**Chris Nelson Memorial Grant Application**

Name of Team Leader: Beth Sommers

Team Leader is a member of NHSTE: Yes

Team Leader Email: bsommers@sau50.org

Participating Districts:SAU 50

Participating Schools: Greenland Central School

Team Leader Contact Information 70 Post Road, Greenland NH 03840 431-6723

Team Members and level/discipline taught:

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| Name | level/discipline | NHSTE member |
| Beth Sommers | STEM teacher 1-5 | Yes |
| Sue Bacon | K-4 Library Media | Yes |
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**Project Title: Maximizing Informed Design and Inquiry-based STEM Education**

**Project Abstract:**

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| At Greenland Central School, we believe we only get one chance to help our students become the next generation of innovators. Providing outstanding STEM education, emphasizing the “T” and “E”, is essential to maximizing this opportunity. Challenging our students, beginning in first grade, to develop solutions through experimentation builds essential skills for addressing future problems. In addition, research reveals that interest in STEM subjects is largely formed by the time students reach upper elementary/middle school. Therefore, it’s imperative that we strive to capture and engage students’ interests in these areas by providing the highest quality STEM content and instruction that we can. Our grant request is for eight iPads to be shared by all grades 1-5 students in our STEM Lab to enhance their learning experiences. These mobile technology tools would allow us to leverage innovative, standards-based, STEM content; facilitate students’ engineering design troubleshooting and sense-making; and transform our Engineering Design Notebooks into digital journals where students’ use of text, audio, and images would provide valuable resources for reflection, assessment, and individualized learning. Integrating iPads would reflect the authentic use of technology by scientists and engineers and contribute to the seamless flow of lessons.  |

Project Description and Timeline

"Greenland Central School (GCS) serves approximately 400 K-8 students in the town of Greenland, located in southeastern NH. . Our school’s mission is to enable every student to acquire and demonstrate the skills, knowledge, and problem-solving abilities needed to become thinking citizens.
STEM education at GCS began three years ago with the implementation of “Engineering is Elementary” (EiE) units. This allowed us to infuse our science units with engineering content in grades 1- 5. In 2015/2016, we began incorporating coding while maintaining our engineering focus by implementing Lego WeDo 2.0 activities. In 2016/2017, self-reflection revealed a desire for a stronger constructivist approach to our STEM program that would increase students’ ability to develop deeper understandings and their capacity to be flexible and creative thinkers.
Project Description:
Our grant request focuses on maximizing our students’ abilities to innovate by using hands-on, STEM PBL (project-based learning), emphasizing the “T” and “E” in STEM. PBL represents the very essence of engineering, requiring students to work together, think critically, and communicate. Engaging our students with exemplary, digital content, such as that found in Project Lead the Way (PLTW), will help us meet our goal. Successfully implementing PLTW in grades 1 – 5 requires accessing their digital Learning Management System. iPads are the means to which their content is best accessed.
Digitizing our Engineering Design Notebooks is essential to providing a level of student reflection, assessment, and individualized learning that we couldn’t achieve otherwise. During design challenges, students would use iPads to collect photos for use as evidence within an explanation, audio, for developing arguments, and video, for capturing valuable images that can be used to better inform student’s design-based trouble-shooting.
Research reveals that beginning designers tend to be unfocused when watching their prototype tests and need structure and scaffolding to effectively troubleshoot their designs. Because iteration is a cornerstone of design learning, solutions are best optimized when students can base their improvements on the results of simple tests and identification of failure points. Students need the tools, instruction, and practice to help them see the problems in their designs, identify and determine the causes, and fix them.
Enduring impacts we hope to realize include that our students understand the value and importance of continual, lifelong learning and have the confidence to systematically and creatively address future challenges. Lastly, as they acquire new ways to learn fostered by and with technology, we hope they’ll recognize and capitalize on the benefits of living, learning, and working in a connected world.
Assessment Plan:
Engineering design tasks are unique in that evaluating how students approach problems to find workable solutions is most important. Gauging student progress will occur best by using continuous formative assessments such as: checks for understanding, documentation in journals, and teacher observations.
Summative assessments will take the form of team presentations, featuring students’ digital Engineering Design Journals with text, images and audio. Student teams will share their solutions to authentic audiences, i.e., small group, their class, or experts in the field, for feedback. They’ll explain how they met the criteria and constraints, utilized science and engineering practices, and incorporated content knowledge in their solutions. Feedback, in the form of rubrics, will be provided to students, indicating their skill level from “novice” to “gaining skills” to becoming “proficient” to eventually becoming “role models”. Students will present to the greater GCS community at our annual STEM event in the spring.
Finally, student reflections of their STEM journeys will also be recorded in their journals, helping students make connections, understand their successes and failures, and become aware of all that they learned. Reflections will also help us more accurately identify where students are in their learning and how we might then adjust our instruction.
Implementation Plan:
August – September:
Purchase hardware and install applications.
Introduce students to iPads and digital journals.
Meet with teachers to determine schedule for STEM units.
Begin weekly, whole-class, STEM for grades 1 and 2.
Begin bi-weekly blog posting.
October – June:
Begin Reading and Math Enrichment, including with Novel Engineering and Computer Science units.
Begin STEM units of instruction with digital journals.
Present at the annual Christa McAuliffe Conference in December.
Host Engineering Showcase so students can share their work.
Complete post-project reflection and evaluation.
Ongoing, Throughout the Project:
Provide training and support as needed with students to successfully use the iPads and apps.
Provide PD to teachers on our tech integration tools and methods.

