



Wisconsin
Evaluation
Collaborative

August 2024

Years 2&3 Evaluation Report

Galaxy Scouts Comic Book Series

UW-Madison Astronomy Department

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Report Information

About the Author

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Rebecca Cors is a Scientist and Evaluator at the Wisconsin Evaluation Collaborative. In 2016, she earned a PhD from the University of Geneva. Questions about this report can be directed to Rebecca via email at rcors@wisc.edu.

About the Wisconsin Evaluation Collaborative

The Wisconsin Evaluation Collaborative (WEC) is housed at the Wisconsin Center for Education Research at the University of Wisconsin-Madison. WEC's team of evaluators supports youth-serving organizations and initiatives through culturally responsive and rigorous program evaluation. Learn more at <http://www.wec.wceruw.org>.

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Executive Summary

The UW-Madison Astronomy Department is developing the Galaxy Scouts comic books series to promote youth excitement about, and engagement with, science. The Department hired the Wisconsin Evaluation Collaborative (WEC) at UW-Madison's Wisconsin Center for Education Research to support development of the comic books and related outreach programs. During the second and third year of an NSF-funded effort, the main focus was on development of Galaxy Scouts activity books.

Two evaluation activities took place to elicit feedback: 1) testing of prototype drafts of individual activities by 202 youth, and 2) once the first activity book was published, 12 educators reviewed it and gave feedback. Educators were from mostly informal learning settings, including libraries, science centers, nature centers, science outreach programs, and planetariums. In addition, the Galaxy Scouts team set up two mechanisms for tracking public interaction with comic book materials: a log of the number of youth who took copies of activities at outreach events and a log of website analytics.

Four evaluation questions (EQs), about youth engagement, science learning activation, and instruction, guided the evaluation. Feedback collected for each EQ is summarized below on this page and described in detail in the following pages.

EQ1. Intent: Was the activity book effective in reaching its goals?

The majority of educators who reviewed the activity book thought that most activities were written with the target reading level – 4th to 8th grade – in mind. They indicated that other activities, which were accessible to youth with less advanced reading levels, added to the mix of activities, something they found effective for a science activity book. Educators thought the activity book addressed most of its goals for accessibility, usefulness at events, youth interaction with science from the comic books, and usefulness for science education instruction. Educators were mixed about how well the activity book got youth actively doing science, which the Galaxy Scouts comic design team plans to focus on for future books.

EQ2. Engage: In what ways does the activity book attract and hold youth interest?

Educators thought the front and back matter of the book was attractive, clear, interesting, and informative. Most youth who tested some of the activities said they “liked” or “loved” them and almost all said they would like to do more.

EQ3. Activate: How did using the activity book activate science learning?

When asked to give an overall rating, most educators indicated that the activity book was very effective in activating science learning.

EQ4. Instruct: Would the activity book support science education instruction?

Educators thought that some activities would be useful for instruction by managers of science education programs. Website analytics showed a slow but steadily growing stream of visitors to the Galaxy Scouts website. We speculate most of these visitors were educators and parents.

Directions for the future

Evaluation feedback from youth and educators about activities and the first activity book, respectively, informed the Galaxy Scouts design team. The following are some *examples of improvements* they made:

- The table of contents now clearly indicates the difficulty level of each activity using stars that relate to reading aptitude.
- Youth testing of early versions of six activities helped guide development of activities in activity books #1 and #2.
- The characters have been adjusted, through things like fashion and electronic devices, to be more relatable to middle schoolers.
- Dr. Halley's character has been adjusted to have a more casual appearance to avoid the stereotypical presentation of a scientist wearing a white coat.
- The comic stories more purposefully bring in the scientific process and involve more back-and-forth science conversation between kids, instead of a more classical approach where Dr. Halley mainly explains science concepts.

Evaluation results point to the following *areas for further growth and evaluation*, areas the Galaxy Scouts team wants to take on:

- Is science accessible to youth?
- Do comic and activity books spark youth interest in science?
- To what extent do the activity books get youth actively doing science?
- To what extent does the Galaxy Scouts comic book series activate science learning in youth – sparking fascination, valuing science, competency beliefs, scientific sensemaking – and give them resources to be successful?

