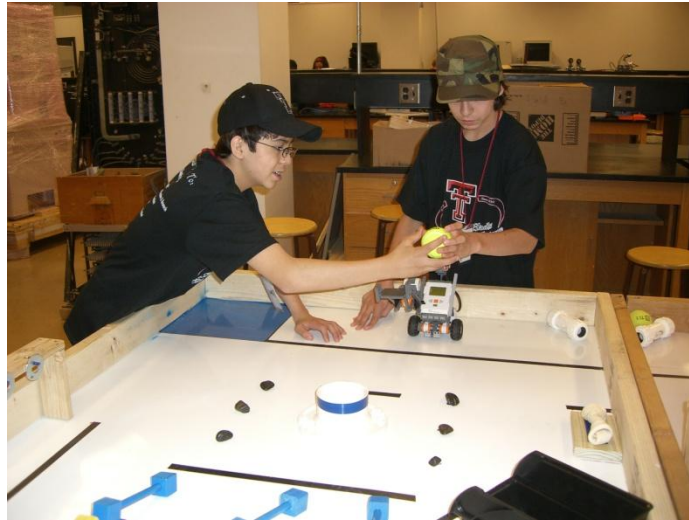


Get Excited About Robotics (GEAR)



GEAR is a 6 week LEGO robotics challenge for elementary and middle school students during which student teams build and program LEGO robots (using the MINDSTORMS NXT kits) to perform specified tasks. To solve the challenge, students reinforce math and scientific principle and playfully learn important engineering concepts such as brainstorming, designing, building, testing, trouble shooting, and improving their design. GEAR (www.gearrobotics.org) is a nonprofit 501(c) 3 volunteer organization, which was created to foster interest among today's youth in a career in engineering, science or technology. It provides the game rules for the annual competition and maintains a question and answer section on their website. During the last 3 years a GEAR competition was held at Texas Tech University in Lubbock and was organized by Drs. Tanja Karp and Richard Gale with support from the TTU T-STEM Center, the Department of Electrical and Computer Engineering, and a Texas Workforce Development Grant. 10 – 15 elementary schools from West Texas have been participating with one or several teams. Each participating school has a teacher who sponsors the school team(s). Schools decide how they want to participate in the GEAR competition. Some schools offer LEGO robotics as an afterschool activity while others incorporate the activity in their math, science, technology, or GT classes. In 2009, the following activities are organized as part of GEAR

Important Dates:

- **New Teacher Workshop:** February 7, 9 am – noon, teachers who have not participated in GEAR before learn about the competition based on last year's game and program their robot such that it accomplishes some of the tasks. Location: Texas Tech University, Electrical Engineering Building, Room 217.
- **Kickoff:** February 21, 1 – 4 pm, Texas Tech University, Engineering Livermore Center. The competition challenge will be presented, rules will be distributed, teams will be working on engineering challenges. The event is featured as part of the COE's Engineers Week: www.coe.ttu.edu/eweek
- **Practice Run:** March 28. 1 – 4 pm, Teams come and practice on official game boards. Texas Tech University, Health Exercise Science Center Gym (room 103).
- **Competition Day:** April 4, Texas Tech University, Health Exercise Science Center Gym (room 103).

GEAR HIGHLIGHTS

ECE student involvement: During the grant period of the Texas Workforce Development Grant we recruited ECE undergraduate students and particularly freshmen to be mentors for schools teams. The students were paid to build game pieces, meet with school teams to provide assistance, help their teams during kick-off, practice run, and game day. Having hands-on experience at an early stage in their curriculum reinforces the students' choice of major, provides them with contacts to upper classmen and faculty and boosts their self-confidence in becoming knowledgeable engineering. They also improve their communications skills and in general are very enthusiastic about their job.

Assessment: A survey run on participants and non-participants of the 2007 GEAR competition showed that students who participated had a better understanding of the engineering competition and a more positive attitude toward math and sciences. Furthermore, the more often a student participated in GEAR, the more positive the attitude.

Publications:

- R. Gale, T. Karp, L. Lowe and V. Medina. "Generation NXT". Proceedings of *Meeting the Growing Demand for Engineers and Their Educators 2010-2020 International Summit*, 14 pages, Munich, Germany, 9-11 Nov. 2007.
- E. Beutlich, T. Karp, and, R. Gale. "Building Engineers with LEGO". Poster presentation at *On Being An Engineer: Cognitive Underpinnings of Engineering Education Conference*, Lubbock, TX, USA, February 2008. Abstract is available at http://www.ciser.ttu.edu/Conference/poster_papers.aspx
- L. Lowe, V. Medina, R. Gale, and T. Karp. "Engineering Can be Fun: Changing Kids Attitudes with Robotics". Poster presentation at *On Being An Engineer: Cognitive Underpinnings of Engineering Education Conference*, Lubbock, TX, USA, February 2008. . Abstract is available at http://www.ciser.ttu.edu/Conference/poster_papers.aspx
- L. Lowe, V. Medina, R. Gale, and T. Karp. "Changing Attitudes toward Engineering through Interconnected Outreach Programs for K-12 Students". *TETC Best Practices Conference 2008*, Dallas, TX, USA, February 2008.

Grants:

R. Gale and T. Karp. Texas Technology Workforce Development Grant Program. "Integrated Outreach, Mentoring, and Placement of Texas Youth in Engineering Careers". Budget: Phase I: \$94,742, Phase II: \$183,344. August 2006 - March 2008.

Support:

Support from individuals and companies for GEAR is highly welcome. Make checks payable to Texas Tech Foundation and mention GEAR as purpose of payment.

Contact:

Dr. Tanja Karp, Associate Professor
Department of Electrical and Computer Engineering
Texas Tech University
Box 43102
Lubbock, TX 79409-3102
tanja.karp@ttu.edu
Phone: (806) 742 0140

