Process Evaluation of an Immersive Learning Experience for Grades K-4 Youth

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Challenger Learning Center®
MICRONAUTS

Overview of Presentation

I. Evaluation Context
II. Design and Development Goals
III. Evaluation Research Questions
IV. Theoretical Framework
V. Method
VI. The Media Is the Method
VII. Findings
VIII. Next Steps

I. Evaluation Context

- Micronauts is a federally funded STEM education development project targeting early primary school-age children.
- The Center for Educational Technologies® at Wheeling Jesuit University in Wheeling, WV, conducted a formative evaluation of the Micronauts simulator development project funded by NASA.
- The evaluation documented the strategies, technology tools, and scenario contexts used to engage young students in science, technology, and mathematics activities.

Formative Assessment

- The formative assessment involved 11 pilot tests, totaling 205 students.
- Qualitative observation methods were used to assess the impact of the experience in regard to the:
  - Simulation education experiences.
  - Physical environment, scenario storyline, and related hands-on activities.
  - Integration of NASA educational content and resources.
- As part of a process evaluation, findings from the pilot testing were shared with the design and development team so that the program was refined between each pilot test to optimize student interest and participation.

II. Design and Development Goals

1. The WJU CLC will build on its success in providing simulated space missions for upper elementary through middle and high school age youth where more than 20,000 students complete onsite or online missions annually.
2. Micronauts will use an engaging storyline and innovative approach in its design of the simulation experience for young children. The hands-on activities will be aligned to state and national standards so that educators and parents can readily see and assess the value of the STEM learning activities.
3. Micronauts will integrate NASA's past and future space projects to inspire and give context to the simulation storyline and hands-on activities.

III. Evaluation Research Questions

1. How has the WJU CLC been able to build on prior success to promote regional interest in this new K-4 science education facility?
2. What aspects of the setting, context, sequence, and structure work best with young learners?
3. How are NASA resources integrated into Micronauts activities?

IV. Theoretical Framework

Several factors supported applied use of the systematic screening and assessment method (Leviton & Gutman, 2010)* for this process evaluation (King, 2007)**:

- Focus on promising innovations for evaluation
- Assistance and feedback from content and technical experts
- Cost efficiency
- Cross-site synthesis of trends and common practices

*Leviton, L.C., & Gutman, M. A. (2010). Overview and rationale for the Systematic Screening and Assessment Method. In L. C. Levton, L. Kettel Khan, & N. Dawkins (Eds.), *The Systematic Screening and Assessment Method: Finding innovations worth evaluating*. New Directions for Evaluation, 125, 7-31.

**King, J. A. (2007). Developing evaluation capacity through process use. *New Directions for Evaluation*, 116, 45-59.

V. Method

Research Question	Data Collection Procedures	Instruments
1. How has this project built on prior success to promote regional interest in this new K-4 science education facility?	• Interviews with project PI, project manager, curriculum writer, and graphic designer • Observation of school visits	• Interview notes and recordings • Meeting notes • Web resources used • Document archives • Image documentation
2. What aspects of the setting, context, sequence, and structure work best with young learners?	• Observation of youth participation in simulations • Interviews with teachers and parents	• Observation forms • Photos and videos • Design documents and plans • Artifacts and notes
3. How are NASA resources integrated into Micronauts activities?	• Artifact analysis • Interviews with team members and experts • Media to support scenario context and activities • Observation of meetings and pilot tests	• Document analysis of proposed activities • Movies and photos of onsite events • Observation notes

V. The Media Is the Method

- Technology used to support the formative evaluation
- Affordances of technologies to collect and provide evidence
- Organization and analysis of technology data
- Interpretation and representation of multimedia evidence