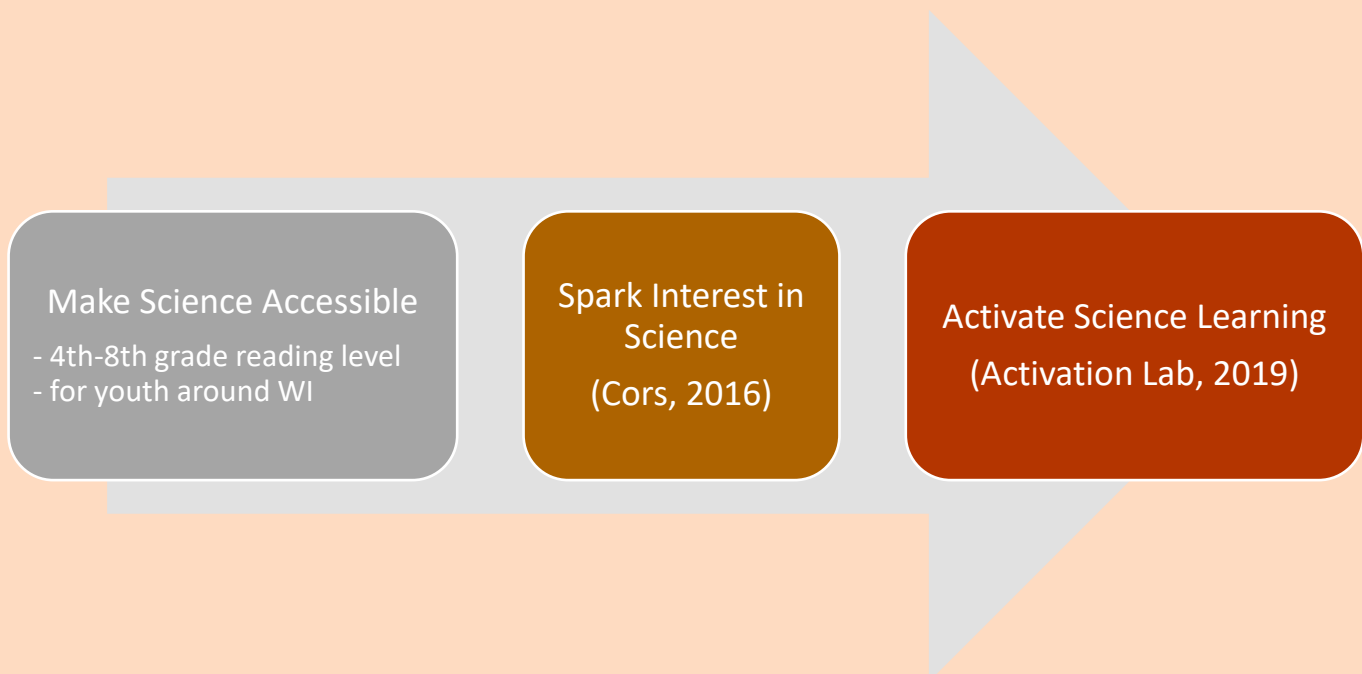
Purpose

The UW-Madison Astronomy Department is developing the Galaxy Scouts comic books series to promote youth excitement about, and engagement with, science. The Wisconsin Evaluation Collaborative (WEC) at UW-Madison's Wisconsin Center for Education Research is supporting development and ongoing improvement of the comic book series. This work is funded by the NSF (grant #2108370).

During the 2022-23 and 2023-24 academic years, evaluation focused on supporting development of the first activity books and on how activities are/could be used. An early step was working with the comic book development team to identify frameworks for developing the activities. Based on previous educator input in 2021 and on existing studies, the team selected several frameworks to guide their work. The first, to make the comic books accessible to youth around Wisconsin with a 4th to 8th grade reading level, is a core principle of the Galaxy Scouts comics. The second framework is about getting youth interested in science. A core goal is to spark youth interest in science and, while the comics have their attention, to activate youth science learning. For more details about activating science learning, see Appendix A.

These frameworks, shown as a sequence in Figure 1, below, are a simple logic model that describes the theory of action for Galaxy Scouts comic and activity books. The Galaxy Scouts comic book series designers worked with their evaluator to elicit feedback from educators and youth that could guide development of activity books based on this model.

Figure 1: Frameworks for development of Galaxy Scouts comic book series.



Process

Direct feedback from youth, who tested prototype activities, and from educators, who reviewed the first activity book once it was published, shed light on how youth would experience the activity books and allowed the team to optimize them.

Evaluation Questions

The following evaluation questions (EQs) guided the evaluation:

- EQ1. Intent: Was activity book #1 effective in reaching its goals?
- EQ2. Engage: In what ways do (individual) activities attract and hold youth interest?
- EQ3. Activate: Did the activity book activate science learning?
- EQ4. Instruct: Would the activity book support science education instruction?

Data Collection

Several team members were involved with data collection. Evaluator Rebecca Cors led the evaluation effort: Rebecca worked with the creative team, Jan Lin and Robert Tetzner, to define frameworks and specific questions for data collection. Kay Kriewald led collection of data from youth visiting the UW Space Place. In addition, the Galaxy Scouts team set up two mechanisms for tracking public interaction with the comic book materials: a log of how many youth took copies of activities from outreach events and also a log of website analytics. More information about the team members is in Appendix B.

