



Aeronauts 2000 Mission to Mars Intergenerational Project: Aging in place, Living in Space

Overview

Aeronauts 2000 Intergenerational Project challenges our young technology leaders of tomorrow to create tools to improve the lives of older adults today. This summer students from Shaker Heights High, North Olmsted High School, Cuyahoga Community College and the University of California, Irvine will work as interns to conduct research on space challenges of living on Mars, aging on Earth and game design. NASA studies show that there is a correlation between the physiological changes of living in Deep Space and the aging process on Earth, such as bone loss, sensory and cognitive impairment, and isolation. Students will use their research and field work with seniors to design a multi-purpose vehicle, deep space habitat, and physical diagnostic and monitoring tools, which will be used in a video game and implemented as technology aids for seniors called “Gerontechnology.”

Goals and Objectives

The goal is to engage young people to be more sensitive about the challenges of growing older and to motivate them to use their talents and skills to develop technology tools that will enable seniors to age in place. The objective is to engage learning in Science, Technology, Engineering and Math (STEM) through edutainment, i.e., quality education that is also fun, and at the same time integrate knowledge about the aging process, a topic rarely embraced by people of any age group, much less youth. Interns will be working with seniors to dispel myths, understand the physiological changes as seniors age, and identify opportunities for technology solutions that foster independent living. Interns will present their findings in a poster board presentation to faculty and industry experts at a fall conference at Tri-C and test their solutions at community events with students and seniors through sponsored by participating partners. Ultimately, we are preparing our young people for the best technology jobs of the future.

Problems Addressed

As we age, how the senses interpret the environment affects how the brain processes information. Impaired visual, hearing, reaction time, and cognitive changes are issues for seniors and a challenge for astronauts living in space. Sensory impairment can affect our ability to hear, see, and sleep, as well as sit, stand and walk, or operate any kind of vehicle, be it a car, airplane or a spacecraft. These physiological changes include cardiovascular deconditioning, balance disorders, weakening bones and muscles, disturbed sleep, depression and depressed immune response. These same changes occur in space. The effects of microgravity are similar to a person standing on their head for prolonged periods. The headstand invert the body’s blood flow, pushing more blood toward the head. When the person stands up again, often they may feel disoriented and dizzy, among other symptoms. Space biomedical research improves our understanding of the basic mechanisms of aging, and aging research contributes to a better understanding of physiological deconditioning in space.

Community Outreach and Impact

A critical component will be the outreach efforts by team mentors and interns, who will be the ambassadors for the Project and who will work directly with seniors at Cuyahoga Metropolitan Housing Authority; and Eliza Bryant Village, where they will play Wii bowling with seniors and then interview them about their interests, needs and challenges. They will also interview independent seniors through the Encore Program sponsored by Tri-C, and will host Saturday Family Academy where young people and their grandparents can test the paper prototypes and engage with each other in sensitivity exercises. Interns will produce You Tube Videos for dissemination on social media about sensitivity issues relating to seniors and how young people can help with technology tools. Interns will also have the opportunity to publish their field work, their Gerontechnology solutions and research, and present their findings to the community through forums at local public libraries in Shaker Heights, Ohio and San Diego, California, and at poster sessions at a minimum of two conferences. The game and curriculum will be tested by paraprofessionals in allied health and computer science at Tri-C and partner schools, with a particular focus on underrepresented middle and high school students. Finally, the team will launch an online competition on the



Gerontechnology solutions on Grandparents Day in September of 2017, based upon the templates developed by the interns in 2016. Winning submissions will be integrated into the game as resource elements. Aeronauts 2000 curriculum has reached to date, over 100,000 teachers and students across the country. We anticipate the potential reach of the video game and curriculum could exceed that number in game play, testing and outreach through the various activities and media and internet outlets.

Broader Impact

This project responds to the White House challenge to use technology to improve the lives of older Americans. According to the National Center for Chronic Disease Prevention and Health Promotion, by 2030 adults age 65 and older will account for roughly 20 percent of the U. S. population.¹ Seventy-five percent of these adults are currently living with a chronic condition. While technology and the internet are key resources for help with healthcare and independent living challenges, this age group is the least likely to use the internet or adopt technology without assistance.² This provides a unique opportunity for tech savvy students to create technology tools that are accessible to seniors. The team will partner with industry leaders who are engaged in technology development in gerontology and aeronautics to implement their design solutions.

