# Jigsaw Jigsaw

### **Strategy Overview**

Many of today's most successful companies have rejected "cubicle culture" and instead restructured their workforces into self-managed teams. What these businesses have learned is that when employees collaborate in pursuit of a common goal, worker satisfaction, company morale, and productivity increase across the board. The same idea holds true in school: Students who are well versed in the skills of cooperative learning—skills like active listening, effective communication, consensus building, and conflict resolution—are better able to solve challenging problems, formulate clear and cogent opinions, and produce first-rate work. Moreover, as the workforce of the future, students who can understand and work effectively with their peers hold a significant advantage over students whose academic life is marked largely by independent seatwork.

In this chapter, we explore the strategy known as Jigsaw, a highly effective cooperative learning strategy. Jigsaw teaches research, communication, planning, and general cooperative skills by having students

- Join a "Jigsaw Team" comprised of three to five students, each of whom takes responsibility for becoming an expert in one aspect or subtopic of the content.
- Join an expert group to conduct research on their assigned subtopic.
- Work with their expert groups to develop a plan for teaching what they have learned back to the Jigsaw team.
- Collaboratively construct the "big picture" by teaching their subtopic to the Jigsaw team and learning about the other subtopics from other members of the Jigsaw team.

# The Strategy in Action

"Jigsaw is a real workhorse," says middle school science teacher Carl Carrozza:

It builds research skills. It builds communication and reporting skills. It builds interpersonal and cooperative skills. It allows students to acquire and master a large amount of information in a relatively short time. But what I've discovered over the years is that it's more than just a strategy for teaching a particular lesson. In fact, I like to design mini-units, say three to five days in length, around Jigsaw.

Carl is beginning one such mini-unit on reptiles. After an introductory activity in which students were asked to consider how a frog would need to adapt or evolve if it were to live on land (in effect by "becoming" a reptile), Carl delivers a New American Lecture on reptiles. The lecture is built on students' already-acquired knowledge of amphibians and, after a basic overview of reptilian characteristics, follows a comparative structure outlining the similarities and differences between reptiles and amphibians.

The next day, Carl explains to his students that they will be responsible for learning and teaching the key content of the rest of the unit using the Jigsaw technique. During the unit, students will seek answers to two essential questions:

- · What kinds of reptiles are there?
- · How do reptiles adapt to their environment?

Once he sets up his unit in this way, here's how Carl uses Jigsaw to implement the remainder of the unit:

- 1. First, he breaks students up into Jigsaw teams of four and provides each student with a general research organizer that divides the content into clear chunks (see Figure 15.1, p. 185). Carl then reviews the Jigsaw process with students, reminding them that each member of the team will become an expert in one major aspect of the content and will teach that aspect back to the Jigsaw team.
- 2. Carl then has each Jigsaw team decide which students will develop expertise in which topics. However, to ensure that experts do not conduct their research too narrowly by focusing on only one order of reptile and perhaps lose sight of the bigger picture of adaptation, Carl establishes the topics for expertise around each of the four adaptations. Thus, each member of the Jigsaw team becomes one of the following: a food expert, a temperature and water expert, a survival expert, or a child-rearing expert. This way, students have to search for relevant information across all four orders of reptiles.

- 3. Experts in each topic meet with the experts in the same topic from the other Jigsaw teams. Together, experts search for the relevant information and collect it on their experts' research organizer (see Figure 15.2, p. 186). Carl uses two different organizers because he has learned that the general grid organizer helps students see the content at a glance, but a separate, question-based organizer for the experts spurs students to go deeper in their search for answers. This organizer also keeps students focused on the ultimate goal of their research: presenting the answers they find back to their Jigsaw teams.
- 4. For their research, expert groups begin by consulting their text-books. However, Carl also talks with students about the potential short-comings of research driven by a textbook only, and he encourages students to consult a range of resources from around the room, including books, articles, and the Internet. After the expert groups agree that they have collected all of the necessary information, they develop a plan for teaching what they have learned back to their Jigsaw teams. As expert groups plan, Carl meets with the expert groups to help them develop sound and engaging plans that are organized around the big ideas and relevant details. Finally, all expert groups must submit three suggested test questions based on their topic—two short-answer questions and one constructed-response question that members believe captures the most important idea in their topic.
- 5. Experts return to their original Jigsaw teams. Experts take turns teaching their lessons to the members of the Jigsaw team, who record the information in the appropriate grids of their general research organizers (see Figure 15.1). During this "lesson day," Carl circulates around