VI. Findings: Research Question 1

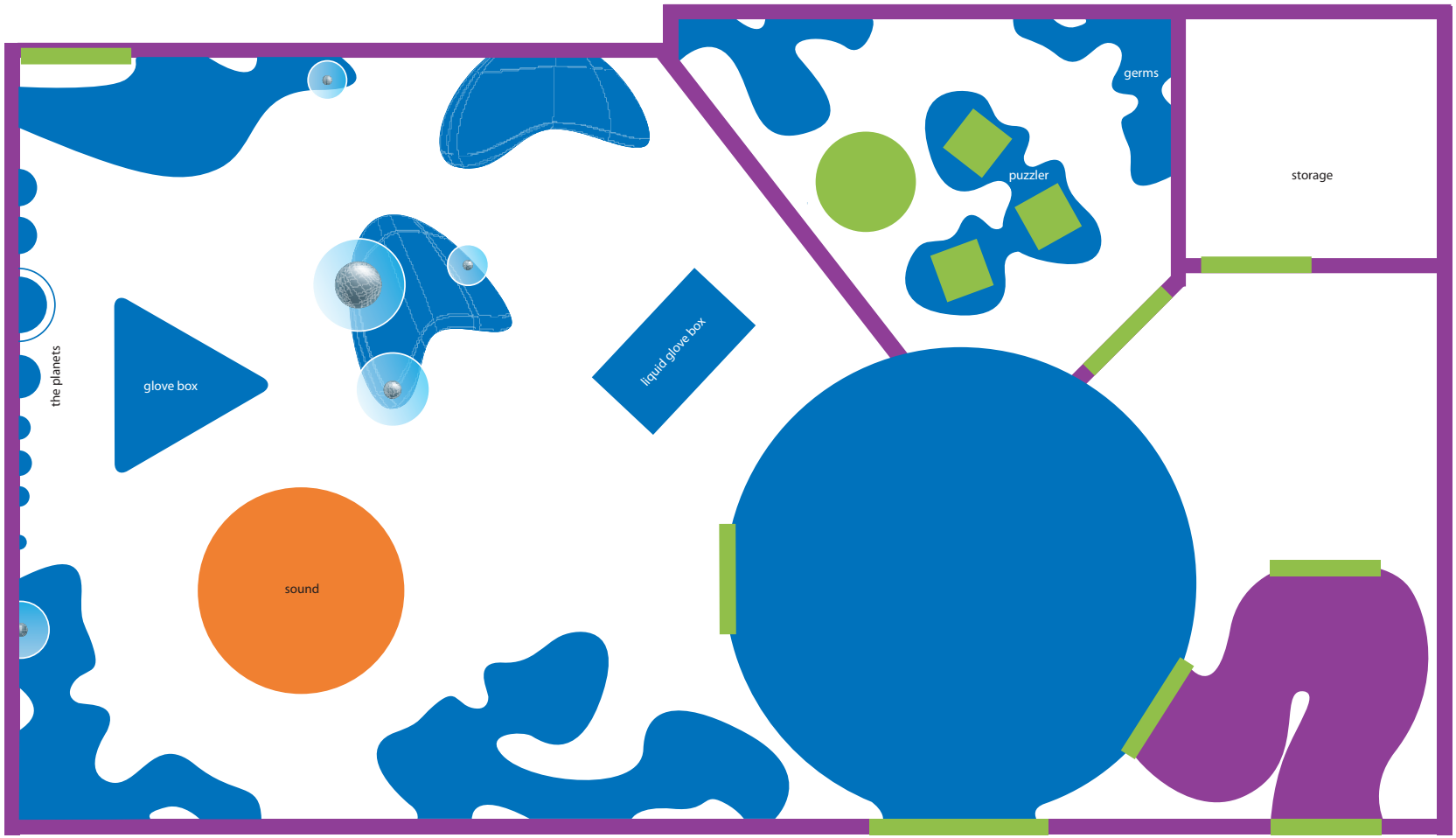
How has the WJU CLC been able to build on prior success to promote regional interest in this new K-4 science education facility?

