

Cooperative Learning Structures

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A cooperative, group oriented classroom is predicated on an underlying belief in the potential of all students to succeed. It also operates on the assumption that such success is fostered by student-to-student interactions in carefully monitored permanent or semi-permanent student learning teams. Day-to-day classroom functions, however, are carried out or operationalized by specific structures. Structures are essentially content-free procedures, such as a brainstorming technique called Roundtable, which can be used in virtually any discipline for a variety of purposes. When content is added to a structure it becomes a specific classroom activity. When a series of activities are linked, they become a lesson or unit plan.

Some of the most commonly used structures in higher education are discussed in this section. These structures need to be carefully planned and executed, but they don't require the presence of permanently formed groups in your class. The activities involve student interactions and active learning, thus promoting deep learning, but they can be organized quickly.

Basic	Advanced
Three-Step Interview	Value Line
Roundtable	Jigsaw
Structured Problem Solving	Within-Team Jigsaw
Think-Pair-Share	Responsive Written Exchanges
Visible Quiz	Paired Annotations
Stand Up and Share	Send/Pass a Problem
Three-Stay One-Stray	Dyadic Essay Confrontation (DEC)
Gallery Walk	Reciprocal Peer Questioning

Basic Cooperative Learning Structures

Three-Step Interview

Common as an ice-breaker or a team-building exercise, this structure, developed by Kagan (1989), also helps students reinforce and internalize important concept-related information based on lectures or textbook material. Some faculty have used it successfully as a modified role-playing activity, having students interview one another while assuming the roles of historical characters, such as President Harry S. Truman or Major General Laurence S. Kuter. The interview questions, focused on content material and having no right or wrong solutions, are usually posed by the instructor, as in the Think-Pair Share examples. In a Three-Step Interview, one student interviews another within specified time limits (Step one). The two then reverse roles and conduct the interview again (Step two). In a learning team composed of two pairs, the students then share the highlights of the information or insights gleaned from the paired interview (Step three). This structure also results in the formation of new learning quads which may then move on to other team-related activities. An extra question can be added for pairs working more rapidly than others, an "extension" or "sponge" recommended for many cooperative learning activities. This structure reinforces listening and probing skills, helps students process and rehearse information, and results in shared insights. Used at the beginning of a class period, the readings-based questions give students immediate feedback under low-risk conditions on their understanding of the assigned material. As you monitor the interviews, you can also determine how well the students have responded to the readings and possibly incorporate some of their ideas in your follow-on lecture/discussion

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Roundtable

Roundtable, a cooperative learning structure useful for brainstorming, reviewing, or practicing a skill, uses a single sheet of paper and pen for each cooperative learning group. Students in the group respond in turn to a question or problem by stating their ideas aloud as they write them on the paper. It is important that the ideas be vocalized for several reasons: (a) silence in a setting like this is boring, rather than golden; (b) other team

members need to be reflecting on the proffered thoughts; (c) variety results because teammates learn immediately that someone has come up with an idea they know now not to repeat; and (d) hearing the responses said aloud means that students do not have to waste valuable brainstorming time by reading the previous ideas on the page.

Team members are encouraged not to skip turns, but if their thoughts are at a standstill, they are allowed to say "Pass" rather than to turn the brainstorm into a brain drizzle. Thus, there is almost universal participation in Roundtable.

Roundtable is most effective when used in a carefully sequenced series of activities. The brainstorming can reinforce ideas from the readings or can be used to set the stage for upcoming discussions. Students, for example, could identify the characteristics of an effective leader or the attributes of terrorism before these topics are formally introduced. Comparing a student-generated list with those of the "experts," creates interest. Many creative uses can be made of the ideas generated, depending on their nature.

In Roundtable, the multiple answers encourage creativity and deeper thinking. This activity builds positive interdependence among team members because of the shared writing surface, but more importantly, it builds team cohesion and reinforces the power of teamwork because students see in action the value of multiple viewpoints and ideas.

