

MAT.HS.PT.4.TUITN.A.298

Sample Item ID:	MAT.HS.PT.4.TUITN.A.298
Title:	College Tuition
Grade:	HS
Primary Claim:	Claim 4: Modeling and Data Analysis Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Secondary Claim(s):	<p>Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.</p> <p>Claim 2: Problem Solving Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.</p> <p>Claim 3: Communicating Reasoning Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.</p>
Primary Content Domain:	Statistics and Probability
Secondary Content Domain(s):	Functions, Algebra, Number and Quantity
Assessment Target(s):	<p>4 A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>4 E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.</p> <p>4 G: Identify, analyze, and synthesize relevant external resources to pose or solve problems.</p> <p>4 B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.</p> <p>4 F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).</p> <p>4 D: Interpret results in the context of a situation.</p> <p>1 G: Create equations that describe numbers or relationships.</p> <p>1 P: Summarize, represent, and interpret data on a single-count or measurement variable.</p> <p>2 B: Select and use appropriate tools strategically.</p> <p>3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions.</p>

HS Mathematics Sample PT Form Claim 4



Standard(s):	S-ID.6, S-ID.7, S-ID.3, S-ID.2, S-ID.8, F-LE.1, F-LE.2, F-LE.5, F-IF.2, A-CED.2, N-Q.3, 8-SP.1, 8.SP.2, 7.RP.3, 7.EE.3
Mathematical Practice(s):	1, 2, 4, 5, 6, 7
DOK:	4
Item Type:	PT
Score Points:	14
Difficulty:	M
How this task addresses the "sufficient evidence" for this claim:	The student uses concepts of statistics, functions, and algebraic thinking to accomplish tasks associated with predicting the future costs of college tuition. The work is supported by calculations and explanations of reasoning.
Target-specific attributes (e.g., accessibility issues):	Accommodations may be necessary for students who have vision challenges, fine-motor-skills challenges, and language-processing challenges.
Stimulus/Source:	<p>For articles used in prework:</p> <p>Article 1 http://www.usatoday.com/news/education/story/2011-10-25/public-college-costs-increase/50919598/1</p> <p>Article 2 http://www.insidehighered.com/news/2010/10/28/tuition#ixzz1mbLlzzuN</p> <p>Article 3 http://www.changinghighereducation.com/2012/01/so-let-me-put-colleges-and-universities-on-notice-if-you-cant-stop-tuition-from-going-up-the-funding-you-get-from-taxpay.html</p> <p>To be used in conjunction with prework research: http://chronicle.com/article/Interactive-Tool-Tuition-Over/125043/</p> <p>A simulated search will be developed in a similar fashion to the search tool provided on this Web site. The search tool will contain a subset of the data on this site. That subset of data will be from the collection of schools/institutions each student chooses in the days leading up to this activity.</p> <p>For data on average college tuition and fees: http://nces.ed.gov/programs/digest/d10/tables/dt10_345.asp</p>
Notes:	Multi-part task
Task Overview:	<p>Students will research data on college tuition over time. They will analyze their data in groups and individually to develop a model that best fits their collected data. Their models will then be used to predict future costs of college tuition.</p> <p><i>Parts C, D, and E</i> will be the only scored portions of this task.</p>
Teacher preparation / Resource requirements:	<p>Teacher preparation: Up to 3 – 5 days prior to the administration of this task, students will be assigned a prework task that will be used to gather data in <i>Part A</i> of the task and to compare data in <i>Part C</i></p>

	<p>of the task. The prework should be done individually, outside of school, and given to the teacher at least one day before the start of the task. The teacher will compile data for a simulated search based on the prework information. The simulated search will be performed individually during <i>Part A</i> of this task. In the latter part of Session 1, <i>Part B</i> will incorporate group work to analyze data and will require the teacher to coordinate partner/group work for this part of the task. The remaining parts of this task will be completed independently. Session 2 will involve modeling and interpreting the data analyzed during the group work.</p> <p>Resource requirements: Spreadsheet software and computers must be available to all students, as well as research tools to help students compile simulated data. Calculators should be available to students, either online or physically. Copies of a specific news article will be handed out and read as part of the prework activity.</p>
<p>Teacher Responsibilities During Administration:</p>	<p>Monitor individual student work and monitor group work. Provide resources as necessary.</p>
<p>Time Requirements:</p>	<p>Two sessions totaling no more than 120 minutes. <i>Parts A</i> and <i>B</i> will be completed during Session 1. <i>Part A</i> should be performed individually and <i>Part B</i> should be performed in small groups. <i>Parts C, D,</i> and <i>E</i> will be completed during Session 2. All tasks during Session 2 will be performed individually.</p>

Prework:

In preparation for this task, teachers must assign students the following task as an individual activity at least 3 days prior to the administration of the performance task. Teachers must hand out copies of these three articles to each student for this prework portion:

1. Marklein, Mary Beth (2011), "Tuition and fees rise more than 8% at U.S. public colleges," from *USA Today*, October 26.

Online articles:

2. Jaschik, Scott (2010), "Tuition Hikes of the Downturn," from *Inside Higher Ed*, October 28.

3. (2012), "The State of the Union on college costs," from *Changing Higher Education*, January 30.

[Note: A copy of each article is at the end of this task.]

Teacher says: Most students have plans to attend college after graduating from high school. There are many costs to consider when planning for college. The major costs are tuition and school-related fees, which are typically combined into one dollar amount. The cost of a college education is expected to increase from year to year. As a result, the yearly cost for a college education during a student's first year may be significantly different four years later when the student is ready to graduate.

