

February 28, 2011

Dear Dr. Higgins:

On behalf of the Milford School District, please accept my enthusiastic endorsement of the District's Title IID application for the purchase and implementation of TI Nspire devices in our high school mathematics classes. The use of this technology will serve to improve student learning and achievement. Our teachers are excited about the potential purchase of these devices and the possibilities it holds for our students.

Thank you for your consideration of this application.

Sincerely,

Robert A. Suprenant

Superintendent of Schools



Milford High School & Applied Technology Center

100 West Street • Milford, NH 03055 • (603) 673-4201 Fax: (603) 673-4202

Student Services • (603) 673-4523 • Fax: (603) 673-4203

Website: <http://www.milfordschools.net/mhs>

February 28, 2011

To Whom It May Concern,

I have read and give my full support to the Title IID technology mini-grant proposed for Milford High School; written by Kathleen Hamon, Justin Campbell and Laurel Johnson. This project will provide substantial opportunities for our students as well as giving valuable information regarding our proposed methods of curriculum delivery.

Sincerely,

Dr. Bradford W. Craven
Principal

Bradford W. Craven, *Principal*

Diane M. Doran, Assistant Principal
Stephen R. Claire, Assistant Principal
Dr. Rosabel W. Deloge, Director of Technical Studies



Justin M. Campbell, Director of Academic Studies
Paul S. Christensen, Director of Student Services
Marc G. Maurais, Director of Athletics

2011 Title IID Mini-Grant Application

Note: Text will be pasted into the online application.

Abstract:

A1. Description, Grades, Content

The Milford High School mathematics department views success in algebra I as a pre-requisite for success in subsequent math courses. Furthermore, we believe that students need hands on experiences designed for them to explore and deepen understanding of the concepts presented. If awarded this grant we will construct a series of lab stations in our algebra I curriculum. These stations will engage students in games, laboratory exercises and authentic, real-world applications and will utilize Texas Instruments' Nspire handheld devices. The Nspire calculators coupled with TI's Navigator system allows teachers to instantly monitor student progress, to share data among different groups of students and to push out formative assessments to students or groups at exactly the moment it is appropriate to do so. Our algebra classes are heterogeneous mixtures of both abilities and ages, though mainly composed of 9th and 10th grade students.

A2. Essential Question

We have all encountered the precocious high school student who asks: "Why are we learning this?" Our project attempts to answer this most basic, frequently repeated, student generated essential question. We believe that by giving students a chance to use algebra concepts in activities including games, labs, simulations and real-world problem solving we can help them to know how and why learning math, and algebra in particular, is beneficial to their lives. We feel strongly that when students have an intrinsic sense of ownership of the knowledge and skills in any course, they engage with the material in a more organic and real way.

D1. Impact, Need

This grant money would allow us to create the math department's ideal 'tech-ready' classroom. The TI Nspire devices, when coupled with the Navigator system, allow the teacher to see and interact with each student's calculator in the room. This level of technology integration does not currently exist in our school and would increase differentiation of instruction and formative assessment. Additionally, formative assessment data can be captured digitally and stored for future analysis and discussion.

Beginning in the 2010-2011 school year MHS has begun implementation of an RTI system for mathematics. We have assessed approximately 100 students using a product from Renaissance Learning called the Star Math assessment. We have identified a weakness in students' ability to work with and analyze data which would seem to be verified by NECAP item analysis of both math and science items. The lab stations proposed in this grant could serve to give students additional opportunities to gather,

manipulate and display data. We see the TI Nspire/Navigator technology as being the way to create a one-to-one computing scenario in math and certain science courses that enhances both instruction and assessment.

D2. Content and ICT

This project will focus on our algebra I classrooms. All of our students take this course during their high school career (excepting a few who take algebra in middle school) and we feel it is the most important indicator of future mathematics success. This project provides a seamless, natural means for integrating ICT literacy skills into a core content area. Students will gather, manipulate, display and share data; create artifacts suitable for inclusion in their digital portfolios, evaluate information; all of which calls upon students to utilize 21st century skills in their learning process.

D3. PBL Pedagogy

A major focus of the Algebra 1 curriculum at Milford is a study of linear functions. Students explore the relationships between variables and the concept of slope as rate of change. They also graph scatter plots and determine the line of best fit to model the data.