Communications with Other Challenger Learning Centers

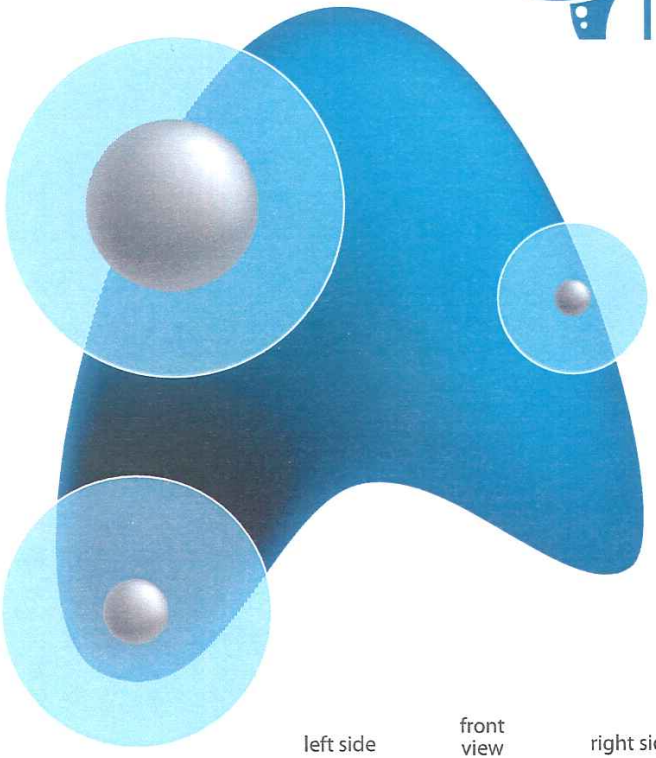
Existing Challenger Learning Center Micronauts programs:

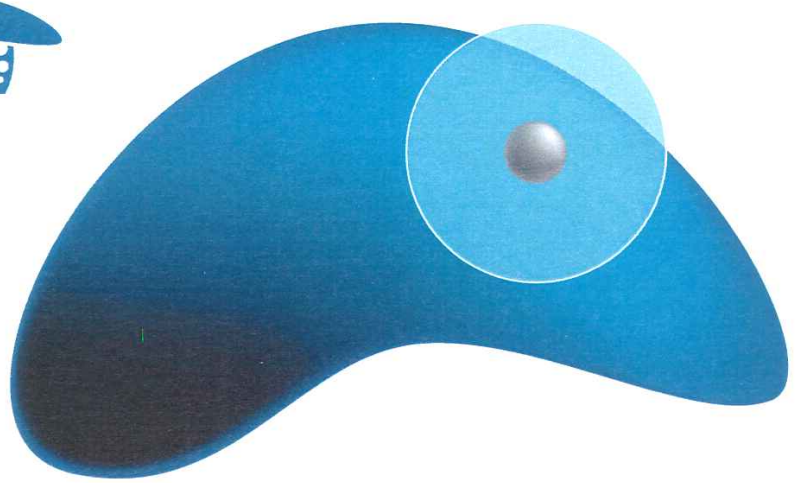
- Brownsburg Challenger Learning Center, Brownsburg, IN
  http://challenger.brownsburg.k12.in.us/default.asp
- Challenger Learning Center, Prairie Aviation Museum, Bloomington, IL
  http://www.challengerlearningcenter.com/teachers/3rd-4th.php3
- Challenger Learning Center, St. Louis
  http://www.clcstlouis.org/programs.html
- Challenger Learning Center of Northwest Indiana, Purdue University
  http://www.clcnwi.com/EducationExplorations/micronauts.html
- Challenger Learning Center, New Mexico
  http://www.challengernm.org/index.php

