**Chris Nelson Memorial Grant Application**

Name of Team Leader: Doug Roy

Team Leader is a member of NHSTE: Yes

Team Leader Email: OlympusDAR@gmail.com

Participating Districts:SAU 33 Raymond

Participating Schools: Lamprey River Elementary School

Team Leader Contact Information 33 Old Manchester Rd., Raymond, NH 03077; 603-895-3117

Team Members and level/discipline taught:

|  |  |  |
| --- | --- | --- |
| Name | level/discipline | NHSTE member |
| Isabelle MacDonald | 3rd grade | Yes |
| Ashley O’Neill | 3rd grade | Yes |
| Marielle Maish | 3rd grade | Yes |
| Doug Roy | 4th grade special ed | Yes |

**Project Title: Virtual Nature Trail Tour: Using EV3 Robots to Educate and Connect with the Community of Raymond**

**Project Abstract:**

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| Through exploring the rich and diverse nature trails at Lamprey River Elementary School, students will intertwine several content areas and weave together their interests, strengths, and passions to create a virtual tour of the trails that give insight into the town they live in. Students in grades 3 and 4 at Lamprey River Elementary School will utilize the content areas of English Language Arts, Mathematics, Science, and Technology to connect with their community and create a virtual tour of our nature trails to be used as an educational tool for the members of our town.  Through addressing several ELA standards revolving around writing and informational texts, students will create an informative, expository presentation to overlay a video recording of our nature trails. Students will utilize the skills and knowledge addressed through the Next Generation Science Standards, Common Core State Standards for Mathematics, and NH Technology Standards to inform viewers of the wildlife and earth systems at work in the backyard of our school, which can be found on the banks of the Lamprey River in Raymond, NH. The goal of this project is to expose the students of Raymond, NH to coding, robotics, and videography while also making a video for the town that educates our community members about the beauty in our own backyard that is accessible to them on the nature trails.  Selected students at Lamprey River Elementary School will meet weekly after school to engage in this robotics program with passionate teachers who are interested in coding and robotics. Beginning in the fall of 2017, students will discover the abundance of wildlife and earth systems on the nature trails and use that information to script a virtual tour of those trails. Students will use their knowledge of informational writing to engage the community in learning about the Lamprey River and temperate forests in Raymond. Students will also use an inquiry-based approach to learn about virtual tours and their components. Using an inquiry-based method, students will create their own rubric and set of expectations for their own virtual tour.  Following the script, students will plan, design, create prototypes, code, and engineer a robot that will hold a video camera to record the virtual tour. Students will learn to create a robot, assess their own design, redesign the robots, and utilize a video camera to make a film that captures the great outdoor resources available to our community members. Students will maneuver the robot through the forest and use that video with an audio recording of their writing to publish a video that will be used to inform our community members of our nature trails.  Students will self-assess their virtual tour videos using the rubric they created at the beginning of this exciting and engaging project. Using that rubric, students will discuss the success of their robots and videos, as well as plan for future engineering projects that involve robotics and videography. |

