

Reasons Behind Sumter School District Students' Decisions to Take Physics

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Sumter School District

Fall 2014

- 167 out of 4740 high school students were enrolled in a physics course.

Spring 2015

- 75 out of 4593 high school students were enrolled in a physics course.

Sumter School District

Fall 2014

- 3.52% of high school students were enrolled in a physics course.

Spring 2015

- 1.63% of high school students were enrolled in a physics course.

Physics Courses Offered in Fall 2014

1. Physics, 11th or 12th grade
2. Physics Honors, 9th or 10th grade
3. Physics Honors, 11th or 12th grade
4. Physics for the Technologies, 11th or 12th grade

Statistics for Enrollment of Physics Courses, Fall 2014

Crestwood High School

Total population: 1167

1. 21

2 and 3. 43

4. 0

Lakewood High School

Total population: 1232

1. 48

2 and 3. 25

4. 0

Sumter High School

Total population: 2341

1. 8

2 and 3. 22

4. 0

Physics Courses Offered in Spring 2015

1. Physics, 11th or 12th grade
2. Physics Honors, 9th or 10th grade
3. Physics Honors, 11th or 12th grade

Statistics for Enrollment of Physics Courses, Spring 2015

Crestwood High School

Total population: 1135

1. 8

2 and 3. 19

Lakewood High School

Total population: 1190

1. 38

2 and 3. 0

Sumter High School

Total population: 2268

1. 0

2 and 3. 10

Lori Smith, Coordinator of Science and Fine Arts of SSD:

- Enrollment in physics courses was insufficient.
- Reduces likelihood of enrolling in physics course in college.
- Prevents from entering career paths with requirement of physics.

Research Objective

Examine the possible factors that were related to and had influenced SSD high school students' decisions to enroll/not enroll in a physics course.

Motivation Behind Research

- Insufficient/Low enrollment in high school physics courses
 - Insufficient/Low enrollment in college physics courses
 - OR unsuccessfulness in college physics courses
 - Reduced number of graduates in science and engineering degrees.

- Physics is the basis of all sciences.
- Physics forms the foundation of engineering.
 - Success in physics crucial for excellent performance in such disciplines

→ Vital for

- societal advancement
- national defense
- upholding the United States of America's position of global preeminence in science and technology

Purpose of Research

- Raise awareness of possible reasons behind low enrollment in physics courses in SSD
- Inform of possible factors that increase enrollment
 - Take appropriate action
- Shape USC Sumter's outreach efforts in local high schools

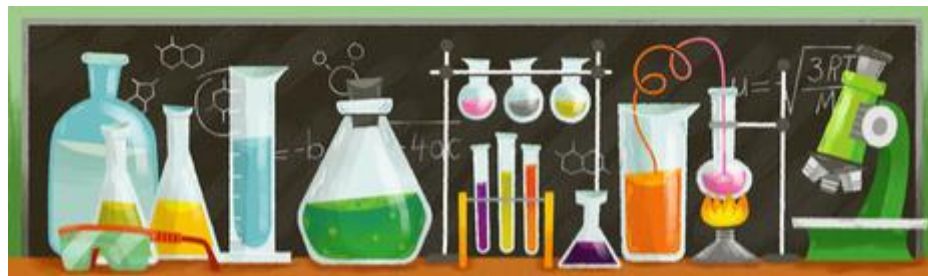
Research Question

What are school-based and student-based factors that had influenced SSD high school students' decisions regarding their enrollment in a physics course?

Methodology

Electronic survey consisting of 29 multiple-choice and short-answer questions conducted among voluntary participants from seniors of SSD.

<https://docs.google.com/forms/d/1oZFhBe3UKY8WVVCcg0KUIzaHp4As77NdtvmoVicm4/viewform?c=0&w=1>



Physics Survey

Your name and contact information will be kept confidential.

Personnel administering survey:

1. School

- ☐ Crestwood High School
☐ Lakewood High School
☐ Sumter High School

2. Name:

3. E-mail address(es):

4. Telephone number(s) (state which is cell, which is home's):

5. Age:

6. Gender:

7. Nationality:

- ☐ USA
☐ Other

If you selected "Other", please indicate:

8. Ethnicity

- ☐ Caucasian
☐ African-American
☐ Hispanic/Latino
☐ Asian/Pacific Islander
☐ Other

If you selected "Other", please indicate:

9. Which parents and/or guardians do you live with?

Eg. Father and mother, mother, father, grandmother, grandfather, aunt, uncle, etc.

10. What is your father's highest educational attainment?

Eg. Elementary school, middle school, high school, associate degree, bachelor's degree, professional degree, master's degree, doctoral degree, etc.

11. What is your mother's highest educational attainment?

Eg. Elementary school, middle school, high school, associate degree, bachelor's degree, professional degree, master's degree, doctoral degree, etc.

12.1. Which extra-curricular activities are you involved in?

12.2. On average, approximately how many hours do you spend on extra-curricular activities per week?

13.1. Do you have a job outside school?

☐ Yes

☐ No

13.2.1. If you answered "Yes", what kind of job do you have?

13.2.2 On average, approximately how many hours do you work per week?

14. Which of the following are you most likely to do after high school?

☐ College

☐ Technical College

☐ Workforce

☐ Military

☐ Other

If you selected "Other", please indicate:

15. What vocation/career/profession would you like to settle in ultimately?

16. What do your parents expect you to do after high school?

☐ College

☐ Technical College

☐ Workforce

☐ Military

☐ Other

If you selected "Other", please indicate:

17. Have you ever been offered a physics class during counseling?

- ☐ Yes
☐ No

18.1. Has anyone ever encouraged you to study physics?

- ☐ Yes
☐ No

18.2. If you answered "Yes", who encouraged you to study physics?

- ☐ Guidance Counselor
☐ Teacher
☐ Parent
☐ Guardian
☐ Other

If you selected "Other", please indicate:

19.1 Has the importance of physics ever been explained to you?

- ☐ Yes
☐ No

19.2. If you answered "Yes", who explained the importance of physics to you?

20. Which of these statements best supports your understanding of physics?

- ☐ Physics is extremely difficult.
☐ Physics is somewhat difficult.
☐ Physics is neither difficult nor easy.
☐ Physics is easy.

21. Have you ever enrolled in a physics class during high school?

- ☐ Yes
☐ No

22. If you answered "No", what was your reason for not enrolling in a physics class?

23. Would/Will your friends or social group support you if you enroll(ed) in a physics class?

- ☐ Yes
☐ No

24.1 If you answered "Yes" in Question 21, which year(s) of high school did you enroll in a physics class?

If you answered "No" in Question 21, please skip to Question 29.

- ☐ Freshman
☐ Sophomore
☐ Junior
☐ Senior

24.2 Which semester(s) of each year stated above did you enroll in a physics class?

Eg. Fall 2012 and Spring 2013.

24.3 What grade did you receive? (If you repeated the class, give both grades.)

25. What was your reason for enrolling in a physics class?

26.1 On average, approximately how many hours did/do you spend per week doing homework for physics class?

26.2 Do you think you were/are given too much homework in your physics class?

- ☐ Yes
- ☐ No

27.1 Outside of class, other than time spent on homework, on average, approximately how many hours did/do you spend per week studying physics?

27.2 Do you think you spent/spend too much time studying physics?

- ☐ Yes
- ☐ No

28 How do you think your physics class(es) could/can be improved?

29. Would you agree to a follow-up interview in person?

- ☐ Yes
- ☐ No

Submit

Never submit passwords through Google Forms.