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Structured Problem Solving

Members of learning teams, usually composed of four individuals, count off: 1, 2, 3, and 4. The teacher poses a question or problem requiring higher order thinking skills. Students discuss the question or solve the problem, making certain that every group member can summarize the group's discussion or can explain the problem. Sponges or extensions with additional content-related problems or activities are particularly important here for teams working faster than others. The instructor calls a specific number and the designated team members (1, 2, 3, or 4) respond as group spokespersons. To avoid repetition, faculty members will usually ask for responses from only three to six groups. The desired learning will already have occurred.

In this activity, students benefit from the verbalization, from the opportunity to exchange differing perspectives, and from the peer coaching that helps high and low achievers, alike. Less class time is wasted on inappropriate responses, and the principle of simultaneity is operative because at any given time 25% of the students are vocal within their groups. Students become actively involved with the material and, since no one knows which number the teacher will call, each has a vested interest in being able to articulate the appropriate response. Those chosen randomly as spokespersons (often students who do not volunteer during a whole-class discussion) feel far less threatened giving a team, rather than an individual, answer. Some faculty members prefer the use of playing cards because the teams then have an immediate identity (Aces, Jacks, etc.) and the individual members are numbered/identified by the suit of the cards (hearts, clubs, diamonds, and spades).

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Think-Pair-Share

In this activity, developed by Frank Lyman (1981), the instructor poses a question, preferably one demanding analysis, evaluation, or synthesis, and gives students thirty seconds or more to think through an appropriate response (Think). This time can also be spent writing the response. After this "wait time," students then turn to partners and share their responses, thus allowing time for both rehearsal and immediate feedback on their ideas (Pair). During the third and last stage, student responses can be shared within learning teams, with larger groups, or with the entire class during a follow-up discussion (Share). The caliber of discussion is enhanced by this technique since, too often, the extroverts with the quickest hand reflexes are called on when an instructor poses a question to the entire class. In addition, all students have an opportunity to learn by reflection and by verbalization. Think-Pair-Share, like most other cooperative learning structures, capitalizes on the principle of simultaneity (Kagan, 1992, p. 4:5-7). Many students (50% in Think-Pair-Share) are actively vocalizing ideas at a given moment, whereas in a more traditional classroom, only the lecturer is active or the one student at a time who is responding to his or her questions.

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Visible Quiz

Students in groups discuss the appropriate response to quiz questions, ones typically displayed on an overhead projector. The answers can be multiple choice (A, B, C, or D) or True (T) and False (F). Each team has a set of large cards with the four letters and the T and F, all sets composed with letters in the same colors (All A's would be red, for example, and all T's, yellow). At a given signal, one person from each team displays the team's choice. The instructor can quickly survey the room to determine how well students understood the question. She then gives the correct answer, going into a mini-lecture if a minority of students gave inappropriate responses. She can also call on groups to explain the rationale for their selection, sometimes uncovering genuine misconceptions and sometimes uncovering poorly constructed, ambiguous wording in the questions. This technique gives both students and teachers immediate feedback on learning. Peer coaching also goes on when the teams discuss each question.

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Bringing Closure: Some Report-out Methods

As indicated earlier, closure is critically important to learning. Students must feel that their discussion and group activities have added to their knowledge, skills, and abilities. Often your summarizing mini-lecture will do the trick, particularly if you weave into it the comments, products, and ideas generated by the students in their small groups. At other times, however, you may wish to rely on a report-out by the students. It is important to recall, however, that whole-class reports can be both time-sinks and repetitious. They should be used with care. Often you can take up materials generated through in-class group activities and either compile a summary for the next class period or comment (very quickly!) on individual or team products.

The report-out methods that follow offer rapid alternatives to the traditional whole-class report approach where a spokesperson from each group summarizes their work. Such traditional reports are always time-consuming, are usually uneven, are often tedious and repetitious, and sometimes provoke intense anxiety for the speaker.

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Stand Up and Share

This report-out method should be rapid and energetic. It works best when students have completed an activity, such as Roundtable, that lends itself to single statement summaries. It relies on students having an easily designated identity within each team so that you can call on the "Number Twos" or the "Hearts" to serve as spokespersons. These designated students then rise, prepared to respond on behalf of the group. Each team responds in turn, giving only one response, in rapid round robin fashion. Depending on the number of answers and the number of teams involved, you may want to go through another rotation, calling on another group member to share one group idea (the "Number Fours" or the "Clubs" this time).