FIGURE 15.1 General Research Organizer—Reptiles

|                             | Food | Temperature/<br>Water | Survival | Child Rearing |
|-----------------------------|------|-----------------------|----------|---------------|
| Lizards                     |      |                       |          |               |
| Snakes                      |      |                       |          |               |
| Turtles                     |      |                       |          |               |
| Crocodiles or<br>Alligators |      |                       |          |               |

FIGURE 15.2 Experts' Research Organizer—Reptiles

| Food Experts:   | Child-Rearing Experts:   |  |
|---|--|--|
| What kind of food is eaten and how is it caught?  | What are the patterns of reproduction, nesting, and child care?    |  |
| Lizards:  | Lizards:   |  |
| Snakes:   | Snakes:  |  |
| Turtles:  | Turtles:   |  |
| Crocodiles or Alligators:   | Crocodiles or Alligators:  |  |
| Temperature and Water Experts:  | Survival Experts:  |  |
| How are reptiles adapted to life on land? How do reptiles react and/or adapt to temperature variations? | What kind of defense is used by each type of reptile for survival? |  |
| Lizards:  | Lizards:   |  |
| Snakes:   | Snakes:  |  |
| Turtles:  | Turtles:   |  |
| Crocodiles or Alligators:   | Crocodiles or Alligators:  |  |

the room and observes the lessons in progress. After all of the lessons have been presented, Carl conducts a follow-up lesson in which experts are called upon to act as leaders in a discussion focused on the most important topics.

- 6. To complete the unit, Carl
  - tests students' understanding through a mastery test based on the expert groups' suggested questions. To ensure both individual and group accountability, Carl gives students an individual grade, Jigsaw teams a team grade, and bonus points to the expert group that did the best job of teaching its material (as revealed by all students' test scores). For example, A.J. received 89 points for his individual score; because A.J.'s Jigsaw team got the second-highest overall score, A.J. received another 2 points; and because the class as a whole "aced" the section of the test related to A.J.'s expert-group subtopic, A.J. received an additional bonus of 1 point. Group scores are posted on a leader's board at the front of the room.
  - $\circ$  holds a discussion in which students reflect on and evaluate the Jigsaw process and their own performance. In their Learning Logs, students record their thoughts and questions, and make suggestions to themselves for improving their performance next time.
  - gives students an opportunity to apply their new learning creatively and comprehensively by asking them to return to their

Jigsaw teams to complete a synthesis task involving a real-world context (e.g., Design a reptile that could live in a cold climate for the Natural History Museum's new exhibit teaching the public about adaptation).

# Why the Strategy Works

Of all the instructional methods teachers use in their classrooms, cooperative learning is probably the most thoroughly researched. Marzano, Pickering, and Pollock (2001) include it in *Classroom Instruction That Works* as one of the nine instructional methods proven by research to make a significant difference in student performance. Ellis and Fouts (1997) claim that, of all the educational practices backed by research studies, cooperative learning has the "best and largest empirical base" (p. 173). In addition, citing their meta-analysis of over 375 studies, Johnson, Johnson, and Holubec (1994) show that cooperative learning consistently yields higher levels of achievement than either competitive or independent learning.

The research backing cooperative learning is not only exhaustive; it is also eye-catching in terms of its benefits. Among the findings

- Cooperative learning leads to peer norms that promote academic excellence. This is critical because peer norms drive adolescent behavior (Slavin, 1995).
- Teachers that employ cooperative learning regularly report increases in student motivation, peer cooperation, and academic performance (Slavin & Cooper, 1999).
- Cooperative learning leads to increased student capacity for demonstrating high-level reasoning, generating new solutions, and applying learning in new contexts (Johnson & Johnson, 1999).
- Cooperative learning nurtures the development of peer relationships among diverse students (Johnson & Johnson, 1999).