Activity	Purpose	Sample size
Observed and surveyed youth about activities	To understand how youth interacted with drafts of individual activities. This feedback helped the team fine-tune activities before publishing activity books #1 and 2.	202 youth in 7 class groups, grades 2-5
Surveyed educators about activity book #1	To gain insight into educator views about the effectiveness of the first activity book. This feedback will help the team develop future activity books.	12 educators
Track youth using copies of activities	To understand which activities youth are interested in.	>500 as shown in Appendix D
Track website analytics	To better understand how often people are accessing information about the comic books through the website.	See Table 3 on page 17

Table 1: Data Collection Activities.

Timetable

Activities to support evaluation took place between September 2022 and August 2024. These included testing activities with youth and eliciting feedback from educators. In addition, two ongoing activities were established to track people's interaction with the comic books. Some outreach events and publishing milestones also occurred during this period.

Figure 2: Timeline of evaluation activities, September 2022 through August 2024.



Feedback from Youth and Educators

EQ1. Intent: Was Activity Book #1 effective in reaching its goals?

- ❖ The target audience can understand the activities.
- ❖ Youth can do activities at home with simple equipment.
- ❖ The activities offer a balance between fun, creativity, and learning challenge.
- ❖ The activity book gets youth interacting with science from the comic books.

Accessible to target audience

Reading comprehension

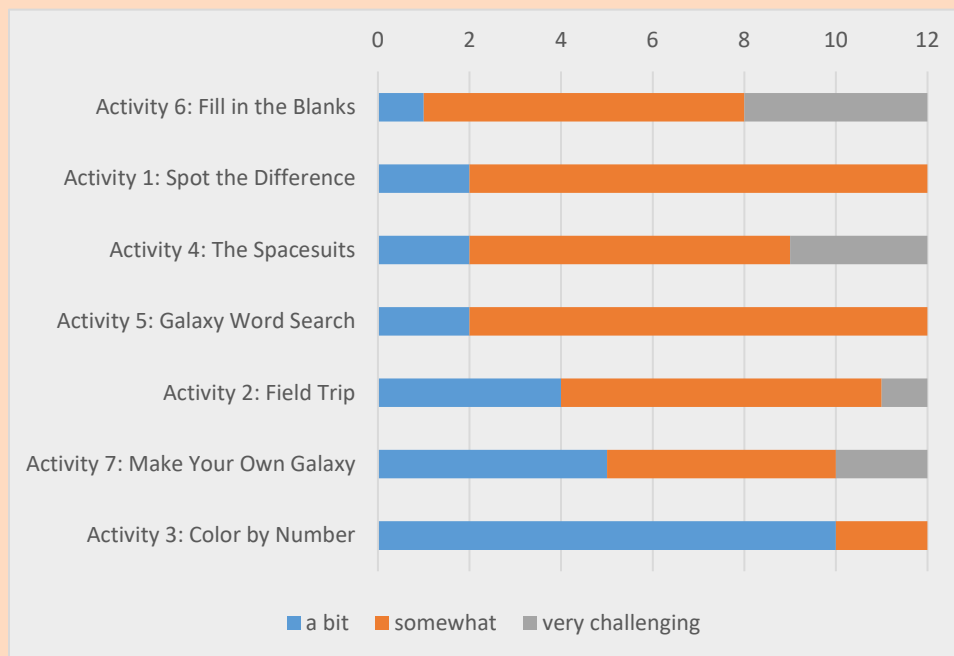
According to most educators, youth with a reading level of grades 4th through 8th (9-13 years old) could understand the activity book activities.

- They thought that four activities were written with the target reading level of 9 to 13 in mind – Activity 4: The Spacesuits; Activity 6: Fill in the Blanks; Activity 7: Make Your Own Galaxy; and Activity 5: Galaxy Word Search.
- One thought Activity 7 might challenge older readers also.

A good mix of fun and challenge

Educators rated how challenging each activity would be for youth. They thought the mix of challenge levels among the activities was effective.

Figure 3: Educators rate how challenging activities would be for youth (n=12).

