

IAA Study Group Status Report

Responsible Commission: Multi-Commissions: 1, 2, 3 and 6

Study Number and Title: 6.16 Multi-Commission
STEM/STEAM for Space - Grand Challenges

Short Study Description (from Study Group Proposal): The launch of Sputnik in 1957 marked the beginning of a global surge in interest in science, technology, engineering and mathematics (STEM) education. The world was excited by each development in space exploration. Not only were there vast improvements in STEM education, but also an increase in participation in these disciplines by our youth. Many of them eventually joined this exciting endeavor, while others utilized their education to benefit mankind in a myriad of other ways. In the 50+ years of the space age, developments have continued apace in the physical sciences. Recent years have also seen impressive advances in the life sciences stemming from space research. These advances are steadily moving toward the enablement of humanity to go beyond near-earth orbit on into the cosmos.

Our objective: As space research has stimulated STEM education, improvements in technical education have benefitted space research and, indeed, all aspects of society. Less recognized is the interaction between the creative arts, space research and STEM education. Space research has stimulated the imagination of the art community in music, architecture, literature, and the graphic arts. Technical developments have made possible new methods of creating works of art. And conversely, the arts have stimulated creativity in science, technology, engineering, mathematics – and space research. It is this complex interaction we have dubbed STEAM. We propose to study this interaction with the objective of increasing the benefits to all. The first step will be to gain a clearer picture of where we are today on the interaction between STEAM education and space research. Then we will address questions such as the following: How can we improve STEAM education for the benefit of space research and vice versa? How can we develop a coordinated initiative to support development of high quality STEAM education? Should we encourage the sort of competitions that have proved so successful in other fields, such as robotics, in our universities, high schools and, yes, even with younger students? If so, how can we persuade governmental space agencies, foundations and private industry to help? While learning from the past, we need to look to the future to fully benefit from the complex interaction between space research and education in science, technology, engineering, art, and mathematics. We need a bright, enthusiastic generation for future space activities and they need us now.

Progress in the past:

The members of the Study Group met at IAA Headquarters during the Academy Spring Annual meeting in Paris (March, 2017):

During the last Study Group meeting in Paris members discussed the importance not only of STEAM Education but also Space Engineering. Space applications in science, technology and business will experience a substantial increase in the next 10 years. It is essential to have a workforce with a strong background in space-related subjects. As an example, Study Group

member Dr. Jordi Gutierrez (Spain) presented plans for a Space Engineering degree at the First Symposium on “STEM/STEAM for Space” last year in Paris. It was well received. Many members from different countries expressed strong interest and support of this development and recommended that this topic constitute one of the special sessions for the Second Symposium “STEM/STEAM for Space. Grand Challenges”.

The space industry has an aging workforce. Young engineers are needed not only to replace those that are retiring, but also to bring a new set of **advanced, multidisciplinary skills and support new businesses**. Thus, the employability of engineers and scientists well educated in STEAM for Space and in Space Engineering is certain. We are sure that graduates in many countries involved in space endeavors will be highly successful. This new generation of space scientists and engineers will apply their knowledge, energy and passion to benefit local, national and international space research, industries and economies.

They will be the leaders of tomorrow!

The members of the Study Group met at the IAA Headquarters last month (August, 2018) to discuss a present status of the preparation of the Second Symposium on STEM/STEAM for Space - Grand Challenges”.

Second Symposium on “STEM/STEAM for Space for the Leaders of Tomorrow”

MIT, Cambridge, USA, October 28-29, 2019, immediately after WSC in Washington DC.

Chairs: Prof. Dr. Wesley Harris and Prof. Dr. Liya Regel

The Goal: As space research has stimulated STEM education, improvements in technical education have benefitted space research and, indeed, all aspects of society. Less recognized is the interaction between the creative arts, space research and STEM education. Space research has stimulated the imagination of the art community in music, architecture, literature, and the digital arts. Technical developments have made possible new methods of creating works of art. And conversely, the arts have stimulated creativity in science, technology, engineering, mathematics – and space research. It is this complex interaction we have dubbed STEAM. We propose to study this interaction with the objective of increasing the benefits to all. The first step will be to gain a clearer picture of where we are today on the interaction between STEAM education and space research. Then we will address questions such as the following: How can we improve STEAM education for the benefit of space research and vice versa? How can we develop a coordinated initiative to support development of high-quality STEAM education? Should we encourage the sort of competitions that have proved so successful in other fields, such as robotics, in our universities, high schools and, yes, even with younger students? If so, how can we persuade governmental space agencies, foundations and private industry to help? While learning from the past, we need to look to the future to fully benefit from the complex interaction between space research and education in science, technology, engineering, art, and mathematics. We need a bright, enthusiastic generation for future space activities and they need us now.

Speakers: Members of National Academies, government agencies, universities and companies

Study group is in preparation to form a Program/Organizing committee; the first announcement and call of papers, and solicitation of the keynote speakers for the Second Symposium on “**STEM for Space for the Leaders for Tomorrow**”.

Issues requiring resolution?

Completion of organization of the Second Symposium on STEM/STEAM for Space.

Product Deliveries on Schedule:

On March 25, 2016 the first Symposium was held with impressive lectures and lively discussions by the international participants on developments in STEM/ STEAM relevant to space activities.

“Paris seemed to be the most appropriate venue for the first symposium on STEAM for Space because it’s most notable landmark and cultural icon is the Eiffel Tower, a perfect illustration of the union of the STEAM subjects,” said Regel. “In 1889, Gustav Eiffel completed his magnificent beautiful creation using his knowledge of science, technology, engineering, art, and mathematics. And where does the tower point? To space! It reminds me of a rocket on its launch pad.”

The program was created by selecting abstracts submitted by representatives of institutions around the globe. Several new members joined the Study group, as the study moved to the next stage after this first highly successful symposium.

The First Symposium on STEM/STEAM for Space - Grand Challenges was successfully held with the outstanding help of the IAA office in Paris.

The Second Symposium on “STEM/STEM for Space for the Leaders of Tomorrow” at MIT, October 28-29, 2019. Lectures on Monday, 28 October and a tour of laboratories the next day, Tuesday, 29 October.

Name of person providing Study Group Status:

Prof. Dr. Liya Regel (Chair)

Status Report Date:

September 2018

Chair: Regel, Liya

Co-Chair: Harris, Wesley L.

Secretary: Maizza, Giovanni

The academy invited Prof. Dr. Regel to chair the study group with MIT Professor Dr. Wesley Harris, a member of the prestigious U.S. National Academy of Engineering. Members of this study group included well-known scientists and educators from space agencies, government research organizations, universities, and aerospace companies from many countries.

Activity:

- Study group Proposal Form
- Status report, September 2014
- Status report, March 2015
- Status report, August 2016
- Status report, March 2017
- Status report, September 2017
- Status report, March 2018
- Status report, September 2018
- Study group meeting, 25 March 2015, Paris, France. Agenda of the meeting
- 1st IAA Symposium on STEM/STEAM for Space, Paris, France, March 25, 2016

Membership:

- Alifanov Oleg M
- Boy Guy Andre
- Cai Guobiao
- Duarte Carlos
- Deng Yulin
- Ercoli Finzi Amalia
- Frischauf Norbert
- Ghafoor Nadeem
- Gany Alon
- Gutierrez Jordi
- Liu Qiusheng
- Kozlovskaya Inessa B
- Malina Roger F
- McPhee Jancy C.
- Lavagna, Michèle
- Oliver Carol
- Orlov Oleg
- Ramachandran Radhika
- Vavilova Irina B.
- Ventskovsky Oleg
- Zhuang Fengyuan