The Leader's Guide
to Supplemental Instruction

THE INTERNATIONAL CENTER FOR SUPPLEMENTAL INSTRUCTION®

We humbly express our gratitude to the SI Leaders and Supervisors around the world who have contributed to this manual. *The Leader's Guide to Supplemental Instruction* is a direct result of your willingness to share your experiences and written materials. Thank you for your dedication to improving the learning of college students everywhere.

Note to the Reader:

The Leader's Guide to Supplemental Instruction is meant to serve as a tool for the SI Leaders on your campus. Our goal is that you will be able to insert your institution's campus-specific information into the electronic copy of this manual, which you are provided as a participant in a training session led by a Certified Trainer from the International Center for Supplemental Instruction at the University of Missouri-Kansas City. Once *The Leader's Guide* has been updated with your institution's information, you will be able to reproduce the personalized version for use on your campus by your SI Leaders. Please be aware that this manual is not intended to be a stand-alone guide to training or supervising SI Leaders. This manual is intended to be paired with training sessions provided by the International Center for Supplemental Instruction or by those trained by the International Center for Supplemental Instruction. For more information on scheduling a training, contact the International Center at the information below. As a participant in the Kansas City SI Supervisor Training workshop, attendees will gain access to SI training materials that are copyrighted by The Curators of the University of Missouri. Participants understand that through their paid registration at the workshop, they have the permission to reproduce these materials for internal use within their organization. Participants understand that they DO NOT have permission to reproduce these materials for use outside of their organization; nor do they have the right to modify or prepare derivative works in the materials. Participants further understand that any reproduction of training processes or materials must be done solely for educational purposes within their organization and must not be utilized for revenue generation or other similar commercial purposes within or outside of the organization. Reproductions must give credit to the International Center for Supplemental Instruction and the Curators of the University of Missouri.

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Part I: Overview of the SI Program

Part II: Relationships

Part III: Conducting SI Sessions

Part I: Overview of the SI Program

THE SI PROGRAM

Underline the key words or ideas presented in this summary. Be prepared to share your responses with the group.

1. The SI program targets traditionally difficult academic courses—those that have a high rate of D or F grades and withdrawals—and provides regularly scheduled, out-of-class, peer-facilitated sessions.

2. SI does not identify high-risk students but rather identifies historically difficult classes.

3. Sessions begin the first week of the term.

4. SI sessions normally occur in classrooms near the course classroom instead of in a learning center.

5. SI sessions are open to all students in the course section and are usually attended on a voluntary basis, free of charge.

6. SI Leaders are key people in the program. They are students who have demonstrated competence in the course and have great facilitation skills.

7. SI sessions are comprised of students of varying abilities, and no effort is made to separate students based on academic ability.

8. Since SI is introduced on the first day of classes and is open to all students in the course, SI is not viewed as remedial.

9. SI Leaders receive ongoing training which covers such topics as how students learn; strategies aimed at strengthening student academic performance; data collection; and session management tips.

10. SI Leaders usually attend all class sessions, take notes, read all assigned material, and conduct three or more 50-minute SI sessions each week. SI sessions integrate how-to-learn with what-to-learn.

11. Students who attend SI sessions discover appropriate application of learning strategies, (e.g. note taking, graphic organization, questioning techniques, vocabulary acquisition, problem solving, and test preparation) as they review difficult course content.

12. Students have the opportunity to become actively involved in the course material as the SI Leaders use the text, lecture notes, and supplementary readings as vehicles for refining learning skills.

13. The SI Supervisor is responsible for identifying the targeted courses, gaining faculty support, selecting and training SI Leaders, monitoring the quality of SI sessions, and evaluating the program.

14. The SI Leaders meet as a group bi-weekly throughout the semester with the SI Supervisor for follow-up, problem-solving, further development, and mastery of learning strategies.

15. SI participants earn higher course grades and withdraw less often than non-SI participants. Also, data have demonstrated higher re-enrollment and graduation rates for students who regularly participate in SI.

Tasks of the SI Leader

Form groups of three and discuss the tasks of the SI Leader. Specifically discuss with your group which of the responsibilities listed below are your favorite and least favorite parts of being an SI Leader.

