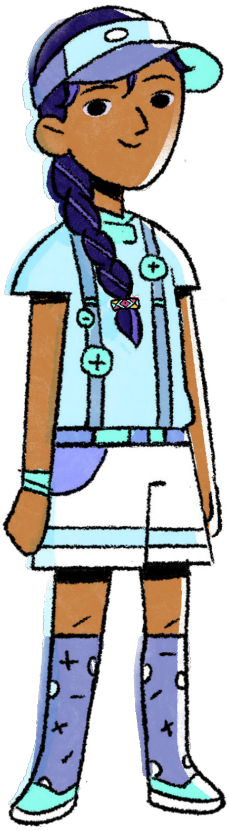
DODGEBALL FISSION

Background: This activity accompanies the Spark Squad Volume 3 Nuclear comic book. Students should have the opportunity to read or listen to the story, including the Spark Squad Intro Video provided. This volume has the Spark Squad determined to qualify for the regional Power Fair by collecting enough joules (power measures) to make them eligible. The Spark Squad introduces a new character, Dakota, who will help the Spark Squad learn about nuclear power and find success in qualifying for the power fair!

Key Vocabulary

- ❑ Chain reaction
- ❑ Critical Mass
- ❑ Data
- ❑ Fission
- ❑ Joule
- ❑ Neutron
- ❑ Nucleus
- ❑ Nuclear reaction
- ❑ Power
- ❑ Renewable energy
- ❑ Spent nuclear fuel
- ❑ Variable
- ❑ Uranium



