IMPACT

University of Idaho Extension

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4-H Youth Development Promoting Science and Engineering Through Lego Robotics

The Situation

Creating and implementing opportunities to engage youth in Science, Technology, Engineering, and Mathematics (STEM) learning activities have been identified as critical needs and as national educational priorities. While recent data indicate students are improving academically in mathematical and science proficiency, the performance of U.S. students remains among the poorest of industrialized nations.[1] Moreover, the demand for science and engineering related jobs is increasing, yet the number of college students graduating with degrees in engineering has steadily decreased over the past two decades, according to the American Association of Engineering Societies. For instance, in 2003, 1.3 million engineering and engineering technology jobs were available in the United States without trained people to fill them.[2] The lack of U.S. students pursuing science and engineering degrees and careers is considered a threat to our economy and our security.[3]

Our Response

In the interest of continuing to provide Idaho youth with excellent developmental programs, 4-H is excited to bring the FIRST activities to Idaho. The FIRST Organization presents possibly the most exciting and effective set of programs for engaging youth in exciting, real, hands-on science and engineering activities. In the FIRST programs, youth learn to work in teams to solve problems, to explore scientific phenomena, and to use their imaginations and intelligence while learning science and engineering principles.

In the past year I have been working with the members of the Idaho Space Grant Consortium from the UI College of Engineering to develop a K-12 program to provide youth with a continuous opportunity to engage in authentic STEM activities. Statewide, I have implemented two primary robotics programs: Junior FIRST Lego League (JFLL) for children 6-9 years old and FIRST Lego League (FLL) for children 9-14. In these two programs, I trained 340 youth and 32 adults from several Idaho Counties including: Canyon, Owyhee, Franklin, Nez Perce, Latah, Kootenai, Ada, Payette, Gem, and Valley. I have organized, trained, and equipped 16 formal FLL Teams and 10 JFLL teams.

FLL Team Research Presentation (2/3/07).

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University of Idaho and U.S. Department of Agriculture Cooperating

Program Outcomes

While the Lego robotics programming through Idaho 4-H is still fairly new, we have had some very encouraging outcomes to date. We piloted our first FLL tournament in early February this year. To participate in the tournament, youth worked together in teams for several weeks to complete a science/engineering challenge. There are two major aspects of the challenge. The first is a research project in which teams identify and investigate a problem, develop a solution, and present their work. The second part of the challenge involves using Lego Mindstorms kit to build an autonomous robot that completes a set of missions.

The Lego Robotics program is more than just science and technology. It is also about helping youth develop life skills. At our FLL tournament a youth from one team related a story about his own growth resulting from his participation. On his team he had taken the lead on building the robot. He had built it and programmed it. It was, in his words, his robot. He was late arriving to one practice session and the team could not get his robot to run so they rebuilt and reprogrammed it. When he arrived later that evening and found the changes they had made he was furious that they had changed his robot. He refused to participate in the meeting that evening. At later meetings he was encouraged to help with the robot. As a result, the team built a better robot that was capable of completing more of the tasks. He expressed to us that he had learned the value of working in a team. His team went on to win the Champion's award for the tournament. The Champion's Award is given to the team that most exemplifies the values of hard work and gracious professionalism.

Another indicator of success of the program is the increasing level of interest for more programming. Several 4-H Club and after-school programs have recently requested support in introducing robotics activities in their areas. These programs will be supported by some new funding provided by the Idaho 4-H Endowment.

FLL Teams Competing in Ocean Odyssey Robot Challenge (2/3/07)

Lego robotics promises to be an excellent opportunity for youth to engage in real-life, problem-solving activities in which they employ technology to learn not only fundamental principles and practices of science and engineering, but also learn and use many of the life skills promoted through 4-H.

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[1] Trends in International Mathematics and Science Study (TIMSS), 2003 Results, National Center for Educational Statistics: http://nces.ed.gov/TIMSS/results03.asp.

[2] National Science Board, "The Science and Engineering Workforce: Realizing America's Potential," HSB 03-69, National Science Foundation, August 14, 2003. http://www.nsf.gov/nsb/documents/2003/nsb0369/nsb0369.pdf.

[3] Committee on Science, Engineering, and Public Policy, National Academy of Sciences (2006). Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. http://www.nap.edu/catalog/11463.html.

For More Information

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