During the two sessions of the upcoming performance task, you will be predicting the total costs for tuition and school-related fees, as a combined cost (which will be referred to as “tuition” throughout the task), for a college of your choice. Your assignment will include the following:

- Choose a college or university that you will use to predict the future cost of tuition. This can either be a local 2-year or 4-year institution or one that you would like to attend in the future. You must provide the name of the school and the type of institution (i.e., 2-year or 4-year, public or private, college or university).
- Find out what the current year’s tuition, including school-related fees, are for the school you chose. This information can often be found by calling the school’s admissions office, obtaining a current school catalog, or doing an Internet search. Be sure to get the cost for in-state students if the school is located in this state. Get the cost for out-of-state students if the school is not located in our state.
- Read the news articles “Tuition and fees rise more than 8% at U.S. public colleges,” “Tuition Hikes of the Downturn,” and “The State of the Union on college costs.”
[Note: Teacher must distribute copies of each of these articles.]
- Use the information you obtained about the current year’s tuition at the school you chose and the information you read in the “Tuition and fees rise more than 8% at U.S. public colleges” news article to predict the cost of college tuition at your choice of schools the year you are first eligible to attend college. You should also predict the total tuition amount for the entire college education. This will be 2 years or 4 years based on the type of school you choose. Have your calculations and an explanation of how you determined your total predicted amount ready when the performance task officially begins.

[Assumptions: The method of handling the research part of the prework is based on this item writer not fully knowing what tools will be available to teachers and students as they perform this task. It is based on the assumption that students will not be allowed to do online searches in the classroom and that some sort of simulated search will need to be developed. The description below is only a suggested possibility. There may very well be an easier way to handle this research portion, such as reproducing the site or using the site itself, if possible.]

The prework from the first bullet (choosing a school) will be provided to teachers 4-5 school days before the start of the task. This is to give time for teachers to prepare a full list of schools that will be combined into one collective simulated search that all students will use

at the start of the performance task.

To do this, teachers will compile the complete list of schools provided by the students. They will enter each school into the search tool provided below.

<http://chronicle.com/article/Interactive-Tool-Tuition-Over/125043/>

Screen shots will be made of each school's tuition data. The screen shots will then be combined to form the simulated search tool to be used by the students when they begin Session 1 of the task.

[Notes: Ideally, the simulated search should be laid out in a similar fashion to the search tool provided on this Web site listed below. The simulated search will be a subset of all schools found on this site.

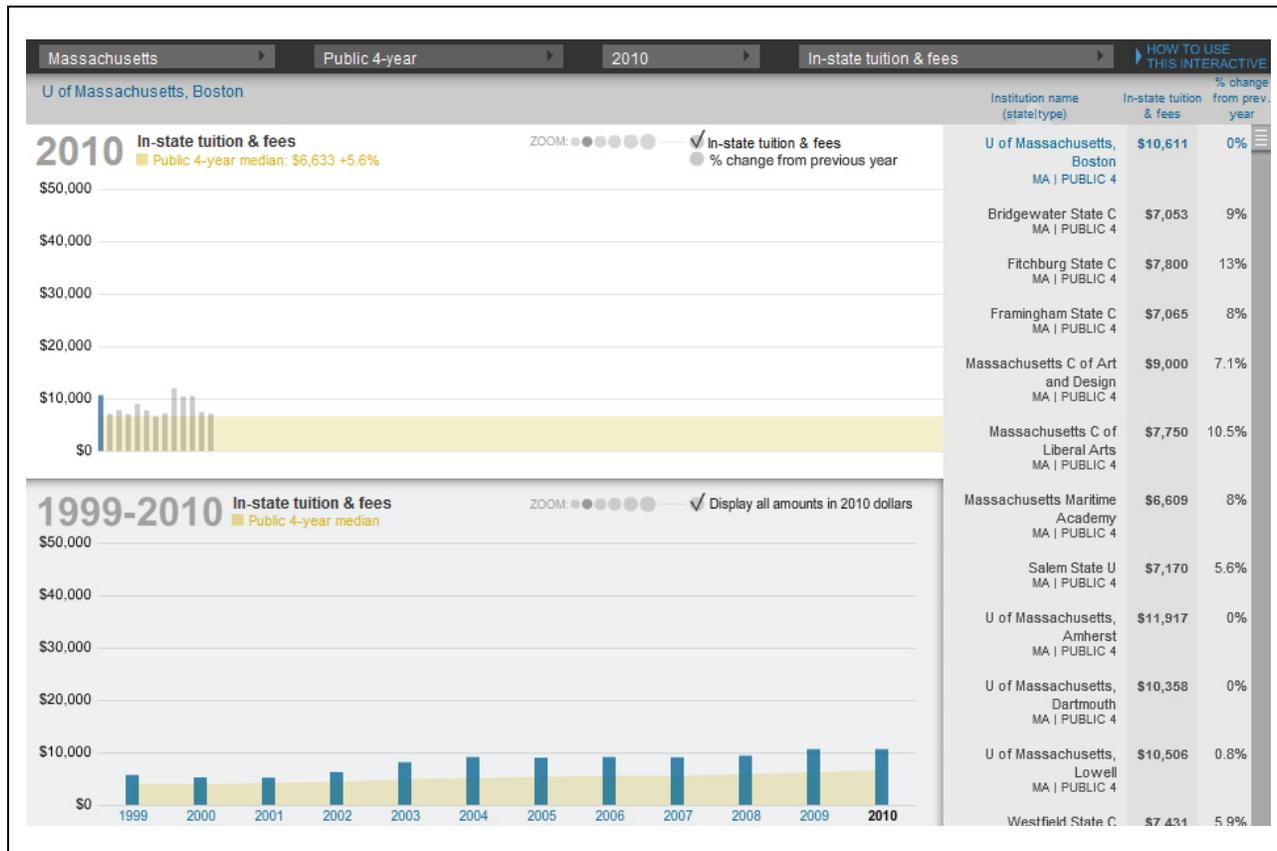
<http://chronicle.com/article/Interactive-Tool-Tuition-Over/125043/>

A sample screen shot is below. (It can be enlarged.) This is the school whose data are used in the sample response.

A simulated search should be created to have only the data from the collective list of schools provided by the students. Students will locate the school they specifically chose, and ideally have these two tables displayed: "1999-2010 In-state tuition & fees" and "1999-2010 Out-of-state tuition & fees."