All students must attend to the sharing because they may serve as the next spokesperson. No ideas should be repeated. If student spokespersons find that all the topics on the team's list have been covered, they merely sit down and the rotation continues. Besides allowing for rapid exchanges (Sometimes this activity becomes a "Stand Up and Shout"), the value of positive interdependence (team work) is emphasized.

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Three-Stay One-Stray

Like "Stand Up and Share," this structure requires the easy identification of a team member who will become the group's spokesperson. It too builds on another structure, such as Structured Problem Solving, but in this case the topics can be far more complex. After the problem solving discussions are complete and all team members indicate that they can give the team's report, you designate the student from each team who will "stray." That is, one student from each group (such as the "Number One" or the "Diamond") leaves it and rotates to an adjoining team to give the report. In large classes it is essential that the order of rotation is clear. Playing cards work particularly well because the "Aces" know to rotate to the "Twos," the "Jacks" to the "Queens," and so forth.

The designated student, who is welcomed as a visitor, shares with this new team the results of his original

group's discussion, giving proposed solutions to problems or summarizing discussions. A second rotation may be desirable if the topic prompted divergent thinking and solutions.

Three-Stay One-Stray offers a low-threat forum where students can exchange ideas and build social skills such as asking probing questions. It also offers students the opportunity to learn by teaching. Placing the report-out responsibility on the students reinforces the valuable conception that knowledge resides within the learning community, not just with the "authority-figure" instructor. Perhaps its greatest value lies in its efficiency. Instead of, for example, ten sequenced five-minute reports to the entire class (fifty minutes, plus transition time), individual students are simultaneously giving five-minute reports throughout the room.

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Gallery Walk

A Gallery Walk requires a report-out that can be visually depicted, preferably on butcher paper. It can be an outline, a concept or mind map, or any other written product. In this case a designated student stays by the desk or table or next to the butcher paper if it is taped to the wall and serves as the group spokesperson. The other students rotate around the room examining the products of other teams' thinking, asking questions of the designated spokesperson. (The spokesperson role should be rotated so that no one is left without the stimulation of exploring the different student creations.)

This structure is also efficient and engenders a sense of team cohesion as each group displays the product of their "group think." The variety of the end products emphasizes the value of critical/creative thinking.

You can use a variation of "Gallery Walk" when you have required individual or team long-term products. Rather than having time-consuming report-puts, each student circulates to classmates a summary of his or her project. Each product, such as a term paper or student portfolio, is assigned to specific work area, as in a conference poster session. Then a class period can be spent with students examining one another's work. To provide an opportunity for feedback, each student leaves a comment sheet next to the product, and browsers write a brief response.

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Advanced Cooperative Learning Structures

Value Line

A Value Line ascertains students' opinions in a quick and visual way by asking them to line up according to how strongly they agree or disagree with a statement or proposition. In a philosophy class, for example, instructors may ask students to respond to the following statements:

- The killing of innocents is never justified.
- The United States made the correct decision in dropping the bomb on Nagasaki.
- The United States should not have intervened in Grenada.
- The bombing of Dresden was an act of terrorism.

Clear instructions reinforced by visual aids are particularly important for implementation of a Value Line because many students are unaccustomed to active learning that involves active movement. To initiate the structure, you should show the students a five point Likert scale on an overhead. Then ask students, after a moment of "think time," to choose the number that best describes their position on the issue. To avoid indecisiveness, it is a good idea to have the students jot down their number before the next step. Instructors next ask students who have chosen "one" to stand at a designated point along the wall of the room. The students who have chosen "two" follow them, and so forth until all students are lined up. It is important to stretch the line sufficiently so that students are not bunched together in large clumps.

After the students have formed a continuous line based on their own opinions, instructors must identify the midpoint. The easiest way to do this is to ask students to ignore the original number they selected as the basis for their location in the line and instead to number themselves sequentially in a military count-off. Find the median student by dividing the last number by two.