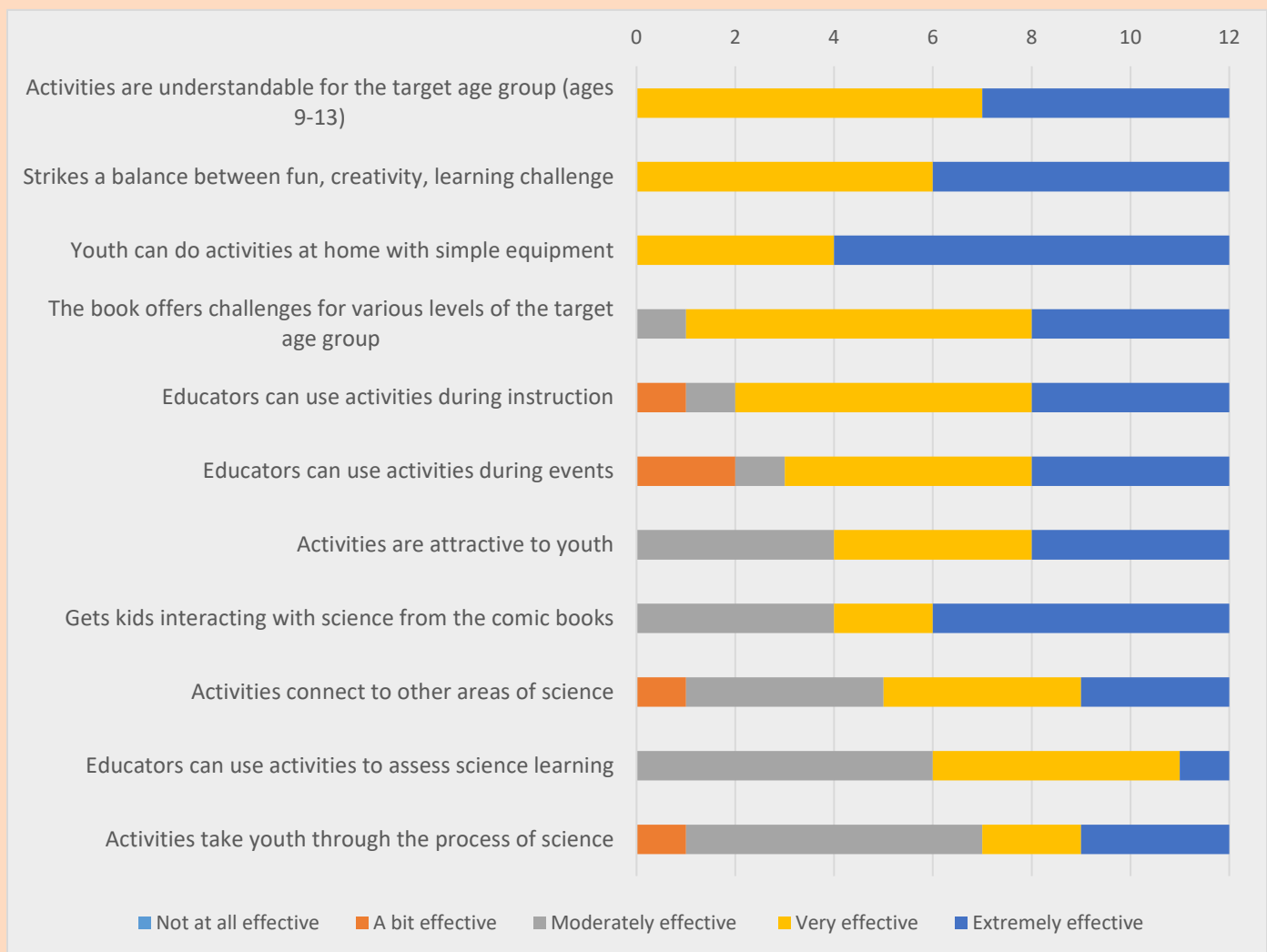


“Some of the activities like the word search, spot the difference, and color by numbers aren't very educational, but I still think they are useful and fun activities to have amongst other learning activities.”
~ anonymous educator

Reaching towards its goals

Educators thought the activity book was effective in addressing its goals for accessibility, usefulness at events, attractiveness to youth, and youth interaction with science from the comic books. Most thought activities were designed so youth could do them at home with simple equipment. Ratings were mixed about how well the activity book brought youth through the scientific process, which the Galaxy Scouts comic design team plans to focus on when developing upcoming comic books.

Figure 4: Educators rate how effective the Galaxy Scouts activity book was in meeting its goals (n=12).



EQ2. Engage: In what ways did the activity book attract and hold youth attention?

- ❖ The design of the book attracts youth.
- ❖ The activities are interesting for youth and they want to try out more.
- ❖ The Galaxy Scouts website is attracting attention.

Attractive

Educators thought the front and back matter of the book was attractive, clear, and informative. They noticed these attractive aspects of the book:

- Colorful, bright, eye-catching, friendly art and images; diverse characters.
- Bios in the back show who was involved and what their job is.
- Writing uses kid-friendly language.
- The mission statement answers the 'what,' 'why,' and 'how' precisely.
- The back matter clearly explains to whom and where to send questions.