Survey details

Sample size: 190

Date: April 23, 2015

☐ 90 from Crestwood HS

☐ 97 from Lakewood HS

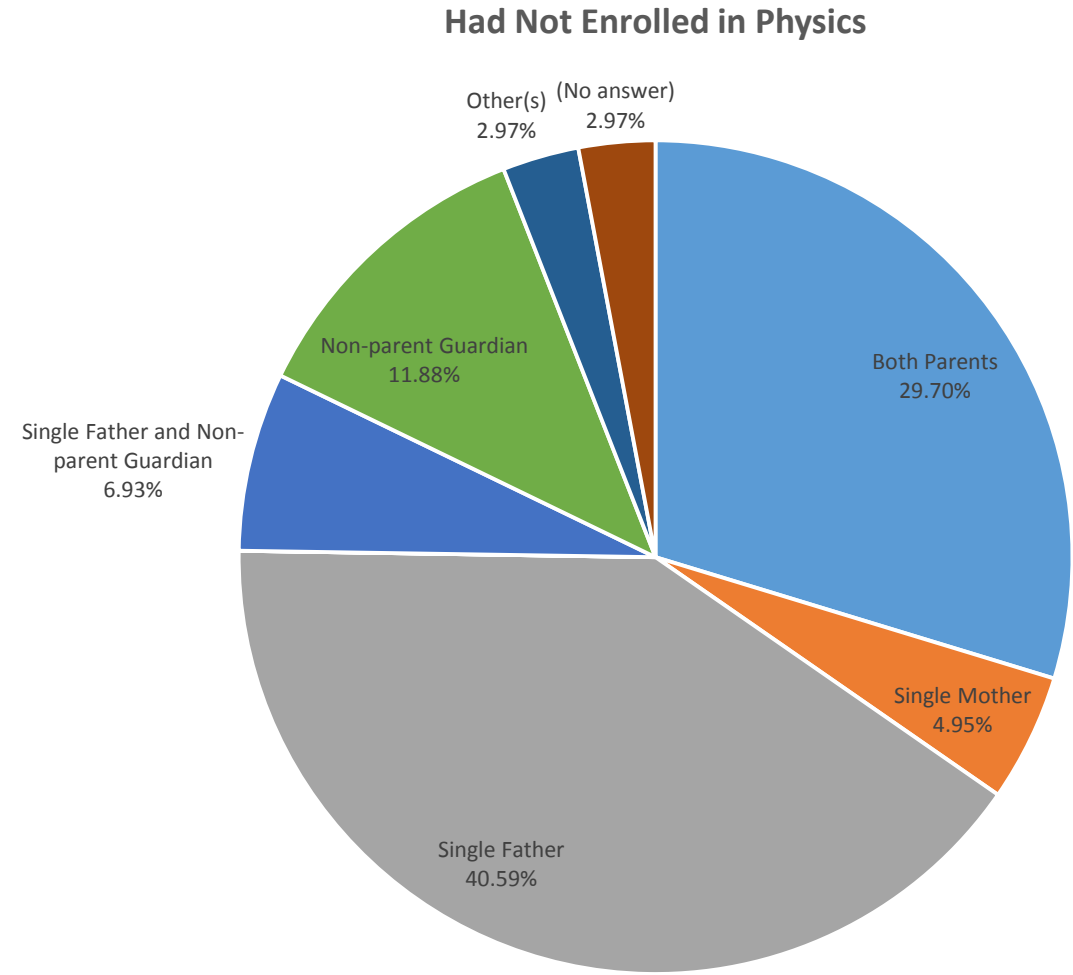
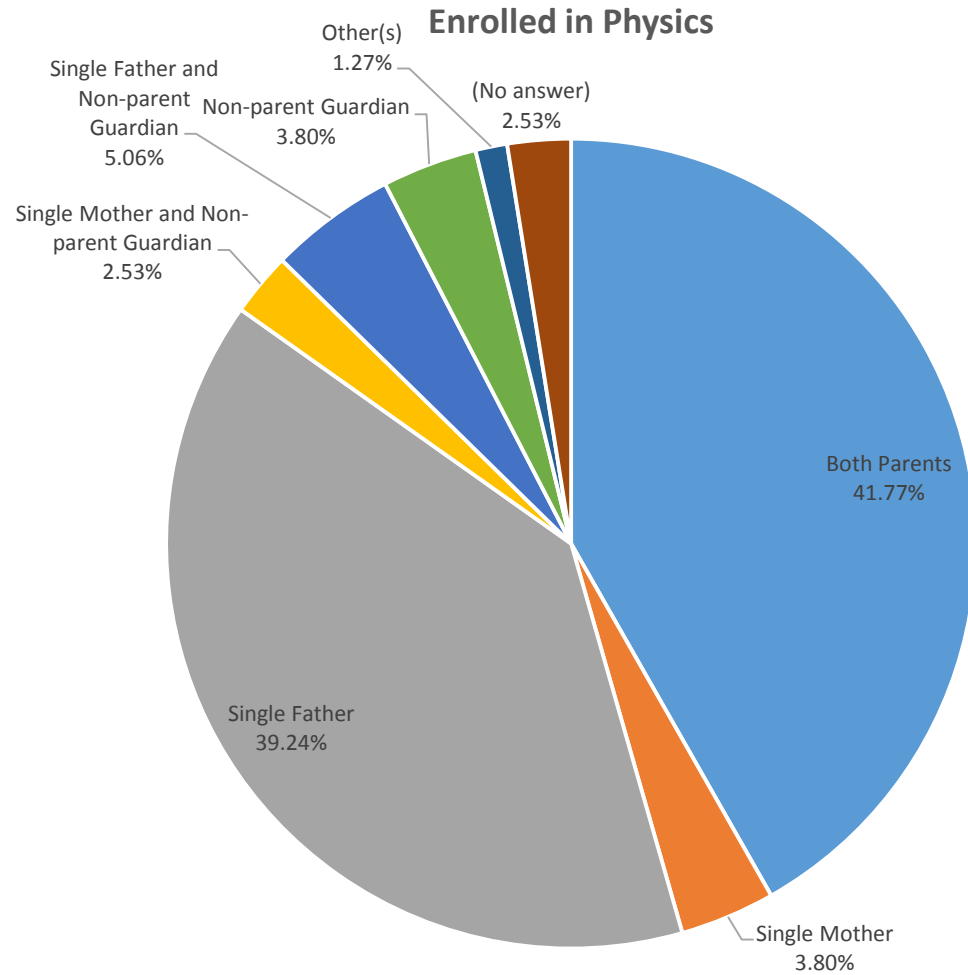
☐ Remaining 3 did not state

