The Effect of P.E. Grades on Student GPA

What would happen if grades earned in physical education courses at CHS were given the same weight as grades earned in academic courses? Would high academically achieving students have lower GPAs due to their performance in a P.E. course? Would the top-performing students miss out on scholarship opportunities due to a grade in a "nonacademic course?" This study attempts to discover what effect grades in physical education courses have had on a student's overall grade point average at CHS.

Method:

Designing this study was more difficult than I thought it would be. My first idea was to identify the top 10% of CHS students, as measured by their overall GPA. I would then look at the grades these students earned in PE courses. If these students earned high PE course grades, it would demonstrate that including PE course grades would not lower the GPAs of top students. Unfortunately, this plan had some major shortcomings. The most glaring problem was that students who are not in the top 10% due to low grades in non-academic courses would not appear in the study. Since these are the students we are interested in discovering, I couldn't use this design.

The second idea I had was to calculate an "Academic GPA" for each student. This would measure student performance in academic courses (which I decided would be all courses except P.E., art, music, and vocational). I would then calculate a "PE GPA" for each student, which would measure the average grade a student received in physical education courses. I would then compare the Academic GPA to the PE GPA. If the PE GPA was significantly lower than the Academic GPA, it would demonstrate that grades earned in PE courses would have a negative impact on overall GPA. Unfortunately, this method was also problematic. First, not every grade is equally weighted. This would make it difficult to calculate an "Academic GPA" that was equal for every student. Second, this method would not concentrate on the top-performing students, in whom we are interested. I needed yet another design for this study.

The method I finally decided to use combined the best features from each of the two previous methods. Here's what was done.

1) I selected the 2001 graduates, since I had the most data from that class. I ended with a sample of 256 students, 129 females and 127 males.
2) I established a common GPA scale:

A+ = 4.33	A = 4.00	A- = 3.67
B+ = 3.33	B = 3.00	B- = 2.67
C+ = 2.33	C = 2.00	C- = 1.67
D+ = 1.33	D = 1.00	D- = 0.67
F = 0.00	I = 0.00	

3) Giving every course equal weight, I calculated an "Academic GPA" for each student. This was a measure of achievement in all everything except PE, art, music, and vocational courses.
4) I ranked students based on their equally weighted Academic GPA and separated them by ability level into 10 groups. The first group represents the top 10% of students academically, while the 10th group represents the lowest 10% of students academically.
5) Using the above GPA scale, I calculated a "PE GPA" for each student. This measured student performance in physical education courses.
6) I then used several graphical and inferential techniques to compare Academic GPA to PE GPA.

Results:

The following table shows the average Academic and PE GPA for male and female students in this study.