The “Stations” (developed by Kathi King) allow students to experience these relationships in a hands-on, constructivist approach. Additionally, students broaden their understanding of mathematical modeling and extend their understanding of functions beyond linear relationships. For example, one lab stacks Legos to create a ramp and then measures the distance a car travels after leaving the ramp. Students create ordered pairs comparing the number of Legos stacked and the distance traveled. After developing their own scatter plot and line of best fit, they can use Nspire calculators to find a more exact equation. Conversations around this lab include a discussion of why the correlation is not one (human variables such as friction in the carpet, the car bumping at the end of the ramp) as well as a consideration of what will happen as the number of Legos gets progressively higher (the slope is undefined). Another lab exploring a linear relationship has students begin with a beaker of water and progressively add marbles. Ordered pairs are developed with the number of marbles as the independent variable and the height of the water as the dependent. In this case, students discover why the y-intercept is not zero. Finding the line of regression using calculators produces a correlation very close to one. Students can compare this result with previous labs.

While many of the labs are linear, there are also some that lead to other models. One requires students to hang a basket from a rubber band on a hook. As students add rocks to the basket, the initial results appear linear. Over time, however, the results appear to approach a constant. Through the use of TI Nspires, students are able to experiment with various regression equations and discover that this is a logarithmic function. Students discuss the point of elasticity and explore why the graph does not go through the origin. In another lab where students add marbles to lids of increasing diameter, they find the

regression equation is quadratic because they are working with two-dimensional area rather than simple length.

These stations allow students to go well beyond the textbook approach to linear functions. Students deepen their understanding of linear functions and rate of change. Moreover, they develop an overall sense of equations as modeling real world situations. Since the use of graphic calculators is integral to the process, students also gain familiarity with the technology and teachers can monitor student progress at any point.

D4. PD Goals

Technology integration training – Train staff in the use of TI Nspire/Navigator system and, more importantly, in effective integration of technology into our curriculum.

Formative Assessment – PLC/Teacher led book group discussing James Popham's Transformative Assessment in Action: An Inside Look at Applying the Process, available through ASCD. This group will discuss best practices in formative assessment and work to integrate these practices into classroom instruction at MHS.

Curriculum Development Work – Work with Dr. Pamela Clark to integrate lab stations into our series of common core competency assessments in the algebra curriculum. Dr. Clark has an extensive background in Wiggins' understanding by design and is an adjunct professor at New England College in Henniker, NH and at Plymouth State University.

After School Academy – In-house training to spread the results of our work to both the middle school and the high school science department.

Teacher Celebration Event – As outlined by grant guidelines.

D5. Admin Support

Superintendent Mr. Robert Suprenant and Principal Dr. Bradford Craven have both read this proposal and are in support of our methods and goals. Letters of support have been emailed as instructed. Please contact Justin M. Campbell (jcampbell@sau40.com) if hardcopies are required.

D6. New MG Teams

The algebra team of teachers in the Milford School District (middle and high school) has not previously been awarded a mini-grant.

D7. Teacher Prep

Dr. Pamela Clark (adjunct professor at New England College in Henniker, NH and Plymouth State University) will be working with Milford High School on this project.

D8. All Students

All students in the Milford School District have algebra I as a graduation requirement. The algebra classes involved in this grant proposal will involve all grade levels and ability levels.

D9. Presentations

Our teachers would like to present our work at the Christa McAuliffe technology conference as well as at the NCTM conference in the 2012-2013 school year; allowing for one year of implementation. Additionally, we anticipate presenting our findings in Dr. Clark's teacher preparation courses and presenting an article for publication.

D10. Video

Milford High School offers a video production class as part of the Applied Technology Center at our school. Students in video production routinely film presentations in other coursework and create professional, edited videos complete with voice-over and many other features. We will not require any training and will be able to present a student created promotional video which covers all aspects of the project.

Criteria:

C1. Scope of Work

The lead teachers in this project (Kathleen Hamon and Erik Thibault) have experienced and documented amazing success using the "Stations" approach in another school district in NH. Additionally, we have piloted the activities in a limited (by our access to technology) way in one section of algebra this year. This grant would allow us to begin to more fully adopt an approach that data and research has shown to be successful in our pilot study.

The group of students involved in the pilot study was involved in a qualitative analytical study designed to search for the efficacy of this approach. Qualitative methodology was utilized so as to elicit student responses and thinking around our guiding, essential question. We feel that this approach to mathematics instruction builds a metacognitive recognition in students about why and how mathematical thinking is beneficial to their lives. This, in turn, builds students' motivation which dramatically increases their learning and achievement in math.