☐ 79 had enrolled in a physics class during HS

☐ 101 had not enrolled in a physics class during HS

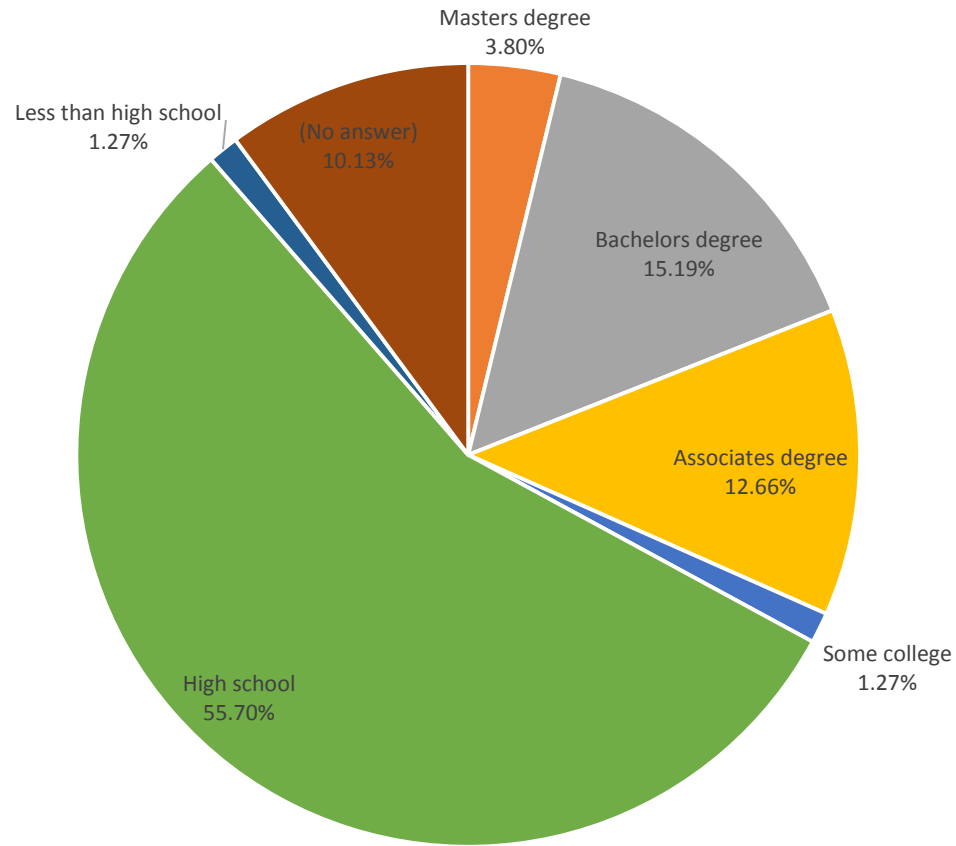
☐ Remaining 10 did not state

9. Which parents and/or guardians do you live with?

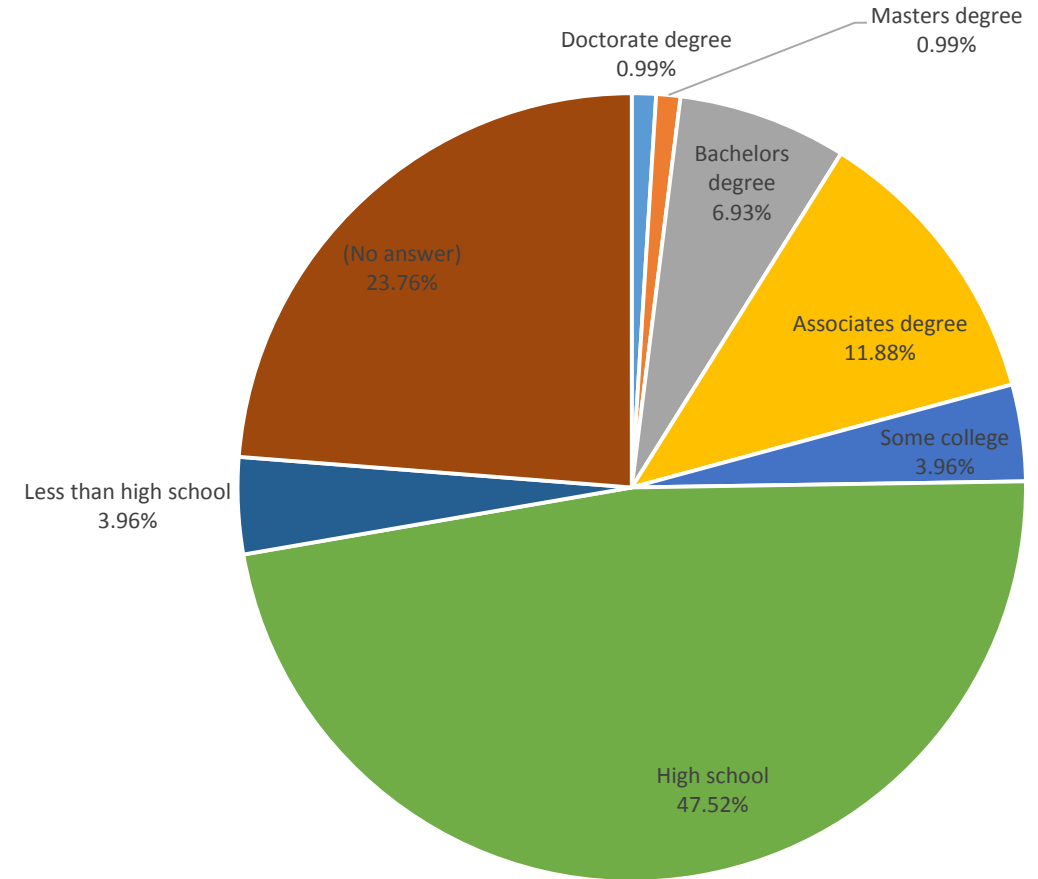


10. What is your father's highest educational attainment?

Enrolled in Physics

