globe from a potato chip company.

The girls appeared to have a higher interest and enthusiasm. The girls from the experimental group attended extracurricular meetings at the local college. They did more home activities and made more inquiries in class than did the girls in the mixed classes.

It is the writer's feeling that the girls class did some good recruiting for the class. The enrollment in physics increased from six to eight sections in the 1970-1971 school year. There probably were other factors involved in this in-

crease. Along with this total enrollment there is also an increase in percentage of girls.

Another observation made about the class is the fact that no students dropped the course after the start of the school year. Normal experience finds three to five girls dropping during the first grading period.

Although the girls in the experimental group did not show substantially more growth in the PAT test, their grades did show improvement. The following table shows the mean grade-point average for the first and third nine-week period.

TABLE 3

Physics Class Grade-Point Average of First and Third Grade Periods

	<i>First Period GPA</i>	<i>Third Period GPA</i>
Experimental Group	2.77	3.22
Control Group	2.36	2.55
Total Physics Group	2.67	2.88

Taking the observed facts of unity, attitude, higher interest, larger enrollment, decreased dropouts, and growth of grade-point average, it is strongly recommended that research be continued in this area.

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