Contact with Nationally Recognized Designers of Learning Spaces for Children

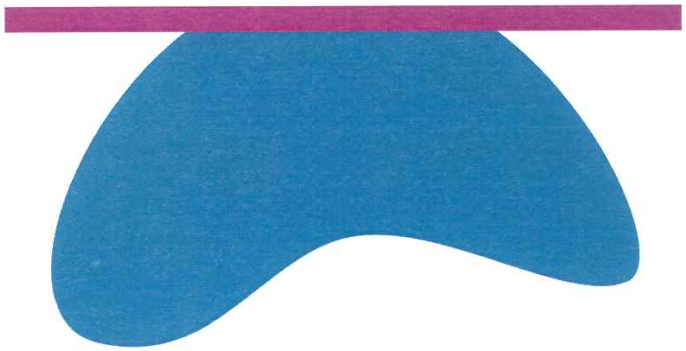


plexi-glass circles
are at different heights





against the wall

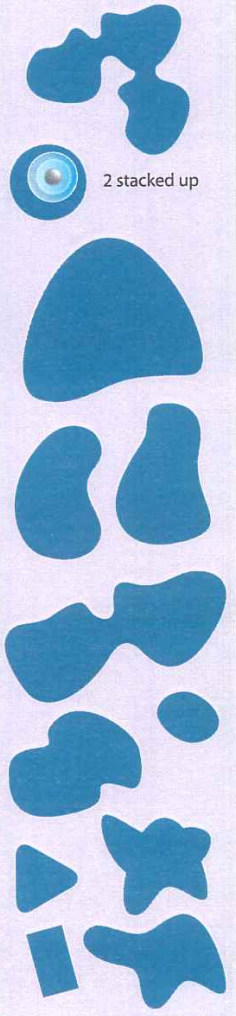


left side

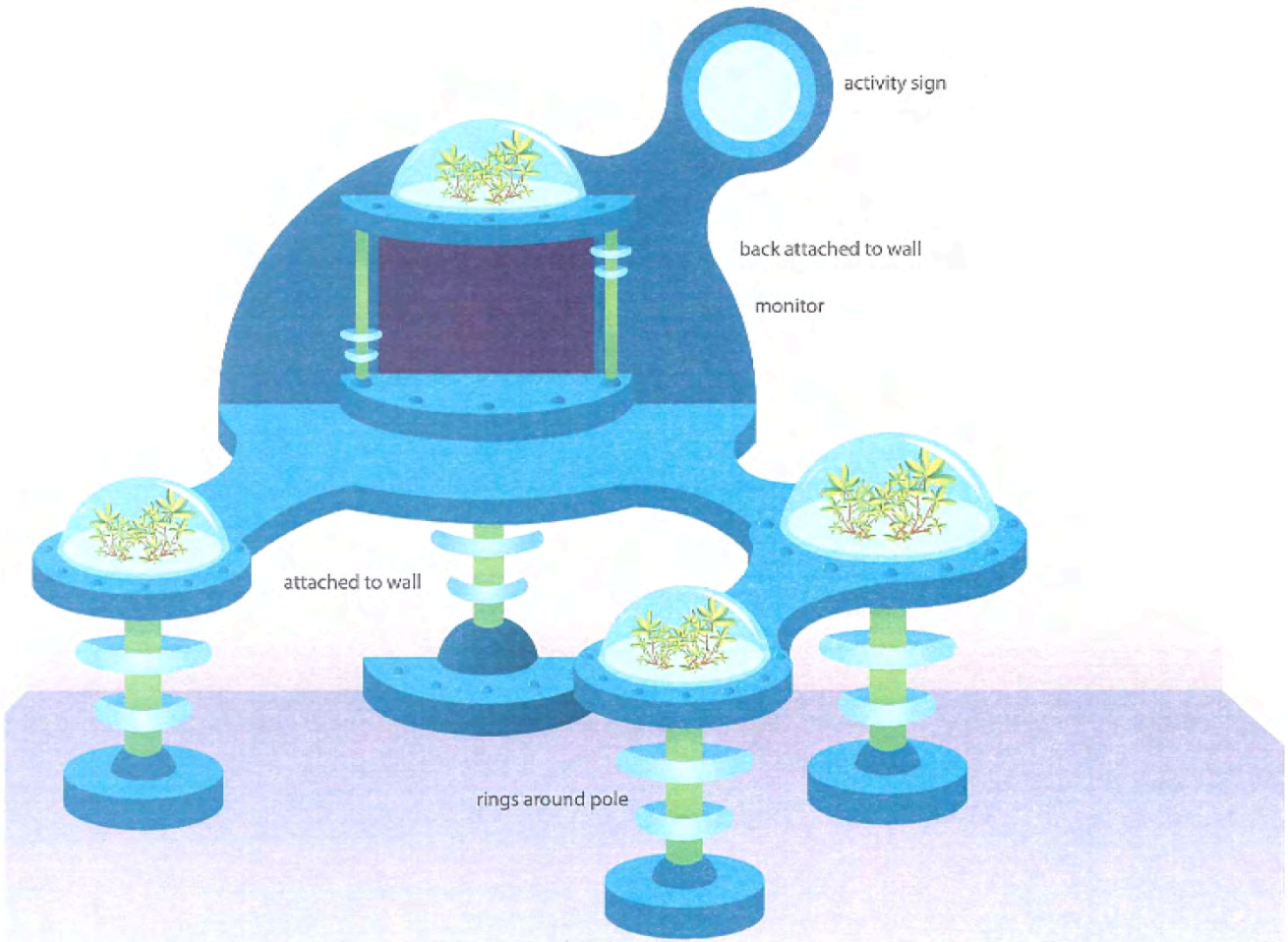
front
view

right side

plexi-glass tables
one higher than the other



2 stacked up


activity sign
back attached to wall
monitor
attached to wall
rings around pole


top views

Using In-house Expertise for Simulation Experience