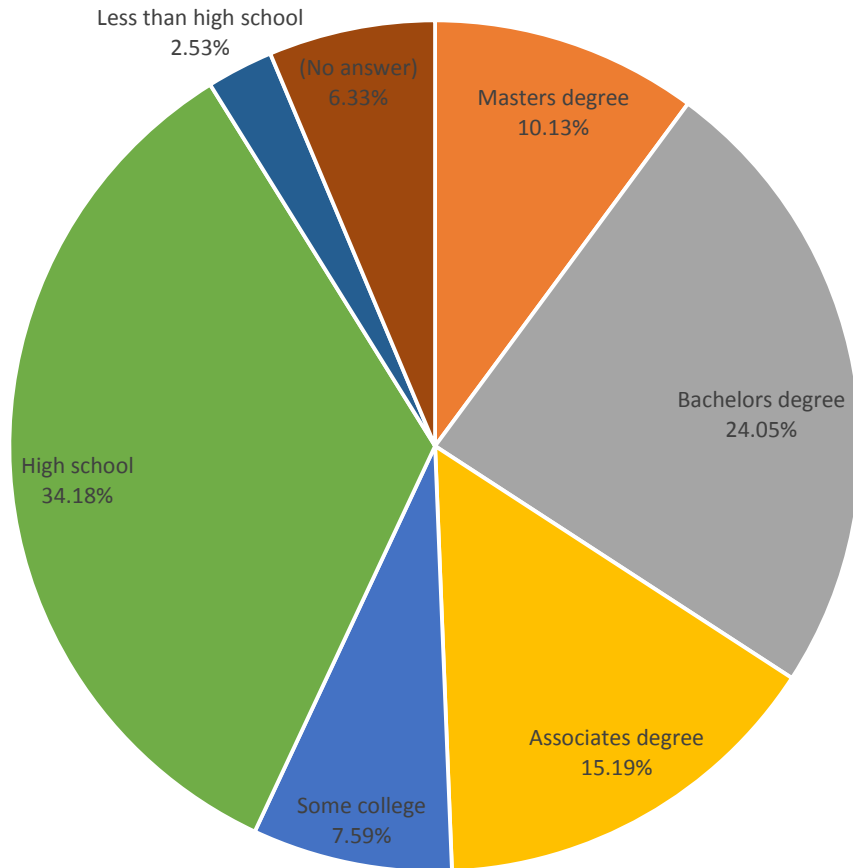


Had Not Enrolled in Physics

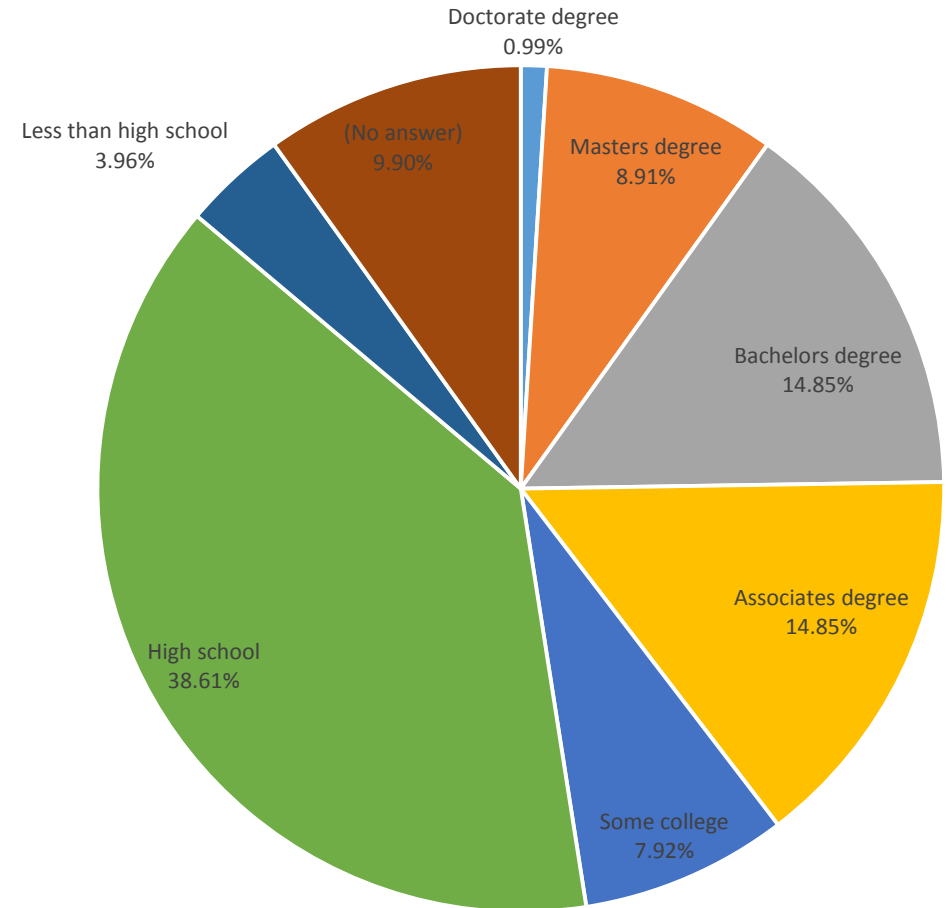


11. What is your mother's highest educational attainment?

Enrolled in Physics

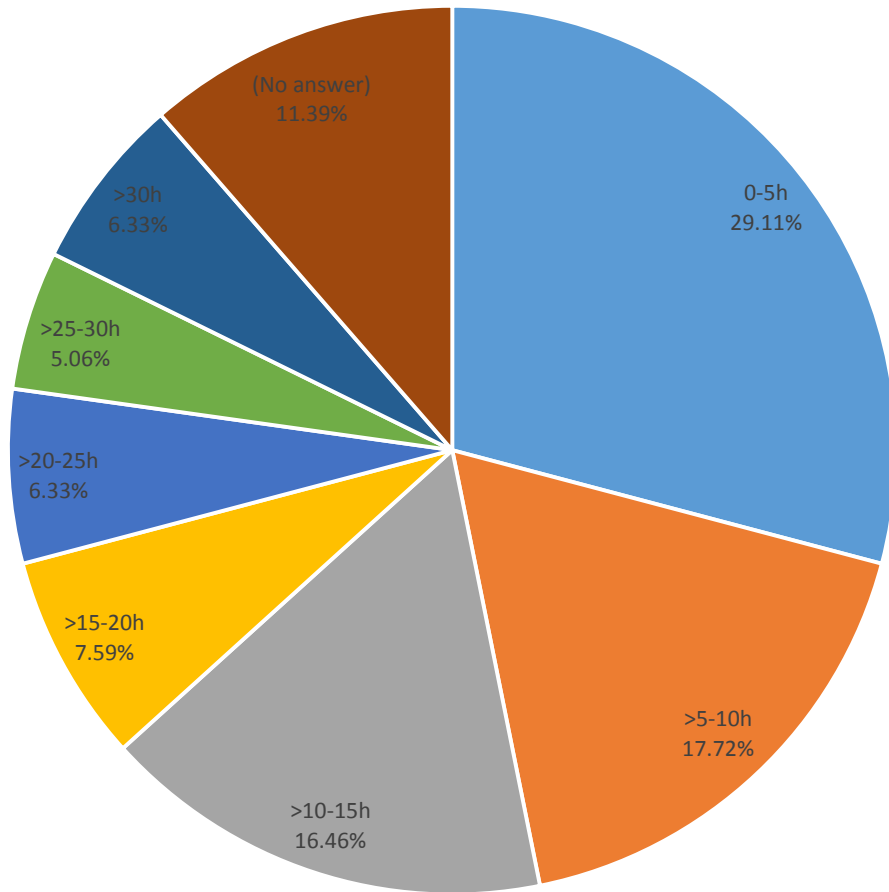


Had Not Enrolled in Physics

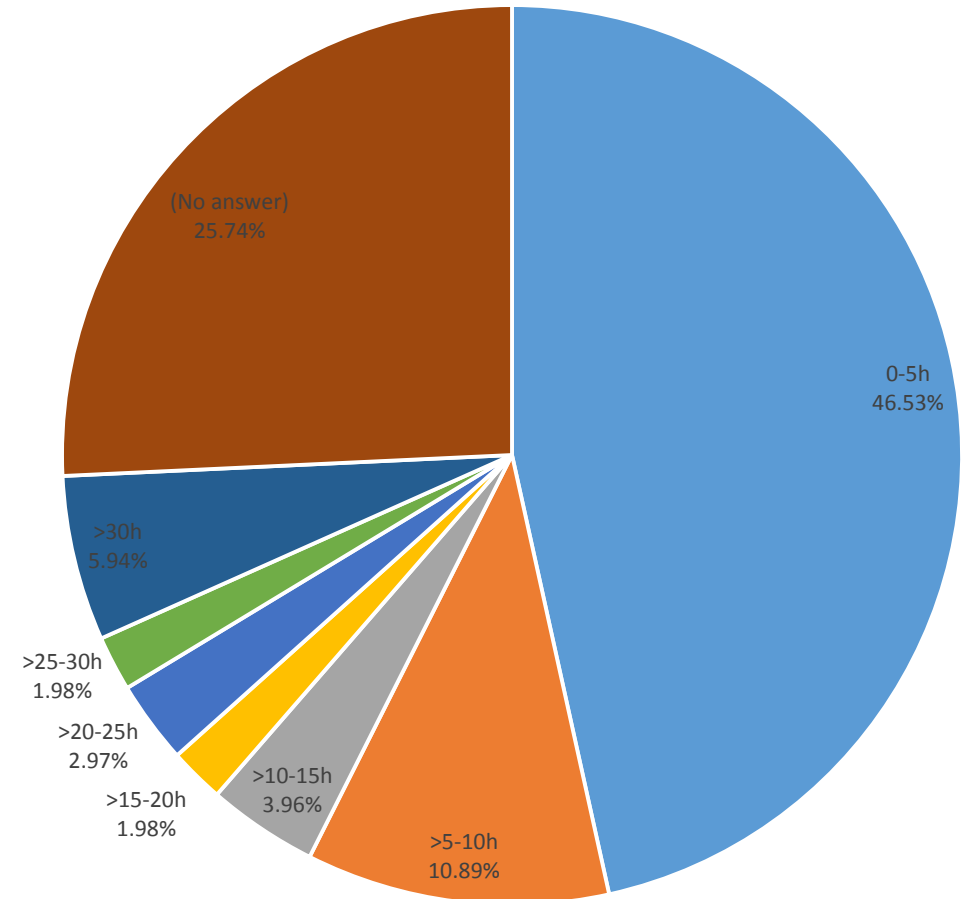


12.2. On average, approximately how many hours do you spend on extra-curricular activities per week?