Jigsaw is one of the most well-known and most effective of all cooperative learning strategies. In the original version of Jigsaw (Aronson et al., 1978), students work together in heterogeneous Jigsaw teams to learn content that has been broken up into chunks (for example, a primary teacher might break a lesson on seasons up into winter, spring, summer, and fall). Each member of the Jigsaw team is assigned one of these chunks to master. Members from each Jigsaw team who have been assigned the same chunk form expert groups that help each other learn (or research) the material and develop a plan to teach it back to their original Jigsaw teams. Experts then return to their Jigsaw teams and take turns teaching their area of expertise to the members of the team. For evaluations of learning, the teacher gives students a quiz, and grading is based on individual performance.

More recently, Robert Slavin (1986) developed Jigsaw II. Jigsaw II strengthens the connection between group effectiveness and individual performance by introducing a group reward structure. Students receive an individual grade and a team grade determined by adding the test scores of all members of each Jigsaw team. Team scores then serve as the basis for a competition among the Jigsaw teams. While both methods have been shown to improve students' self-esteem, relationships with other students, motivation, and academic performance, Jigsaw II tends to yield better results (Slavin, 1995). To get even better results, we also suggest giving a bonus score to some of the expert groups to promote quality teaching: When students perform well on the portion of the test that corresponds to an expert group's subtopic, it signals that members of the expert group have done a good job teaching its content back to the Jigsaw teams.

# **How to Use the Strategy**

- 1. Divide students into heterogeneous Jigsaw teams of three to five students each. Each Jigsaw team member will be responsible for one subtopic of the content. Provide an organizer that makes these subtopics clear.
- 2. Allow students from each Jigsaw team to meet with students from other Jigsaw teams who are responsible for the same subtopic.
- 3. Instruct the members of these expert groups to use the provided resources to conduct research on their subtopics. After individual research, expert group members assemble to review, discuss, and determine the most important concepts.
- 4. Work with expert groups to develop a plan to teach their subtopic back to the Jigsaw team, and have all expert groups draft a set of questions related to their subtopic for use on the test.
- 5. Reassemble Jigsaw teams. Have experts take turns teaching their subtopic while the other Jigsaw members record key information on their organizer. Circulate and observe these student-led discussions to ensure key ideas are being covered.
  - 6. Lead a discussion or follow-up session covering the entire topic.
- 7. Develop a quiz or test based on the questions submitted by expert groups. Provide students with two grades—an individual grade and a team grade (found by adding the test scores of all the members of the Jigsaw team). Provide bonus scores to any groups whose subtopic content was "aced" by the class. To increase the sense of competition, post team scores and provide recognition for high-achieving Jigsaw teams and expert groups.

# Planning a Jigsaw Lesson

In planning a Jigsaw lesson, you will need to consider the questions on the following pages:

- 1. What topics lend themselves to the Jigsaw format? Typically, Jigsaw lessons are designed around topics with three to five natural divisions or subtopics: the three branches of government, the four main parts of speech (noun, verb, adjective, and adverb), or the four major U.S. coins. Of course, many other creative divisions within any content are possible. For example, in order to teach students about the consequences of the American Revolution while working to develop students' skills in interpreting different forms of historical data, high school history teacher Sherry Gibbon developed a Jigsaw lesson around Howard Gardner's model of multiple intelligences (Gardner, 1999):
  - The *Eyes-On Team* studied a portfolio of maps (spatial intelligence).
  - The *Personal History Team* studied excerpts from diaries and personal biographies (intrapersonal, linguistic intelligence).
  - The *Policy Team* studied excerpts from policy documents (logical-mathematical, linguistic intelligence).
  - $\circ~$  The Accounting~Team studied tables, charts, and graphs (logical-mathematical, spatial intelligence).
  - The *Arts Team* studied representations of the war and its aftermath in the visual arts and poetry (spatial, linguistic intelligence).