Additional information:

1. If the simulated search can be computer based, scrolling over the bars from the bar graph will list both in- and out-of-state tuition and fees for the particular school.
2. If the simulation will not be available via computer, the output should be adjusted from what is shown in the screen shot below. (The screen shot below shows "2010 in-state tuition & fees" displayed on top, followed by the "in-state tuition and fees" table.) The output should be adjusted to show the "1999-2010 In-state tuition and fees" on top and the "1999-2010 Out-of-state tuition and fees" underneath.
3. The data on this Web site is based on tuition and fees only. No additional expenses are reflected unless specifically noted.
4. This is the data students will use in *Part A* of the task.]



Session 1

[Note: Session 1 of the performance task consists of two *Parts*: *A* and *B*. *Part A* should be performed individually. *Part B* should be performed in pairs or small groups. The teacher should allow for the majority of Session 1 to be devoted to group work.]

College Tuition

Your Assignment:

Based on your research during the last few days, you may have realized that the cost of a college education in the United States can be expensive. During this performance task, you will use a spreadsheet and your knowledge of functions and statistics to predict the future cost of college tuition.

Steps you will be following:

To accomplish this, you will use a spreadsheet to help perform the following:

1. Gather data on the past year's tuition amounts.
2. Analyze the data and choose a model type that will best predict the future tuition total.
3. Develop a model equation based on the model type chosen.
4. Predict the total tuition amount for a 2-year or a 4-year college education in the near future.
5. Compare the predicted total tuition amount using the model equation with the total predicted tuition amount you calculated prior to the start of this task.
6. Compare tuition amounts at the college you chose with the average tuition amounts of all public 4-year colleges in the United States.
7. Predict the total tuition amount at a 2-year or a 4-year college education in the distant future.

Part A**Past Year's Tuition**

During the past few days, each of you chose a specific college or university to research. In order to predict the total tuition amount at that college or university, you must first research past year's tuition amounts for that school.

You will use a computer to search for these data specific to the school you chose. Your search will provide you with the combined cost for tuition and school-related fees at your school over the past several years. Gather these data and enter them into a spreadsheet. The data must include the tuition and school-related fees, as one total dollar amount, for the past 10 years.

[Note: With the data provided on the simulated searches in this example, that will be for the years 2001–2010.]

Part B**Choosing a Model**

After you have collected your data and entered it into the spreadsheet, get into pairs or groups of 3 or 4. In your group, you will analyze each team member's data by determining the following:

- what the data look like graphically
- what outliers, if any, exist
- what model type, either linear or nonlinear, best fits the data

As a group, decide which model type will be used to determine the function (model equation) that will predict each member's future tuition amounts at his/her chosen school. The model types may or may not be the same for all group members.

Model Types

Member 1: _____

Member 2: _____

Member 3: _____

Member 4: _____

Look for similarities and differences in each group member's data. Discuss some reasons why the data cause the model types for each group member to be the same or different.

[Note: Allow 5-10 minutes at the end of Session 1 for a whole class discussion about what was discovered during the group work. Students should discuss the reasons they came up with for why the model types in their individual groups, and the class as a whole, may or may not be the same.]

End of Session 1

Session 2

[Assumptions: All work involving the use of spreadsheet is based on the assumption that students know how to enter data, how to use the chart wizard (or other graphing utility) to create graphs, and how to enter formulas—particularly for linear and exponential regressions, mean, and standard deviation.]

[Note: Session 2 of the performance task consists of three parts: C, D, and E. All parts should be performed individually. Part C will make use of the prework involving student’s predicted tuition amounts based on the “Tuition and fees rise more than 8% at U.S. public colleges” news article they read and the current year’s tuition amount for their chosen school. Part E will require students to analyze their work based on information they read in the news articles “Tuition Hikes of the Downturn” and “The State of the Union on college costs.”]

Part C

Predicting Future Tuition

[Note: Have students take out the predicted tuition amounts they calculated as part of their prework assignment. Ask the students to summarize what they learned from the “Tuition and fees rise more than 8% at U.S. public colleges” news article they read as part of the prework and how the article guided them in calculating their predicted tuition amounts.]

When you did your previous group work for this performance task, you each determined the model type that fit your data best. Now, use your spreadsheet to determine the model equation that will be used to predict the tuition amount, as a single dollar amount, at the school you chose.

[Note: Using actual 4-digit years (2001, 2002, 2003, etc.) as opposed to whole-number years (1, 2, 3, etc.) will result in very different model equations. The equation using the actual 4-digit years will not give tuition amounts appropriate to this problem. Teachers should instruct students to either use whole-number years or try both types of year inputs and make their own judgments as to the appropriate model equation to use.]

1. Write your model equation here. Show or explain how you found your answer.

2. Use your spreadsheet and your model equation to predict the total 2-year or 4-year tuition amount for the school you chose. Your prediction should begin with the school year that you are first eligible to attend college. Write the tuition amounts below, as well as the total for all years. Be sure to include each year.

Next, compare these total predicted tuition amounts:

- the prediction based on your model equation and spreadsheet data from above
 - the prediction you made after reading the "Tuition and fees rise more than 8% at U.S. public colleges" news article prior to starting this task, using the current year's tuition amount from your particular school
3. Are these predicted amounts similar or different? Explain why these amounts are similar or different. What does this suggest about the rate of increase for both predicted calculations?

Part D**Comparing Individual Tuition
and Average Tuition**

The following table shows actual data for the average tuition costs for all 4-year public universities in the United States.

**Annual Tuition Average
of Public 4-Year Colleges**

School Year	Yearly Amount (\$)
2000-2001	3501
2001-2002	3735
2002-2003	4046
2003-2004	4587
2004-2005	5027
2005-2006	5351
2006-2007	5666
2007-2008	5943
2008-2009	6312
2009-2010	6695

Use your spreadsheet to compare the data you found on your college's tuition amounts over a 10-year period with the data for the average tuition amounts at 4-year public colleges.

Suppose the data for the average tuition amounts for all 4-year public colleges were used to create a new model equation. Also, suppose this model equation was used to predict the future college tuition amounts.

