Educator Case Study

NATICK HIGH SCHOOL INVENTEAM'S PATH TO U.S. PATENT 9,511,833 B2

Invention: Remotely Operated Vehicle (ROV) with submersible for ice search and rescue dive teams

Twenty-three Massachusetts high school graduates and their former teachers at Natick High School were issued a patent in December 2016 for a remotely operated vehicle (ROV) that helps search and rescue teams find a potential survivor when it appears that someone has fallen through an icy lake. On average, inventors are 30 years old when they receive an initial patent, so these students' accomplishment stands out as a telling case for what can happen when young people's creative and inventive mindsets are nurtured in the early stages of their academic years.

Students at Natick High School, under the guidance of technology and robotics teacher Douglas Scott, researched invention ideas for their InvenTeam grant application to the Lemelson-MIT Program during the summer of 2012. They wanted to build an invention that would positively impact their community and beyond. Students realized a need for a technological solution for ice search and rescue operations during a meeting with their local fire department's dive team. The result was a remotely operated vehicle (ROV) equipped with a submersible camera that could assist with icy water search and rescues. Rather than lingering in frigid waters, dive teams could drive the ROV out onto the ice, lower the submersible camera into the break in the ice, and quickly pinpoint the location of the object or victim, making the ice dive safer for firemen and potentially increasing the survival rate of victims.

Natick High School was awarded a $10,000 InvenTeam grant in September of 2012, kick-starting several years of inventing that culminated in the award of U.S. Patent 9,511,833 B2 in December 2016.

CREATING A GENERATION OF INVENTORS

The 23 students on the InvenTeam, ranging from sophomores to seniors, were not all "science fair" kids. Many were academically inclined, while others found traditional learning difficult. The ROV project provided a way for the latter to excel outside of the classroom. InvenTeam students have the unique opportunity to collaborate and form bonds with students outside of their normal academic and social circles. The Natick High School InvenTeam quickly learned that successful

inventors recognize the value of everyone around them and use the differential strengths to further their invention. Some of the team members led the design phase of the project while others were instrumental in fabricating a working prototype. Others were more adept at communicating to the community about the invention or managing the financial aspects of the grant.

The inventing, engineering, leadership, and teamwork skills learned through their InvenTeam experience followed the students beyond high school into their college and professional lives. One student on the team who had struggled academically, was able to parlay his InvenTeam experience into a career with the U.S. Air Force's satellite management program where he has excelled.

"That whole process was where I discovered my niche - I want to continue inventing for the rest of my life."

– *Airman 1st Class Ford Grundberg, 3rd Space Operations Squadron Defense Satellite Communications System satellite vehicle operator*

Katelyn Sweeney (left) and Olivia Van Amsterdam (Right) with President Obama at 2014 White House Science Fair. *Photo credit: White House*

The team's only two female students, Katelyn Sweeney and Olivia Van Amsterdam, represented the Natick High School InvenTeam at the 4th annual White House Science Fair in 2014. Sweeney and Van Amsterdam have also tutored students in robotics and science, technology, engineering and math (STEM), and are devoted to ensuring young girls are exposed to inventing and engineering.

"When they're not busy building life-saving robots they're also establishing an all-girls robotics team. And we are very, very proud of them, so let's give them a round of applause."

– *President Barack Obama about Katelyn and Olivia at the White House Science Fair*

STUDENTS INSPIRING THEIR TEACHER

Teachers provide guidance and mentorship to students from the beginning to end of their invention project. Natick High teacher Douglas Scott was reluctant to work with his students to apply for the grant because he knew how much time it would mean for him, in addition to his regular teaching duties and other extracurricular robotics and business competitions he already led.

He reconsidered after seeing a previous round of InvenTeam grant winners present at Lemelson-MIT Programs' annual EurekaFest event, wanting his students to experience that sense of pride and teamwork. Scott, who is now a STEM coordinator and teacher at Hopkinton High School in Massachusetts, worked with the students well beyond that first year, helping them prepare for the 2013 EurekaFest, a 2014 presentation at the White House Science Fair where they met President Barack Obama, and the 2016 awarding of their U.S. patent. Scott, along with another mentor teacher, Sue Haverstick, and the 23 students are listed as inventors on the patent.