1. SI Leader Training

- Attend the entirety of pre-semester training and training held throughout the semester.
- Meet with SI Supervisor and faculty regularly.
- Prepare a written session plan for each SI session.
- Show session plans to your Supervisor and the instructor for feedback (especially the first few weeks).
- Include the learning objectives, difficult content, and strategies for the learning activities.

2. Attend the Targeted Class

- Introduce yourself to the course instructor before the semester begins.
- Ascertain requirements for the course before the semester begins.
- On the first day of class, introduce SI to the students and administer a beginning-of-term survey, or explain how surveying will be conducted.
- Schedule SI sessions according to the most popular times on the survey.
- Check with SI Supervisor for room assignments for SI sessions.
- At the second class, announce the SI schedule and room locations.

3. Conduct Sessions

- Plan an introduction to the SI session.
- Hold marathon SI sessions or extra SI sessions when needed.
- Organize the SI session with built-in flexibility for the needs of attendees.
- Utilize Wait Time One, Wait Time Two, Redirecting Questions, and Checking for Understanding consistently to ensure proper facilitation.
- Provide closure (e.g. a quiz, a summary, a suggestion for future study) to check for understanding.

4. Support Faculty

- SI Leaders support the classroom instructor by providing feedback about students' difficulties, content-related issues, etc.
- The SI program is offered only in classes in which the faculty member understands and supports SI.

5. Integrate Content and Learning Strategies

- Redirect discussion to the group. **This is a key facilitation skill.**

- Provide Wait Time after a question is asked (One) and after an answer is given (Two) to allow students time to process the question and answer. **This is a key facilitation skill.**
- Use the language of the discipline, and have students do the same.
- Integrate how-to-learn with what-to-learn.
- Get students organized and get them started, but don't do the work
- for them.

6. Collect Data for Program Evaluation

- Collect attendance data at **every SI session**, (e.g. student name, course title, date, and time).
- Administer mid/end-of-term questionnaires.
- Work with SI Supervisor as needed to prepare final report.

History of Supplemental Instruction

Developed by Dr. Deanna Martin in 1973 at the University of Missouri-Kansas City, Supplemental Instruction (SI) is a peer-facilitated academic support program that increases student performance and retention. Ten years prior to the development of SI (1963), The University of Kansas City, a private institution, had joined the public University of Missouri System. In the years that followed, UMKC's enrollment grew, and the new, larger population of UMKC students demonstrated a greater degree of variance in academic preparedness. Retention rates fell, and Dr. Martin, then a graduate student in the UMKC School of Education, was tasked with developing a model of student support that would improve retention rates and academic preparedness of students moving into the workforce and on to postgraduate study.

SI was recognized in 1983 by the U.S. Department of Education's Joint Dissemination Review Panel National Diffusion Network as an "Exemplary Program" and was awarded funding to begin the process of disseminating SI to other higher education institutions around the United States. Funding and status was validated and renewed in 1992 by the same body.

Dissemination of the SI model throughout the United States by Certified SI Trainers continued in the 1990s, and Dr. Martin and her team at the Center for Academic Development at UMKC began disseminating the SI model outside the U.S. SI became known as PASS (Peer Assisted Study Sessions) and PAL (Peer Assisted Learning) as it spread around the world.

In 1999, the International Center for Supplemental Instruction was established at UMKC and the first conference on Supplemental Instruction was held in Kansas City, Missouri. The International Center for Supplemental Instruction, along with National Centers in Sweden, South Africa, Australia, and Canada, serve as hubs for SI training, best practices, and innovation.

Defining SI

In 2018, Certified Trainers from the National Centers and the International Center held their biannual Certified Trainers Meeting and developed a standard definition to answer the question, "What is SI?" The definition is as follows:

> Supplemental Instruction (SI) is a non-remedial approach to learning that supports students toward academic success by integrating "what to learn" with "how to learn." SI consists of regularly scheduled, voluntary, out-of-class group study sessions driven by students' needs. Sessions are facilitated by trained peer leaders who utilize collaborative activities to ensure peer-to-peer interaction in small groups. SI is implemented in high-risk courses in consultation with academic staff and is supported and evaluated by a trained supervisor.