C2. Appropriate for District

The Milford School District recently completed a K-12 revision of our math curriculum as part of our ongoing curriculum cycle. All grade levels and courses were aligned with New Hampshire state standards and we also worked with Mahesh Sharma who helped us to align with the Common Core as well. Unfortunately, the current economic environment has slowed the speed with which we can implement certain areas of our curriculum. This grant will allow us to fully implement a major component of algebra I which is, for many students, the crucial class at the high school level.

In preparation for implementing our new curriculum we have done all of the ‘legwork’ necessary. We have teachers who are trained in the use of the TI Nspire/Navigator system; we have teachers who are experienced in the “Stations” approach to algebra I; we have technology support provided by our IT department; and we have the full support of both district and building level administration. Furthermore, our Milford School District technology plan emphasizes the importance of developing ‘tech-ready’ classrooms. These factors, when taken in sum, create an environment where the spark created by this mini-grant will quickly grow into a sustained, long-term evolution in how we deliver the algebra I curriculum.

C3. Structures, policies, procedures

The Milford School District mathematics curriculum has identified core competencies that must be mastered by all students in algebra I. We believe that a project-based approach deepens and enhances student knowledge of these most important skills and concepts. Our technology plan stresses the importance of technology ready classrooms and teachers which would be created through the funds provided in this grant. Mathematics is one area where students traditionally struggle to find artifacts suitable for inclusion in an electronic portfolio. This grant would help our students to demonstrate ICT literacy in their math courses through the work accomplished in the “Stations.”

C4. Team Expertise

Our lead math teacher, Mrs. Kathleen Hamon, has years of experience as a teacher and math department chair. Mrs. Hamon has played a crucial role as co-author of our algebra curriculum. Our second lead teacher, Mr. Erik Thibault, has led this year’s pilot of the “Stations” approach in an algebra I classroom. Mr. Thibault has demonstrated (as measured by student interviews, administrative observation, parent feedback and student assessment data) that he is able to efficiently and effectively implement and deliver the curriculum that would be used and expanded should we be awarded this grant. Both lead teachers have worked together in two districts in NH and have a record of tremendous student achievement and curriculum development.

Additional support will be provided on an as needed basis by Justin M. Campbell (Director of Academic Studies at Milford High School) and Laurel Johnson (Assistant Superintendent). Dr. Pamela Clark will assist in continuing to revise and perfect common core competency assessments throughout all areas of the curriculum.

C5. Team and Admin Commitment

Erik Thibault (teacher) and Kathleen Hamon (teacher) will implement the program in four sections (approximately 100 students) of algebra I during the 2011-2012 school year. Justin M. Campbell (Director of Academic Studies at Milford High School) and Laurel Johnson (Assistant Superintendent) will coordinate the professional development opportunities described in this proposal. Justin and Kathy will participate in all mini-grant meetings with additional representatives attending as needed. The documentary video will be coordinated by Terry Toland (video production teacher at Milford High School) but most work will be accomplished by his students. Lesson plans will be created by Erik and Kathy with input from other members of the math department as well as Justin and Laurie. Kathy and Justin will attend the mini-grant celebration day. Kathy and Justin will present the project within the district and at other venues. Kathy, Erik, Justin and Laurie will participate in the post-project evaluations.

C6. Extent of Impact within

We are viewing this grant proposal as giving us the opportunity to show our department, school, administration and board what our ideal, tech-ready math classroom will look like and what it is capable of accomplishing. Initially the direct impact will be on four sections of algebra I; two teachers and approximately 100 students. Indirectly, this project will impact the entire math and science departments; 18 teachers. In future years the impact from this work will be felt by all students who attend Milford High School.

C7. Extent of Impact to Other Schools

Ours is a small state and a close-knit group of teachers reside here. Our school has experience sending teachers to speak at local and regional professional conferences. Administration supports these activities and sees these opportunities as beneficial to both our own students and to students more generally. We anticipate this work to begin with two teachers in the math department who will in turn work to spread the results to our entire math department which already works closely with the science department as well as the middle school math department. Finally, we will be sending our math teachers to speak at conferences, as we have done in the past.

Budget

B1.

Equipment

30 handheld graphing calculators (Texas Instruments Nspire) @ \$125.96 each
1 cart to hold Nspire units @ \$1100 each

Software

Texas Instruments Navigator system (package price includes software, chargers and other wireless equipment needed) at \$2612

PD Events

\$500 for teacher celebration event

\$104 for teacher stipends for TI Nspire training

\$104 for teacher stipends to deliver after school academy for math and science departments

\$1801.20 for summer curriculum work

B2. Item Totals

Equipment - \$4878.80

Software - \$2612

PD Events - \$2509.20