Enrolled in Physics

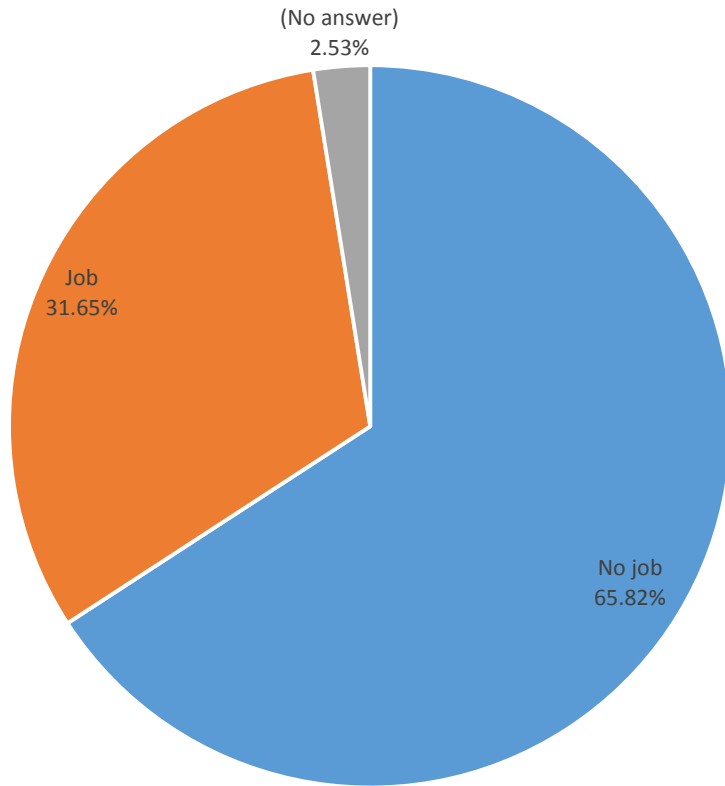


Had Not Enrolled in Physics

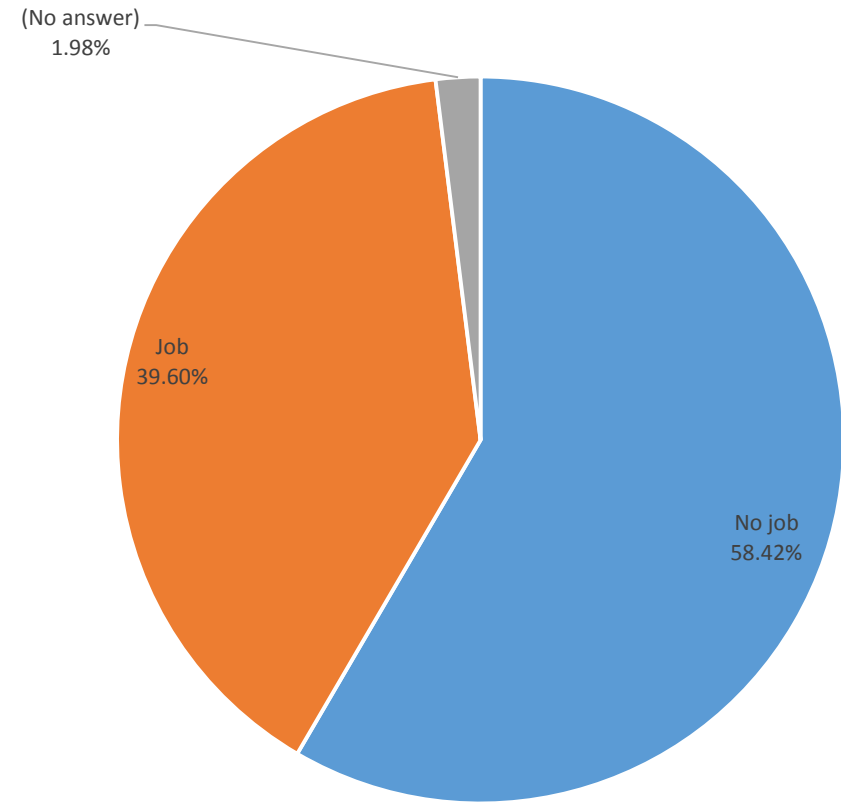


13.1. Do you have a job outside school?

Enrolled in Physics

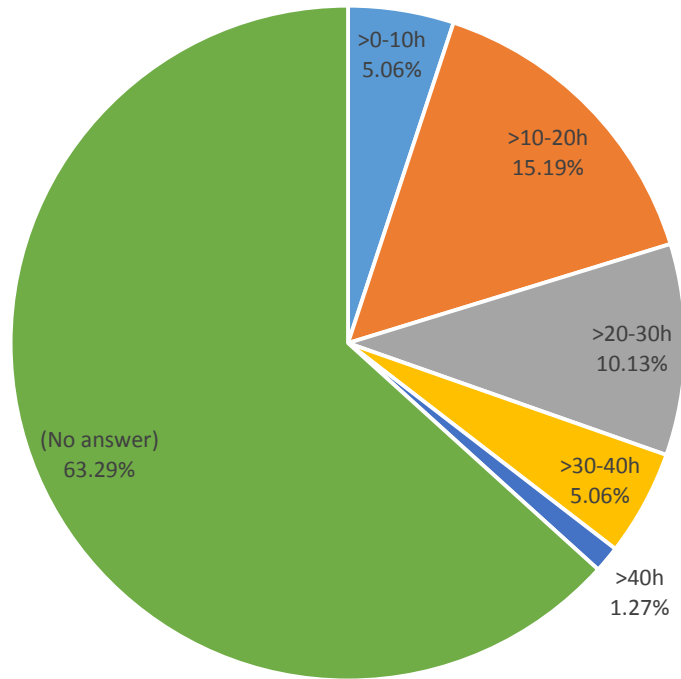


Had Not Enrolled in Physics

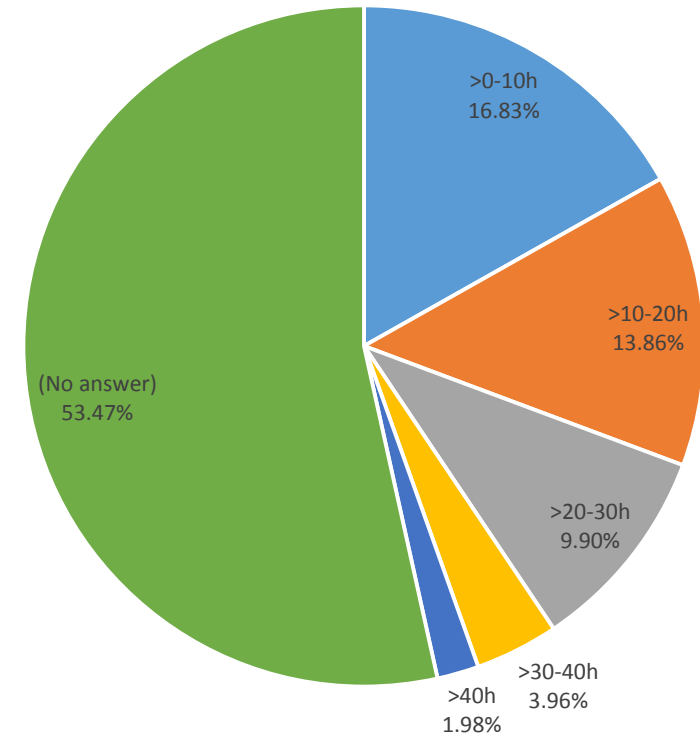