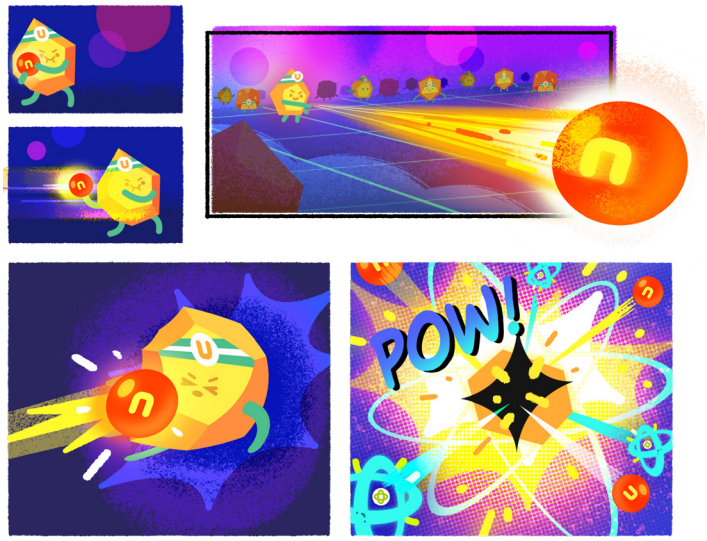
Materials

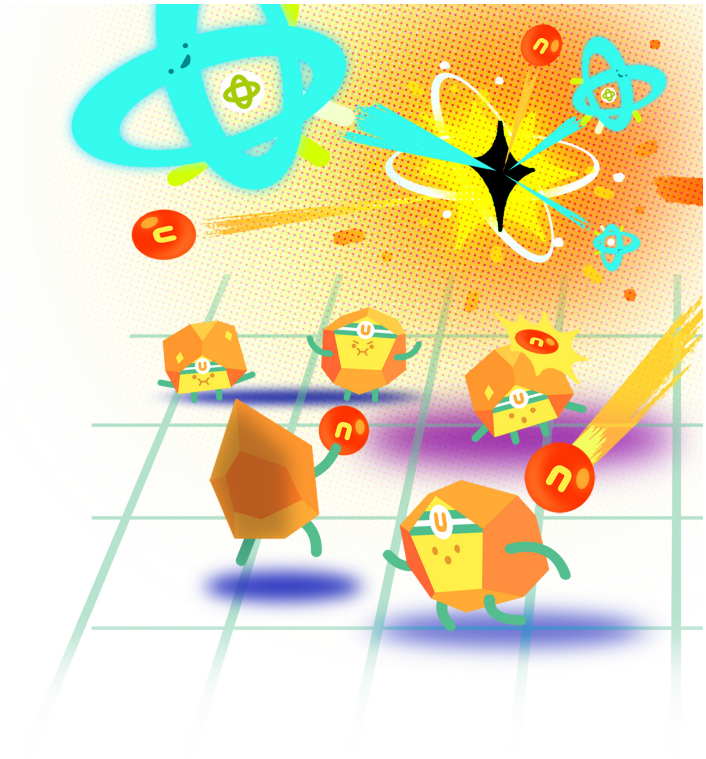
- ❑ Small rectangular blocks (such as dominos, building blocks). Students can use their imaginations and suggest other items that might be used.
- ❑ Flat, smooth surface to set up the chain reaction such as a table or the floor.
- ❑ Data sheets provided (Dodgeball Arena)
- ❑ Ping Pong Balls or recycled paper wadded into spheres (2-3 per student)
- ❑ Uranium paper headbands — one per student, U-235 character provided (optional)

Warm-Up Activity: Students (groups of two or four) will design their own chain reaction using small rectangular objects. Some suggested items are dominoes, building blocks, or any light, uniform weight, rectangular item. Show students an online video (there are many available on YouTube) of an example of a reaction using dominoes to cause a chain reaction. Have students use the items they have chosen to demonstrate a chain reaction, and make sure they document their variables in the reaction on the Dodgeball Arena Data Sheets provided.

You can suggest how many blocks they can use, how the reaction varies when more are used, and how the reaction changes depending on the types of blocks that are used. Provide students with time and freedom to explore all variables and collect their data.

Dodgeball Arena Data Sheet: Which variables affected the number of dominoes that fell pushing one domino? Does it matter how far apart the blocks are placed? Does it matter how many dominoes are used? How many blocks fall with each try using only one push on the lead object? Each iteration (change) can be noted by drawing a sketch of what the students have done or what they changed. Have students come back together as a large group and share results. Consider compiling data from all the groups and ask students if they can see any patterns. Students can also calculate averages from the data and compare their results to the average.

