

# Gender Differences in High School Preparation for University Introductory Physics

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## PHYSICS FOR SCIENCE & ENGINEERING:

## PHYSICS FOR BIOLOGY & PRE-MEDICINE:

Data sample – Fall term, 5,636 students (1,261 female, 4,375 male) from 40 different classes with 22 different instructors.

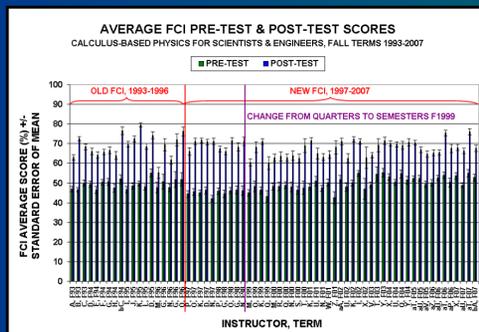
Average enrollment/term 800 students  
Average class size 200 students.  
Average dropout rate 7%, average D/F rate 3%  
3 lecture/week  
2 hours lab/week – average 16/section  
1 hour discussion session/week – same students & TA as lab

Lab and discussion sessions taught by TAs emphasize quantitative problem solving using Cooperative Group Problem Solving using context-rich problems.

The Force Concept Inventory (FCI) Exam given during the first and last week. It does not count in the grade. Only revised FCI (1997-2007) included in this analysis.

Females make up 22% of these classes.  
Average course grade 73.5±0.2% (males) 72.0±0.3% (females)

### FCI SCORES 1993-2007



Data sample – Fall term, 1,266 students (743 female, 523 male) from 7 different classes with 5 different instructors.

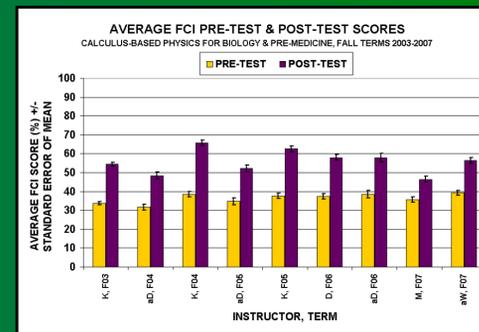
Average enrollment/term 400 students  
Average class size 200 students.  
Average dropout rate 5%, average D/F rate 3%  
4 lecture/week  
2 hours lab/week – average 16/section  
1 hour discussion session/week – same students & TA as lab

Lab and discussion sessions taught by TAs emphasize quantitative problem solving using Cooperative Group Problem Solving using context-rich problems.

The Force Concept Inventory (FCI) Exam given during the first and last week. It does not count in the grade. Only revised FCI (2003-2007) included in this analysis.

Females make up 60% of these classes.  
Average course grade 74.5±0.5% (males) 72.4±0.4% (females)

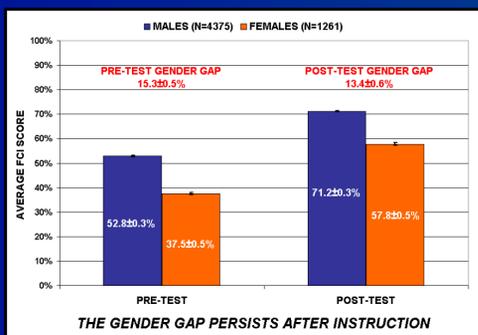
### FCI SCORES 2003-2007



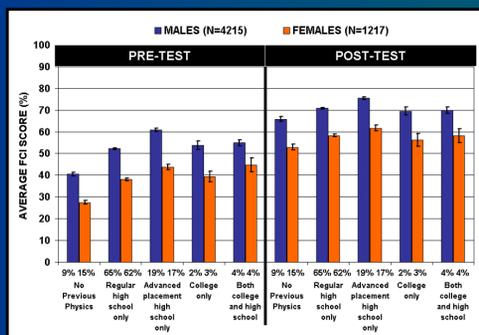
FORCE CONCEPT INVENTORY

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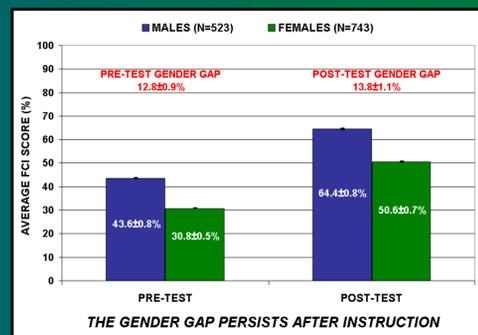
### FCI GENDER GAP