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**Curriculum Standards**

"Curriculum standards this project addresses include:
NGSS Standards:
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
ISTE Standards for Teachers:
Facilitate and inspire student learning and creativity.
Design and develop digital age learning experiences and assessments.
Model digital age work and learning.
ISTE Standards for Students:
Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.
Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.
CSS/Math:
Make sense of problems and persevere in solving them.
Reason abstractly and quantitatively.
Construct viable arguments and critique the reasoning of others.
Model with mathematics.
Use appropriate tools strategically.
Attend to precision.
CCSS/ELA:
Key Ideas and details-
Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
Integration of Knowledge and Ideas-
Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
Range of Reading and Level of Text Complexity-
Read and comprehend complex literary and informational texts independently and proficiently.
Capacity for Success:
Beth Sommers is the Team Leader for this project, responsible for all communication with NHSTE, and has been teaching at GCS for 10 years. She develops and teaches STEM units and lessons to our grades 1–5 students, develops and provides Math and Reading Enrichment to grades 3-4 students, organizes and runs our annual Invention Convention, and facilitates our after-school Robotics and Engineering Clubs for grades 3-6 students. She is passionate about STEM education and learning and recently completed a graduate program in Elementary Engineering Education at Tufts University. She’s a certified Teacher Educator for the Boston Museum of Science’s “Engineering is Elementary” program as well as “Project Lead the Way’s” Launch curriculum. She organizes our school’s annual Egg Drop and field trip to Fenway Park for their annual STEM Education Day. She collaborates with engineering students at UNH to bring them to GCS so they can connect with, provide positive role models for, and inspire our students about STEM-related careers. In the summer, she teaches engineering to grades 2 – 5 campers for 3 weeks at UNH.

Beth is a member of the NH DOE’s Elementary Science Team, charged with determining what science standards educators should meet to craft and sustain dynamic teaching and learning experiences for all students. She’s received multiple “Excellence in Education” awards for STEM Education by the Clipper Foundation and the NH Society of Professional Engineers’ “STEM Excellence in Teaching” award last spring.

Sue has been a highly respected and involved school community member for over 14 years. She is the K-8 Library/Media Specialist and collaborates with all faculty members. She regularly assists classroom teachers with technology integration. She is our go-to staff member for any technology questions, needs, or issues. Her exemplary leadership is evident in her many roles at GCS.
Unified Arts Team Leader
Technology Committee Member and Secretary
Professional Learning Communities Leadership Team member
Past SAU 50 Professional Learning Advisory Council member
Standardized Testing Support Leader
School Website Administrator
School Facebook Page Administrator
Technology PD Provider for GCS staff
Classroom/Media Center collaborator
Sue teaches K-4 students each week on various topics including digital citizenship, tech research and information fluency, tech operations and concepts, coding, and google applications. In ICT/Media class, Sue will enable students to gain understandings of technology, applications, and usage of iPads for our STEM project and performance tasks. Resources such as multimedia creation tools (Edu creations, Popplet, Book Creator, Explain Everything, Shadow Puppet Edu, video creation, etc.) will be explored in weekly ICT classes with Sue. Students will develop the basic knowledge needed to effectively use these tools to foster authentic learning and problem-solving through our inquiry-based units.

Sue and Beth’s combined experiences, expertise, and training will help ensure the highest program quality and sustainability. If they receive this grant, they’ll look forward to sharing their knowledge and experiences with our school’s and district’s classroom teachers to help them make an impact in their own classrooms and schools. Sue and Beth will collaborate each week during their planning times to work on this project and write biweekly blog posts as required by NHSTE. Our principal has approved our attendance at the Christa McAuliffe Technology Conference while Sue and Beth have agreed to collaboratively work on the post-project evaluations for program improvement.

Structures and policies in place that support our project and its goals include our Superintendent’s, Assistant Superintendent's, and Principal’s reviews and approvals of our application and encouragement to submit it on our students’ behalf. Our Parent Organization (GPO) has provided materials and volunteers for STEM initiatives while our School Board has enjoyed multi-media presentations on our STEM happenings each year. Our Technology Committee is in full support of this project and our principal has approved the yearly addition to our school budget for the digital subscription to PLTW Launch’s digital learning management system. Our school has a dedicated classroom for STEM instruction along with eight Windows laptops.

Presentations at School and District Board Meetings, the STEM Teachers’ Collaborative, NHSTE and NHSTA events, and other outlets may ignite interest in having conversations about how to transfer and apply our methods and lessons learned to the greater community.

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Unified Arts Team Leader,Technology Committee Member and Secretary,Professional Learning Communities Leadership Team member,Past SAU 50 Professional Learning Advisory Council member,Standardized Testing Support Leader, School Website Administrator,Technology PD Provider for GCS staff, and Classroom/Media Center collaborator.
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**Budget**

https://docs.google.com/spreadsheets/d/1WO0lsgtIZcUP9xGhGvl5trEBCK1YMY-HPoanynGylWE/edit?usp=sharing