Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 1 - Structures in Our Neighborhood
Page No. in Guide: 44-49

Name of Cooperative Learning Structure: Pairs Compare
Page No. in Cooperative Learning by Spencer Kagan: Pairs Check 10:5

At what point in the lesson was this structure used?
Session 1 - Neighborhood Walk

Materials Needed Per Team: paper and pencil

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Lesson Format:

1. Lead statement or question:

   Students work in pairs. They observe structures together and keep one record sheet of their observations. When all pairs have finished, the pairs compare their information with another pair, adding any new ideas.

   Move on to the next structure. Repeat the procedure but this time when it is time for pairs to compare, have students pick a new pair to team up with. Repeat at each structure visited.

2. Basic steps to implement lesson.

   Have students switch being the recorder for each box on their charts or when they go to a new structure. This will ensure individual accountability and equal participation. If each partner uses a different colored pen or pencil, you can tell who wrote which section.
Before moving to the next structure, have students share their observations with the group. Discuss differences and similarities of structures.

3. **Helpful hints:**

   - Add one idea, then pass paper to next team mate, add and pass, continue until time is up.

   - When time is up, have a team tell one of their ideas, if no other team had that idea they get 1 point. Go around sharing ideas and recording points. Or you may want to eliminate the point system and simply have teams update their lists to include any new ideas shared.

   - As ideas are given, record them on a class idea chart.
Cooperative Learning Structures for Structures

Science Lesson Title: **Learning Experience 2 - Why Do Structures Stand Up?**
Page No. in Guide: 73 - 77
Name of Cooperative Learning Structure: **Round Table**
Page No. in Cooperative Learning by Spencer Kagan: **10:12**

**At what point in the lesson was this structure used?**
This structure was used at the beginning to introduce the concept and generate ideas.

**Materials Needed Per Team:**
1. 1 piece of construction paper (light color)
2. 1 marker or pen

**Domain Addressed:**
- Classbuilding
- Teambuilding
- Mastery
- Thinking Skills
- Communication Skills
- Information Sharing

**Lesson Format:**
1. **Lead statement or question:**
   "Why do structures stand up?"

2. **Basic steps:**
   Have one person from each team record the question in the center of a piece of construction paper.
   "Why do structures stand up?"

   Tell students they will be comparing answers in 2 minutes and the team with the most ideas that no other team came up with will be the winners. (This is similar to the game Scategory. Or you may want to eliminate the team competition in order to promote the cooperative nature of this structure and give class points instead.)

**Begin Round Table**
Students take turns writing their ideas on the one team web page. The first student writes one response and passes it to the next student. The paper goes around the table until all have run out of ideas or the teacher calls time.
Stand and Share - record ideas

Create one large idea-web as the ideas are shared
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 3 - Making a Structure
Page No. in Guide: 88 -92
Name of Cooperative Learning Structure: One Stray, Three Stay
Page No. from Cooperative Learning by Spencer Kagan: 12:6

At what point in the lesson was this structure used?
Introduce prior to the group building time. During the lesson I called out a different number to stray about every 15 or 20 minutes.

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Lesson Format:

1. Lead statement or question:
"Many construction firms hire consultants, to give advice and share ideas during a project. Today we're going to use a structure called One Stray, Three Stay in which some of you will work as consultants to gather information for your team."

"While your team is building, I will spin and call a number. If your number is called you become the consultant for your team. You are to walk around the room, observing the structure techniques you see other teams using in their structures. Spend about a minute at each building site. Take notes. Then go back and report to your team what you have observed."

2. Basic steps to implement lesson:

Explain that when consultants are called in on a building project, they often research the project by looking at what works in similar construction projects.

If time allows give each member a chance to be the consultant.

3. Helpful hints:
The lesson in the guide asks students to take on specific roles and work in cooperative groups. Using this structure gives the students the experience of reporting back to the team, like an independent consultant. It also is a way of sharing building techniques without students complaining about copying.
Cooperative Learning Structures for Structures

Science Lesson Title: **Learning Experience 4- What it Feels Like to be a Structure**  
Page No. in Guide: **101 - 106**

Name of Cooperative Learning Structure: **Formations**  
Page No. in Cooperative Learning by Spencer Kagan: **9:11  Formations: #1 Geometric Forms**

**At what point in the lesson was this structure used?**  
Begin the lesson with this activity.

**Materials Needed:**  
Dry erase or chalk board can be used to draw the shape  
or  
Pictures of the shape or building

**Domain Addressed:**

- Classbuilding
- Teambuilding
- Mastery
- Thinking Skills
- Communication Skills
- Information Sharing

**Lesson Format:**

1. **Lead statement or question:**  
   "Today you are going to discover what it feels like to be a structure."