	GPA	
	Academic	P.E.
Male	2.86	3.42
Female	2.91	3.28

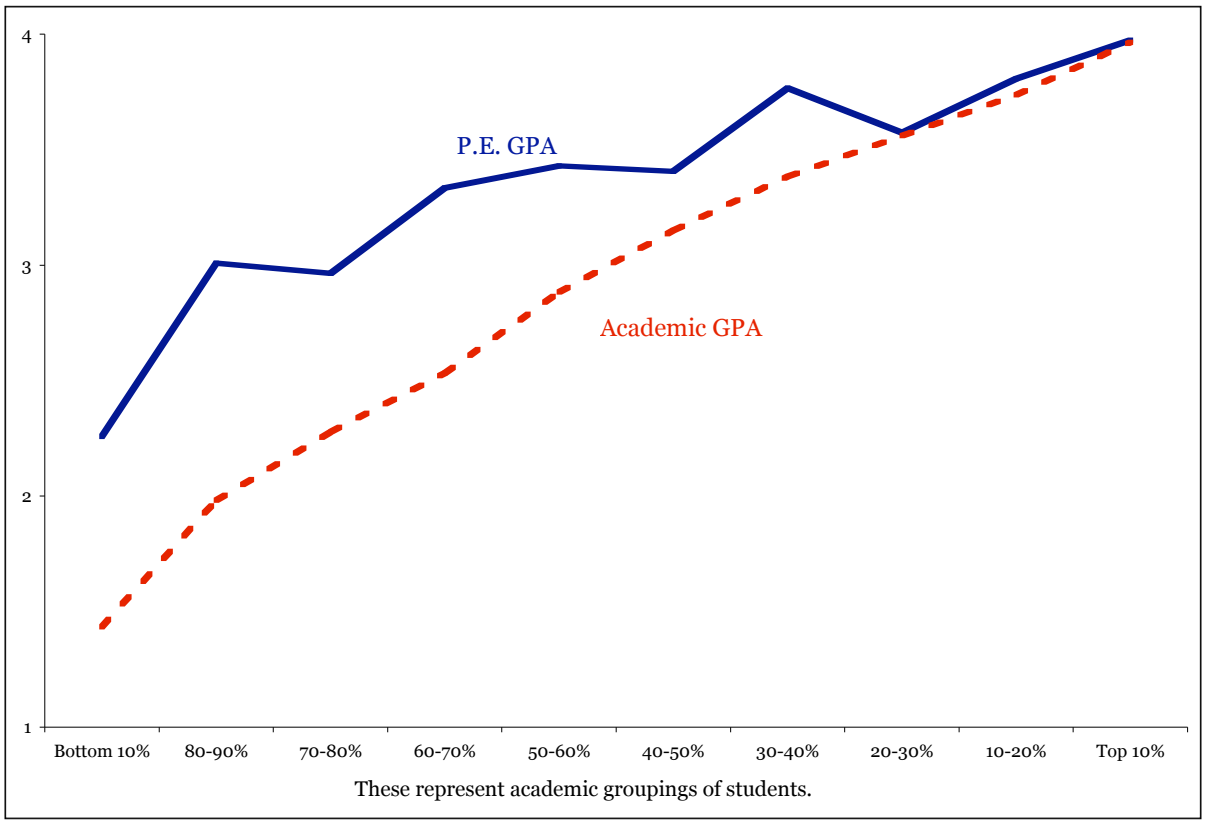
PE GPA – Academic GPA difference = 0.46

PE GPAs are 0.46 higher than Academic GPAs

95% Confidence Interval: (0.36 – 0.57)

Right away, you can see that PE grades tend to be higher than grades in academic courses. This difference is statistically significant, demonstrating that the average student earns a higher grade in PE than he or she earns in academic courses. This would indicate that including P.E. course grades would improve most students' GPAs. You can also see females in this sample had higher Academic GPAs and lower PE GPAs than the males. These differences are not statistically significant.

The following chart shows the average Academic and PE GPAs of students grouped by academic ranking. You notice that students in every academic group (from the top 10% to the bottom 10%) earn higher GPAs in PE courses than in academic courses. This indicates that giving PE grades an equal weight in calculating a student's overall GPA would benefit students regardless of their academic performance. The lowest academically performing students would receive the biggest gain in overall GPA if PE course grades were included. The overall GPAs of the highest achieving students would increase by a smaller amount if PE course grades were included.



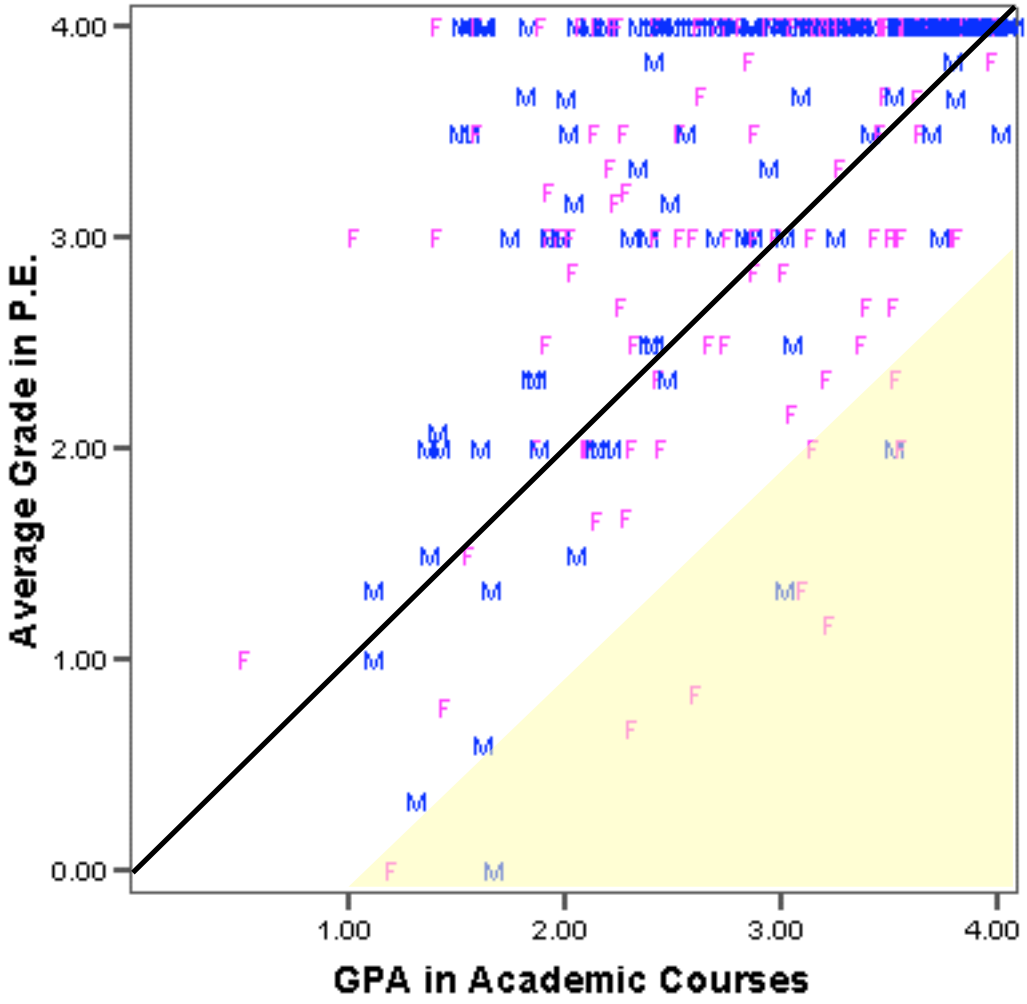
Since the lower-achieving students would benefit the most by including PE grades in calculating an overall GPA, would the top students drop in their class ranking? To find out, I ranked each student by Academic GPA (yielding ranks from 1 to 256). I then calculated an overall GPA, giving PE courses equal weights to academic courses. After ranking students based on this unweighted overall GPA, I looked to see if the PE grades lowered any student's class rank. It turns out that 158 students change class rank after including PE courses (79 students improve their class rank, while 79 students fall in rank).