The next steps are critically important. You form the first group of four students by taking one from each extreme of the line and two from its midpoint. To insure the rapid and accurate identification of these four students, it is helpful to use an overhead transparency allowing the instructor to draw lines through the numbers associated with students who have been assigned to teams. A simple numerical grid works well. In a class of 40, for example, you would call the numbers 1, 40, 15, and 14, striking over them on the grid. For the next team, you would call 2, 39, 13, and 16, again striking over the numbers on the grid. Additionally, if the group is large, instructors can ask a student from the first group formed to record on the blackboard or a flip chart the four numbers as they are called out for each team. Instructors continue to form teams with this procedure until all students have been assigned to a team and have found their designated seats. Any students left over join a team as a fifth member.

A Value Line lends itself well to paired discussion, also. To form pairs or dyads where students can exchange viewpoints on various topics, have the students line up as before based on their stand on a controversial issue. This time, instead of pulling four students from the ends and mid-points to form a quad, break the line at the midpoint and literally double it back around so that the two students at each end are paired, and so on (e.g., 1 and 40 pair; 2 and 39 pair; 3 and 38 pair, etc.). Pairing students of opposing viewpoints allows them to stretch their perspectives and to learn to examine at least two sides of an issue.

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Jigsaw

Students in many disciplines often confront complex, challenging problems involving multiple pieces of information necessary for a final, overall solution. Such problems are ideally suited for the cooperative learning structure, Jigsaw. In this structure, each member of a team assumes responsibility for a specific part of a problem. They are responsible not just for mastering or knowing their part; they must also be able to teach the material to their fellow teammates. Thus, working together, the group merges the various portions to solve the "puzzle."

In Jigsaw, students temporarily leave learning teams to form expert learning teams which may be organized, for example, on the suits of the playing cards. The student holding the heart from each of the groups meets with all the other hearts in the classroom. Those holding spades, diamonds, and clubs form similar expert teams. A class of twenty can be quickly transformed from five structured learning teams into four expert learning teams with five members, one from each of the original groups. If classes are larger, then students can form two or more expert teams on the same piece of the puzzle. If the original structured team consists of five members rather than four, then two students pair and work as a unit in their expert team and when they return to their original team.

In expert learning teams, the students master or solve their part of the problem. They also discuss and develop strategies to teach the solution--and the process of deriving it--to the other members of their structured learning teams once they have rejoined them. Students must recognize that for Jigsaw to succeed, no one should leave his or her expert team without the ability to explain clearly--to teach--the problem solving process and procedures just developed.

Jigsaw takes careful monitoring. Instructors will be moving among the various expert teams, monitoring their progress and checking to see that all students are involved. Since these expert teams do not have the defined roles identified in the structured learning teams, students do not function as efficiently in these new, temporary teams. Instructors must ensure that students remain focused on both the learning objectives and on the subsequent teaching task. Clearly, too, they must be certain that students are producing valid responses.

Once satisfied that the students are ready, usually after the prescribed time has elapsed, the students return to their structured learning teams. The instructor urges the team monitor to confirm that each student in the group understands their piece of the puzzle and is prepared to teach their teammates. Then the students, rotating in turn, teach their respective parts of the overall problem solving task. After sufficient time has elapsed, the instructor may conclude the class with a brief summary of both the problem solving concepts and the purpose of Jigsaw itself.

Instructors must work hard to structure the team activities, the physical logistics, and the time frame of a Jigsaw. This is not a structure to be attempted by relative newcomers to cooperative learning, particularly if large classes are involved. Students, too, must be coached to understand both the mechanics and the value of Jigsaw. Instructors must guard, for example, against student tendencies to get off task. Instructors must clearly communicate to students that more is at stake than finding "the right answer." The ability to teach fellow

teammates--and hence master and retain important materials and develop analytical skills--lies at the crux of Jigsaw. Students should be encouraged to think creatively about their teaching approach by rehearsing their presentation and by designing visual aids or study sheets. Thus, a properly executed Jigsaw provides benefits that far outweigh its costs in terms of time and effort.

Like most complex structures, Jigsaw reinforces the most basic tenets of cooperative learning. Positive interdependence is fostered by the fact that students must work together and teach one another in order to get the "big picture," all of the information and skills they will need as problem solvers in their discipline. At the same time, individual accountability is reinforced by the fact that students must learn all the information, not just their own portion, because they are tested individually. The fact that students interact within two different groups reinforces the idea of heterogeneity as a way to bring multiple perspectives to a given problem. The positive interactions that result from these brief, but intense encounters in the expert groups help to develop the skills students will need in the "real world." The fact that expert teams have the responsibility of making certain that all members can successfully teach the materials/conclusions also reinforces the important concept of group processing and accountability.