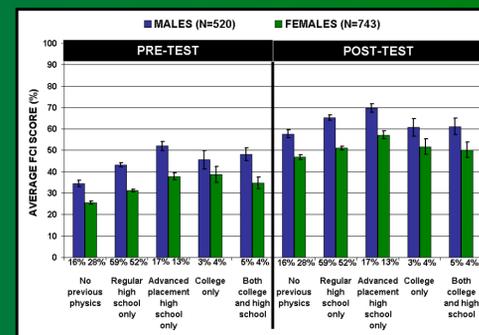
### PREVIOUS PHYSICS



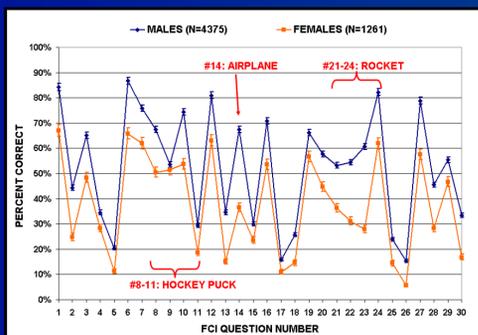
### FCI GENDER GAP



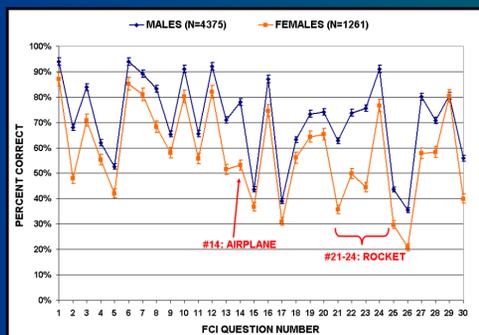
### PREVIOUS PHYSICS



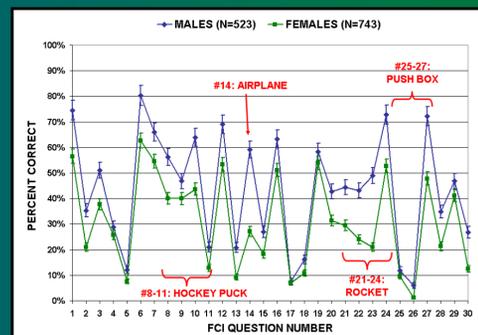
### FCI PRE BY ITEM



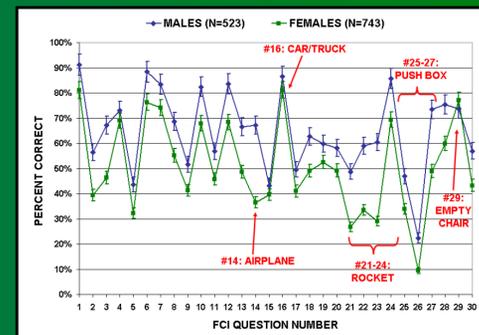
### FCI POST BY ITEM



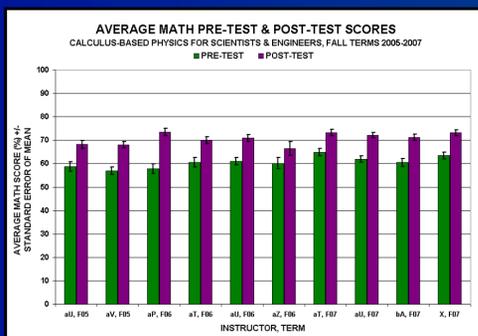
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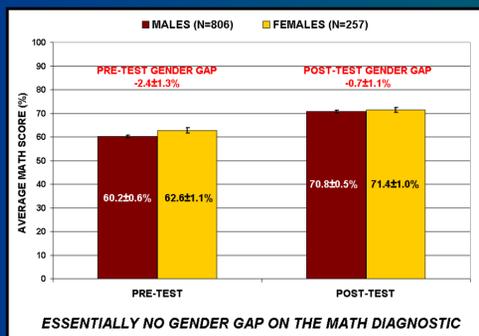
### FCI POST BY ITEM