Frequently Asked Questions About the SI Program

What is SI?

Supplemental Instruction (SI), created at the University of Missouri-Kansas City, is a non-remedial approach to learning that supports students toward academic success by integrating "what to learn" with "how to learn." SI consists of regularly scheduled, out-of-class group study sessions driven by students' needs. Sessions are facilitated by trained peer leaders who utilize collaborative activities to ensure peer-to-peer interaction in small groups. SI is implemented in high-risk courses in consultation with academic staff and is supported and evaluated by a trained supervisor.

What is an SI Leader?

Have you ever wished you could do something over, knowing what you know now? SI Leaders are students themselves and are prepared to share with you what they have learned over the years about how to study. They have taken this course, have done well in the course, and can be a valuable resource to you.

They know the course content and are anxious to help guide you through it. They will be in class with you every day, hearing what you hear, and reading what you read. What they won't do is re-lecture; their job is to help you think about the lectures you hear and the books you read, and then put it all together during the SI review sessions. SI can help you learn difficult course material more efficiently.

When do SI review sessions start?

On the first day of class, you will be surveyed by the SI Leader regarding your class schedule. Each SI Leader will set up two or three review sessions each week at times that are best for the majority of students taking the class. You can attend as many or as few sessions as you'd like; each one will be different because you'll have new material to discuss. SI sessions are informal. Bring your notes; bring your textbook; bring your questions; you may even bring your lunch!

How will this impact my success in the course?

If you attend SI sessions regularly, chances are you'll earn a better grade. You also will have developed a better understanding of course content as well as more effective ways of learning. This will help you with other classes you are taking, now and in the future.

Part II: Relationships

The SI Leader and the Instructor

Break into groups of five or six. Assign each person in the group one of the situations presented below and ask them to lead the group in a discussion about how they would handle it. Review the "Dos and Don'ts" on the next page for tips.

What would YOU do in these situations?

1. The instructor asks you to do something the SI Supervisor has asked you not to do (example: lecture for them during a time they will be absent).

2. The instructor offers to show you some of the test items from an upcoming exam.

3. The instructor asks you not to pass out old exams in SI. A student brings one to the SI session.

4. The instructor asks you to help distribute handouts in class.

5. The instructor asks if they can visit one of your SI sessions.

6. The instructor wants to know which students have been attending the SI sessions.

7. The instructor asks for feedback about content related difficulties the students are experiencing.

Do

- Treat the instructor as your ally, never your adversary.

- Meet with the instructor during their office hours to clear up any uncertainties you may have regarding material discussed in the SI session or in the lectures.

- Provide the instructor with feedback about how the sessions are going. Although it is not recommended that instructors attend SI sessions, most SI programs will not self-destruct if the instructor elects to visit one or two sessions.

- Respect the anonymity of the student participants and discourage the instructor from attending or observing the session. It is recommended that instructors attend SI sessions in a different course and discipline if they are curious on how an SI Session is run. This

preserves the anonymity of the session and allows the instructor to focus on process as opposed to content.

- Show the instructor a copy of your plan for your SI session. They can help make your plan more appropriate to the course material.

- Ask the instructor for permission to make announcements to the class. Even though your instructor agreed in advance to allow you time to survey the class and to make necessary announcements, it is always good policy to request permission before doing so.

- Be helpful to the instructor whenever possible. You should not assume the role of being the instructor's assistant, but offer to assist the instructor in tasks such as passing out materials or other similar activities.

Don't

- Criticize the instructor during an SI session. Students will report this to the instructor and it is not helpful. Students are responsible for their academic performance, regardless of the instructor's style.

- Grade papers or tests or be involved in constructing test items.

- Set yourself up as a teacher. Your purpose is to facilitate the learning of the material, not to do or evaluate the teaching.

- Hesitate to refer the instructor to the SI Supervisor if they request anything about which you are uncertain or with which you are uncomfortable.

- Answer questions the instructor poses to the class or involve yourself in class discussions unless the instructor directly invites you to do so.

THE SI LEADER AND THE STUDENT

Break into groups of five or six. Assign each person in the group one of the situations presented below and ask them to lead the group in a discussion about how they would handle it. Review the "Dos and Don'ts" on the next page for tips.