4. Which model equation would have a higher correlation factor:

- the model equation created from the average tuition amounts; or
- the model equation created from the tuition amounts at your chosen school?

Explain why that model equation has a higher correlation factor. What does this suggest about how reliable each model is for predicting future college tuition amounts? Explain your reasoning. You may use a combination of diagrams, mathematical expressions/equations, and words.

Part E

Predicting Tuition for the Next Generation

In this last part of the task, you will predict the total tuition amount someone in a future generation will be expected to pay.

Use your spreadsheet and the model equation you determined for your college to predict the total tuition amount for a family that has a child born 10 years from now. You should assume that this child will:

- attend the college you chose,
- begin college at age 18, and
- attend for the full length of time (either 2 or 4 years).

5. Show how you determined the predicted total college tuition amount for this person. You may use a combination of diagrams, mathematical expressions/equations, and words.

Consider the two articles, “Tuition Hikes of the Downturn” and “The State of the Union on college costs,” you read prior to starting this task.

6. Use these articles to help justify why predicting college tuition costs too far into the future, beyond a few years, might not be reliable. Cite information from each article that supports your reasoning.

[Note: Students should have both articles available during this portion of the task.]

End of Session 2

Sample Top-Score Response:

Prework (Not Scored)

Should include:

Name of school, type of school, and current full-year tuition amount

E.g.,

UMASS Boston, 4-year University, \$11,407 for 2011-2012 in-state tuition and fees

Source: http://www.umb.edu/bursar/tuition_and_fees/

The predicted cost for college tuition should apply a yearly increase close to 8.3% for each year's tuition amount.

E.g.,

Start college for school year 2013-2014

First year's predicted tuition amount: $\$11,407 \times 1.083 \times 1.083 = \$13,379$

The sum of 2 or 4 consecutive years' projected tuition amounts should be made, approximately 1-3 years from the current year.

E.g.,

First year predicted amount: \$13,379

Second year: $\$13,379 \times 1.083 = \$14,489$

Third year: $\$14,489 \times 1.083 = \$15,692$

Fourth year: $\$15,692 \times 1.083 = \$16,994$

Total = $\$13,379 + \$14,489 + \$15,692 + \$16,994 = \mathbf{\$60,554}$

Part A (Not Scored)

The spreadsheet should show data in two columns. The first column should include the most recent 10 years shown on the tuition data site. The second column should include the corresponding yearly tuition amounts for the college chosen by the student. For example:

	Year	UMASS Boston In-state Tuition
1	2001-2002	5170
2	2002-2003	6229
3	2003-2004	8142
4	2004-2005	9112
5	2005-2006	9028
6	2006-2007	9143
7	2007-2008	9060
8	2008-2009	9353
9	2009-2010	10,611
10	2010-2011	10,611

Part B (Not Scored)

Model types (linear or nonlinear – exponential or quadratic) should be listed for each group

member.

Some notes or reflections should portray some similarities and some differences among the data in the group. The students should provide reasonable explanations why the data have these similarities and differences.

Part C (Scored)

1. The student determines the correct linear (or nonlinear) model that best fits their specific data. The model is written either as an equation or as a function. The student should show the formula and data they used in the spreadsheet in order to determine their model equation. The student is able to interpret the output from the formula correctly in order to write the model equation.

E.g., using data from part A

Formula = "=LINEST(C2:C11,A2:A11)"

Output = 519.133, 5790.667

Model equation: $f(x) = 519.133x + 5790.667$

2. The student correctly applies the model equation they determined for years in the near future. The student substitutes the appropriate 2 or 4 school years for x into the model equation and gets the predicted college tuition amount, y . The student adds the amounts for each year's output, y , to determine the total predicted college tuition amount. For example:

Year		UMASS Boston In-state Tuition
1	2001-2002	5170
2	2002-2003	6229
3	2003-2004	8142
4	2004-2005	9112
5	2005-2006	9028
6	2006-2007	9143
7	2007-2008	9060
8	2008-2009	9353
9	2009-2010	10,611
10	2010-2011	10,611

	slope	y-intercept
Linear model	519.133	5790.667
11	2011-2012	\$11,501
12	2012-2013	\$12,020
13	2013-2014	\$12,539
14	2015-2016	\$13,059
15	2016-2017	\$13,578
16	2017-2018	\$14,097
Total		\$53,273

3. The student notices a similarity or difference between the two predicted total amounts and is able to reasonably explain why the similarity or difference exists. If the predicted total using the model equation is less than the predicted total based on the article, the student explains that the average yearly increase must be less than 8.3%. If the predicted total using the model equation is more than the predicted total based on the article, the student relates that the average yearly increase must be greater than 8.3%.

For example:

Total predicted tuition based on model equation: \$53,272

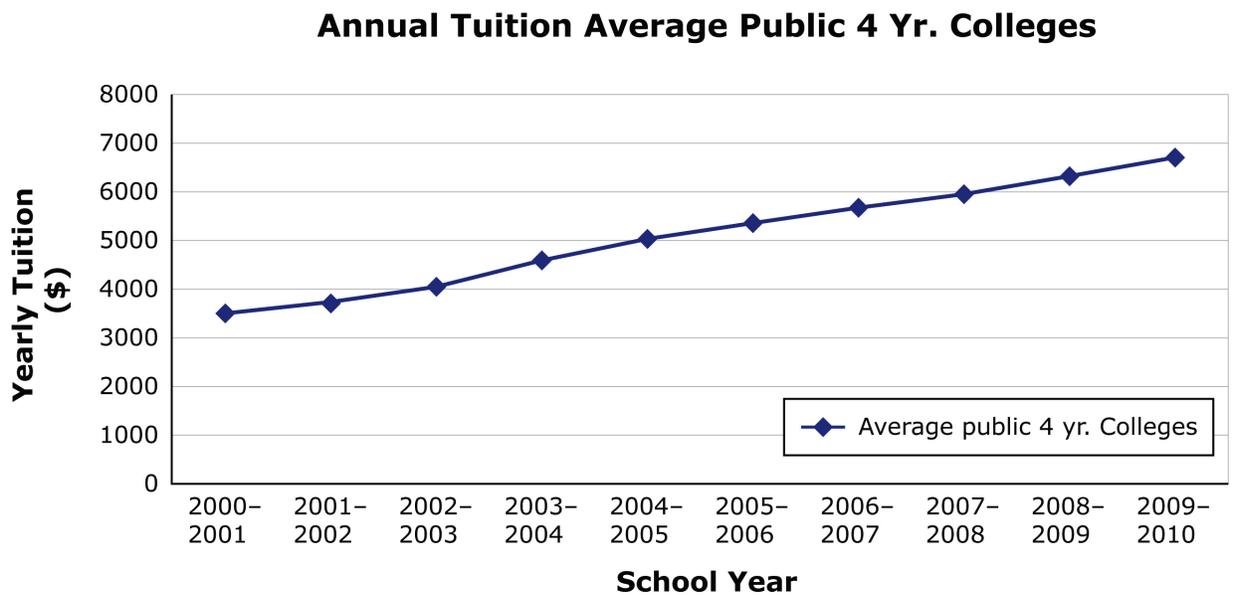
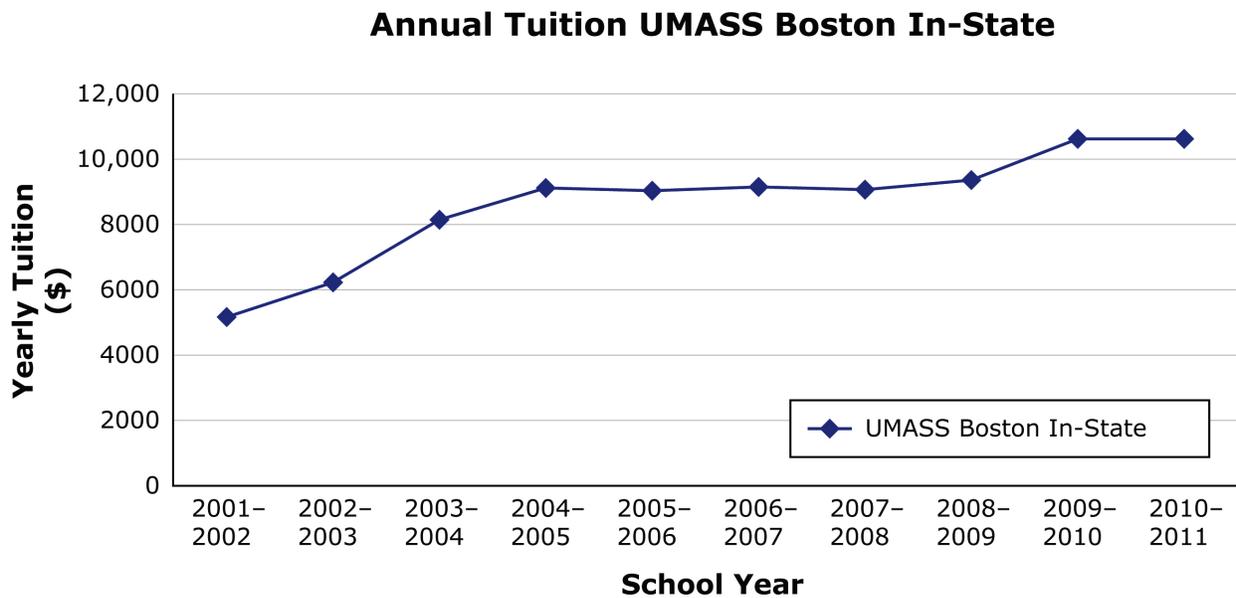
Total predicted tuition based on current year’s tuition and data from article: \$60,554

These predicted amounts differ by a significant amount, \$7282. This is most likely because the rate at which the model predicts tuition to increase each year is less than the 8.3% average mentioned in the article.

Part D (Scored)

4. The student gives a reasonable explanation of why the average tuition model equation (most likely) has the higher correlation factor. The student relates the almost perfectly linear relationship of the average data to having a line of best fit that produces a model equation very close to the actual data points, creating a high correlation factor. The data for the chosen school, however (most likely), do not have as close a linear relationship, so the

line that best fits that data will have a (slightly) lower correlation factor. For example:



The student offers a reasonable explanation as to how the reliability of each model and the correlation factor associated with each model are related. The student recognizes that the higher the correlation factor, the more reliable the model is expected to be.

For example:

The model equation for the average tuition data is $f(x) = 362.612x + 3091.933$. When I input the years 1-10 into this equation and correlate these outputs to the actual averages, I get a correlation factor of 0.99739. This is a very high correlation factor, which is expected since the data on the graph show an almost linear relationship with the given data. This

high correlation factor indicates that the model for the average tuition data is very reliable.

When I input the years 1-10 into the model equation I found for my college and correlate these outputs to the actual averages, I get a correlation factor of 0.90441. This makes sense that the correlation factor is somewhat lower because the data for UMASS' tuition is not quite as linear as the data for the average tuition. While this is not as high a correlation factor as the average tuitions' model, it still is fairly high and indicates that the model equation to predict the tuition for my college is still fairly reliable.

Part E (Scored)

5. The student correctly applies the model equation from part C. The student recognizes that the starting value of x must be 28 ($10 + 18$) more than the value of x for the current year. The student substitutes the appropriate 2 or 4 school years for x into the model equation and gets the predicted college tuition amount, y . The student adds the amounts for each year's output, y , to determine the total predicted college tuition amount for someone in the next generation. For example:

28 years from now

40	2040–2041	\$26,556
41	2041–2042	\$27,075
42	2042–2043	\$27,594
43	2043–2044	\$28,113
Total		\$109,338

I determined that this person would be attending college 28 years from now, beginning in the year 2040. I used the 4-year period beginning in that year to determine the total tuition using the model equation for UMASS found in part C.