2. **Basic steps:**

   Show, draw or name a three dimensional form. Tell the students that in order for the form to be complete, all members must be joined and part of the structure. Have teams get into the form as quickly as possible. Ask, "In what parts of your body do you feel tension or compression?" Show next shape.

   Start with forms that have 4 corners, so teams of 4 can easily involve all members.

**Possible Forms:**  
A square house with a pointed roof
A cylinder shaped tower - Peachtree Plaza, Atlanta, GA.
Arch - Gateway Arch, St. Louis, MO.
The King Dome
The Washington Monument

3. **Helpful hints:**

- I started with a picture of an Egyptian Pyramid. You could also use from the math manipulative the geometric blocks, or draw the shape on the board.

- The lesson in the guide suggests students work in pairs. I chose this activity as a warm-up to introduce the lesson and to enhance team-building.

- Sources for Pictures:
  Old Silver-Burdett Math Series, Poster from 5th grade Level called The Sky’s the Limits, books on building.
Cooperative Learning Structures for Structures

Science Lesson Title: **Learning Experience 5: Live-Load Challenge**

Page No. in Guide: **123-130**

Name of Cooperative Learning Structure:

The Cooperative Structure lesson designers believe that Lesson 5 is written in a cooperative format and does not need the addition of a Kagan Cooperative structure.
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 6: Frameworks
Page No. in Guide: 149-162
Name of Cooperative Learning Structure: Think-Write-Roundrobin
Page No. in Cooperative Learning by Spencer Kagan: 15:16

At what point in the lesson was this structure used?
Teaching Sequence, “Exploring and Discovering,” page 151

Materials Needed: Paper, pencils

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Lesson Format:

1. Lead statement or question:
   Challenge the students to remove from their structures those straws that are not necessary to help it support itself and its live load.

2. Basic steps to implement the lesson:
   A. Present the challenge to the students.
   B. Give students “thin time”. Take one minute for this. No talking.
   C. At the end of the “think time” begin the Roundtable.
      State the challenge again.
      One of the students starts writing for the team. That student writes a response to the challenge then passes the paper to the next student.
      The second student responds to the challenge and passes the paper.
      The writing and passing continues until the teacher calls time.
   D. At the end of Roundtable, call on one student from each team to stand.
      Go around the room asking each team to share one idea from their list until all ideas are shared.
   E. Continue with the lesson as written in the manual.
3. **Helpful Hints:**

- Make sure each team member knows his/her team number.
- One piece of paper and pencil for each team is necessary.
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 7 “Card Construction”
Page No. in Guide: 163 -170

Name of Cooperative Learning Structure: Think Pad Brainstorming (variation of 4-S Brainstorming)
Page No. in Cooperative Learning by Spencer Kagan: 8:10 and 11:5 Smart Card #11

At what point in the lesson was this structure used?
Session One, p. 166, beginning of lesson

Materials Needed: Little sticky pads (one for each student)
Large chart paper

Domain Addressed:

Classbuilding  TeambuildingMastery
Thinking Skills Communication Skills Information Sharing

Lesson Format:

1. Lead statement or question:
Ask students to name as many building materials as they can.

2. Basic steps to implement the lesson:
Each team member should have a sticky pad and pencil.

Lead Statement: Name as many building materials as you can.
Each student writes as many responses to the lead statement as they can,
announcing the idea as they write. All ideas are placed in the center of the table.

At the end of a designated time, have students lay out all the slips of paper and sort the ideas into categories.
Share the categories/materials with the class, using the large chart paper.
3. **Helpful Hints:**

Make sure each team has assigned a Sultan of Silly, a Synergy Guru, a Sergeant Support and a Speed Captain.
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 8: Shapes
Page No. in Guide: 175 - 192

Name of Cooperative Learning Structure: Talking Chips
Page No. in Cooperative Learning by Spencer Kagan: 13:1

At what point in the lesson was this structure used?
Teaching Sequence, Session 1 “Getting Started”, page 178

Materials Needed: Chips

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Lesson Format:

1. Lead statement or question:
   "What are some of the best ways to use cards to make a structure?"

2. Basic steps to implement lesson:

3. Ask the lead question.

   If a student wants to talk, he/she must put a chip in the center of the table.
   A student may only speak while he/she still has chips.