What would YOU do in these situations?

1. A student asks you for a copy of your lecture notes because their mom is in the hospital.

2. A student asks you for copies of the materials you have prepared for the SI session but says they can't stay for the actual SI session.

3. A student repeatedly arrives late for the SI sessions.

4. The material you have created for the session is on the reading that was required for the last class session. No one in the group has done the reading.

5. A student states, "I got a 90 on my last test, and I don't need to come to SI anymore."

6. A student confides personal problems. (This could range from registration difficulties to marital problems.)

7. A student is attempting to go beyond the actual content of the course as presented in class or assigned reading materials.

Do

- Say "yes" to students' requests whenever it is reasonably possible to do so.

- Remember that the goal of SI is more than simply helping students score well on examinations. Many things can contribute to attrition.

- Recognize the limits of your job description and training. You are a recognized expert on the course, but that's as far as you have to go. Listen patiently to all other problems and refer the student to those persons who are recognized experts with the problem the student describes. When in doubt, contact your Supervisor immediately if you are concerned about the students' safety.

- Provide straightforward, truthful responses.

Don't

- Allow yourself to be drawn into an argument with students.
- Demand that students have to defend themselves to you; if they miss a session, act concerned, but don’t demand an explanation.
- Say anything that would make you sound like an authority of any kind.
- Feel obligated to fix problems that students create and can solve for themselves. Just remember to be diplomatic when you must decline the invitation to get involved.
- Feel obligated to be available to students 24/7. You are a student first, and your work and well-being must take priority.

The SI Leader and the Supervisor

It is the responsibility of the SI Supervisor to assist you in doing your job as an SI Leader. How might the SI Supervisor assist you with students, instructors, and sessions? Jot down some ideas in the spaces provided, and then pair up with a partner to share your ideas.

My Supervisor can assist me with students when . . .

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My Supervisor can assist me with the instructor when . . .

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My Supervisor can assist me in getting things I will need for the sessions such as . . .

REFERRING STUDENTS

Break into pairs. Looking at the "Guide to Campus Resources," use the "Turn to a Partner" technique and discuss with your partner your recommendations regarding where to refer students who reported the following difficulties:

1. "Someone broke into my car and stole my laptop."
2. "English is my second language and I'm having difficulty following the lectures."
3. "I would like to get involved in some campus organizations."
4. "My father recently passed away."
5. "I have a learning disability and need accommodations in my course."
6. "I would like to find out if there are other students here who are also from my country."

Guide to Campus Resources

Include a “Guide to Campus Resources” for your university into your Leader’s Guide to Supplemental Instruction.

Sample of the UMKC’s “Guide to Campus Resources”

UMKC HelpLine
Phone: 816-235-2222
E-mail: helpline@umkc.edu

Campus Police
4825 Troost Ave.
Suite 214b
Kansas City, MO 64110
Emergency Dial 9-1-1
Phone: 816-235-1515
E-mail: umkcpd@umkc.edu

Counseling Center
4825 Troost Ave
Suite 206
Kansas City, MO 64110
Phone: 816-235-1635 or 816-235-5820
E-mail: chtc@umkc.edu

Student Health and Wellness
4825 Troost
Suite 115
Kansas City, MO 64110
Student Health and Wellness: 816-235-6133
Health Promotion: 816-235-5350
Student Health: studenthealth@umkc.edu
Health Promotion Services: healthpromo@umkc.edu

Office of Services for Students with Disabilities
Office of Students with Disabilities Services
4825 Troost Suite 104
Kansas City, MO 64110-299
Phone: 816-235-5612
E-mail: disability@umkc.edu

Part III: Conducting SI Sessions

The First Day of Class

There are many things SI Leaders must remember to do on the first day of class. Organize the tasks below, numbering them in the order in which they should be done. After you have completed the exercise below, pair up with a partner to share your ideas.

- Remind the instructor that you will need to make a brief presentation about Supplemental Instruction to the class.
- Write your name, email address, and campus SI office number on the board.
- Distribute the beginning-of-the-term survey to the students.
- Introduce SI to the students.
- Hand out a one-page overview of the SI program that includes some of the material from your oral presentation.
- Arrive early for the class session.