"The illustrations were bright, vibrant, and eye-catching. The back was well-done. The kids loved learning about each of the people who helped create it." ~ anonymous educator

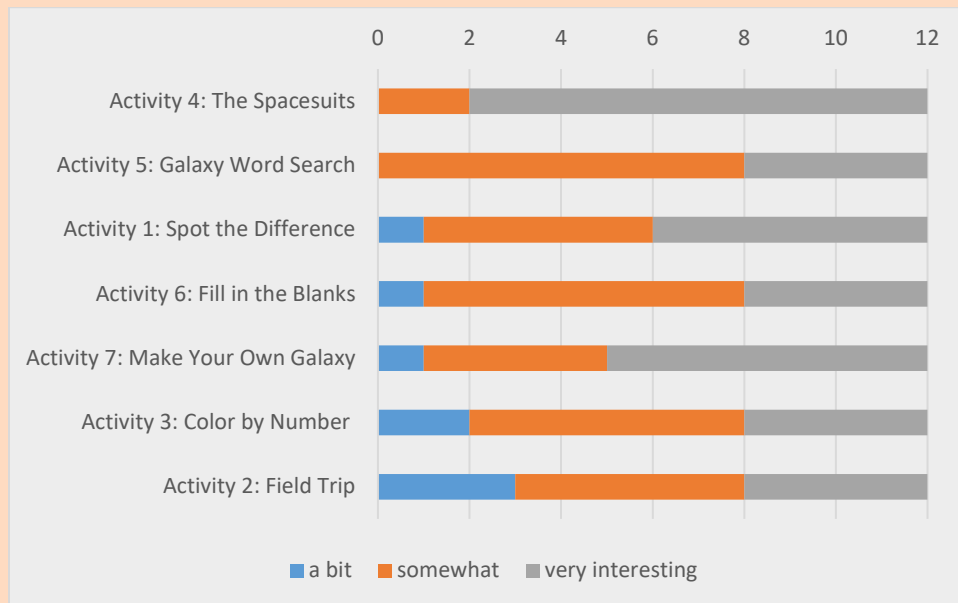
"I thought the cover looked interesting and fun. I like the diversity of the characters. With regards to the bios in the back, I thought it was cool to see who was involved and what their job is. It is written in kid-friendly language which is good too." ~ anonymous educator

Interesting

Educators rated how interesting each activity in the activity book would be interesting for youth.

- All indicated that two activities, Activity 4: The Spacesuits and Activity 5: Galaxy Word Search, would be somewhat or very interesting.
- More mixed ratings came from educators for Activity 3: Color by Number and Activity 2: Field Trip.

Figure 5: Educators rate the extent to which each activity would be interesting for youth (n=12).



Youth feedback in numbers

Youth tested some of the activities before they were published in activity book #1.

202

202 youth who visited the UW Space Place tested activities.

7

These youth were from seven different school groups.

6

They tested six activities: Coding, Maze, Word Search, Fill in the Blank, Pack for a Field Trip, and Draw My Own Space Suit.

80%

Most youth (80%) said they "liked" or "loved" the activities. Almost all said they would like to do more activities like the one they tested.

500

More than 500 youth took copies of activities from events they attended, so they could try them at the event or do them at home.

EQ3. Activate: Did the activity book activate youth science learning?

❖ The activity book was generally effective in activating science learning.

When asked to give an overall rating, educators indicated they thought the activity book was effective in activating science learning.

Ratings from educators (N=12)	Count
Not at all effective	0
A bit effective	0
Moderately effective	5
Very effective	6
Extremely effective	1

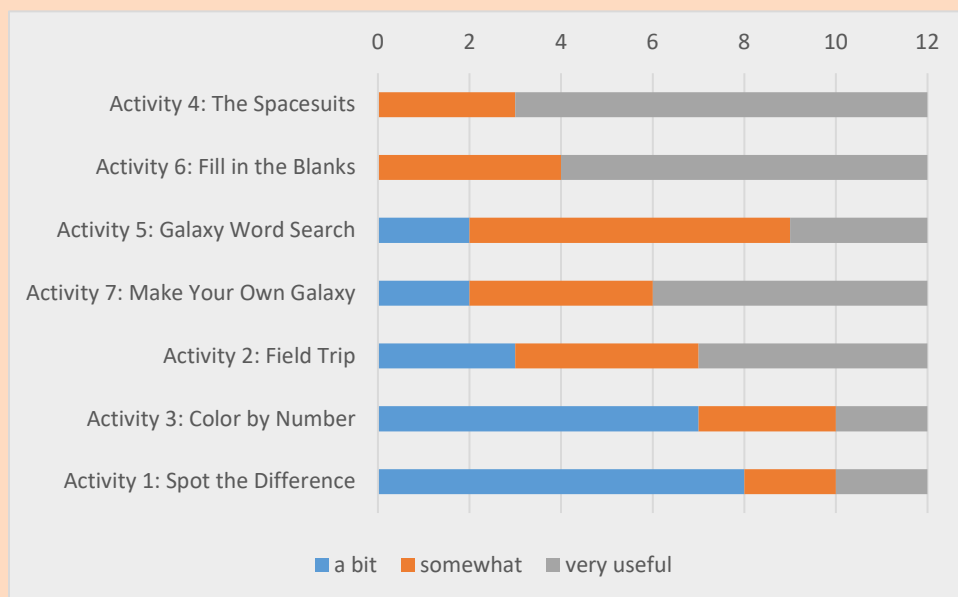
Table 2: Educators rate the overall effectiveness of the activity book for activating science learning.