Scott, currently a Lemelson-MIT Master Teacher and 2014 Massachusetts STEM Teacher of the Year (sponsored by Raytheon and presented by The Hall at Patriot Place), says that while the InvenTeam experience can seem daunting – and it is – it changes you as a teacher.

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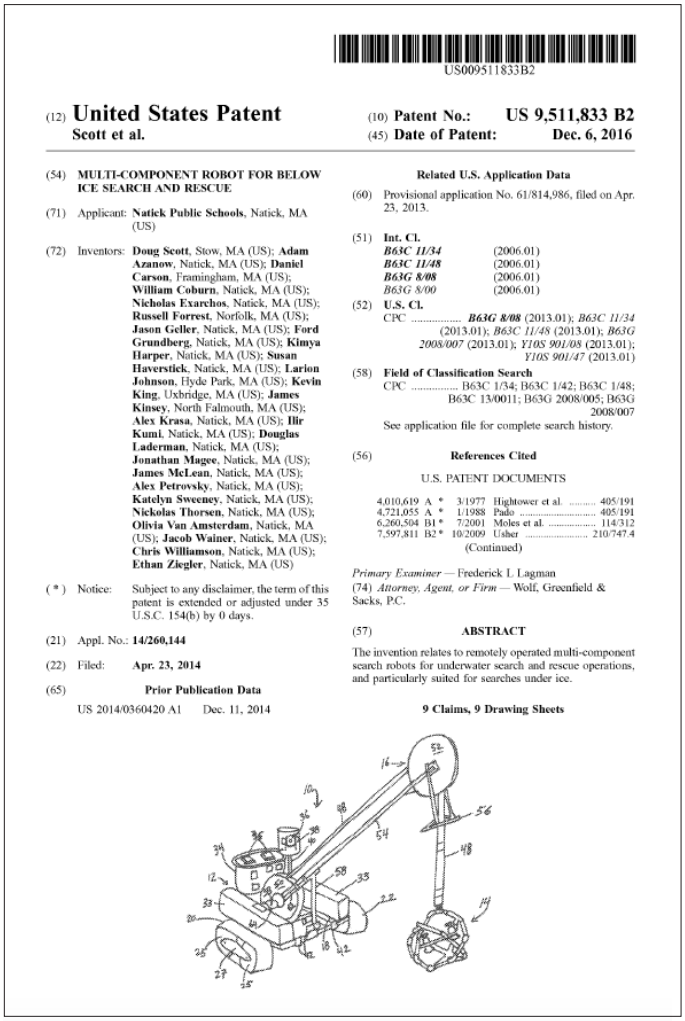
“For me, it was a major turning point in my ability to help students – all students. I have seen the level of achievement they can reach. InvenTeams has made me a more confident, experienced, and better teacher.”

– Douglas Scott, InvenTeams Master Teacher

The Lemelson-MIT Program’s invention education staff provides guidance to all InvenTeams over time, cultivating a network of invention education teachers who have the experience to lead an invention-based curriculum. InvenTeam teachers, like Scott, who possess the expertise of managing a rigorous STEM invention project and are professionally inspired by seeing their students excel in STEM during the InvenTeam process, make up the program’s Master Teacher network. Select master teachers remain active with the Lemelson-MIT Program to provide peer-to-peer support for future InvenTeam educators in collaboration with the Lemelson-MIT Program staff.



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Scott et al.