Other:

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Introducing SI to the Class

Prepare a short speech to introduce SI to the class. Organize your presentation as though you were attempting to answer questions students might ask or have about the program. Use a conversational style, and let your personality show through.

Possible points to include in your first day speech:

- Sessions are offered weekly
- Students benefit most when they attend at least one session per week
- Content is reviewed in small groups, giving students the opportunity to:
    - Improve understanding of important concepts
    - Compare notes
    - Get to know classmates
    - Develop study and learning strategies
    - Test yourself before your professor does
- Supports historically difficult courses with high DFW rates
- Students who attend SI sessions statistically earn better grades
- The program is non-remedial, so sessions are for everyone no matter your grade
- The program is FREE for students!

Be sure to personalize your intro… Get creative! ☺

Notes:

SI Marketing Strategies

Select your "top three" strategies for improving attendance at SI sessions and discuss them with your group.

1. Report SI vs. non-SI test differences to the class, such as test score averages, amount of difference in scores, and DFW and AB rates. Your SI Supervisor can provide you this information.

2. Report test scores from previous academic terms. Use national data until you develop your own history of institutional data.

3. Distribute reminder handouts to attend SI sessions throughout the term.

4. Develop sample tests in SI sessions with the students.

5. Provide skeletal handouts—empty outline, matrix, chart, etc.—that students can fill out in a session; students will appreciate having something tangible to take with them. These can be especially helpful for problem-solving courses. Have students put these on the board and explain them.

6. Post anonymous quotations from students on how SI has helped/is helping. Include some of these with the SI email on the first day of class.

7. Write the daily SI times and locations on the board during each class.

8. Allow for discussions between the class and the SI Supervisor if SI attendance is low.

9. Offer regular reminders from SI Leaders in class on attending SI.

10. Offer something specific in SI sessions—a study skill, rules for problem-solving, jeopardy, games, text review, etc.

11. Change SI times to accommodate the greatest number of students. Resurvey the class if necessary.

12. Offer "how to" handouts on the most efficient/effective study skills.

13. Tell student lab instructors about SI and ask for their support in promoting the service.

14. Report differences in final course grades from previous terms.

15. Post updates, session times, and session topics on social media.

16. Create an awareness video (5 minutes) that explains and promotes SI. Show it on the first day of class.

17. Be sure to promote the SI program through academic advisors, new student orientation programs, and other means before the academic term begins.

18. Place an ad in the student newspaper that lists all courses to which SI is/will be attached. Remember to include a short description of SI.

19. Place an advertisement or announcement in the campus course booklet or electronic timetable that identifies all courses to which SI will be attached. Again, remember to include a short description of SI.

20. Post flyers and/or electronic signage on campus bulletin boards or televisions.

What other SI Attendance Strategies would you add?

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OPENING THE SI SESSION

An SI session always starts with an "opener." An opener is an activity that is completed within 5 to 10 minutes and one that helps the SIL assess where the students are with the material that is about to be covered. The opener also creates an expectation of how the session will run and enforces a facilitated group style.

Discuss the following questions:

1. How will you arrange the room?
2. Where will you sit?
3. How will you introduce yourself to the group?
4. How will you introduce SI to the group?
5. How will you introduce the group members to each other?
6. What will you do if students come to the first SI session and seem upset when you explain that you will not "tutor" them?
7. How will you explain why participants need to sign in each time they attend?
8. If a student comes in halfway through the SI session, will you still ask the student to sign in?
9. What will you do if you only have one student show up for a session? No one?

Active Leading

Description:
Active learning means checking in with students throughout the session as they work on material independently or within pairs/groups to ensure that they are fully understanding the material. The SIL can achieve this by also being actively involved in the session: walking around the room, asking students questions, or sitting down with them and joining the discussion.

Rationale:
Leaders must make sure to have consistent active leading throughout their session in order to cover all the content they had planned for the session, and also to ensure that the students are engaged, thinking and learning, rather than reliant on the SIL for answers.