- Graphic design
- Video
- Hands-on activities
- Science content
- Educational research and evaluation

Resulting in capacity-building for the Challenger Learning Center by bridging the gap between early childhood educators and the research and development team.

Findings: Research Question 2

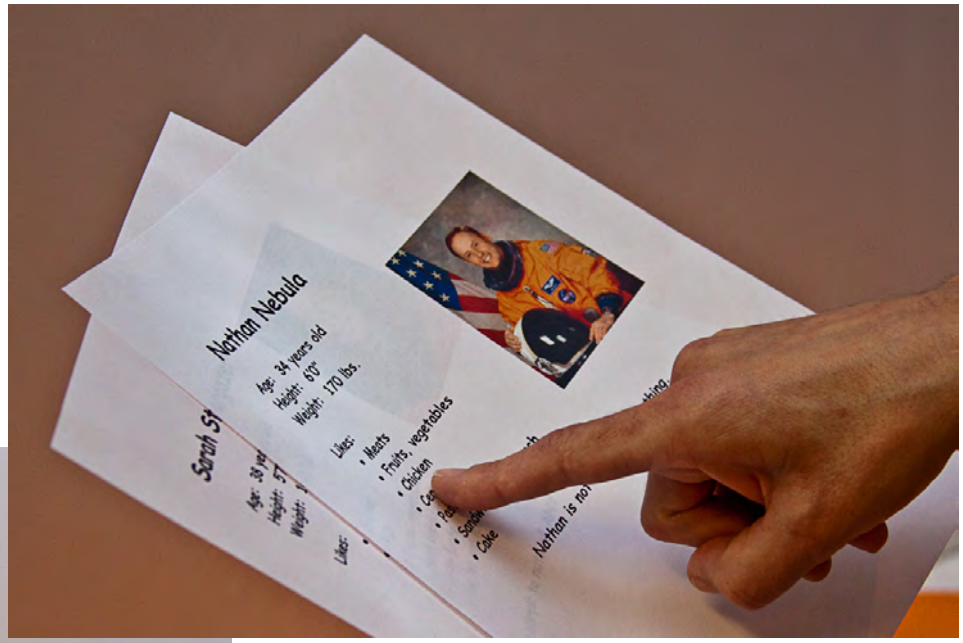
What aspects of the setting, context, sequence, and structure work best with young learners?

Before and after images of the area used to house the Micronauts simulator.