6. The student gives a reasonable explanation to justify why predicting college tuition costs too far into the future might not be reliable. The student cites details relating to how the varying percentage amount increases by decade shown in the Annual Average Tuition Increases (Inflation-Adjusted) by Sector table [in article 2] indicates that a single percent increase, as given in the model equation, cannot be relied on. The student relates the impact that the economy plays in driving tuition rates up [in articles 2 and 3], and that without a clear prediction of the future of the economy, it is hard to predict how college tuition rates will increase. The student discusses that differences exist in average tuition increases based on the type of school it is (public vs. private). The factors that influence these different percent increases are discussed along with the possibility that this trend may not always be the case [in article 2]. The student cites concerns outlined in President Obama's State of the Union address [in article 3] that government may need to take some control in the future by limiting the amount of government aid colleges receive if tuition increases continue climbing at their current rate. The student relates this to the possibility that tuition increases may start to decline, thus making their model unreliable several years into the future.

Scoring Notes:

Each question in the scored parts is evaluated individually. The total number of points is determined by adding the points assigned for each question.

Scoring Rubric:

Scoring Rubric for **Part C**:

Part C, Question 1: Responses to this item will receive 0-2 points, based on the following:

2 points: The student shows a thorough understanding of how to use a spreadsheet to determine a regression function and interpret the result of the output. The student uses the correct regression formula in the spreadsheet, references the correct data values for the function, and interprets each output number from the formula to write the correct model equation (e.g., A linear regression formula outputs two numbers. The first number represents the slope of the function and the second number represents the y -intercept).

1 point: The student shows partial understanding of how to use a spreadsheet to determine a regression function and interpret the result of the output. The student uses the correct regression formula in the spreadsheet, references the correct data values for the function, but misinterprets the output numbers from the formula. **OR** The student uses the correct regression formula in the spreadsheet, but references the incorrect data values for the function. However, the student is able to interpret the output numbers from the formula correctly.

0 points: The student shows inconsistent understanding of how to use a spreadsheet to determine a regression function and interpret the result of the output. The student does not use the correct regression formula in the spreadsheet, and does not interpret the output numbers from the formula correctly to write a model equation.

Part C, Question 2: Responses to this item will receive 0-2 points, based on the following:

2 points: The student shows a thorough understanding of how to use a spreadsheet to apply a regression function to find a total predicted tuition amount. The student projects out the starting year and ending year correctly for when they plan to attend the college. The student uses those years in the model equation to find the predicted tuition amounts for those years and then sums the 2- or 4-year amounts for one total.

1 point: The student shows partial understanding of how to use a spreadsheet to apply a regression function to find a total predicted tuition amount. The student projects out the starting year and ending year correctly for when they plan to attend the college. The student uses those years in the model equation to find the predicted tuition amounts for those years but does not find their total sum. **OR** The student projects out the incorrect starting year and ending year but applies the model equation correctly to find predicted tuition amounts for those years. The student sums the amounts for one total.

0 points: The student shows inconsistent understanding of how to use a spreadsheet to

apply a regression function to find a total predicted tuition amount. The student may or may not project out the starting year and ending year correctly. However, the student applies the model equation incorrectly and does not find or incorrectly finds the sum the 2- or 4-year amounts.

Part C, Question 3: Responses to this item will receive 0-2 points, based on the following:

2 points: The student shows a thorough understanding of how to compare predicted tuition amounts using more than one method for predicting. The student correctly identifies whether the two predicted tuition sums are similar or different. The student relates the rate of increase mentioned in the article to the rate of increase used in the model equation.

1 point: The student shows partial understanding of how to compare predicted tuition amounts using more than one method for predicting. The student correctly identifies whether the two predicted tuition sums are similar or different but does not relate the rate of increase mentioned in the article to the rate of increase used in the model equation.

0 points: The student shows inconsistent understanding of how to compare predicted tuition amounts using more than one method for predicting. The student incorrectly identifies whether the two predicted tuition sums are similar or different.

Scoring Rubric for **Part D**:

Part D, Question 4: Responses to this item will receive 0-3 points, based on the following:

3 points: The student shows a thorough understanding of how to analyze data in terms of correlation and uses that knowledge to make judgments about the reliability of models. The student identifies which model has a higher correlation factor and provides an accurate explanation as to why it is higher. The student reasonably relates the correlation factor to the reliability of each model. The student provides a complete and accurate explanation for all aspects of this part using diagrams, expressions/equations, and/or words.

2 points: The student shows some understanding of how to analyze data in terms of correlation and uses that knowledge to make judgments about the reliability of models. The student identifies which model has a higher correlation factor but does not provide a complete explanation as to why it is higher. The student reasonably relates the correlation factor to the reliability of each model. The student provides a complete and accurate explanation for most aspects of this part using diagrams, expressions/equations, and/or words.

1 point: The student shows partial understanding of how to analyze data in terms of correlation and uses that knowledge to make judgments about the reliability of models. The student identifies which model has a higher correlation factor and provides an accurate explanation as to why it is higher. The student incompletely or inaccurately relates the correlation factor to the reliability of each model. The student provides a complete and accurate explanation for some aspects of this part using diagrams, expressions/equations, and/or words.

0 points: The student shows inconsistent understanding of how to analyze data in terms of correlation and uses that knowledge to make judgments about the reliability of models. The

student may or may not identify which model has a higher correlation factor but provides no explanation or an incorrect explanation as to why it is higher. The student incompletely or inaccurately relates the correlation factor to the reliability of each model. The student provides no complete or accurate explanation for any aspect of this part using diagrams, expressions/equations, and/or words.

Scoring Rubric for **Part E**:

Part E, Question 5: Responses to this item will receive 0-2 points, based on the following:

2 points: The student shows a thorough understanding of how to apply the model equation to find a total predicted tuition amount in the distant future. The student projects out the starting year and ending year correctly. The student uses the appropriate years in the model equation to find the predicted sum of the tuition for a student attending college in the future.