13.2.2 On average, approximately how many hours do you work per week?

Enrolled in Physics

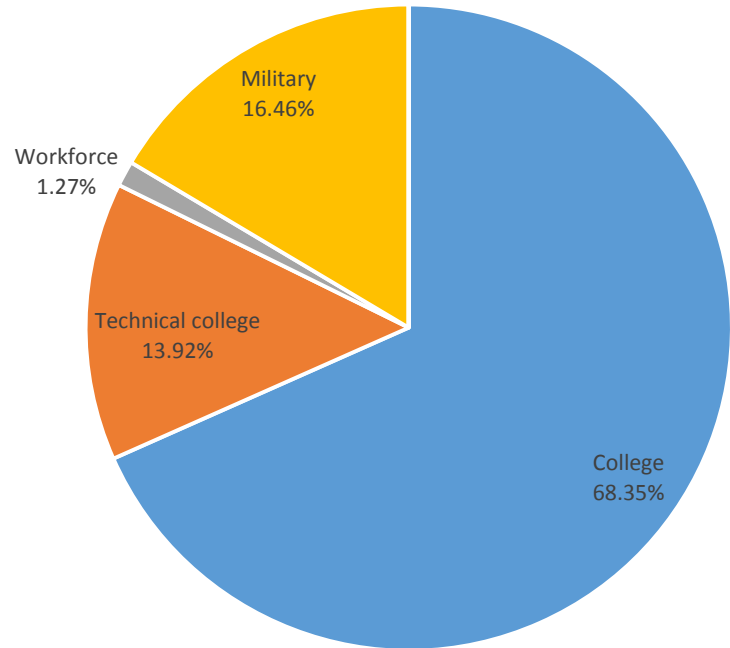


Had Not Enrolled in Physics

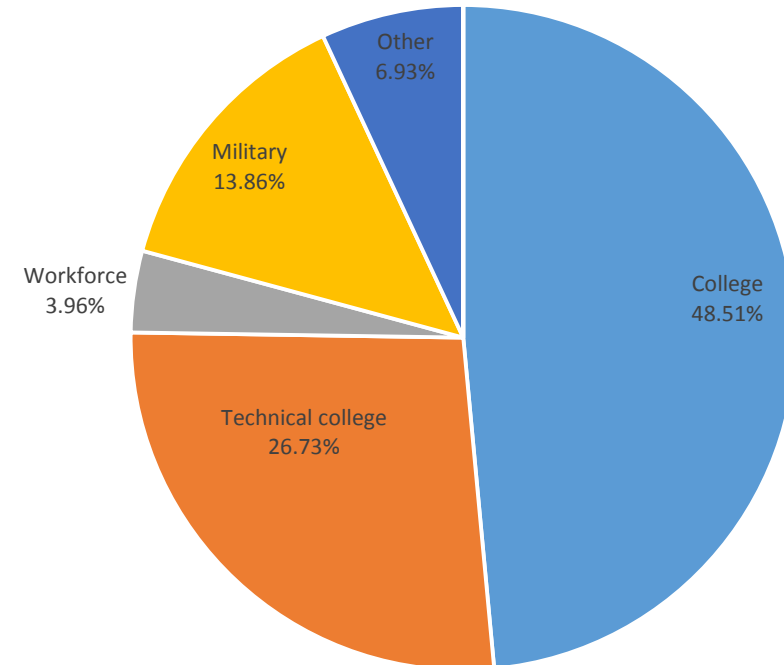


14. Which of the following are you most likely to do after high school?

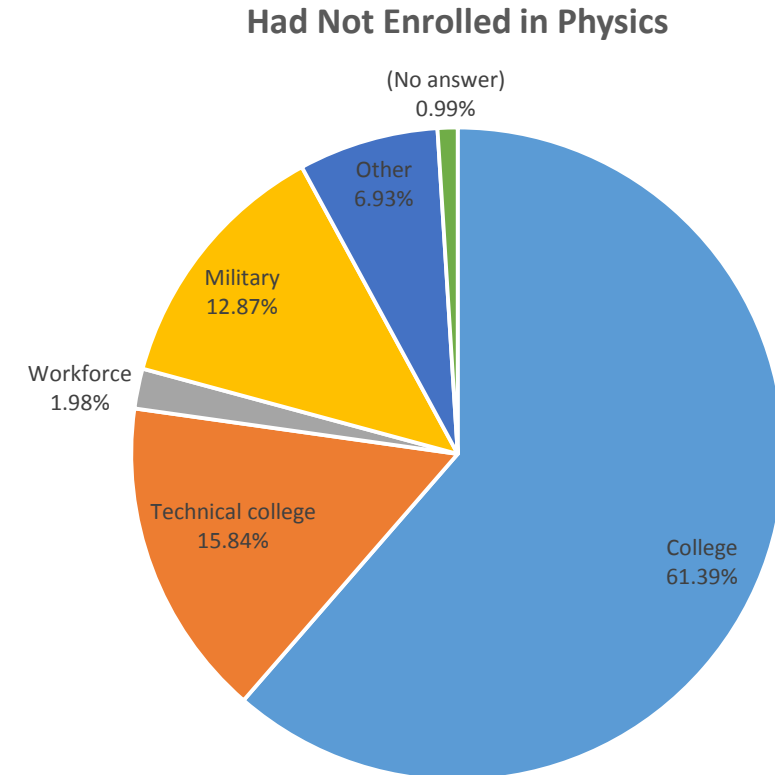
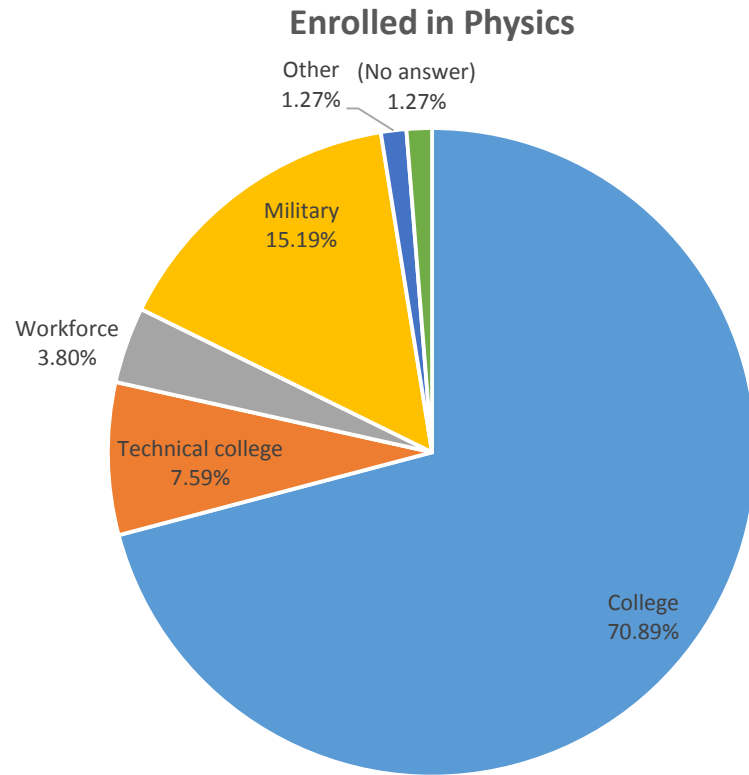
Enrolled in Physics