Active Leading	Passive Leading
● Actively group students by counting students off (1, 2, 3…). ● Actively group students by stating the names of students who will be working in a group together. ● Actively group students by having the seats put into groups prior to the start of the session. ● Have students write solutions on the board. ● Sit with the students as they work on the activity. ● Ask different students questions throughout the activity while in groups and when working as a whole. ● When putting two or more students together to work on an activity, consistently checking that all students are contributing to the group's work. ● Circulate to check on student progress during an activity. ● Ask students to work in groups and kindly ask students to move if they are able and do not automatically do so without direction.	● Standing at the front of the room while students work on an activity ● Asking students to work in groups but not requiring them to move around ● Staying up at the board and writing solutions ● Moving from the current activity to a new activity without checking for understanding ● Pairing students up but allowing them to work individually ● Suggesting an activity but not enforcing the activity to be done or bringing the group together before moving on

Mid-Session Scenarios

Break into small groups. Assign each person in the group one or more of the situations presented below and ask them to lead the group in a discussion about how they would handle it.

What would YOU do in these situations?

1. One person is dominating the conversation of the group.
2. Students are having side conversations.
3. All of the interactions in the SI sessions are between you and the students. There is no student-to-student interaction.
4. Every time you ask a question over the course content, the group becomes very quiet.
5. You have one student in the session who rarely talks.
6. A student becomes confrontational and suggests the sessions are a waste of time.
7. Students who typically do not show up for sessions are being ignored by those who do.

CLOSING THE SI SESSION

Having a closing activity at the end of every session is just as, if not more, important than having an opening activity. Similar to openers, closers are also 5 to 10 minutes long. Closers are done, as their name indicates, to close the session. They should be a quick wrap-up of any loose ends of the session and get students back on the same page before they leave. This should be a review, a confidence builder, or a summarizing activity. Think of wrapping a present. A closer puts the bow on the package.

What do YOU think?

1. Why is it generally important to provide closure at an SI session?

2. If things are really going well during an SI session, should the SI Leader stop to do the closer? Why or why not?

3. Many SI Leaders report they find it difficult to complete a closer at an SI session because they run out of time. What recommendations can you offer to avoid this problem?

Conducting Sessions Overview

The instructor-centered learning environment is one most SI Leaders and students are familiar with. In this model, the instructor or content expert is at the front of the room delivering information to those who presumably do not have the information and want to learn it. While this model has its place, the SI model works to engage students with each other around the content to create an active learning environment.

SI Leaders are responsible for creating this active learning environment, and they do so by using **facilitation strategies**, **collaborative learning techniques**, and **learning strategies** to guide student interaction patterns. The visual below depicts these tools and the interaction patterns they define:

SI Leader + Students = Facilitation Strategies

Course Material + Students = Learning Strategies

Students + Students = Collaborative Learning Techniques

The first component we will explore are the proven **facilitation strategies** that SI Leaders should use throughout every SI session:

- **Wait-Time**
- **Redirecting Questions**
- **Checking for Understanding**

WAIT-TIME

Definition[1]:
Wait-Time is the time that elapses between an SI Leader-initiated question and the next behavior (student response or the Leader talking again).

There are two kinds of wait-time:

Wait-time 1: The time the Leader waits after asking a question
Wait-time 2: The time the Leader waits after a response is provided, regardless of the accuracy

Rationale:
Wait-time is an important factor in successful SI sessions. Extensive research has demonstrated that the quality and quantity of students' verbal responses increases significantly if SI Leaders regularly utilize at least 15-20 seconds of wait-time. **Wait-time 2** seems to be even more significant than **Wait-time 1**. If SI Leaders resist the natural temptation to jump in too quickly to answer or rephrase, student learning improves. Increased wait-time allows the brain more opportunity to consolidate information, which allows for deeper processing. According to de Jong and Ferguson-Hessler[2], deep-level knowledge is associated with comprehension, abstraction, critical judgment, and evaluation. Deep-level knowledge "has been thoroughly processed, structured, and stored in memory in a way that makes it useful for application and task performance."