Technology as a Tool to Engage Students in Scientific Inquiry

a. Internet resources
b. Robotics tools
c. Microscopes and slides of data
d. Hands-on guided inquiry
e. Audio investigations
f. Sensory explorations
g. Visual discrimination and classification

Internet Resources



Robotics Tools

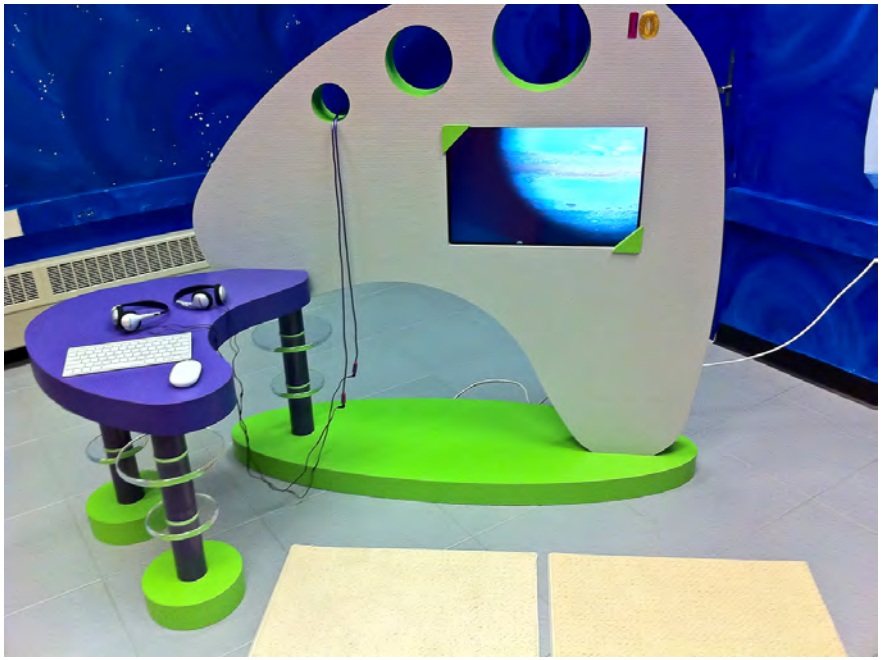
Microscope and Slides of Data

Hands-on Guided Inquiry

Audio Investigations

Sensory Explorations

Visual Discrimination and Classification



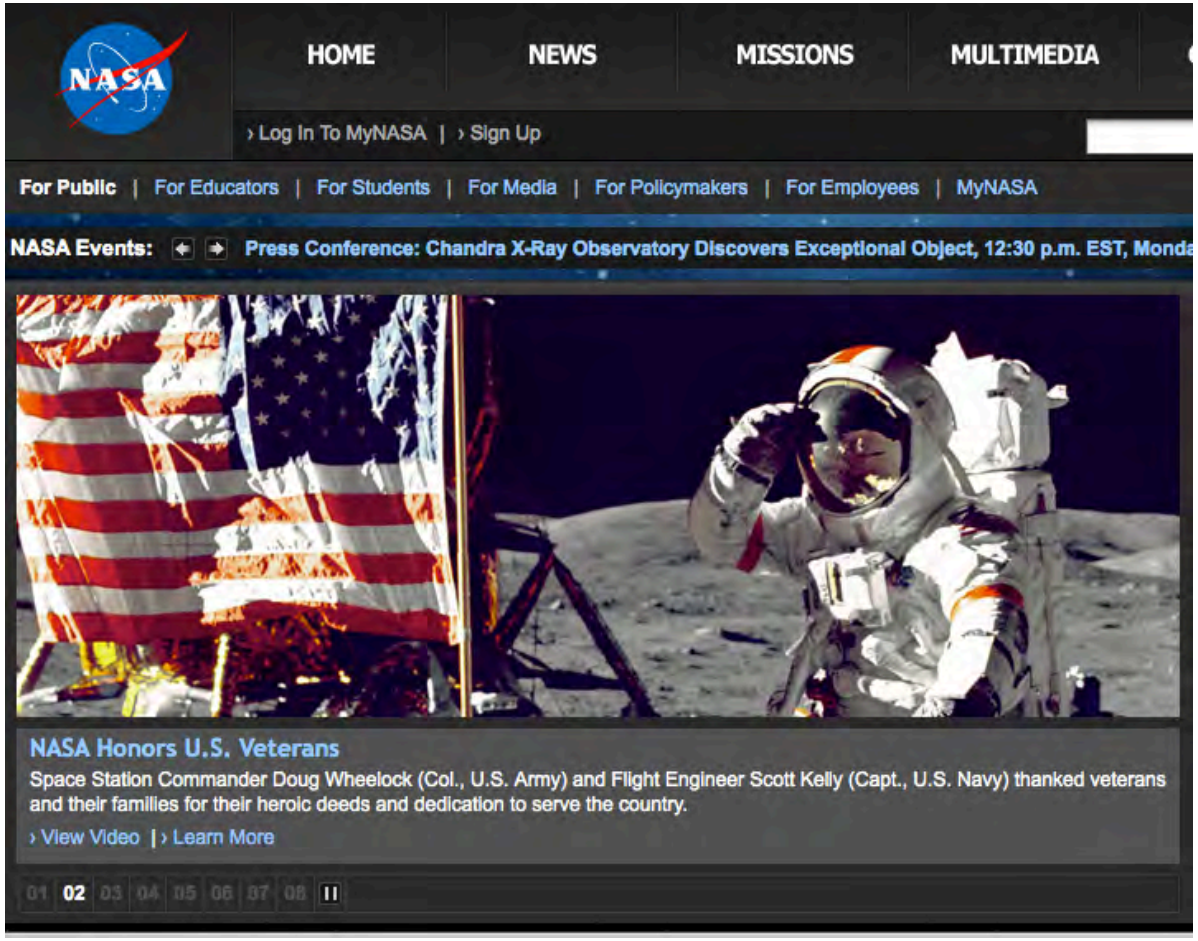
Micronauts in Action!