**Project Description and Timeline**

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| A group of students will participate in an after-school, extra-curricular group tasked with creating a robot that can traverse the recently opened ‘Lamprey River Eco Center Trail’, with the ultimate goal of recording a virtual tour of the trail, allowing community members to explore the “LREC” on their computer or mobile device.  This project will allow the students to explore robotics creation and programming, as well as video recording, editing and enhancement. Students will need to decide what form of robot will best traverse the established trail (wheeled, tracked, quad-rotor, walker, hover, etc.), build and troubleshoot the robot, program it to navigate and record the path, then edit the video and turn it into an educational tool that can be shared with both their local community and with a broader learning community beyond Raymond’s borders.  The goal is to make this an extended extra-curricular, beginning in late September and concluding sometime in April. Students will be presented with the challenge in September and begin problem solving immediately. They will need to brainstorm and test robotic locomotion before the trail becomes unnavigable due to weather, around the end of November. At that point, attention should shift to building, programming and testing the robot, until the end of March. April and May will be spent recording the video, then editing and enhancing it to become a teaching tool for their peers, as well as reviewing their process and planning steps for next year.  This project is intended to impact everybody, from the teachers and students of the elementary school who will be directly participating, The district will benefit from increased positive exposure, as well as the founding of a technology and robotics program at the elementary school level, which can then advance to additional projects, as well as be continued through the middle school, to help prepare participating students to go on to more advanced technology programs in high school. Our community will get to further highlight an outstanding local resource that might otherwise go unnoticed and encourage other conservation projects.  Student progress will be gauged at the end of each project phase. Have the students succeeded in their assigned task? How have they overcome any unexpected obstacles (both figuratively and literally) along their path? Are they working together as a team? Ultimately, has the LREC been emphasized appropriately? Is this something the LRES and Raymond community can be proud of? Are the students proud of what they’ve accomplished? What would they do differently next time?  Students can also explore: What improvements do we (as a team) suggest future teams make? What would we have liked to do, but ran out of time? What advice would I give to future teams? How will my team experiences benefit me in the future? How will I use my team experience to benefit others? |

**Curriculum Standards**

Common Core State Standards: Mathematics (Grades 3 & 4)

These standards will be addressed as students record the virtual tour of our nature trails and as students use video editing software to overlay the audio recordings with the video.

Solve problems involving measurement and estimation:

CCSS.MATH.CONTENT.3.MD.A.1

Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

CCSS.MATH.CONTENT.4.MD.A.3

Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Common Core State Standards: English Language Arts (Grades 3 & 4)

These standards will be addressed as students write, present, and record the audio for our virtual tour of our school’s natural trails. This recording will be overlayed with the video recorded by students using a robot and video recording device.

Text Types and Purposes:

CCSS.ELA-LITERACY.W.3.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-LITERACY.W.3.2.A

Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

CCSS.ELA-LITERACY.W.3.2.B

Develop the topic with facts, definitions, and details.

CCSS.ELA-LITERACY.W.3.2.C

Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.

CCSS.ELA-LITERACY.W.3.2.D

Provide a concluding statement or section.

CCSS.ELA-LITERACY.W.4.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-LITERACY.W.4.2.A

Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

CCSS.ELA-LITERACY.W.4.2.B

Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

CCSS.ELA-LITERACY.W.4.2.C

Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).

CCSS.ELA-LITERACY.W.4.2.D

Use precise language and domain-specific vocabulary to inform about or explain the topic.

CCSS.ELA-LITERACY.W.4.2.E

Provide a concluding statement or section related to the information or explanation presented.

Production and Distribution of Writing:

CCSS.ELA-LITERACY.W.3.4

With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-LITERACY.W.3.5

With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grade 3 here.)

CCSS.ELA-LITERACY.W.3.6

With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

CCSS.ELA-LITERACY.W.4.4

Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-LITERACY.W.4.5

With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grade 4 here.)

CCSS.ELA-LITERACY.W.4.6

With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

Presentation of Knowledge and Ideas:

CCSS.ELA-LITERACY.SL.3.4

Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

CCSS.ELA-LITERACY.SL.3.5

Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.

CCSS.ELA-LITERACY.SL.3.6

Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 3 Language standards 1 and 3 here for specific expectations.)

CCSS.ELA-LITERACY.SL.4.4

Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

CCSS.ELA-LITERACY.SL.4.5

Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

CCSS.ELA-LITERACY.SL.4.6

Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (See grade 4 Language standards 1 here for specific expectations.)

Integration of Knowledge and Ideas:

CCSS.ELA-LITERACY.RI.3.7

Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

CCSS.ELA-LITERACY.RI.4.7

Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Conventions of Standard English:

CCSS.ELA-LITERACY.L.3.1

Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCSS.ELA-LITERACY.L.4.1

Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Knowledge of Language:

CCSS.ELA-LITERACY.L.3.3

Use knowledge of language and its conventions when writing, speaking, reading, or listening.

CCSS.ELA-LITERACY.L.3.3.A

Choose words and phrases for effect.\*

CCSS.ELA-LITERACY.L.4.3

Use knowledge of language and its conventions when writing, speaking, reading, or listening.