The more important question to ask is: How many students changed their class rank by a significant amount? I arbitrarily picked a 5% change in class rank to be significant (which is equivalent to an increase or decrease in rank of 13). I found that 11 students fell 5% in class rank, while no students increased their ranking by 5%. This demonstrates that only a small percentage of students would have their class rank significantly impacted by including PE course grades in their overall GPAs. Of the 11 students who fell 5% or more in rank, only 2 had academic GPAs over 3.5. The GPAs of top-achieving students are not harmed by PE grades.

In order to display the Academic and P.E. GPAs of all students, I created the scatterplot on the next page. Identified by gender, this displays the information for all 256 students. As you move from left to right on the chart, Academic GPAs increase. As you move from the bottom to the top, PE GPAs increase. You can see, once again, the general trend that students with higher academic grades tend to earn higher PE grades.

To help in interpretation, I identified two students on the chart. Find student #1, located near the top left of the chart. The dotted line to the left indicates that this student earned a 3.00 in PE (which is equivalent to a 'B' grade). The dotted line going down from student #1 shows us that this student has an Academic GPA near 1.00 (which is a 'D' average). Obviously, this student's overall GPA would increase if we were to include the P.E. grades.

Student #2 is near the bottom-right side of the chart. This student earned a 'D' average in P.E. courses (as indicated by the dotted line moving to the left). This student has an Academic GPA of 3.33 (or a 'B+' average), as indicated by the dotted line moving to the bottom. This student's overall GPA would decrease if we were to include the P.E. grade.



This is another copy of that scatterplot. I have drawn a line down the middle of the chart. Students who fall on this line have PE GPAs exactly equal to their Academic GPAs. Students below (to the right) of the line are those who earned lower grades in PE than they average in academic courses (PE would lower their GPAs). Students above (to the left) of the line are those who would have higher GPAs if PE courses were included. 62 of the 256 students had lower PE grades than academic grades. 193 students had higher PE grades than academic grades.

It's important to note that not all of these differences are significant. The yellow area on the chart highlights students whose PE GPAs were at least one point below their academic GPAs. This is equivalent to a one letter-grade difference between PE and academic courses. You can see that 12 students fall in this area (3 of whom have GPAs over 3.50). That's less than 5% of students who earn PE grades one letter-grade below their average academic grades. If you factor in that PE grades play a small role in the calculation of an overall GPA, you can see that PE grades will have no real negative impact on any student's overall GPA.

If we look for students who earn PE grades one letter-grade higher than their average academic grade, we will find 60 students (which represents 23% of this sample). 8 students earn PE grades a full 2 letter-grades higher than their average academic grade. This demonstrates that including PE grades in calculating an overall GPA would have the following effects:

1) Around 5% of students would have their GPAs slightly lowered. Less than 1% of students earning a GPA over 3.50 would have lower GPAs.
2) Around 20% of students would have their GPAs slightly raised. These are mostly students whose academic GPAs are between 1.00 – 2.00
3) Less than 5% of students would have their class rank lowered. Two or three students with GPAs over 3.50 may have their class rank drop by 5%