



Girls CREATE: Teaching K-8 Girls Engineering Principles through Illustrative Story Telling

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Dr. Adrian Lee received his Ph.D. in mechanical engineering from the University of Illinois at Urbana-Champaign in 2009, specializing in probability and risk analysis of aviation security systems. Dr. Lee served as a post-doctoral research engineer at Vishwamitra Research Institute, Center for Uncertain Systems: Tools for Optimization and Management, and is currently President of Central Illinois Technology and Education Research Institute. Dr. Lee also holds an adjunct academic position in the Department of Bioengineering at the University of Illinois at Chicago, and is a member of the Institute for Operations Research and Management Science (INFORMS), the Institute of Electrical and Electronics Engineers (IEEE), the Society for Industrial and Applied Mathematics (SIAM), and the American Society for Engineering Education (ASEE). His research interests include STEM education, probability and statistics, and stochastic optimization.

Title: Girls CREATE: Teaching K-8 Girls Engineering Principles through Illustrative Story Telling (curriculum exchange)

Target Grade Level: 3rd & 4th grade, with 7th & 8th grade mentors

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Curriculum Summary:

Girls CREATE (Composing Relationships through Engineering, Artistic, and Teaching Experiences) is an after school program – currently in its second year – designed to teach 3rd and 4th grade girls the use of narrative and illustrative techniques to portray connections between various engineering problems and their potential solutions. The students use LEGO StoryVisualizer software to compose short stories depicting common engineering problems and their existing or potential solutions. Initially, LEGO StoryStarter components are used to construct scenes depicting a specific engineering problem (see topics below) along with illustrating a creative solution to that problem. Next, the students capture images of their scenes with the aid of an inexpensively made light box. The images are then either imported into the LEGO StoryVisualizer software or sequenced using a stop motion application (e.g., SAM Animation Software/myCreate, iMotion HD) to compose an artistic reflection upon the posed problem. In addition, 7th and 8th grade girls are invited to help lead small groups by offering guidance on the topic and software operation.

By forming a social, collaborative environment, the Girls CREATE program encourages future interest in science, engineering, and technology through the strengthening of creative writing skills. The instructional material is intended to teach the students how to identify, plan, solve, and portray solutions to the types of problems scientists and engineers encounter in practice using a hands-on, three-dimensional building approach. By utilizing modern technology and software, the program’s curriculum includes projects designed to prepare students for their future academic careers and teach them about the role of technology in society.

List of Engineering Topics:

1. Environment: e.g., air pollution, recycling, clean water
2. Energy: e.g., solar, wind, clean coal, electric vehicles
3. Health: e.g., medicine, equipment designed to improve fitness, monitor elderly
4. Safety: e.g., transportation, fire prevention, emergency preparedness
5. Rescue: e.g., communication systems, robotic search devices, locating devices
6. Exploration: e.g., space and underwater exploration, robotic vehicles

Equipment Used:

1. *LEGO StoryStarter Sets* –Recommend assigning 1 to 3 students per set.
2. *LEGO StoryVisualizer software* – Web based software provided by LEGO Education
3. *Camera* – Compact camera with micro mode, external or integrated PC/tablet camera
4. *Light box* – Capture scenes under controlled lighting (An inexpensive light box can be built using a cardboard box, tissue paper, packaging tape, and white construction paper.)
5. *Image processing software* – Used to adjust light and color properties, apply filters, or convert select elements of the photo to a portable network graphics (png) format for overlaying images (e.g., Adobe Photoshop, GIMP).