   When all the chips are in the center of the table, students retrieve the chips and
   continue the discussion.
   Allow enough time for students to explore the question.

3. Helpful Hints:
• Make sure each person has an equal number of chips at the beginning of the discussion.
Science Lesson Title: Learning Experience 9: What It Feels Like to be a Structure: Tension & Compression Teaching Sequence

Page No. in Guide: 195-200

Name of Cooperative Learning Structure: Rotating Review
Page No. in Cooperative Learning by Spencer Kagan: 10:15

At what point in the lesson was this structure used?
At the top of page 109, the teacher explains that students will have a chance to explore tension and compression. Instead of having students fill out the Group Recording Sheets A-1 and A-2, pose the five challenges on separate charts around the room.

Materials Needed: 5 pieces of chart paper (1 piece for each challenge) divided into numbered sections for each team to draw their answer) blue, red, and green markers; 1 set per team (blue to show tension, red to show compression, and green to draw figures)

Domain Addressed:
Class building Teambuilding Mastery
Thinking Skills Communication Skills Information Sharing

Lesson Format:

1. Lead statement or question:
In teams, you will be using the questions located on each chart paper as a guide to explore tension and compression in your own bodies.

2. Basic steps:
A. Review the steps of Rotating Review for this lesson:
a. Challenges are described on the top of charts posted around room. Each chart is divided into as many numbered sections as there are teams.

b. Form teams of four. (If more than five teams, make additional posters.)

c. Teams each stand by a chart. Students have three minutes to read the challenge, explore the formation, and record their best ideas.

d. At each chart, three teammates will act out the challenge while the fourth acts as the artist, drawing a representative stick figure and recording the team's ideas about the forces. The artist should use the green marker for the basic figure, blue to show tension, and red to show compression in the numbered space provided for their team.

e. Teams then rotate clockwise to the next chart, choose a different artist, take one minute to review the previous idea(s), and three minutes to act out and record their own. (Subsequent teams to each chart should draw figures different from those drawn by previous teams.)

f. When teams have rotated back to their initial chart, allow a couple minutes for them to review all the possible answers.

3. Helpful hints:

- Students enjoyed acting out tension and compression situations, and the challenge of finding solutions different from those of other groups. However, the timing may need to be adjusted to meet your students' needs. The first teams to each chart may finish early while subsequent teams may need more time to think of ideas not yet recorded.
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 10 - Tension and Compression: Triangles
Page No. in Guide: 218

Name of Cooperative Learning Structure: Consensus Seeking
Page No. in Cooperative Learning by Spencer Kagan: 13:5

At what point in the lesson was this structure used?
On page 225, where students “continue by using no more than four straws to strengthen the shapes as much as possible”.

Materials Needed: Kit Materials

Domain Addressed:
Classbuilding    Teambuilding    Mastery
Thinking Skills  Information Sharing  Communication Skills

Lesson Format:

1. Lead statement or question:
   Challenge each team to strengthen the shapes they constructed in the previous lesson as much as possible using no more than four straws.

2. Basic steps:
   A. Students work in teams of four.
   B. Review how the Consensus Seeking structure works:

   • Team members are simply instructed to find the best solution to which they can all agree.
   • Give each team four straws.
   • Tell teams they may not use any straw or piece of straw until all members of the team agree on where it should be placed on the triangle or square. If one student in the group insists that a straw be used in a certain way, he or she must convince the rest of the group.
   • Continue with the rest of Lesson 10.
3. **Helpful hints:**

- Structures Learning Experience 10 already utilizes cooperative learning to a high degree. Although this structure is a very simple addition to the lesson, it does prevent some students from dominating the task, allowing others to have a say in how the straws are used, thus heightening accountability.
Cooperative Learning Structures for Structures

Science Lesson Title: Learning Experience 11 - Building Bridges Teaching Sequence
Page No. in Guide: 242

Name of Cooperative Learning Structure: Three Stray, One Stay
Page No. from Cooperative Learning by Spencer Kagan: 12:6

At what point in the lesson was this structure used?
After groups have completed building their bridges.

Materials Needed: One sheet of chart paper taped at the front of the room.

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Lesson Format:

1. Lead statement or question:
2.
    "Now that your groups have completed building bridges, your challenge is to share certain information about your bridge with other groups." (Refer to questions written on chart paper. See below.)

2. Basic steps:

A. On chart paper, write the following questions:

What were the factors taken into account when designing the bridge? Did you have any problems in construction? How did you solve them? Where do you think there is tension/compression when the live load is added? Why did you choose to use cards or straws where you did?