Curriculum

Aeronauts 2000 Intergenerational Project builds upon existing STEM curriculum for middle and high school students related to a manned mission to Mars, called **Aeronauts 2000**. Developed by Professor Andrea Johnson in collaboration with scientists at **NASA Glenn Research Center, Jet Propulsion Laboratory and Johnson Space Center**, a team of high school students, teachers, and climatologists; the curriculum has been validated for 20 years and is being expanded into an edutainment game. The game design is being created by students for students with experts in curriculum and game development and modeling technology. Students will apply their research and field work to design a habitat for deep space, a multi-purpose transport vehicle, and physical diagnostic and monitoring technology, e.g. nanotechnology to monitor body functions and self-replicating assistive technology. Tri-C students and the high school students may be eligible to receive academic credit for their work. The intergenerational activities include sensitivity training for interns on aging and Gerontechnology solutions; and field work through focus groups and bonding exercises with seniors at Eliza Bryant Village, Cuyahoga Metropolitan Housing Authority (CMHA) and the Encore Program, sponsored by Tri-C.

Benefits to Interns

Learning outcomes for the interns include 1) achieving basic competency in one or more STEM subjects as it relates to space travel, aging technology, and/or game design and integration; 2) team building and complex problem solving skills; and 3) increase performance in technology solutions related to communications, transportation, and monitoring devices for space travel and aging. Interns studying these physical and cognitive changes have the opportunity to gain exposure to technology innovations across STEM areas, such as biomedical technology for diagnostic testing and monitoring; robotics and nanotechnology for telehealth; and communications technology. This will prepare them for careers at every level of higher education, whether it is paraprofessional training in physical therapy, engineering, medicine, or information technology. Interns will also focus on teamwork and creative problem solving across STEM disciplines; skills that are particularly important in technology and healthcare. Studies show that students' ability to effectively collaborate will often be the difference between success or failure in implementing viable solutions.

Project Deliverables

The deliverables for Summer 2016 will be as follows:

¹ "The State of Aging and Health in America 2013", National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health

² "Attitudes, Impacts, and Barriers to Adoption", PewResearchCenter, Internet, Science & Tech, April 3, 2014



- 1) Fact Sheets on the three topic areas: Planetary Conditions on Mars, Living on Mars, and Aging Challenges Among Seniors; and Charts on the Senses and Technology options explaining the correlation of common senses on communication, navigation and transportation, and monitoring of vital signs.
- 2) Paper Prototypes of a design for a Multi-purpose transportation vehicle; deep space habitat; and physical monitoring and diagnostic toolkit. The latter will also be used for a “Gerontechnology” solution to aid seniors in independent living (target audience is adults age 60+). Interns will create Poster boards or Infographics to explain their solution.
- 3) You Tube Videos produced by interns and seniors for social media, sensitizing young people to aging challenges.
- 4) Sensitivity Training on Aging Curriculum interns for informal settings.
- 5) Report on Learning Outcomes of Collaborative Learning in Interdisciplinary STEM Subjects in Informal Settings. The Report will include a summary of the activities and deliverables, findings from the student pre and post-tests, questionnaires and surveys for seniors, observations that support or refute the hypothesis, and recommendations for future research on pedagogy and informal learning environments.

About the team

Professor Andrea Johnson is the Director of the Center for Intellectual Property, Technology and Telecommunications, Inc. (CIPTT), a 501(c)(3) nonprofit organization that produced the original Aeronauts 2000 curriculum in 1996 under an unsolicited grant from NASA. Johnson is a Harvard law graduate and emeriti law professor who an expert in technology-based learning, having taught the first online class connecting five external sites in 1996. She served on President Clinton’s Transition Team for Science, Space and Technology, focusing on the National Science Foundation under Dr. Sally Ride. She designed a web-based authoring platform for skill-based learning, called Cyber Workbooks, and was a Carnegie Scholar. She is very active in philanthropy and has sponsored scholarships at several institutions and volunteers for Hospice of the Western Reserve. See Aeronauts 2000 - <http://ciptt.net>

Dr. Mary Milidonis, PhD, MMSc, PT, Associate Professor, Director Certificates in Gerontology, Milidonis is currently Associate Professor and Graduate Faculty in the Health Science Department at Cleveland State University. Her teaching responsibilities are in both Doctor of Physical Therapy Program and the Bachelor of Science Health Science Program. Dr. Milidonis research interests are in the area of geriatrics, orthopedics, arthritis, disability, community exercise, clinical outcomes, and professional education. Dr. Milidonis recent grant activity includes study of Intergenerational Communication and Tai Chi Light impact on balance, self-efficacy and pain for low income elders (2015); Physical Therapy for Medically Under-served Adults (2014); and to create a program that will improve the quality of life of area senior citizens by having students teach music technology to the older adult participants.