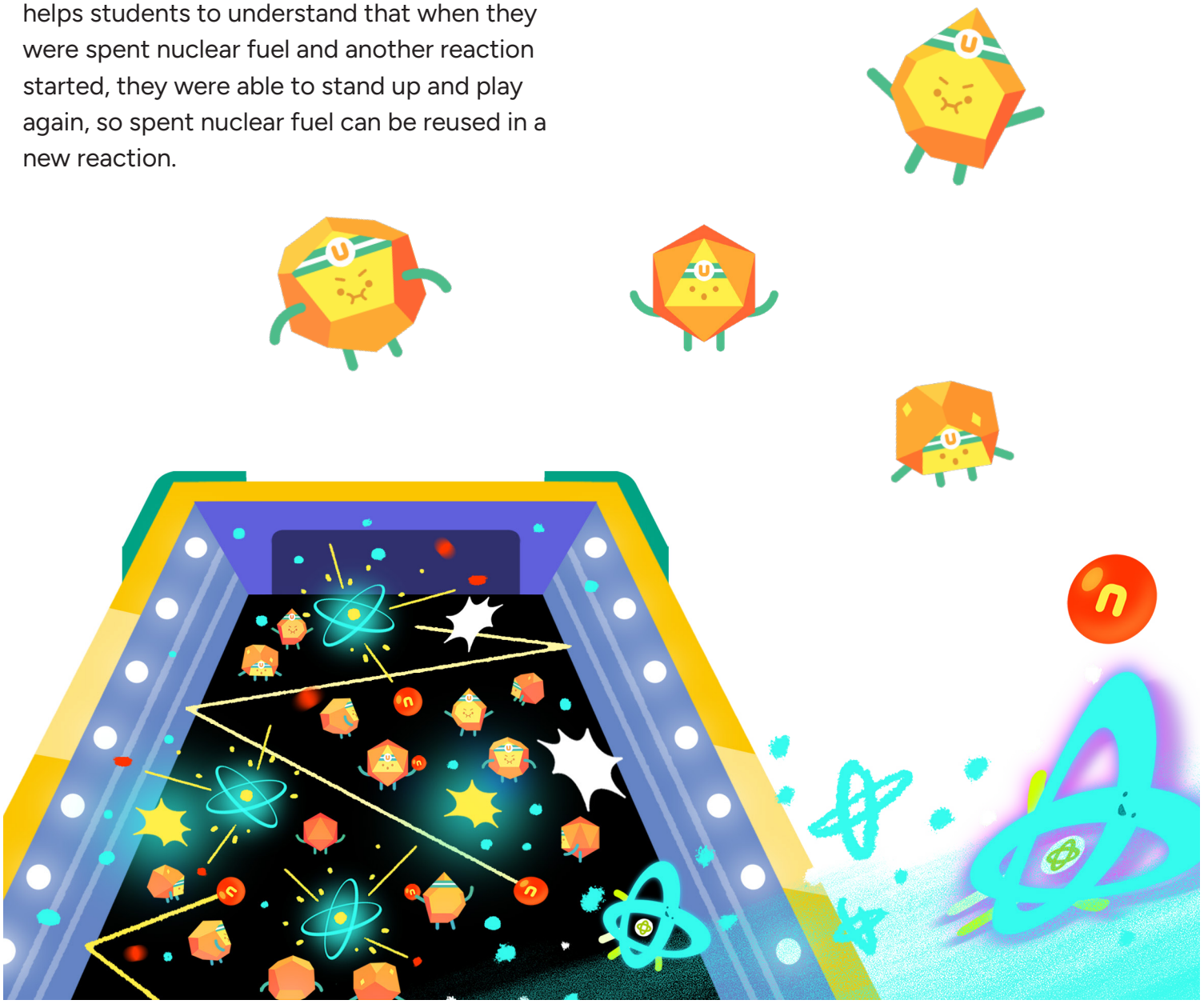




Student Participation Demonstration of a Chain Reaction: Now that students have designed their own chain reactions in small groups, they will participate as a large group in one big chain reaction. This activity can take place in a room (you may want to move the chairs or desks to the walls) or a space outside with grass or soft surface. (If you have provided the Uranium headbands, students can put them on their heads.) Each student is now a Uranium atom and will have 2 or 3 neutrons (ping pong balls or paper balls) in their hands and stand together in a group. The educator or leader will begin the chain reaction (dodgeball game) by tossing a neutron into the group. If a Uranium atom (student) is hit by a neutron, they

fission (split)—tossing their spheres randomly to the group causing other Uranium atoms to split. Once a Uranium atom splits and tosses their neutrons, they sit on the ground as spent nuclear fuel. The reaction is over when there are no more neutrons being tossed. Was everyone sitting? If not, did it make a difference where the Uranium atoms were standing? There needs to be a critical mass (Uranium atoms close together) to allow the chain reaction to continue. You can perform this group activity multiple times, demonstrating the different variables to students and having them suggest how they might change the reaction. This also helps students to understand that when they were spent nuclear fuel and another reaction started, they were able to stand up and play again, so spent nuclear fuel can be reused in a new reaction.

Activity Wrap Up: As a final wrap up and discussion of this activity, you might have students compare their data sheets and discuss critical mass in the context of their small-scale chain reactions. Have students view the Spark Squad Video again and revisit the comic book to point out key terms (below). Students may also want to research definitions for each key term. How was each of the reactions they participated in similar? How were they different? How did the changing conditions change the reaction?



DATA AND NOTES

Spark Squad Dodgeball Fission Activity

Uranium Headbands

FRONT OF HEADBAND

EXTRA HEADBAND LENGTH PIECES