

The Thornburg Center for Space Exploration proudly presents our newest workshop...

Designing Interplanetary Spacecraft:

A STEM Curriculum for Upper Elementary and High School Grades

Day-long or multi-day workshop (e.g., 9:00AM to 4:00 PM, including time for breaks and lunch)

Size limit: variable – participants work in teams

Setting: Tables and chairs, not auditorium seating

Technology: Participants should bring computers if not provided by the venue. Broadband access is essential.

All curricular and support materials are provided for each participant by the workshop leaders

Audience: STEM Educators – focus on middle grades through high school

Abstract

An effective STEM program has two major characteristics: First, it treats all four subjects in an integrated fashion. Second, it lets students explore not only the knowledge and skills associated with STEM fields, but the identities, values and thinking processes of professionals in these fields as well.

This workshop addresses these characteristics with a complete integrated year-long STEM curriculum for middle grades through high school. When implemented, your students will become members of the design team for an interplanetary ship designed to handle missions to the Moon, Mars, and other destinations in the Solar System. The projects are authentic, and represent the kinds of questions professionals in the space workplace encounter themselves. By starting with an “incomplete manual” for the spacecraft *Beagle*, students are provided with questions to be answered in order to insure the spaceship's successful journey. Rather than treat STEM topics (including the arts) in separate parts, students get to see them as a whole. Depending on the structure of your class, students form “interdisciplinary teams” to address various topics. Student projects can range from isolated activities over a short period of time, to an entire year-long course. Student work can be done both inside and outside the classroom. We provide lots of free software and resources for you and your students to use anywhere, including on their home-based computers.

Projects range from the aesthetic (e.g., interior design for comfort on long trips to other planets)

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to the technical (e.g., growth of food and waste management). The curriculum document provides just enough of an overview to set the context for over forty projects and activities students can do during the year. Educators are free to expand the curriculum by adding new activities.

The inquiry-driven, project-based curriculum is aligned with the AAAS benchmarks on STEM education, insuring that both breadth and depth are approached through real projects. The results of student activities can range from written documents to scale models, functioning robots or computer simulations. Final projects are perfect for sharing with the school community, and students complete the course with a much clearer view of the knowledge, skills and other attributes associated with STEM professionals.

Every participant in the workshop receives a binder with the complete curriculum, a disk with additional resources, and a wealth of links to sites where students can learn more about the questions they have chosen to address.

Contact us by e-mail (dthornburg@aol.com) right away to schedule your dates.

About our group:

The Thornburg Center for Space Exploration has highly-qualified workshop leaders with tremendous depth of experience in inquiry-driven project-based learning. Depending on the size of the workshop group, you may get one, two, or more of us. The goal is not just to provide a day-long experience and provide some materials, but to foster a culture of professional development in which you maintain contact with us for as long as you want it. Our team includes:

David Thornburg, PhD

David is the Founder and Director of Global Operations for the Thornburg Center. He is an award-winning futurist, author and consultant whose clients range across the public and private sector throughout the planet. His razor-sharp focus on the fast-paced world of modern computing and communication media, project-based learning, 21st Century skills, and open source software has placed him in constant demand as a keynote speaker and workshop leader for schools, foundations, and governments.

As a Child of the October Sky, David was strongly influenced by the early work in space exploration, and was the beneficiary of changes in the US educational system that promoted

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and developed interest in STEM (science, technology, engineering, and math) skills. He now is engaged in helping a new generation of students and their teachers infuse these skills through the mechanism of inquiry-driven project-based learning.

His educational philosophy is based on the idea that students learn best when they are constructors of their own knowledge. He also believes that students who are taught in ways that honor their learning styles and dominant intelligences retain the native engagement with learning with which they entered school. A central theme of his work is that we must prepare students for their future, not for our past.

Norma Thornburg, MA

Norma is currently the director of emerging technologies for the Thornburg Center where she shares her insights on trends relating to tools that help students learn more effectively. She has been a classroom teacher, a principal, a technology coordinator, and an educational consultant. Her work brings her all over the world.

She has worked for years on projects where students designed and built computer-controlled robots that were programmed using the Logo language and is the author of the first books on Logo published in Brazil. Norma is a popular presenter at conferences where she can share her interests and expertise with educators.

Norma has many years experience working in the field of inquiry-driven project-based learning (PBL) and was the lead designer of a five-year PBL program that, at its peak, reached over 15,000 students throughout Brazil. She and David split their time between the US and Brazil doing similar work in both countries.

Norma's most recent work involved leading a major school redesign project (pre-K through middle grades) where everything from classroom layout to underlying school culture was transformed in support of the students and faculty.

Sara Armstrong, PhD

Sara has been an educator for over 35 years—as a classroom teacher, principal, and professional developer. She is recognized for her dedication to project-based learning and the benefits that accrue to students and teachers through this practice, particularly in the elementary grades. She conducts workshops in developing effective projects across the country, and has also led workshops in Nairobi, Kenya, Gabarone, Botswana, and Monterrey, Mexico. She is a firm believer in meaningful assessment, and presents workshops on developing effective rubrics for all aspects of project work. Sara is also interested in the power of story and storytelling, and

infuses it into her presentations and workshops. Her latest book, *Information Literacy: Navigating and Evaluating Today's Media* (Shell Education, 2008), helps students and adults think critically about the deluge of daily information we all experience. Sara is a recipient of both the Gold and Platinum Disks from Computer-Using Educators.

Her recent work at the *STEMstitutes* in Indiana and her ongoing work with PBL Associates provided her with the opportunity to help transform daily practice among educators. She brings fresh insights to any project with which she is involved.