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Within-Team Jigsaw

In Within-Team Jigsaw, expert learning teams consist of a pair formed within a quad. If instructors are using playing cards to identify team roles, the suits can be used for pairing, black suits forming one pair and red suits the other. These suit partners function as smaller expert learning teams, similar to their larger counterparts formed in Jigsaw. Any fifth member (sometimes identified with a wild card or joker) joins a pair to form a triad.

As in Jigsaw, the two pairs master their part of the material and plan to teach it to the other pair. At the conclusion of the specified work time, the students regroup in their original teams. There they teach one another their portion of the problem. They can be asked to compare and contrast the results and to discuss their implications.

Within-Team Jigsaw is easier to implement than Jigsaw. Its disadvantage lies in the fact that the "puzzle" can have only two pieces. In Jigsaw the number of pieces is limited only by the imagination of the instructor and the number of students in the class. Within-Team Jigsaw, however, can be a creative, efficient way to ensure content mastery and peer learning.

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Responsive Written Exchanges

In this activity, advocated by Toby Fulwiler, a Writing Across the Curriculum scholar, students reflect in writing on issues identified through sentence stems or prompts. It involves letter exchanges between students.

You prepare an activity sheet with the prompts (sentence stems) for reflection. These can be presented as individual handouts for out-of-class assignments or projected on an overhead for in-class writing. Because these exchanges can be composed fairly rapidly, they are often effective as an active learning/reflective in-class activity lasting about thirty minutes. All assignment sheets begin with a salutation (Dear X) and end with a P. S. "One personal thing about me you may not know is:"

Typical prompts might be: "I think the strongest candidate in the first Presidential debate was . . . because . . ."
"His strongest point was . . ."; "The 'Just War' tradition has relevance today because: . . ."

Paired students, working simultaneously in class or outside of class, write a personal letter to their partner based on the sentence stems. They exchange letters, read them, and write a response focused primarily on the issues, but they may also address in their own P. S. a response to the personal comment made by their partner. The partners again exchange letters so that they can read each others' responses (No one likes to write a letter without getting a reply!). The letters can be kept by the students without teacher review, but more often they are taken up, read informally, and returned where they can become part of an on-going class journal.

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Paired Annotations

This activity motivates students to read important chapters or articles prior to a class session. Besides this useful "front-loading" of course material, another key objective is to build critical thinking and writing skills by having students contrast and then compare their responses to the same piece of writing.

You identify a pool of articles on a specific topic under consideration or the students themselves can identify key resources. Students, working individually, prepare a reflective commentary on one of the articles or chapters. They do so using a double-column format, where they cite key points excerpted from the original source on the left-hand side and reactions, questions, commentary, and connections with other readings on the right (the columns will not be the same length).

When students come to class, you randomly pair them with another student who has read and analyzed the same article or chapter. The two partners now read one another's reflective commentaries, comparing both the key points they have identified and their specific responses to them. They discuss their reasons for these choices. Then, working together, they prepare a composite annotation summarizing the article. If time permits, several students can present to the class their joint annotations. This step offers more peer reinforcement and enhances the speaking/presentation skills students will need.

This activity should be repeated several times during the semester, pairing different students. It enables students to reflect on their own thinking skills (metacognition) and to compare their thinking with that of other students. The more paired annotations they complete, the more skilled students become at identifying key points in an article. They are also more likely to remember the material because they had an opportunity not only to give a personal response, but also to discuss their response with another individual.