EQ4. Instruction: Would the activity book support science education instruction?

- ❖ Most activities would be useful with science education programs.
- ❖ Many activities are designed for a self-motivated learner.

Educators indicated that most activities in the activity book would support science education program instruction. For two activities, Activity 3: Color by Number and Activity 1: Spot the Difference, ratings were more mixed.

Figure 6: Educators rate the usefulness of activities for program instruction (n=12).



“I think that with guidance this book does work well to spark curiosity and engage learners. It seems that on its own, many of the activities appeal to intrinsically motivated students.”

~ anonymous educator

“Many activities were designed for self-motivated youth learners and instructors.”

~ anonymous educator

Website analytics

In spring 2024, the Galaxy Scouts team started tracking visits to early versions of its website, <https://galaxyscouts.wisc.edu/>. Data show a slow but steady increase in the number of visits and downloads, which we assume are primarily educators and parents.

Right now, two comic books and two activity books are available as flip books on the Galaxy Scouts website. (See the names and covers of each book in Appendix C.) All who have a computer may download these as .pdf files.

In the future, one way the Galaxy Scouts team hopes that more educators will access comic and activity book materials is through the website.

	Users	New Users	Downloads
March 2024	43	40	11
April 2024	30	28	7
May 2024	19	15	15
June 2024	21	19	11
July 2024	34	33	20

Table 3: Analytics for the Galaxy Scouts website, March – July 2024.

References

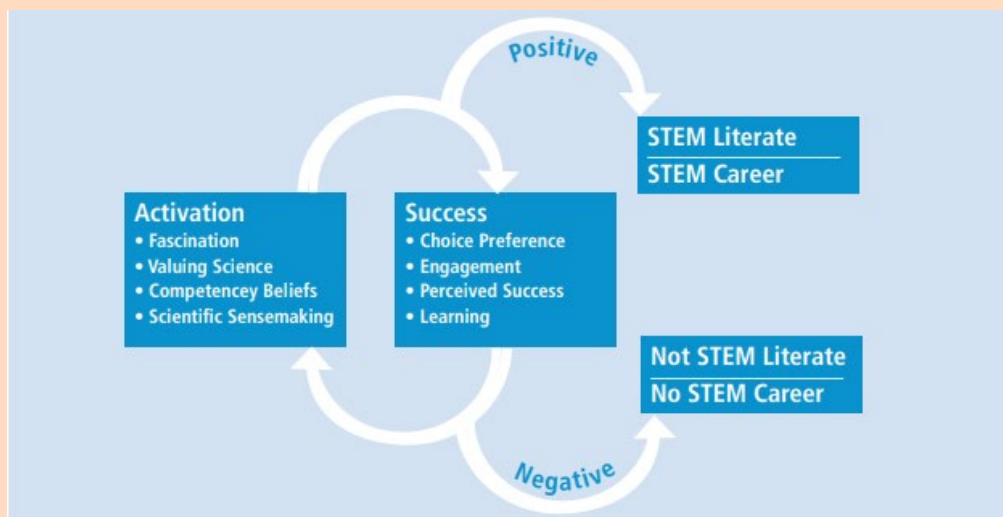
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Appendix A: What does it mean to activate science learning?

The Galaxy Scouts education-design team looks at 'science activation' as a framework that guides their work. Science activation focuses on students having successful experiences with science that motivate them to return to science again and again, making them science-literate citizens and opening opportunities for them to explore interests in science and technology careers.

“Activated science learners have the resources to be successful when they engage with science. This success makes them more activated, which makes them more likely to engage with science and be successful, which leads to more activation, and so on. This feedback loop is the heart of why activation is important. Learning experiences that increase science learning activation can encourage youth to follow pathways to science.” ~ from Dorph, Schunn, & Crowley, 2016.