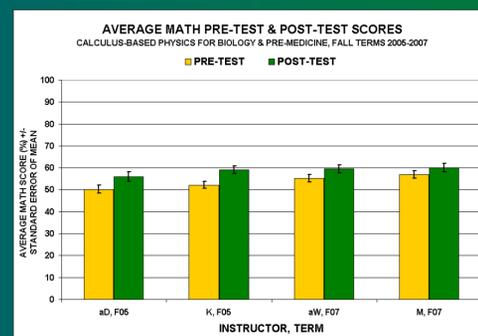
### MATH TEST 2005-2007



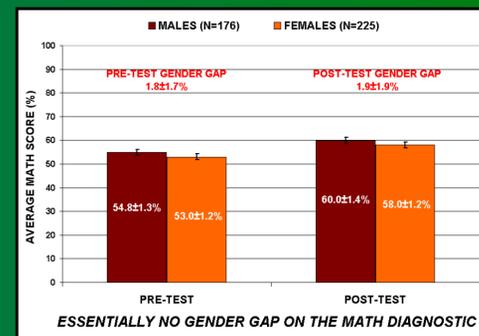
### MATH BY GENDER



### MATH TEST 2005-2007



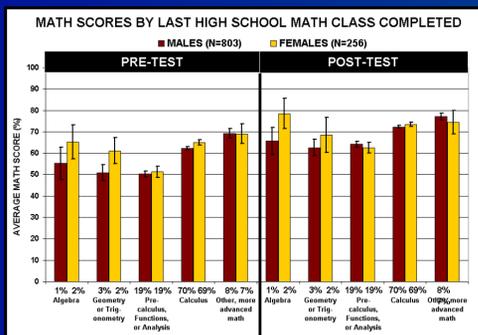
### MATH BY GENDER



CALCULUS MATH DIAGNOSTIC

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### HIGH SCHOOL MATH

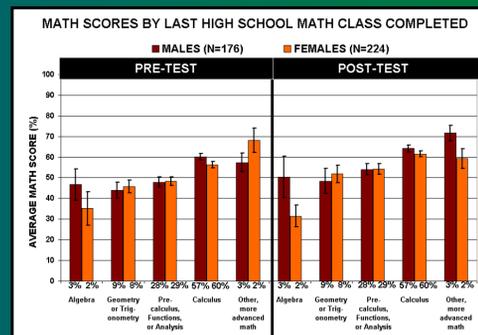


### GRADE PREDICTORS

PERFORMANCE PREDICTORS	SCIENCE & ENG		BIO & PRE-MED	
	MALES	FEMALES	MALES	FEMALES
FCI PRE-TEST & COURSE GRADE	0.210	0.111	0.163	0.109
MATH PRE-TEST & COURSE GRADE	0.251	0.308	0.199	0.176
FCI POST-TEST & COURSE GRADE	0.338	0.283	0.267	0.285
MATH POST-TEST & COURSE GRADE	0.236	0.306	0.234	0.239
FCI PRE-TEST & FINAL EXAM	0.223	0.110	0.141	0.071
MATH PRE-TEST & FINAL EXAM	0.272	0.245	0.157	0.101
FCI POST-TEST & FINAL EXAM	0.346	0.312	0.233	0.279
MATH POST-TEST & FINAL EXAM	0.247	0.242	0.212	0.205
FCI PRE-TEST & MATH PRE-TEST	0.196	0.093	0.153	0.112
FCI POST-TEST & MATH POST-TEST	0.253	0.226	0.244	0.220
FCI PRE-TEST & FCI POST-TEST	0.531	0.423	0.483	0.316
MATH PRE-TEST & MATH POST-TEST	0.419	0.455	0.494	0.568

Correlation coefficients correspond to the square root of each value

### HIGH SCHOOL MATH



### CONCLUSIONS

1. There is a significant gender difference in average FCI scores for both populations of students when they enter introductory university physics.
2. There is essentially no gender difference in math skills in either population of students.
3. Neither math skills nor FCI scores account for enough variance in the course grade to be used for screening students.
4. Males and females make equal and significant gains on the FCI in both populations. Instruction is gender neutral so gender gap remains essentially the same.
5. The FCI gender gap remains whether females are the minority or the majority in the class.
6. Although initial FCI performance does depend on high school physics background, the gender gap does not.