Although the bulk of the writing is done outside of class, students will need class time to compare and discuss their responses if the activity is to have critical thinking value. The student pairs turn in their double-columned analyses along with their jointly prepared annotation. You need not assign a letter grade to each piece of writing. Assuming that the work is of sufficient quality, students can receive "x" number of points for the analysis and for the paired annotation, points applied toward a criterion-referenced final grade. If students come to class unprepared, they must complete their analysis individually while their classmates work together, and they receive no credit, of course, for a paired annotation. Fortunately, this activity motivates students to arrive prepared if only because of peer pressure. Informal, hand-written comments on the pieces will reinforce student thinking and provide feedback leading to more sophisticated writing in the future. It is useful to share exemplary models with the class as a whole. If time is a problem, then the final step of preparing a joint annotation can be omitted, leaving students time, however, to discuss their reactions, a valuable learning tool. The final presentation step can always be deleted.

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Send/Pass a Problem

This structure is particularly effective for problem solving. Its exact source is unknown. The Howard County Maryland Staff Development Center developed a version of it inspired by Kagan's (1989) work. The starting point is a list of problems or issues, which can be generated by students through an activity such as a Roundtable or can be teacher-selected. Each team identifies the particular problem or issue upon which they wish to focus initially and records their choice on the front of a folder or envelope. Each team selects a different problem. The teams then brainstorm effective solutions for these problems and write them down on a piece of paper. At a predetermined time, the ideas are placed in the folder or envelope and forwarded to another team. The members of the second team, without looking at the ideas already generated, compile their own list. This second set of ideas is forwarded to a third team which now looks at the suggestions provided from the other teams, adds its own, and then decides on the two most effective solutions. Besides encouraging collaborative higher order thinking skills, this structure results in student evaluative judgments, the highest cognitive level in Bloom's well-known taxonomy. Reports to the whole group occur as time permits and can take many forms, including written reports when the material is relatively complex. Some faculty members use this structure for examination review sessions by putting typical exam questions in folders for group problem solving.

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Dyadic Essay Confrontation (DEC)

Developed by Sherman (1991), this structure enables faculty members to "front-load" learning by making certain that students work independently outside of class to master assigned material. Students then extend and validate their individual study through an in-class writing/thinking cooperative learning exercise.

Students read assigned material, such as a textbook chapter, and prepare an essay question. They come to class with their essay question on one sheet of paper, along with a second sheet of paper, which includes the question and their carefully thought-out response. Randomly-paired students exchange questions, spending about 20 minutes writing an answer, either closed or open book depending on the complexity of the material, to their partner's essay question. The two then read, compare, and discuss the four answers, looking in particular for the differences between the in-depth responses prepared before class and the spontaneously generated in-class responses. This structure promotes critical thinking by requiring students to confront differing ideas, offers writing-to-learn opportunities, and provides solid and immediate feedback to students about their intellectual responses to discipline-specific material.

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Guided Reciprocal Peer Questioning

King (1990; 1991; 1995) developed a series of questions stems based on Bloom's well-known taxonomy.

Questions involving analysis, for example, include What is the nature of ____? Why is ____ happening? What are the implications of ____? How does ____ effect ____? Students read an article, chapter, or literary work and prepare questions based on these stems. To make the questions authentic, they do not have to be able to provide an answer. In groups, students alternate posing their questions with sufficient time allotted for a meaningful discussion of each one.

Generic Question Prompts

Explain why _____. (Explain how _____.) Why is _____ important?
What would happen if _____? How are _____ and _____ similar?
What is the nature of _____? How does _____ apply to everyday life?
What are the strengths and weaknesses of _____? What is a counter-argument for _____?
What is the difference between _____ and _____? What is the best _____, and why?
Why is _____ happening? What is the solution to the problem of _____?
What is a new example of _____? Compare _____ and _____ with regard to.
How could _____ be used to _____? What do you think causes _____? Why?
What are the implications of _____? Do you agree or disagree with this statement: _____?
What evidence is there to support your answer?
What is _____ analogous to? What is another way to look at _____?
How does _____ effect _____? What does _____ mean?
How does _____ tie in with what we learned before? Describe _____ in your own words.
Why is _____ important? Summarize _____ in your own words.
How are _____ and _____ similar? Compare _____ and _____ with regard to.
How does _____ apply to everyday life? What do you think causes _____? Why?
What is a counter-argument for _____? Do you agree or disagree with this statement: _____?
What evidence is there to support your answer?
What is the best _____, and why? What is another way to look at _____?
What is the solution to the problem of _____? What does _____ mean?
Summarize _____ in your own words. Describe _____ in your own words.

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