Had Not Enrolled in Physics

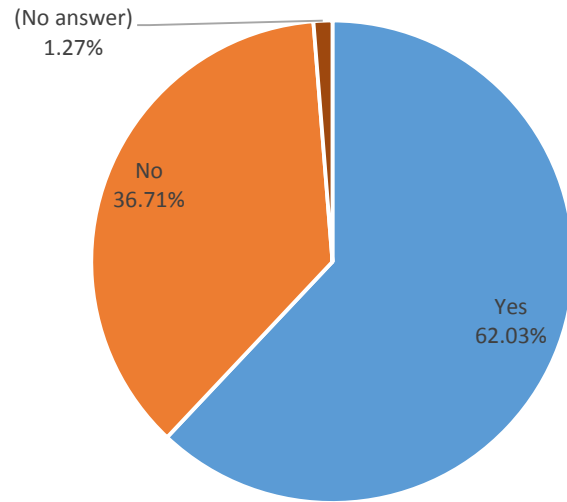


16. What do your parents expect you to do after high school?

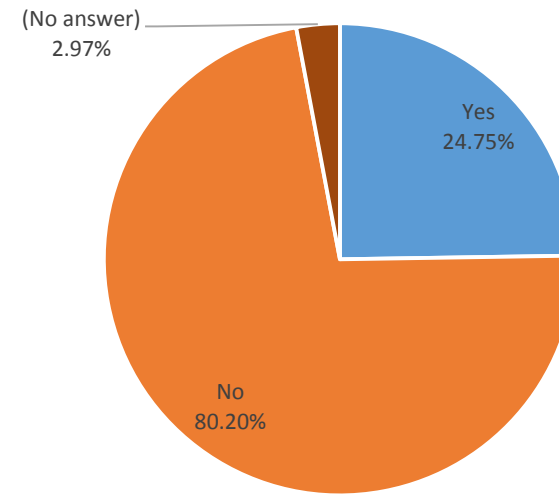


17. Have you ever been offered a physics class during counseling?

Enrolled in Physics

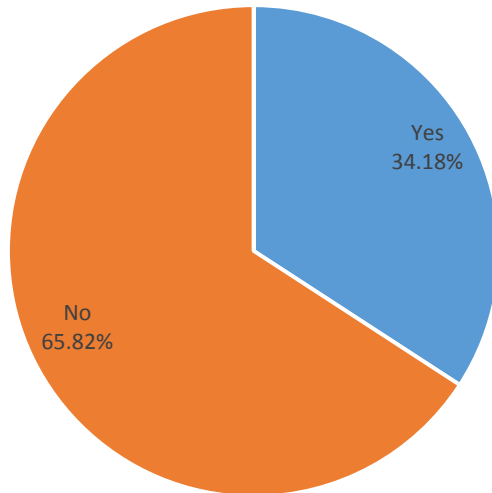


Had Not Enrolled in Physics

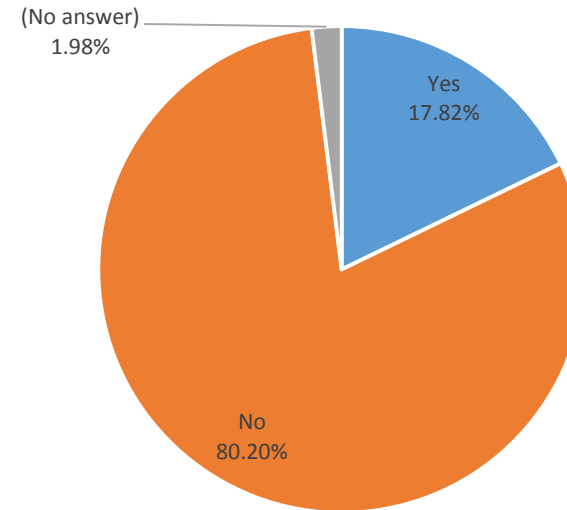


18.1. Has anyone ever encouraged you to study physics?

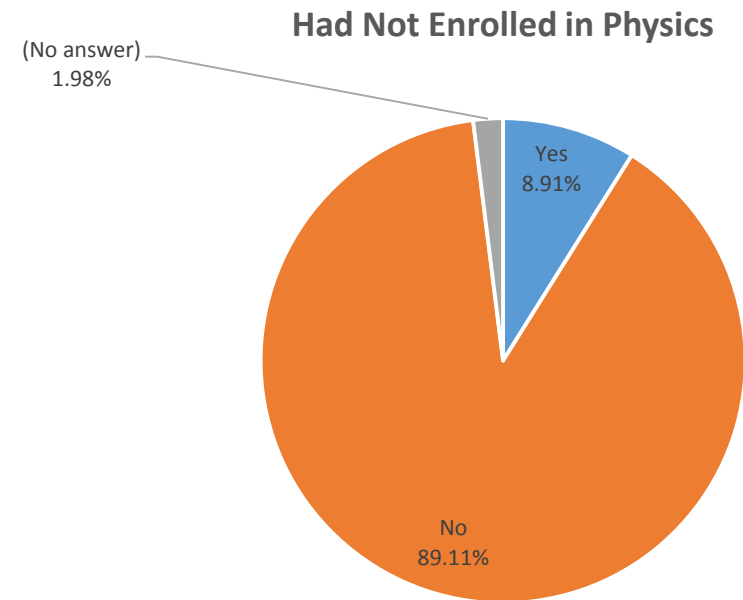
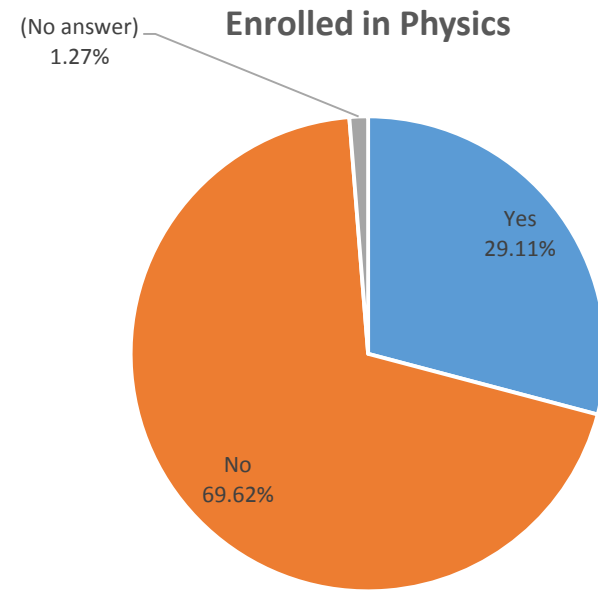
Enrolled in Physics