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(54) **MULTI-COMPONENT ROBOT FOR BELOW ICE SEARCH AND RESCUE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(51) **Int. Cl.**

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B63G 8/08	(2006.01)
B63G 8/00	(2006.01)

(52) **U.S. Cl.**

CPC ***B63G 8/08*** (2013.01); *B63C 11/34* (2013.01); *B63C 11/48* (2013.01); *B63G 2008/007* (2013.01); *Y10S 901/08* (2013.01); *Y10S 901/47* (2013.01)

(58) **Field of Classification Search**

CPC B63C 1/34; B63C 1/42; B63C 1/48; B63C 13/0011; B63G 2008/005; B63G 2008/007

See application file for complete search history.

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(57) **ABSTRACT**

The invention relates to remotely operated multi-component search robots for underwater search and rescue operations, and particularly suited for searches under ice.

9 Claims, 9 Drawing Sheets

“The students from the Natick High School InvenTeam have accomplished the important step of protecting their intellectual property with the federal government, but it’s not the end point. I will be curious to see what these bright and aspiring young people will do next with their invention as well as in their careers.”

– Leigh Estabrooks, Lemelson-MIT Program Invention Education Officer

ABOUT LEMELSON-MIT INVENTEAMS™

Lemelson-MIT InvenTeams are teams of high school students, educators, and mentors that receive grants up to $10,000 each to invent technological solutions to real-world problems. InvenTeams research intellectual property, exchange ideas, design parts, build models, and make modifications as they develop their invention prototypes. They learn to move forward through challenges and celebrate “Eureka!” moments, all while cultivating their technical leadership skills. Projects are collaborative efforts, driven by the students. The InvenTeam initiative fosters a “learning-by-doing” environment fueled by inquiry-based thinking.

The InvenTeam initiative is administered by the Lemelson-MIT Program, a sponsored program under the School of Engineering at the Massachusetts Institute of Technology, an institution with a strong ongoing commitment to creating meaningful opportunities for K-12 STEM education. The Lemelson-MIT Program is funded by The Lemelson Foundation. Learn more at lemelson.mit.edu

TIMELINE

June 2012 – Doug Scott, recognized as a Lemelson-MIT Excite Award Recipient and finalist invited to submit an InvenTeam grant, attends EurekaFest at MIT.

September 2012 – Natick High team of students and Doug Scott submit final application for the Lemelson-MIT $10,000 InvenTeam grant after spending the summer months researching ideas for a Remotely Operated Vehicle (ROV) to assist ice search and rescue dive teams.

October 2012 – The Natick High School team is awarded an InvenTeam grant. They officially form an afterschool club for students to work on the InvenTeam project.

November - December 2012 – The InvenTeam create a small prototype out of Lego® Mindstorms®- a building system they had experience with - to illustrate the concept of their invention. They also visit Natick Army Labs to learn how to think critically about current and future designs.

January-February 2013 – Fabrication of the ROV begins based on the students' CAD designs.

April 23, 2013 – The InvenTeam filed a provisional patent prior to Natick High School's hosting of a community event for all three InvenTeams from Massachusetts where teams were presented with a commendation plaque from Governor Duval Patrick.

May 2013 – The ROV is taken to a nearby dock to test its camera's submersible capabilities.

June 2013 – The students present the ROV at Lemelson-MIT Programs' EurekaFest event to great praise.

October 2013 – The ROV is taken to the Massachusetts Fire Academy to learn more about its real-world potential.

January 2014 – The team takes the ROV onto frozen ice to test its remote operation in its intended environment.

April 23, 2014 – The Natick School District applied for a U.S. patent listing the 25 InvenTeam members (teachers and students) as inventors utilizing pro bono legal support.

May 2014 – Two of the students represent their team at the 4th annual White House Science Fair in Washington, D.C., letting President Barack Obama test-drive the ROV in the Blue Room.

September 2015 - Two students attend the the opening of the new Lemelson Hall of Invention and Innovation at the Smithsonian National Museum of American History where they are panelists with other inventors talking about lifesaving devices.

December 6, 2016 – The U.S. Patent Office issues a utility patent, US 9,511,833 B2, for "remotely operated multi-component search robots for underwater search and rescue operations, and particularly suited for searches under ice."