Figure A-1: Science Learning Activation Framework from Dorph, Schunn, & Crowley, 2016.



The Galaxy Scouts comic book series aims to give youth chances to interact with science concepts and the scientific process. To do this, the activities should introduce youth to the science process and enable youth to have successes with it. For more about what it means to be an activated science learner, and how some educators describe this using four or five dimensions, look at this [summary](#), this [technical report](#), or this [research paper](#).

Appendix B: Galaxy Scouts Team

The Galaxy Scouts team is a group of artists, academics, and outreach educators.

Snežana Stanimirović is a professor at the University of Wisconsin-Madison who studies how molecules and stars form in the interstellar medium. She is the creator of and an advisor for the comic.

Rebecca Cors is a social scientist and evaluator at WCER who studies how people learn about, and co-exist with, science and nature. She is the Galaxy Scouts evaluator and an advisor for the comic.

Kay Kriewald is an outreach specialist at the University of Wisconsin Space Place in Madison. She is the field tester and an advisor for the comic.

Amy Gaeta is a social science researcher, practicing poet, professional editor, and disability rights activist. She's the editor and proofreader for the comic.

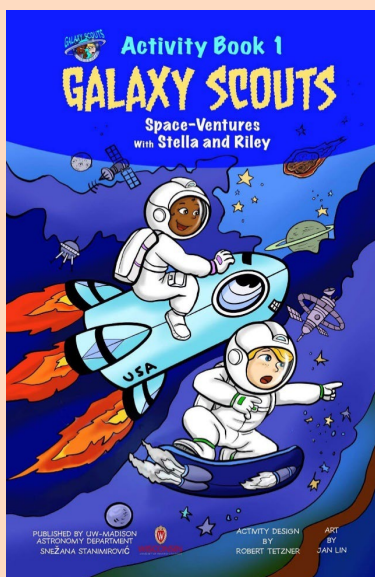
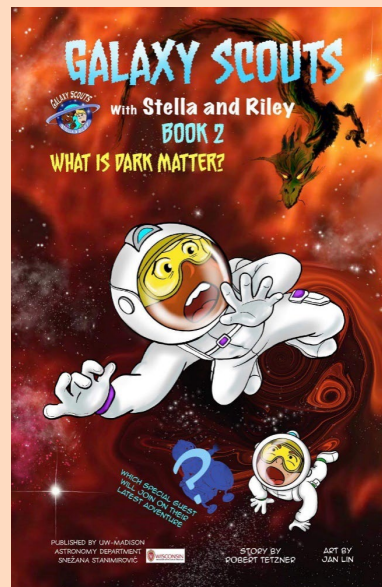
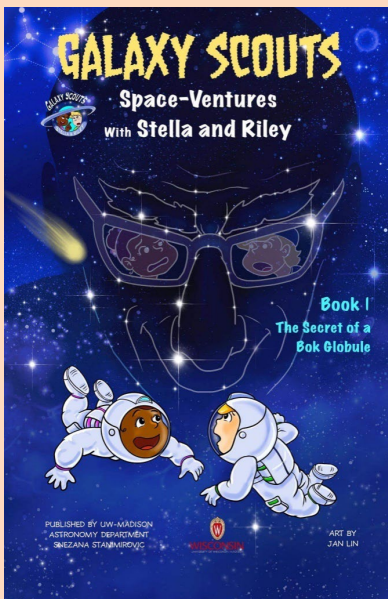
Jan Lin has illustrated many children's educational books in Taiwan. She is the illustrator and art director for the comic.

Robert Tetzner is a director of an ESL school in Taiwan. He also writes and illustrates children's books and magazines. He is the chief writer and activity designer for the comic.

Sophia Didier works at UW-Madison and is the manager of the Galaxy Scouts website.

Appendix C: Galaxy Scouts Comic and Activity Books

To enjoy Galaxy Scouts now, go to its website at <https://galaxyscouts.wisc.edu/>, where you will find two comic books and two activity books. All can be viewed online as flip-books and all are in a downloadable .pdf format.



Appendix D: Distribution of Individual Activities at Outreach Events

In spring 2024, the Galaxy Scouts team started bringing copies of three activities – Color by Number, the Maze, and Hidden Objects - to outreach events. Table D-1 below shows that they distributed more than 500 copies of these activities.