Finally, in thinking about your topic, you will need to decide whether you are developing a basic one-period lesson, a mini-unit such as the one created by Carl Carrozza in The Strategy in Action section (see p. 184), or something in between.

- 2. **How much support will students need?** A class that has already demonstrated positive working relationships, supportive attitudes, and solid work habits will be ready to study a sophisticated, challenging topic. A class that needs work in these areas is probably better served by a carefully chosen topic with plenty of teacher modeling built into the process. For help in supporting students as they work through the challenges of working cooperatively, see The Cooperative Learning Troubleshooter's Guide in Figure 15.4, p. 193.
- 3. What resources will students need in order to gather the appropriate information? A simple Jigsaw lesson can be designed around a single textbook section or an article divided into sections. More involved lessons that stress research can involve multiple sources including texts, articles, primary documents, essays, visual materials, Web pages, and even hands-on learning activities that are set up as learning centers.
- 4. How will Jigsaw teams and expert groups be organized? In deciding on Jigsaw team and expert group membership, consider the particular strengths of individual students. Cooperative groups work best when they are composed of students who bring different talents (e.g., conceptualizing, creative thinking, organizing information, tending to details) to the learning process.
- 5. What kind of organizer will you design to help structure and organize student learning? The most typical organizer is a simple grid or

matrix that reveals the larger structure of the topic and gives the student room to write about each subtopic. However, many different organizer formats are possible. For some ideas, take a look at the sample organizers associated with New American Lecture (Figure 1.3, p. 30).

- 6. How will you ensure the quality of student lessons? Because students depend on other students to learn critical information, it is important that the lessons the students teach back to their Jigsaw teams are clearly organized and contain all the necessary information. Here are some tips for helping the expert groups plan and deliver high-quality lessons:
  - Create a separate research organizer or worksheet for each expert group like the one Carl Carrozza created for his lesson on reptiles (see pp. 184–187).
  - Meet with expert groups to make sure they have collected all the necessary information. Then, work with each group to develop a lesson. Provide suggestions, coaching, and examples from your own teaching.
  - Have the students in the expert groups generate and reach consensus on the one or two key questions their lesson must answer.
     Coach them through the process of aligning their lesson with their question(s).
  - Listen in on the lessons. Praise good teaching. For studentteachers who have trouble delivering the lesson, use focusing questions that point them to the main ideas and essential details.
- 7. How will you assess student learning and performance? In the improved version of Jigsaw known as Jigsaw II (Slavin, 1986), students are tested and the results are compiled in two ways. First, to ensure individual accountability, students will be given an individual grade. In addition, students receive a score based on the overall score of all the members in their Jigsaw team. This adds a competitive element to the lesson and motivates students to work as productively as possible with their team members. In designing your test, consider having the expert groups generate the questions. Finally, if your Jigsaw lesson is involved and carries a significant content load, you may want to design a synthesis task that requires students to apply their learning in a new context.
- 8. How will you help students process the lesson and their roles in it? One of the most important aspects of a strategy like Jigsaw is its hidden goal of helping students learn how to learn. Be sure to give students time to discuss and reflect on the process using questions such as:
  - What did you like best and least about this lesson? Why?
  - What kinds of information were hardest for you to remember?
  - What information was easiest to remember?
  - $\circ$  Did working with your expert group make research easier for you? How?
  - What did you learn about yourself as a researcher? As a teacher? How might you improve next time?

#### **Variations and Extensions**

In this section, we provide you with an innovative cooperative learning strategy and a tool for improving the levels of cooperation in any class-room. The strategy, Learning by Committee, uses the authentic context of news committees to motivate students to work together to produce a high-quality product. The Cooperative Learning Troubleshooter's Guide (see Figure 15.4, p. 193) is a tool that offers a host of practical suggestions for overcoming the most common classroom challenges associated with cooperative learning lessons.