CCSS.ELA-LITERACY.L.4.3.A

Choose words and phrases to convey ideas precisely.\*

Next Generation Science Standards

These standards will be addressed as students write, present, and record the audio for our virtual tour of our school’s natural trails. This recording will be overlayed with the video recorded by students using a robot and video recording device. Students will be asked to research and describe some of the wildlife that inhabits our nature trails. Students will also be asked to identify areas of weathering on our nature trails and relate that weathering to erosion and changes in the landscape of our nature trails.

The engineering standards cited below will be addressed as students plan, design, build, and rebuild a robot with a video camera that will be used to record the nature trail tour. Students will build a prototype and use that model to make improvements to their design. Students will assess their design and continue to make improvements as they use the robot to record the video to be used as a virtual tour of our nature trails.

Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms (Grade 3)

3-LS4-3.

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Inheritance and Variation of Traits: Life Cycles and Traits (Grade 3)

3-LS1-1.

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Engineering Design (Grades 3 & 4)

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.

Earth’s Systems: Processes that Shape the Earth (Grade 4)

4-ESS1-1.

Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-ESS2-1.

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

ISTE Standards for Students

1. Empowered Learning: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

1a. Articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

1c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

1d. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

2. Digital Citizen: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

2a. Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

2b. Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.

2c. Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

3. Knowledge Constructor: 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.

3a. 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.

3c. Students curate information from digital sources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

3d. Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

4. Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

4a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

4b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

4c. Students develop, test and refine prototypes as part of a cyclical design process.

6. Creative Communicator: 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.

6a. Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

6d. Students publish or present content that customizes the message and medium for their intended audiences.

7. Global Collaborator: Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

7b. Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.

7c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

ISTE Standards for Teachers

1. Facilitate and Inspire Student Learning and Creativity Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity and innovation in both face-to-face and virtual environments.

a. Promote, support, and model creative and innovative thinking and inventiveness.

b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources.

c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning and creative processes.

d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in faceto-face and virtual environments.

2. Design and Develop Digital Age Learning Experiences and Assessments Teachers design, develop and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills and attitudes identified in the ISTE Standards.

a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity.

3. Model Digital Age Work and Learning Teachers exhibit knowledge, skills and work processes representative of an innovative professional in a global and digital society.

a. Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.

b. Collaborate with students, peers, parents and community members using digital tools and resources to support student success and innovation.

c. Communicate relevant information and ideas effectively to students, parents and peers using a variety of digital age media and formats.

4. Promote and Model Digital Citizenship and Responsibility Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.

a. Advocate, model, and teach safe, legal and ethical use of digital information and technology, including respect for copyright, intellectual property and the appropriate documentation of sources.

b. Address the diverse needs of all learners by using learner centered strategies and providing equitable access to appropriate digital tools and resources.

c. Promote and model digital etiquette and responsible social interactions

5. Engage in Professional Growth and Leadership Teachers continuously improve their professional practice, model lifelong learning and exhibit leadership in their school and professional communities by promoting and demonstrating the effective use of digital tools and resources.

b. Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others.

d. Contribute to the effectiveness, vitality and self-renewal of the teaching profession and of their school and community.

New Hampshire Educators Online: Education Technology Frameworks (Grades 3-5)

These standards will be addressed by students as they access informational text through online research to enhance their knowledge of our school’s nature trails and the habitat through which our nature trails exist. Students will also address these standards as they work through the engineering design process to create a robot that will travel down the nature trail path and create a virtual tour of our nature trails.

Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide.

Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use.

Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom.

Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom.

Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities.

Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems.

**Capacity for Success**

Team members will be chosen from the third and fourth grade student populations via a teacher ‘nomination’ process, whereby classroom teachers will recommend students of potential who they feel would most benefit from exposure to the program, but would have little access to the experiences, skills and hardware that this project will provide. Teachers will take into consideration the collaborative skills of their nominees and their leadership values. These two characteristics of the student team members will be vitally important in the success of this project.