Comments from Participants

- Participant response to the station design, room layout, and pleasing atmosphere for children has been positive and enthusiastic. Several individuals noted the colors and shapes of the murals and stations were beautiful, kid friendly, and provided adequate space for groups of up to 25 children to maneuver through the room.
- Students uttered phrases such as "Cool!" "Awesome!" "I want to try it," and "It's my turn," as they entered and moved about the simulation.

Findings: Research Question 3

How are NASA resources integrated into Micronauts activities?

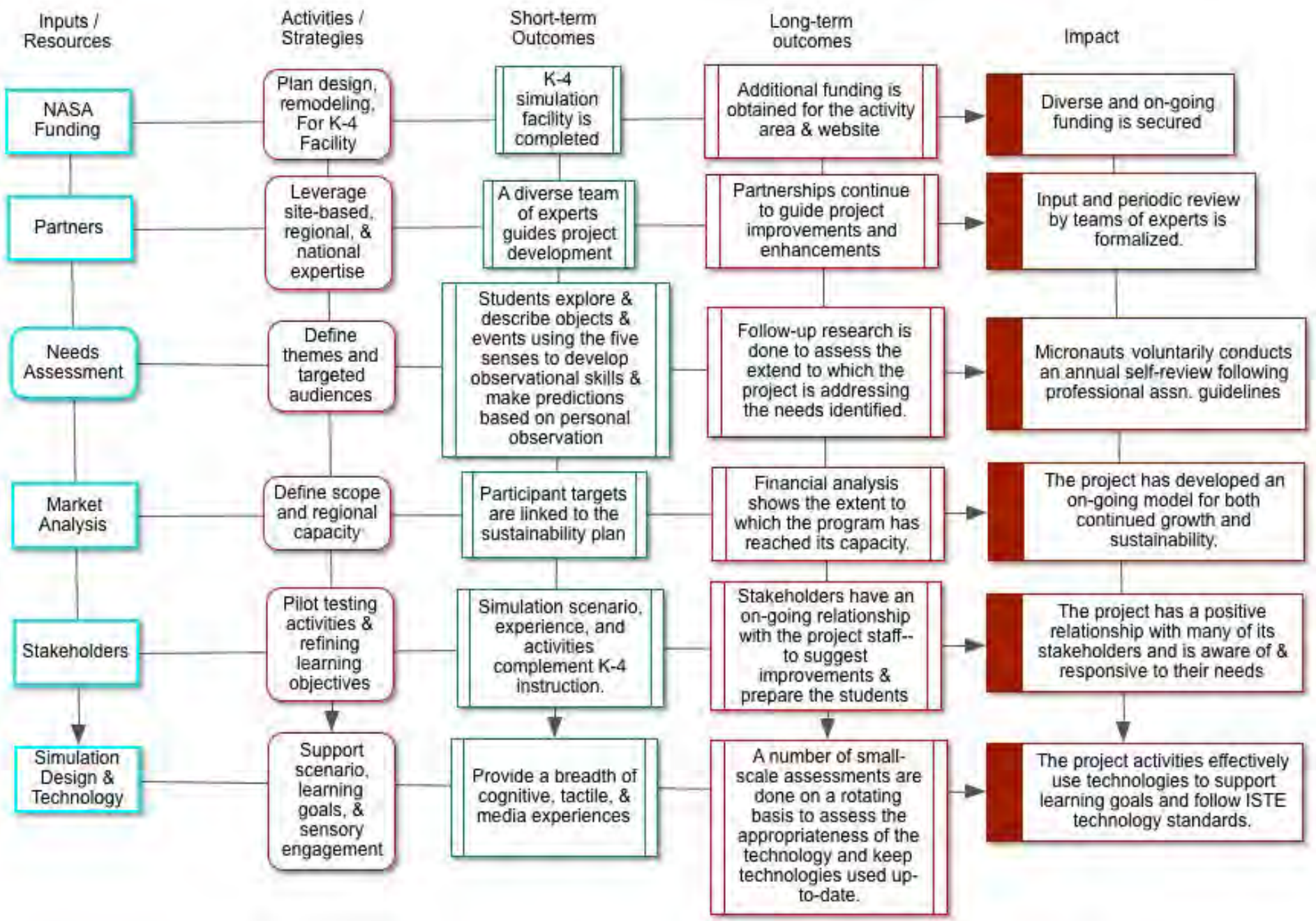


Integration of NASA Resources

- Context: the name and scenario
- Hands-on activities
- Images, video support
- Docent uniform and title

VIII. Next Steps

- The process of ongoing refinement and expanding the development of context support media and hands-on activities should continue with the following support:
  - A structured implementation evaluation that examines each of the demonstration and station-based activities
  - An annotated curriculum map to be made available for teacher comments
  - Integration of an annual review based on the AfterSchool Network Program Quality Self-assessment Tool


Inputs / Resources
Activities / Strategies
Short-term Outcomes
Long-term outcomes
Impact
NASA Funding
Partners
Needs Assessment
Market Analysis
Stakeholders
Simulation Design & Technology
Plan design, remodeling, For K-4 Facility
Leverage site-based, regional, & national expertise
Define themes and targeted audiences
Define scope and regional capacity
Pilot testing activities & refining learning objectives
Support scenario, learning goals, & sensory engagement
K-4 simulation facility is completed
A diverse team of experts guides project development
Students explore & describe objects & events using the five senses to develop observational skills & make predictions based on personal observation
Participant targets are linked to the sustainability plan
Simulation scenario, experience, and activities complement K-4 instruction.
Provide a breadth of cognitive, tactile, & media experiences
Additional funding is obtained for the activity area & website
Partnerships continue to guide project improvements and enhancements
Follow-up research is done to assess the extend to which the project is addressing the needs identified.
Financial analysis shows the extent to which the program has reached its capacity.
Stakeholders have an on-going relationship with the project staff-- to suggest improvements & prepare the students
A number of small-scale assessments are done on a rotating basis to assess the appropriateness of the technology and keep technologies used up-to-date.
Diverse and on-going funding is secured
Input and periodic review by teams of experts is formalized.
Micronauts voluntarily conducts an annual self-review following professional assn. guidelines
The project has developed an on-going model for both continued growth and sustainability.
The project has a positive relationship with many of its stakeholders and is aware of & responsive to their needs
The project activities effectively use technologies to support learning goals and follow ISTE technology standards.

Learn More at NASA*Talk*

Go to the K-4 Science Education Collaborative at NASA*Talk*:

www.nasatalk.com

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