Had Not Enrolled in Physics

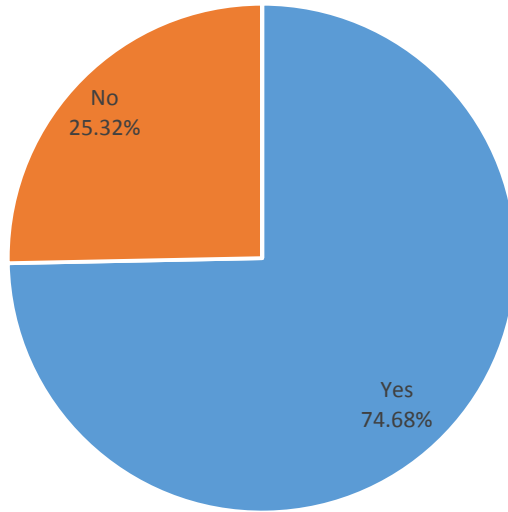


19.1 Has the importance of physics ever been explained to you?

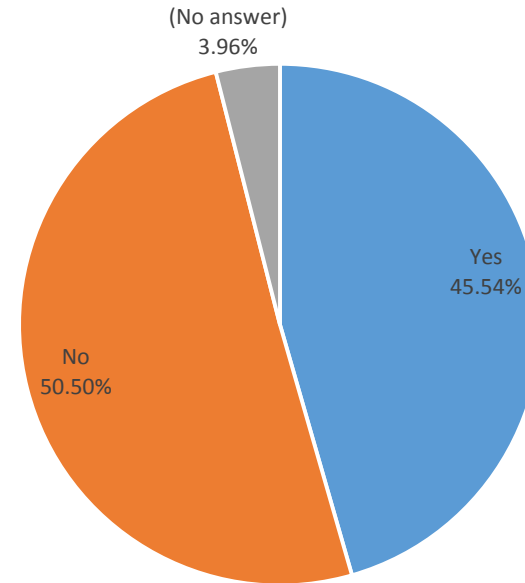


23. Would/Will your friends or social group support you if you enroll(ed) in a physics class?

Enrolled in Physics



Had Not Enrolled in Physics



22. If you answered “No”, what was your reason for not enrolling in a physics class?

Out of the 76 students who had not enrolled in a physics class, who answered,

Number of students	General answer
14 (2 also gave answer below)	Did not need it to graduate.
11 (2 also gave answer above)	Was not offered it.
10	Did not want to. Was uninterested.
4	Never considered enrolling in a physics class.
3	Unaware there was a physics class.
2	Considered physics too difficult.
1	Did not like Math.
1	“Not a physics person.”

25. What was your reason for enrolling in a physics class?

Out of the 65 students who had enrolled in a physics class, who answered,

Number of students	General answer
43	Required/Made to.
7	Helpful for future plans.
5	Wanted to.

28. How do you think your physics class(es) could/can be improved?

Out of the 66 students who answered,

Number of students	General answer
11 (1 also gave answer below)	Teach/Explain better.
7 (1 also gave answer above)	Less work.
6	More hands-on activities/experiments.
4	Student studies more.
2	Render in more interesting manner.
2	More group activities.
1	More visual examples.
1	More practice.
1	Less math.
1	More physics background starting in elementary school.

7 students expressed that nothing more could be done to improve the class.

Analytical Discussion

Percentage who enrolled in a physics course during HS

VS.

Percentage who had not enrolled in a physics course during HS

- " > " living with both parents
- " < " living with single parent
- " < > 3x " living with non-parent guardian
- " > 2x > " father's highest educational attainment bachelors degree
- " > " mother's highest educational attainment bachelors degree

Percentage who enrolled in a physics course during HS

VS.

Percentage who had not enrolled in a physics course during HS

- " < " spent average 0-5 hours per week on ECA
- " > " spent average >5-10, >10-15, >15-20, >20-25, >25-30 and >30 hours per week on ECA

Percentage who enrolled in a physics course during HS

VS.

Percentage who had not enrolled in a physics course during HS

- " < " held a job outside school
- " < >3x " worked >0-10 hours per week
- " > " worked >10-20, >20-30 and >30-40 hours per week
- " < " worked >40 hours per week

Percentage who enrolled in a physics course during HS

vs.

Percentage who had not enrolled in a physics course during HS

- " > " said most likely to attend college/join the military after finishing HS
- " < " said most likely to attend technical college/enter work force/be involved in other matters after finishing HS
- " > " parents expected to attend college/enter work force/join the military after finishing HS
- " < " parents expected to attend technical college/be involved in other matters after finishing HS

Percentage who enrolled in a physics course during HS

VS.

Percentage who had not enrolled in a physics course during HS

- " > 2x > " offered a physics class during counseling
- " 2x > " encouraged to study physics
- " > 3x > " had importance of physics explained to
- " > " would be supported by friends or social groups if enrolled in a physics class

- Results of short-answer question 22:

Most of the students who had not enrolled in a physics class did not enroll in one because they did not need it to graduate.

- Results of short-answer question 25:

Majority of the students who enrolled in a physics class enrolled in one because they were made/required to.

- Results of short-answer question 28:

Most of the students thought that physics classes could be improved by teaching and explaining better.

Conclusion

The data suggests...

- ... students who were living with both parents compared to single parents were more likely to enroll in a physics course during high school.
- ... students who were living with a non-parent guardian were significantly less likely to enroll in a physics course during high school.
- ... students whose fathers' highest educational attainment was a bachelors degree were significantly more likely to enroll in a physics course during high school.
- ... students whose mothers' highest educational attainment was a bachelors degree were more likely to enroll in a physics course during high school.

- ... students who spent an average of 0-5 hours per week on ECA were less likely to enroll in a physics course during high school.
- ... students who spent an average of >5-10, >10-15, >15-20, >20-25, >25-30 and >30 hours per week on ECA were more likely to enroll in a physics course during high school.

- ... students who held a job outside school were less likely to enroll in a physics course during high school.
- ... students who worked an average of >0-10 hours per week at their jobs were significantly less likely to enroll in a physics course during high school.
- ... students who worked an average of >10-20, >20-30 and >30-40 hours per week at their jobs were more likely to enroll in a physics course during high school.
- ... students who worked an average of >40 hours per week at their jobs were less likely to enroll in a physics course during high school.

- ... students who expressed an inclination to attend college or join the military after finishing high school were more likely to enroll in a physics course during high school.
- ... students who expressed an inclination to attend technical college, enter the work force, or be involved in other matters after finishing high school were less likely to enroll in a physics course during high school.
- ... students whose parents expected them to attend college, enter the work force, or join the military after finishing high school were more likely to enroll in a physics course during high school.
- ... students whose parents expected them to attend technical college or be involved in other matters after finishing high school were less likely to enroll in a physics course during high school.

- ... students who were offered a physics class during counseling were significantly more likely to enroll in a physics course during high school.
- ... students who were encouraged to study physics were significantly more likely to enroll in a physics course during high school.
- ... students who had the importance of physics explained to were significantly more likely to enroll in a physics course during high school.
- ... students who would be supported by their friends or social groups if they enrolled in a physics class were more likely to enroll in one during high school.

- ... students were most likely not to enroll in a physics course during high school because they did not need it to graduate.
- ... students were most likely to enroll in a physics course during high school because they were made or required to.
- ... most students believed that better teaching and explanation could improve physics classes.

Advocacy

Factors that are within our control, eg.:

- Offering a physics class during counseling
- Encouraging students to study physics
- Explaining the importance of physics to students

**Strong in their influence.*

→ School districts may increase enrollment in physics classes by taking action accordingly.

- Start physics society to provide social support to students
 - Administer such surveys to discover reasons behind students' decisions to enroll/not enroll in physics courses
- Ideas implemented appropriately

Acknowledgements

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