#### **Learning by Committee**

Learning by Committee (Silver, Strong, & Perini, 1999) is a cooperative strategy that helps students create original work while highlighting the essential content from a particular unit of study. The strategy revolves around the real-world context of newspaper production committees who must develop and implement a plan for production. In a typical Learning by Committee lesson, students break up into four groups:

- The **current events committee** is responsible for "fast-breaking" stories. Each group member chooses one topic and independently drafts a historically accurate news story about the event or topic.
- The **editorial page committee** focuses on a controversial issue. Two members of the group draft opposing editorials, while the other members each draft a letter in response to one of the editorials.
- Members of the **feature article committee** select a person to interview or choose important places or ideas to write about. Each member should draft a human interest feature article that explores the content in depth.
- Members of the **graphic design committee** work with the other groups to create appropriate visuals for the newspaper. Visuals may include graphs, charts, maps, time lines, diagrams of battles, political cartoons, and so on.

While students are working, the teacher monitors progress and levels of cooperation. When a group has difficulty, the teacher should advise members on how to work cooperatively and use other groups as models of effective collaborators. When students complete their drafts and visuals, group members work together to revise and edit their own and each other's work for accuracy, coherence, and clarity. After all students produce a final draft of their work, the class convenes to arrange the written and visual elements together to create the newspaper. Figure 15.3 (p. 192) shows how a high school teacher used the Learning by Committee strategy with her students.

#### FIGURE 15.3 Sample Learning by Committee Task

#### Read All About It!

As you now know, the Middle Ages was one of the most dynamic periods in all of human history. It was a time of kings and queens, lords and ladies, long-suffering peasants, and wily craftsmen. It was also a time of plots and ploys for power when popes and kings played chess with ideas and real-life knights in their quest for empire. Within this time, Europeans faced a plague that wiped out one-third of the population, planted the seeds of democracy, developed the concept of nationhood, and launched the first international war.

As reporters for *The Middle Ages Chronicle*, it is your group's job to capture the essence of this dynamic period in a newspaper format. After our class discussion, the class will break up into groups and form committees:

- A current events committee
- An editorial page committee
- A feature article committee
- · A graphic design committee

Each group will be responsible for studying the essential elements of its reporting format and then using the group's research to create individual drafts. The group members should help each other revise and refine drafts through feedback on accuracy, coherence, and clarity. The committees will also be evaluated according to how productively they worked together. Each member will be responsible for a final draft written on a clean piece of paper.

After group members have completed their final drafts, the class will come together to assemble a complete edition of *The Middle Ages Chronicle*.

#### The Cooperative Learning Troubleshooter's Guide

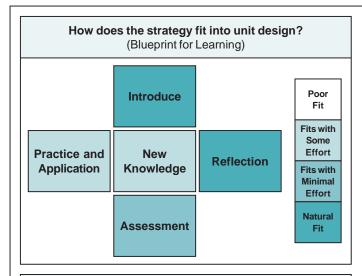
In spite of all the benefits suggested by the research on cooperative learning, most teachers have experienced cooperative learning lessons that seem to fall flat or disappoint in terms of their outcomes. One common reason for these failures lies in a lack of distinction between group work and cooperative learning. Cooperative learning is much more than clumping students into groups and telling them to work together. In fact, successful cooperative learning lessons are designed around five principles for success, which are adapted from the work of Johnson and Johnson (1999). The Cooperative Learning Troubleshooter's Guide (Figure 15.4) outlines these five principles of effective cooperative learning lessons, lists potential signs of trouble that result when particular principles are not in effect, and provides troubleshooting tips on how to restore each principle and improve current and future lessons.

