Conference Report

Conference Title: International Conference on Technology in Collegiate Mathematics (ICTCM)

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Submitted by: Professor Roebuck

The keynote address was delivered by Mr. Conrad Wolfram. The title of the talk was "Stop Teaching Calculating, Start Teaching Math". Mr. Wolfram is co-founder/CEO of the Wolfram group of companies responsible for the series of Mathematica software. His group has also developed Computational Document Format Standard (CDF) which permits the use of advanced computational tools without the need of having the particular software program installed on a computer or server; this is "Cloud" computing.

 In his address Mr. Wolfram spoke about the teaching of mathematics rather than mathematical computation. Computers and calculators can compute we need to re-think math education into a computer-based subject that concentrates on the teaching of concepts and not just calculations and algebraic manipulations. Instructors of the subject should be looking ahead into the future and providing students with an understanding of what is needed in the 21st century and it is not computation. This is a new and more dynamic approach to teaching and learning mathematics, and it is not being stressed in today’s textbooks.

Mr. Wolfram stated that the computational and repetitive nature of school mathematics needs to be replaced with a focus on teaching concepts with the aid of computers and that to maintain our standing in the global society we need and should take this new approach. This was a very enjoyable presentation.

I attended several sessions including a mini-course, a calculator workshop and couple of regular sessions. In this report I will describe the mini-course, the calculator workshop and one of the regular sessions.

The calculator workshop was presented by Lisa Yocco and Bridgett Lee both from Georgia Southern University. The title of the workshop was "Nspiring Activities for College Algebra in Context". This workshop featured the new TI-NSpire calculator and ways to use it to solve real-life problems, and to concentrate on concepts rather than computation. The presenters demonstrated how the calculator could be used to quickly draw piecewise functions to answer real-world applications when the model is not continuous. They also demonstrated how a slider could be added to a graph to show how changing a particular parameter changes the graph.

One of the most interesting demonstrations was how to download a picture from the internet and use the calculator to create a function that would model a particular aspect of the picture; for example, a picture of a water fountain and the best-fit equation that could be used to model the parabolic shape of the water leaving the spout and returning to the pool.

The ability of the calculator to analyze data was also demonstrated. The calculator was used to capture real world data in a spreadsheet and a scatter diagram was created. The best-fit line was determined from that data, and then the equation of the line was produced. We also took a look at the residual plot to determine how useful our equation was for prediction, it was very useful.

The last demonstration was the "Decay Lab". This was an experiment that demonstrated how the decay of a population could be modeled by using exponential equations and M & M’s. This experiment consisted of a using a regular size bag of M &M’s , placing them in a cup, shaking them up, pouring them on the desk and keeping the ones that landed with "M" in the up position; those were the survivors. We repeated the above steps until there were no survivors. After each trial the data was recorded, inserted into the calculator’s spreadsheet program and use to create the" best-fit" exponential equation for the data. We were asked to determine if the equation was a "good" model for the data and to explain why or why not. We were also asked how we could improve the fit of the curve to the data. This led to the final problem: Determine an equation that would better fit the data and to sketch the graph.

This workshop was very interesting and provided me with the opportunity to see several ways that the graphing calculator (TI-NSpire) could be used to encourage exploration in the mathematics.

The mini-course I attended was "How Autograph can Help make a Difficult Subject Palatable", presented by Douglas Butler, ICT Training Centre. This was a hand-on demonstration of the software called Autograph. Autograph is mathematical software that embraces all levels of mathematics, including Algebra, Geometry, Trigonometry, Calculus, Linear Algebra and Differential Equations. It also includes several modalities of delivery: data projectors, interactive whiteboard, tablets, laptops, desk tops and mobile devices. This is one way in which this software differs from other well-known math software on the market.

For the duration of the mini-course I decided to watch the demonstration on the portable interactive whiteboard rather than attempting to follow the key strokes he performed on the computer at which I was seated. This permitted me to fully appreciate the usefulness and the capability of the software. Toward the end of his presentation, Mr. Butler suggested that because of the time constraint that all participants view the demonstration on the interactive whiteboard. This is a very remarkable program and its usability was well demonstrated. Mr. Butler demonstrated drawing 2- and- 3 dimensional graphs; 2- dimensional parametric graphing and the use of controllers for creating animation. He also showed how to use the program to demonstrate 2- dimensional matrix transformation.

One of the most impressive demonstrations was the creation of solids by using either the disk or shell method. It was interesting to actually see the solid being created by revolving the curve around one of the axes. The program can do this in "slow plot" which allows you to see the solid actually being created; very impressive. This ability to demonstrate the creation of the solid would definitely prove useful to students in calculus.

A second major way this software differs from others is that this software contains two levels; standard and advanced. The standard is available for the less experience user and once you gain experience you may move to the advanced level which has more options. Finally, because of the window type interface the learning curve is extremely low.

A regular session I attended was "Teaching Introduction Statistics Using the TI-84". This session was conducted by Gloria Barrett from North Carolina school of Science and Mathematics. I selected this workshop because we currently have a classroom set of the TI-84 graphing calculators and thus this information could be used immediately.

Ms. Barrett demonstrated how the calculator could be used to manipulate, summarize and graph both univariate and bivariate data efficiently. However, I was more interested in how the calculator could be used to analyze bivariate data. Ms. Barrett demonstrated this by the creation of a scatter plot, formulation of a regression equation, and how to superimpose the regression line on the scatter plot. She also included in her presentation, calculation of and graphing the residuals. I would highly recommend that we use graphing calculators to develop these concepts in our Math 125 – Statistics classes.

The use of technology in the classroom is complicated. First the institution must allow instructors to have access to the technology, which requires funding; and secondly, instructors must have the time and the resources to incorporate the use of the latest technology within the framework of the course syllabus. The major question is: Does the use of the technology enhance and aid students in the understanding of the course content? Of course, an affirmative answer is expected.

I strongly recommend that in the future funding is done in five parts. Part one: Instructors review available software and discuss how it may be used in the classroom. Part two: Using the SLOs creation of actual lessons that incorporate the use of the selected software. Part three: A pilot program to test the lessons with students. This will provide both instructors and students with the opportunity to provide feedback and revision of the lessons if necessary.

Part four: Implementation throughout the Department, i.e. the software and lessons are introduced into all courses where appropriate. Part five: The Department formulates a committee, with stipends for committee members and funding to purchase additional software and to maintain current licenses; the charge: review new software, review and update the usage of the current software, and a yearly report of its findings and activities to be submitted to the Department members and the administration. This report would also include three very important sections: new uses and lessons for the current software, recommendations for use across disciplines, and feedback from current students and instructors. Finally, the committee would be charged with the dissemination of its findings at both local and national conferences.

The collection of technology for the sake of claiming that technology is available has no value whatsoever. We need to acquire the technology that we plan to use, and we need to clearly demonstrate how its use enhances the teaching and learning of mathematics both in and outside of the classroom.

Respectfully Submitted:

S. Roebuck