1 point: The student shows partial understanding of how to apply the model equation to find a total predicted tuition amount in the distant future. The student projects out the starting year and ending year correctly but applies the model equation incorrectly.

0 points: The student shows inconsistent understanding of how to apply the model equation to find a total predicted tuition amount in the distant future. The student does not project out the starting year and ending year correctly. The student does not apply the model equation correctly to find the predicted sum of the tuition for a student attending college in the future.

Part E, Question 6: Responses to this item will receive 0-3 points, based on the following:

3 points: The student shows a thorough understanding of how to interpret information regarding the future of college tuition rate increases presented in news articles and justifies conclusions based on the analysis. The student gives a complete and reasonable explanation as to why predicting college tuition costs too far into the future might not be reliable. The student supports his or her reasoning with at least 3 statements coming from both related articles.

2 points: The student shows some understanding of how to interpret information regarding the future of college tuition rate increases presented in news articles and justifies conclusions based on the analysis. The student gives a reasonable explanation as to why predicting college tuition costs too far into the future might not be reliable. The student supports his or her reasoning with at least 2 statements coming from both related articles.

1 point: The student shows partial understanding of how to interpret information regarding the future of college tuition rate increases presented in news articles and justifies conclusions based on the analysis. The student gives an incomplete or partially correct explanation as to why predicting college tuition costs too far into the future might not be reliable. The student supports his or her reasoning with at least 2 statements coming from both related articles. Or the student supports his or her reasoning with statements coming from only one article.

0 points: The student shows inconsistent understanding of how to interpret information regarding the future of college tuition rate increases presented in news articles and justifies conclusions based on the analysis. The student gives an incorrect explanation as to why predicting college tuition costs too far into the future might not be reliable. The student may or may not support his or her reasoning with statements from both related articles.

Article #1

<http://www.usatoday.com/news/education/story/2011-10-25/public-college-costs-increase/50919598/1>

Tuition and fees rise more than 8% at U.S. public colleges

By Mary Beth Marklein, USA TODAY

Updated 10/26/2011 2:12 AM

Tuition and fees at America's public colleges rose more than 8% this year as a weakened economy and severe cuts in state funding took their toll, a report out today says.



By Jacquelyn Martin, AP

Gan Golan of Los Angeles, dressed as the "Master of Degrees," holds a ball and chain representing his college loan debt during an "Occupy D.C." protest Oct. 6.

Public four-year universities charged residents an average of \$8,244, up 8.3% from last year, while public two-year schools charged an average of \$2,963, up 8.7%, says the report by the non-profit [College Board](#). About 80% of the nation's undergraduates attend public institutions.

That increase is more than double the inflation rate of 3.6% between July 2010 and July 2011. Family earnings dropped across all income levels. And state funding per student declined by 4% in 2010, the latest year available, and 23% over the past decade, the report says.

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College costs

Average estimated costs* for full-time undergraduates in 2011-12, before grant aid**:

Public two-year commuter student: \$15,286

Public four-year, in-state, lives on campus: \$21,447

Public four-year, out-of-state, lives on campus: \$33,973

Private non-profit four-year, lives on campus: \$42,224

*Costs include tuition and fees, room and board, books and supplies, transportation and other expenses.

**About one-third of full-time undergraduates receive no grant aid.

Source: College Board

Molly Corbett Broad, president of the [American Council on Education](#), called the findings "sadly familiar," and said the drop in state support was particularly troubling. "It has become all too common for state legislatures to dip into the pockets of students and families to balance state budgets," she says.

The tuition and fee hike is not the worst of the decade — that occurred in 2004, when sticker prices rose 11% beyond inflation from the previous year.

The report says there may be some good news: a rise in federal student aid — including tax credits and deductions — is blunting the impact for most families. "At a time when students and families are ill-equipped to manage additional expenses, student financial aid is more important than ever," report author Sandy Baum says.

Net price — the published price minus grants and tax breaks — at public four-year colleges averaged \$2,490, the report found.

About two-thirds of undergraduates receive grant aid, which averaged \$6,539 last year. Average federal loans averaged \$4,907. Borrowing by students and parents increased about 2% from 2009-10 to 2010-11.

Borrowing from private sources declined for the third straight year. In Denver today, [President Obama](#) will announce a plan through which students can consolidate their debt and reduce their interest rates. The plan also will allow borrowers to cap their student loan payments at 10% of discretionary income.

Article #2

<http://www.insidehighered.com/news/2010/10/28/tuition#ixzz1mbLlzzuN>

Inside Higher Ed

Tuition Hikes of the Downturn

October 28, 2010 - 3:00am

By [Scott Jaschik](#)

Tuition is up (no surprise) and this year the percentage increases for public and private four-year colleges and universities are higher than they were last year. Generally, the percentage increases at public institutions are larger than those at privates (which are more expensive to start with). Those trends are standard for tight economic times, when states cut budgets and try to make up for shortfalls with larger tuition increases, and when many private colleges worry that sticker shock will scare away families and so tend to moderate price increases.

Across the board, the increases exceed the inflation rate of about 1.2 percent for the last year, which, while low, was higher than the slightly negative rate of the year before.

Those are the key findings from this year's [annual survey on college prices](#) (and a [companion survey on student aid](#)) being released today by the College Board. In many respects, the data extend trends that were evident last year as well. Here are the overall figures for the 2010-11 academic year:

Tuition and Fees by Sector

Sector	2010-11 Tuition and Fees	One-Year Dollar Increase	One-Year % Increase	Previous Year's % Increase
Private, nonprofit four-year colleges	\$27,293	\$1,164	4.5%	4.4%
Public four-year colleges, in-state residents	\$7,605	\$555	7.9%	6.5%
Public four-year colleges, out-of-state residents	\$19,595	\$1,111	6.0%	6.2%
Community colleges	\$2,713	\$155	6.0%	7.3%
For-profit colleges	\$13,935	\$679	5.1%	6.5%

For room and board, public increases also outpaced the privates, and privates are also more expensive. The average public college rate is going up by 4.6 percent, to \$8,535, and the average private rate is going up by 3.9 percent, to \$9,700. Those figures are for four-year institutions only, as the pool of community colleges and for-profit colleges charging for room and board remains small.