B. Teams gather at tables or groups of desks with their bridges and discuss how they will respond to each question during their presentations.
B. Review steps of the Three Stray, One Stay structure for this lesson:

   a. Students within teams number off 1-4.

   b. Students 2, 3, and 4 rotate clockwise to another table, while Student 1 stays to explain the bridge to visiting group members. Student 1 refers to the chart questions to ensure the presentation is thorough.

   c. After 5 minutes, groups rotate. Student 1 joins 3 and 4 to hear another presentation while Student 2 goes back to his/her team's bridge to explain it to the next group.

D. Continue rotating in this manner until all team members have visited each structure.

3. **Helpful hints:**

   - You may need to vary the amount of time allowed for presentations to meet the needs and interests of your students. Utilizing this structure can save time instead of having each team present its bridge to the whole class. However, it can also take more time if students want to ask a lot of questions to the presenters.

   - This structure motivates students to be engaged in the process of listening to fellow students and to be knowledgeable enough to share information with a small group.
Cooperative Learning Structures for Structures

Science Lesson: Learning Experience 12-The Second Tour: What Do You See Now?
Page No. in Guide: 260

Name of Cooperative Learning Structure: Roundtable
Page No. in Cooperative Learning by Spencer Kagan: 8:9

At what point in the lesson was this structure used?
Page 263, after students have filled out individual worksheets recording examples of tension, compression, columns, beams, trusses, and materials used in structures around their neighborhood. This cooperative structure will take place as students complete a group recording sheet.

Materials Needed: (1) Group Recording Sheet, page 1 for each team

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Lesson Format:

1. Lead statement or question:

   Using your individual worksheets from the neighborhood walk, your team is now going to decide what information to transfer to the Group Recording Sheet page 1, using the Roundtable structure.

2. Basic steps:

   Group students into the same teams used for the neighborhood walk.
   
   Distribute Group Recording Sheet, page 1.
   
   Review the Roundtable structure for this lesson:
A. Team members pass around Group Recording Sheet, page 1, with each team member adding one example to the list, then passing it on to the next person.

B. If a group member disagrees with information written by a team member, he/she places a question mark next to the information, and the group immediately votes whether or not it should be included.

3. **Helpful hints:**

- You may want to make copies of each team’s recording sheet so all team members will have one for their science notebooks.

- You may want to form teams from students who were not in the same group during the initial neighborhood walk.
Science Lesson Title: **Learning Experience 13: Creative Playground Construction**

Page No. in Guide: **277-286**

Name of Cooperative Learning Structure: **4S Brainstorming**

Page No. from Cooperative Learning by Spencer Kagan: **11:5, 8:10**

**At what point in the lesson was this structure used?**
After individual students have filled out the Science Notebook Page and are given time in their groups to share ideas and develop a group design for a playground structure. The purpose of this structure is to brainstorm ideas/designs prior to construction. (See top of page 283.)

**Materials Needed:**
(1) Science Notebook Page worksheet per student
(4) gambit chips for each role: Speed Captain, Super Supporter, Chief of Silly, and Synergy Guru

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**Lesson Format:**

1. **Lead statement or question:**
Challenge groups to brainstorm ideas for creating and constructing an interesting, useful, attractive, and strong structure, for inclusion in a model playground. Remind students to consider function, available materials, and safety when designing their structure.

2. **Basic steps:**
   A. Allow individual students five minutes to fill out the “Science Notebook Page” worksheet.
B. Review the structure, “4S Brainstorming”, for use in this lesson:

Make sure students understand the roles of “Speed Captain” (keeps the activity moving in a timely manner), “Super Supporter” (makes sure all ideas are accepted and praised), “Chief of Silly” (helps the flow of creative ideas by encouraging ‘silly’ ideas), and “Synergy Guru” (encourages teammates to build on and improve each other’s ideas).

These roles are in addition to their roles of architect, draftsperson, etc.

Place students in teams of four, and allow them to choose roles in their groups or assign a role to each student.

Distribute gambit chips.

Allow students sufficient time (5-10 minutes) to share individual ideas/designs and decide on one while using all their gambit chips.

3. **Helpful hints:**

- Ten minutes may not be enough time for some groups to share ideas and come to consensus on a design. Allow sufficient time for your students’ collective, creative ideas to flow.

- If it is necessary in some groups to have five team members, have two “Super Supporters” or “Synergy Gurus”.