Dr. Joshua Tanenbaum is Assistant Professor at the University of California-Irvine, Department of Informatics. He is responsible for training the interns on the iterative design process and designing Technology Survival Toolkit. He will help train and coach interns on the design a “paper prototype” of a Technology Survival Toolkit that could be used on Mars. In addition, he will use the logic to help them design a Technology-appropriate toolkit for seniors. Professor Tanenbaum is pioneering the development of physical narrative environments, interactive costume design and hybrid physical/digital storytelling systems capable of literally bringing a player into the game.

Institutional and Community Partners

Cuyahoga Community College (Tri-C) is Ohio’s largest public community college, providing affordable education to 55,000 students annually, in more than 190 career and technical programs and liberal arts. It ranks first in Ohio and fifth nationally in conferring associate degrees in all disciplines. Tri –C sponsors several community outreach programs for students, **Youth Serving Program** that reaches 10,000 students; **Encore** that provides educational



classes for seniors; and **Saturday Family Academy** that serves 300 people. CIPTT will test and validate its outcomes to foster better community between generations by conducting workshops on senior sensitivity training and testing the prototypes of the game elements in a physical space.

Shaker Heights High School is a public international baccalaureate world school in Ohio that is in the top 2% of high schools nationally, according to Newsweek. More than 80% of their students will attend college. It has one of the only planetariums in Cuyahoga County. It has 22 Advanced Placement courses and its students have received awards in U.S. Physics Team, Science Olympiad, and National Math League.

North Olmsted High School is a public high school in Ohio with 1355 students with 12 Advanced Placement courses. It has received the National School of Excellence Award from the U.S. Department of Education and a strong partnership with NASA Glenn Research Center.

Shaker Heights Public Library will be providing a forum for community outreach and a test site. Their strategic mission is to ensure customers have access to 21st century technology. Their board is very supportive of this project. Interns will also be producing the You Tube videos at **Garfield Heights Public Library**, part of **Cuyahoga County Public Libraries**.

Eliza Bryant Village is oldest continually operating African-American nursing care facility in the United States and serves over 1,200 seniors annually. Its mission is to provide quality services, outreach programs and a dignified, compassionate and secure living environment for seniors 62 years of age and older. It provides independent housing to residents on a 17- acre campus.

Cuyahoga Metropolitan Housing Authority offers activities and housing for seniors in low income public housing. Its senior programs emphasizes and encourages seniors to stay socially engaged, physically active, to continue to learn and give of their wisdom to our youth through intergenerational programs.

External evaluators is **Dr. Brian Davis**, Professor and Department Chair in Biomedical Engineering at the University of Akron. Dr. Davis will evaluate the paper prototypes of technology solutions for Survival Toolkit for Aeronauts 2000 Mission to Mars computer generated virtual environment; and technology solutions for Gerontechnology Survival Kit. Dr. Frates will measure changes in student perceptions of seniors based upon pre and post –tests, and with seniors, their attitudes about technology and use of Gerontechnology.

Why Support This Project?

This project is timely as NASA studies the effects of deep space travel on the Kelly twins; and families are struggling to cope with an increasing elderly population in need of care. Aeronauts 2000 is a unique program developed by young people for young people that will provide a tremendous opportunity for a diverse group of young people. This project is intergenerational and will include students and seniors across race, economic and cultural backgrounds; will transform young people to prepare them for the jobs of tomorrow while assisting seniors to ensure a quality of life; will have measurable impact with concrete deliverables that will be sustainable through existing partnerships at every level of higher education throughout Ohio. The Aeronauts 2000 curriculum has already reached to date, over 100,000 teachers and students across the country. We anticipate the potential reach of the video game and curriculum could exceed that number in game play, testing and outreach through the various activities and media and internet outlets.

For more information contact Professor Andrea Johnson, Executive Director of CIPTT, at 310 864-0100 or ciptt.inc@ciptt.net