Robotics and Engineering Course Curriculum(Curriculum Exchange)

Mr. Norman F. Robinson III, Georgia Institute of Technology

Norman "Storm" Robinson, III is an award winning educator, curriculum designer, presenter, professional development trainer and instructional coach. He has offered programs that have inspired teachers and students to increase interest and participation in STEM/STEAM courses and concepts. His energy, content knowledge and instructional strategies are supported by research and delivered in a style that is relatable and receptive and impacts teaching and learning.

Storm began his career as a Mathematics Teacher at Tanglewood Middle School in Greenville, South Carolina. He was awarded Teacher of the Year after his second year in the classroom. Also at this time he was selected to serve on the Curriculum Leadership Institute for the Greenville County Schools District. After teaching middle school for five years, Storm moved to Riverside High School and instructed integrated mathematics classes for 2 years.

With a solid foundation of teaching experience formed, Storm accepted a position as an Aerospace Education Specialist for NASA's Aerospace Education Services Project. For 7 years Storm designed, implemented and facilitated various STEM programs to inspire teachers and students in STEM. As a "Space Mobiler", he used NASA missions to design and implement standards based activities that teachers could use to supplement their instruction. He also managed and developed curriculum support materials for the Exploring Space Through Algebra and Space Exploration AP Project

Storm returned to the classroom as the 8th grade STEM Magnet Mathematics Teacher at Marietta STEM Magnet Middle School where he was instrumental in developing the school's robotics team. This opportunity lead him to his current position as the Team Lead/Education Outreach Manager for the development of curriculum for the Robotics and Engineering Design Course at the Center for Education Integrating Science, Mathematics and Computing (CEISMC) at the Georgia Institute of Technology. His responsibilities include developing curriculum and providing professional development for teachers implementing robotics in their instruction through the NASA Electronic Professional Development Network.

Mr. Jeffrey H Rosen, Georgia Institute of Technology
Jayma Koval, Georgia Institute of Technology

Robotics and Engineering Design Course (REDC)
Georgia Institute of Technology
Center for Education Integrating Science, Mathematics, and Computing

As part of the Georgia Race To The Top award from the U.S. Department of Education, a team from Georgia Tech developed and implemented a set of four 9-week inquiry-based Integrative STEM courses designed for use in the 8th grade Engineering & Technology classroom. Within each course students experience the entire Design Process using the Universal System approach and practice, in context, the math and science skills related to the context of that specific course. Each course aims to connect to authentic science and engineering research being conducted at Georgia Tech and other institutions and government agencies.

The curriculum of each course starts with a short launcher experience in which students design and test a simple device and learn about both proper testing procedures and the necessity for accurate data collection. Students are then presented with a Request For Proposals (RFP) that requires that they design and test an engineering solution to a designated challenge. Before they can design, however, students spend several weeks exploring the math and science concepts relevant to the challenge. As the students develop an understanding of the math, science and engineering needed to appropriately design a solution, they begin to use new technologies to design and manufacture the pieces they need for their prototype. The 9-week course culminates with an advanced challenge that requires students use all of the skills they have developed to create and justify a design that satisfies the new challenge.

During the REDC course students use engineering manipulatives such as LEGO® MINDSTORM robot kits to perform tasks and collect sensor-related data, and engineering tools such as SolidWorks 3-D modeling software, and 3-D printing to design and manufacture parts for integration into their robot. They are required to maintain a log of their work that documents their testing procedures and results and that includes data to justify design decisions.

The materials that will be provided during the Curriculum Exchange are for one of the nine-week courses, BioMechanics. This includes teacher guides, student worksheets, robot build instructions, robot programs, videos, and required 3-D part files. This course focuses on the science concepts of force and motion and the math concepts of slope, number operations and single variable equations.   In this particular course students analyze the movement of a LEGO Insectobot that has been designed to mimic a real insect's motion. Using Solidworks and a 3-D printer, they design and manufacture different feet for the robot, testing each to optimize the robot's ability to navigate over a textured surface. The LEGO robot is an insect-like robot and logs data related to the robot's motion. The students analyze the effectiveness of their foot design, and redesign it, based on the testing data.

The REDC materials were designed for 8th grade, but could be used with higher-grade levels. Due to the quantity of the materials, a limited number of cd's containing the materials will be available during the exchange. All resources for the BioMechanics curriculum will also be made available online and include guides, handouts, videos, robot design, and robot programs. For more information please contact jeff.rosen@ceismc.gatech.edu.