Color by Number				Maze				Hidden Objects						
date	location	group age	# copie	date	location	group age	# copies	date	location	group age	# copie			
03/08/24	UW Space Place	3rd grade	15	03/08/24	UW Space Place	3rd grade	20	03/08/24	UW Space Place	3rd grade	5			
03/09/24	UW Space Place	6-10 yrs	12	03/09/24	UW Space Place	6-10 yrs	16	03/09/24	UW Space Place	6-10 yrs	0			
03/16/24	UW Space Place	6-10 yrs	32	03/16/24	UW Space Place	6-10 yrs	45	03/16/24	UW Space Place	6-10 yrs	16			
03/23/24	UW Space Place	6-10 yrs	5	03/23/24	UW Space Place	6-10 yrs	12	03/23/24	UW Space Place	6-10 yrs	4			
03/30/24	UW Space Place	6-10 yrs	6	03/30/24	UW Space Place	6-10 yrs	16	03/30/24	UW Space Place	6-10 yrs	12			
04/13/24	UW Space Place	5-11 yrs	21	04/13/24	UW Space Place	5-11 yrs	35	04/13/24	UW Space Place	5-11 yrs	16			
04/20/24	UW Space Place	6-7 yrs	12	04/20/24	UW Space Place	6-7 yrs	11	04/20/24	UW Space Place	6-7 yrs	7			
05/04/24	UW Space Place	6-10 yrs	0	05/04/24	UW Space Place	6-10 yrs	0	05/04/24	UW Space Place	6-10 yrs	0			
03/09/24	Randall elementar	9-11 yrs	25	03/09/24	Randall element	9-11 yrs	25	03/09/24	Randall elemen	9-11 yrs	25			
03/09/24	Monroe art center	6-15 yrs	25	03/09/24	Monroe art cente	6-15 yrs	25	03/09/24	Monroe art cent	6-15 yrs	25			
04/24/24	Shorewood eleme	6-9 yrs	25	04/24/24	Shorewood elem	6-9 yrs	25	04/24/24	Shorewood eler	6-9 yrs	25			
			TOTAL=	178				TOTAL=	230				TOTAL=	135

Methodological notes:

- At the Space Place, we are copying these activities and handing them out to school groups and public programs. These are counts of how many youth took the activity sheets, but we do not know how many sheets were completed. Our observations show that the majority take the sheets with them. Some youth leave incomplete activity sheets at Space Place.
- At some Dane County outreach events, we made copies that some children took away. We estimated how many activities were taken by children.
- For elementary school events, copies were provided with some additional hands-on activities. Most kids took copies home. Some leftover copies were given to the Monroe Arts Center for their coloring table in the waiting room.

Table D-1: Log of outreach events at which the Galaxy Scouts team distributed copies of activities.

Appendix E: Fact Sheet

Information about the Galaxy Scouts Comic Book Series

May 2022

WHO ARE WE?

We are a team of scientists, artists, and educators from the University of Wisconsin, Madison. You can find more about our science education and Galaxy Scouts comic book series at

<https://galaxyscouts.wisc.edu>. This project was funded by the Research Corporation for Science Advancement, the National Science Foundation, and the UW Baldwin fund.

- Our overarching goal is to improve societal literacy about STEM (Science, Technology, Engineering, Math) disciplines.
- We want to share the excitement and importance of STEM discoveries and questions with youth.
- Making science accessible to all people and inviting them to consider themselves as potential scientists are core goals.
- To do that, we are developing comic strips about the space adventures of Stella and Riley that involve cutting-edge STEM topics to engage young students in science learning and discovery. In the future, we plan to develop activity books to accompany each comic book.

WHY ARE WE PRODUCING THESE COMIC BOOKS?

Studies have shown that introducing scientific concepts in an interesting, age-appropriate way is essential to spark students' interest in science and promote long-term engagement with science. Elementary and middle school, when many young people identify their core interests and abilities, is a prime time to encourage youth interest in STEM areas. We want to demystify science and break down common stereotypes used in many layers of society by:

- Featuring innovators and scientists from diverse backgrounds, offering role models for all young people.
- Emphasizing the importance and beauty of scientific discovery through a variety of 'windows,' such as solving problems, helping others, teamwork, being curious, and exploring the unknown.
- Presenting materials appropriate for various age levels.

WHY ARE WE ASKING FOR YOUR IDEAS?

We need your feedback to understand how to formulate stories that will be interesting and inspiring to all people, especially middle school-aged youth. We want to:

- Show how science is part of our everyday lives and, sometimes, our careers.
- Create comic characters and adventures that are interesting and enjoyable to read about.
- Make science explanations clear and simple so that everyone can understand.

HOW WILL WE USE THE INFORMATION FROM THE EVALUATION? WHO WILL BENEFIT?

Your responses will help us understand your experiences with the comic strip. This will enable us to improve how fun and interesting the comic book stories are and make the presentation of the characters and scientific ideas more accessible for everyone. You will not benefit directly from participating in the evaluation. However, constructive feedback will lead to a better quality of future comic strips, which you and others may read.

*If you have any comments or questions about the project, please contact Professor Snežana Stanimirović,
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