Cloud Computing Workshop for Teachers
Assignment #1 & #2
Antonio D. Baccay

A. Lesson: **Definite Integrals by Trapezoids, from Equations and Data**

1. Lesson background
   a. This is a class in **AP Calculus** where students are introduced to find the area under the curve for a given function using the Trapezoidal Rule, among other things.
   b. After the Rule has been derived an example of the Rule was demonstrated in class for the case when \( n = 9 \), where \( n \) is the number of intervals.
   c. It is understood that the approximation of the area under the curve would tend to the true area if the number of intervals, \( n \), is increased.
   d. What would the area tend to if \( n \) is increased to 20, 100, or 1000? The class realized the tediousness of these computations as \( n \) becomes bigger and bigger.

2. Technology background
   a. The students are familiar with Excel and have some background in using formulas in Excel computations. It was proposed that Excel can assist the class in the computations of the areas for \( n = 20, 100, \) and 1000.
   b. Because this was just the start of the school year and some students were not sure exactly how it was done in Excel, an Excel template was done by the teacher for the case when \( n = 20 \) and the students will compute the cases for \( n \) equals 100 and 1000.
   c. The Excel template would have been sent to the students through one of the media, like Dropbox or Google Drive, that was discussed in our Workshop but our IT Department would not want these software installed. They alleged that they have issues with them. Hence, the Excel template was sent to the students through our email server, which in effect my rendition of the implementation of cloud computing.

B. Highlights

1. The result of the computations using the Trapezoidal Rule that this will tend to the theoretical area under the curve of a given function as \( n \) approaches infinity would just have to be accepted by the students as indeed “true” because of the tediousness of the computations.

2. Students now have the ability to work first-hand how to apply the Rule varying the value of \( n \) with the use of technology like Excel.

3. Students work can easily be evaluated, compared, and analyze almost instantaneously using the media discussed in our Workshop except that exchange of information is still done through email in our school.
4. Students become more aware that their active participation is important, that
teamwork is demanded and so either the class can do more in-depth study on a
given topic or more topics can be covered than usual.

C. Results
1. Difficulties in the implementation
   a. The IT department of my school is not into the implementation of Cloud
      Computing for its refusal to install needed software. My guess is that this is not
      their priorities yet.
   b. I might have over-estimated my students in their prior knowledge and ability to
      use Excel as a computational tool that only ONE student actually did the
      assignment. See Attachment 1.

2. Rectification
   a. The Cloud in the implementation of my lesson becomes our mail-server. That’s
      the best I can do for now.
   b. I scheduled a class for computer lab to give my students time to finish their
      assignment and to get them up to speed to what is expected of them.

D. Follow Up
1. When I gave this assignment to my class, it was a way of introducing the second part
   of Calculus, Integration, from the ideas of developing area under the curve (of a given
   function).
2. Two weeks ago, I formally introduced them to the chapter on Integration and we
   revisit the problem of trying to find the area by numerical methods. I asked them to
   use Trapezoidal Rule and develop their “formula” for Riemann Sum using midpoints
   of the interval and almost all of them did their assignments. See Attachment 2.
3. When I gave them computer lab time, our discussion focused now on comparisons
   and analysis rather than the ‘how to’ of computations.

This material is based on work supported by the National Science Foundation under Grant No. 1054754. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Copyright © 2012 by the Center for Pre-College Programs, of the New Jersey Institute of Technology. All Rights Reserved.

Supporting Program: Center for Pre-College Programs, at the New Jersey Institute of Technology

Contributors
Antonio D. Baccay (Manchester Regional High School, Manchester, NJ), Primary Author
Howard Kimmel, Levelle Burr-Alexander, John Carpinelli - Center for pre-College Programs, NJIT.