Team coaches will be LRES faculty members in charge of facilitating the project, keeping it moving forward, and gathering resources to ensure the success of both individual team members and the team as a whole. Team coaches will also be responsible for assisting team members in brainstorming and problem solving solutions in a timely and efficient manner.

The teacher team members of this team are represented by a third grade classroom teacher and a fourth grade case manager. The case manager working on this project genuinely enjoys building computers and has an extensive history in this hobby. He also manages and leads the LEGO club at our school. The third grade teacher is greatly invested in technology in the classroom setting. She integrates many collaborative projects to her students through technology, she has brought augmented reality applications into the classroom, and she tunes into several educational technology podcasts to gain new ideas for technology uses in her own classroom. Both of the educators working on this team find that through collaboration, we grow the most as teachers. The case manager working on this project is constantly collaborating and building a road to success for his students alongside their classroom teachers. The third grade teacher working on this project co-teaches with her teammates and has successfully brought an in-classroom flipped learning model to her students to deliver math instruction while providing choice centers to increase learning. This was made possible through strong collaboration skills and the yearning to learn more about and try new educational technology.

The administrators of our building know about this project and are extremely excited to lend a hand whenever possible. Our nature trails were officially opened in the Fall of 2016. They are new trails and much of the community has not accessed them yet. The administration is excited to give the community exposure to the trails, which are accessible to classrooms during the school day, so that their students can bridge the gap from school to home through a virtual tour. At the district level, this virtual tour may be used to eventually collaborate with the middle school or high school in our district. Further plans may exist to create an interactive, augmented reality tour for our nature trails with the help of older students who have been exposed to such technology. This augmented reality experience would bring the community to the trails to walk them and find out more about our lands.

Lamprey River Elementary School encourages the students and teachers of our building to get outside and use the nature trails, as well as our outdoor classroom, to increase experiential learning. There were recently placed informational signs along the trail to educate hikers and community members about their surroundings. These signs may be used by students as a springboard to diving deeper into the rich wildlife, landforms, and earth systems of the trails. Lamprey River Elementary School strives to involve community members in our learning activities and adventures. By providing the community with a virtual tour of the nature trails, the students of the robotics team will be taking our school’s relationship with our community to new heights.

Our team members need professional development in programming robots and writing code. Though both team members have been exposed to some coding in their educational careers, the level of knowledge about this artform is not deep enough to coach a student through the process of programming a robot. This is an area of learning that our team members need to focus on to make this project successful. Through research, a program offered by PaulPaulito teaches Linux through modules. These modules can be accessed online for $67 a month. The members of this project are invested in using these modules to guide them through the basics of Linux. This in turn will help the educator team members of this project teach the students to program the LEGO Mindstorm EV3 robots. These robots will be programmed to maneuver a certain way along our nature trails. Both members of this team also located several free professional development modules and training sites to enhance their knowledge of robot and computer programming.

This project was planned to be continued, year after year. With the group consisting of both third and fourth graders, each year, one group of students will have the opportunity to become the mentors for next year’s group, refining their ideas or exploring new ones. Team members will be sharing their completed video with not only their schoolmates, but also, due to posting the video online, will share the Lamprey River Eco Trail with the community and the world. Anyone with an Internet connection will be able to experience the trail through the imaginations of the students.

Team members, however, will not be the only ones involved in the project with updates to share. Team administrators will relish the opportunity to brag about student progress and ultimately, their success. This should primarily take the form of blog updates, detailing milestones and setbacks, as well as the the little steps that lead to a completed robot and a virtual tour of one little piece of our community. Team members, both students and administrators alike, will be technological ambassadors to their classrooms, to their district, and to the wider world outside of Raymond. They’ll need to present what they learned and did, to help get others excited about the realities of what is possible now, and in the future.

**Budget**

Our budget spreadsheet can be found here: https://docs.google.com/spreadsheets/d/1Uku5Vf\_9Q0yIwaVsq00Db-OKPjaewIFyvZObbJw3Qgo/edit?usp=sharing