As is the case every year, College Board officials stress that the data show that most colleges -- however much their prices frustrate students and families -- are not in the mid-

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\$50,000 range that attracts so much attention. Total expenses for a private four-year institution are, on average, just under \$37,000 a year. But because the most famous private institutions tend to be well above that average, many people assume tuition rates are even higher than they are. (At Harvard University, an undergraduate's total costs this year, typical for those at elite private research universities and liberal arts colleges, are estimated by the university to be between \$53,950 and \$56,750.)

Many of the data in the report focus on the impact of state budget shortfalls on public colleges. For instance, in comparing inflation-adjusted average tuition increases from the last three decades, the College Board finds that over that time, the rate of increase has dropped for private four-year institutions and gone up for public four-year institutions. Further, while the rate of increase at private institutions was greater than that of publics in the 1980s, it is now smaller.

Annual Average Tuition Increases (Inflation-Adjusted) by Sector

Sector	1980-1 to 1990-1	1990-1 to 2000-1	2000-1 to 2010-1
Private four-year	5.1%	2.6%	3.0%
Public four-year	4.2%	3.3%	5.6%
Community colleges	3.9%	3.2%	2.7%

The College Board's report on student aid notes that the past two years -- which have seen significant increases in tuition at many public colleges and universities and growing economic pressures on many families -- have seen a rapid expansion in aid packages.

From 2008-9 to 2009-10, grant aid per full-time equivalent undergraduate increased by about 22 percent (or \$1,073) and federal loans increased by 9 percent (about \$408). Particularly notable, the College Board report said, was the increase in the maximum Pell Grant of 16 percent in constant dollars in 2009-10, the largest one-year increase in program history. The total Pell budget reached \$28.2 billion, divided among 7.7 million students.

Sandy Baum, a policy analyst for the College Board and co-author of the reports being issued, said that the tuition figures "were not very surprising," given the state of the economy. "I don't think anybody thought public tuition would go up only 2 percent this year."

She urged educators and policy-makers to pay more attention to the long-term issues raised by this year's data. She noted, for example, that the impact of tuition increases on low-income students has been mitigated in part by the strong support for the growth in Pell Grants -- growth that probably will not be matched in the years ahead. "No matter what kind of Congress we get, the idea that Pell Grants will keep growing at this rate is unlikely," she said.

Baum said that in many ways she sees the tuition trends posing more of a threat ahead to public higher education than to private colleges. She said that some private institutions -- those that are being forced to give so much aid to attract students that they can't balance

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their books -- are in danger. But she said that the basic financial model for most privates, in which some students pay enough to subsidize others, is sound.

For public higher education, however, she said she feared that "the basic model may no longer be sustainable." While states are likely to restore some support for higher education as the economy improves, she said, it seems unlikely that enough support will be provided to maintain tuition at affordable levels. She said she anticipates public colleges having to consider more radical changes in how they provide education, ideally using means that cut costs. She noted that while technology has to date not cut costs in providing higher education, that may not be the case in the future.

If new models fail to provide more students with quality education, she said, "we could lose public higher education, and that would be a huge social failure."

Article #3

<http://www.changinghighereducation.com/2012/01/so-let-me-put-colleges-and-universities-on-notice-if-you-cant-stop-tuition-from-going-up-the-funding-you-get-from-taxpay.html>

The State of the Union on college costs

So let me put colleges and universities on notice: If you can't stop tuition from going up, the funding you get from taxpayers will go down. Higher education can't be a luxury. It is an economic imperative that every family in America should be able to afford.

Barak Obama, [State of Union 2012](#)

Does this speech signal that the time has finally arrived when the government - which pays a good part of the bill - will step in to limit the rapid and seemingly never ending growth of tuition? In normal times, the answer would likely be "yes" given that politicians from [both sides of the aisle](#) have been introducing bills that would cap tuition in one way or another for almost a decade. Thus, we might expect to see a quick moving bipartisan effort.

These, of course, are not times when bipartisan efforts go very far, so Obama's statements will probably push Republicans into fierce opposition to the idea. The [response](#) of [Representative Virginia Foxx](#), the North Carolina Republican who is chairwoman of the House Higher Education subcommittee, is probably a pretty good representation of what we will now hear from the Republican side:

The president is saying that people can't afford to go to college anymore, and that just simply is not true. Tuition is too high at most schools, but it isn't the job of the federal government to punish those schools. It's very arbitrary, and the president sounds like a dictator.

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So this probably won't be the tipping point for this issue. But before the higher education community breathes a sigh of relief, its members should note that a President of the United States views the issue as important enough, with enough broad voter appeal, to put it into a State of the Union address, and he is continuing to speak about it at [public events](#). It would be surprising if we didn't hear a lot more over the next two years about the relationship between tuition increases and taxpayer support. And, despite the negative initial overall response of Representative Foxx, it should be noted that she agreed that tuition is too high at most schools - hardly the position that makes a strong ally in this matter.

The reported responses from the academic community to Obama's speech, sadly, fall pretty much as one would anticipate -The current system is close to perfect, and any constraints (fiscal or administrative) will lead to declines in educational outcomes. This is indeed the likely outcome if educational institutions try to handle the constraints without changing their basic approach.

However this speech makes it increasingly clear that the reality must be faced - it is simply not possible for higher education costs to increase at 3% above inflation forever, and the end of the period of rapid increases is getting closer. Educational leaders that refuse to come to grips with this reality are ensuring that the negative outcomes they describe will indeed occur.

It is highly likely that the changes that will be required will involve things that most people in traditional higher education find undesirable because they break with comfortable traditional standards of "how things should be done". But the economic realities of the United States (and most of the rest of the world) are such that "undesirable" actions have been, are, and will be required of almost every segment in order to transition to new, viable configurations. Does higher education have the leadership to rise to the challenge of this kind of transformative change, or will it simply sink into mediocrity while defending the *status quo*?