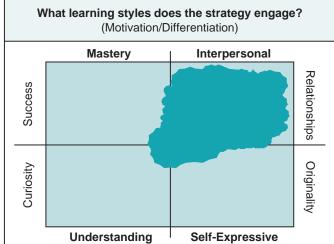
FIGURE 15.4 The Cooperative Learning Troubleshooter's Guide

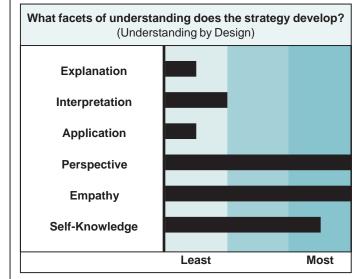
| Principle   | Signs of Trouble   | Troubleshooting Tips  |
|---|--|---|
| Interdependence: Positive interdependence is the perception among students that they are linked so that one student cannot succeed unless the others succeed as well. | <ul> <li>Factions within group</li> <li>Group members pursuing independent paths</li> <li>Noncooperative dividing— "You do Part A, I'll do Part B, and Seth can do Part C."</li> </ul> | <ul> <li>Remind groups that the work of all members is inextricably linked.</li> <li>Use two-tiered grading that rewards contributions to the group as well as individual effort.</li> <li>Highlight the work of effective groups so other groups can see a model.</li> </ul>   |
| Individual accountability: All students must know that they are responsible for their own work and that there is no "hitchhiking" on the work of others.              | Unequal contributions among group members     Some students "loaf" while conscientious students work harder  | <ul> <li>Circulate around the room while groups work to observe individual and group effort.</li> <li>Allow students to evaluate group functioning confidentially.</li> <li>Use two-tiered grading that rewards individual and group effort.</li> </ul>   |
| Face-to-face interaction: Cooperative learning implies proximity; students must know how to work productively and positively with fellow group members face-to-face.  | <ul> <li>Resistance, hostility, name-calling</li> <li>Negative criticism</li> <li>"My way or the highway" attitude</li> <li>Failure to recognize the efforts of others</li> </ul>      | <ul> <li>Model with students positive group behaviors such as praising, applauding effort, active listening, and so on.</li> <li>Teach students the rules of consensus negotiation: <ol> <li>Avoid win-lose situations.</li> <li>Avoid quick and simple solutions.</li> <li>Make sure all positions use evidence.</li> <li>Stay positive and constructive.</li> </ol> </li> </ul> |
| Interpersonal and small group skills: Learning groups are not productive unless members are skilled in cooperating with one another.                                  | Group impasse     Little rapport or trust among group members     Off-task behavior  | <ul> <li>Keep groups small in size (3–5 students).</li> <li>Select a focus skill (e.g., conflict resolution, decision making, communication) and build cooperative learning sessions around different skills.</li> <li>Model effective interpersonal skills.</li> </ul>   |
| Group processing: Effective groups discuss how well group members are learning and maintaining productive relationships.  | "All business" attitude—little recognition of group process     Sitting around once the work is complete   | <ul> <li>Build in time for reflection and discussion.</li> <li>Provide specific prompts and questions to guide reflection and discussion (e.g., Did the group come to an impasse? What did you do to overcome it?).</li> <li>Remind students to think about what happened during the lesson when they process content.</li> </ul>   |

Note: The principles are based on Johnson & Johnson (1999).

#### 16. COMMUNITY CIRCLE







# What skills does the strategy build? (The Hidden Skills of Academic Literacy)

#### **Read and Study**

- O Collect/organize ideas through note making
- Make sense of abstract academic vocabulary
- Read/interpret visuals

#### Reason and Analyze

- Draw conclusions; make/test inferences, hypotheses, conjectures
- O Conduct comparisons using criteria
- Analyze demands of a variety of questions

#### **Create and Communicate**

- O Write clear, coherent explanations
- O Write comfortably in major nonfiction genres
- O Read and write about two or more documents

#### **Reflect and Relate**

- Construct plans to address questions and tasks
- O Use criteria and guidelines to evaluate work
- Control/alter mood and impulsivity

# How does the strategy incorporate the research on instructional effectiveness? (Classroom Instruction That Works)

- Identifying similarities and differences
- O Summarizing and note taking
- Reinforcing effort and providing recognition
- O Homework and practice
- Nonlinguistic representation
- Cooperative learning
- Setting objectives and feedback
- Generating and testing hypotheses
- O Cues, questions, and advance organizers