Research findings[3]:

For Students:

1. More students answer
2. More accurate answers
3. Answers are more elaborate, reasoned, and supported
4. Students listen to each other more
5. More speculative responses
6. More questions asked
7. Increased participation by all students
8. Increase in use of logical consistency in responses

For SI Leader:

1. Asks fewer questions
2. Connects questions better
3. Asks more higher-order questions
4. Demonstrates greater flexibility

[1] Rowe, M. B. (1974). Wait-Time and rewards as instructional variables, their influence on language, logic, and fate control: Part 1—wait-time. *Journal of Research in Science Teaching, 11*(2), 81-94.
[2] deJong, T. & Ferguson-Hessler, M. G. M. (1996). Types and qualities of knowledge. *Educational Psychologist, 31*(2), 105-113.
[3] School Improvement in Maryland. (2003). What have we learned about good instruction? Retrieved March 11, 2003, from: http://www.mdk12.org/practices/good_instruction/projectbetter/thinkingskills/ts-83-85.html

WAIT-TIME

When Students Don't Respond:

SI Leaders may worry about what to do if no one responds. After waiting 15-20 seconds with no responses, they may want to try one of the following[1]:

- ♦ Repeat the question
- ♦ Rephrase the question
- ♦ Simplify the question
- ♦ Ask a student to attempt to rephrase the question
- ♦ Break down the question into its component parts
- ♦ Make the question more specific
- ♦ Ask students what it is about the question they do not understand

After each alternative, wait 5-10 seconds.

What can you, as an SI Leader, do if no one answers a question?

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How do you respond to students who get frustrated waiting for a response?

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[1] Lorsch, N. and Ronkowski, S. (2003). *Teaching tips for TAs: Wait-time*. Retrieved July 23, 2003, from University of California, Santa Barbara website: http://www.id.ucsb.edu:16080/ic/ta/...html
Leader Resource Manual, UMKC pg.87-88

REDIRECTING QUESTIONS[1]

Description:
Redirecting questions can be considered the process most central to the Supplemental Instruction program. The process itself is fairly simple to understand, but difficult to practice without a context in which to do so. The goal of this process is to encourage more and better student-to-student interactions in the sessions. It is based on the concept that we all learn better when we have to explain something to someone else. The natural tendency for anyone is to answer questions asked; this process requires the Leader to suppress that tendency and redirect questions back to the group.

There are generally three levels of redirection we recommend SI Leaders move through before considering providing an answer. They are: **Student to Self**, **Student to Notes/Text**, and **Student to Group/External Resources**.

Sample Interaction:

Student to Leader:	**What is the derivative of a constant?**
Leader:	Can anyone find an answer to that in your notes/text? [*Use the resources that students have. Useful when it is obvious that students don't know the answer. Makes students think for themselves and process the material in a way that will be helpful for them.*]
Student to Leader:	**I don't understand how temperature affects a chemical reaction.**
Leader:	I'm glad you brought that up! Why don't we analyze #5 on the handout to see if we can understand how temperature affects different reactions? Let's see if we can come up with the reasons by the end of the session. [*Remember to use responses that offer positive reinforcement. Leaders often will anticipate problem areas and have sample problems on a handout. A useful handout may structure the answers and list steps.*]
Student to Leader:	**I don't know how to solve this problem.**
Leader:	What part(s) of the problem do you understand? *[This will help narrow the question and divide it up into more useful parts.]*
Student to Leader:	**I understand how to get the derivative, but I don't know what to do next.**
Leader:	Would someone please go to the board and scribe as we work it together? [*Note: This interaction demonstrates that there may be a two- or three-phase process. SI leaders get questions redirected back to them, for example. In that case, help the students to structure the problem, redirecting as you go.]*

[1]Riley, J. P. (1981). The effects of preservice teacher's cognitive questioning level and redirecting on student science achievement. *Journal of Research in Science Teaching, 18*, 303-309.; Brown, B. E. (1979). *Probing skills for tutors*. Paper presented at the Annual Meeting of the Western College Reading Association, Honolulu, HI. (ERIC Document Reproduction Service No. ED184065)

REDIRECTING QUESTIONS

Additional Sample Phrases:
What is this question asking for?
Why are you thinking of it in that way?
Give an example of that.
Can you summarize the discussion up to this point?
Can you think of another way to think about this?
How is your answer (point of view) different from _____?
Let's rephrase it on the board and figure out what information we will need to answer it.
Can you be more specific?
How does your response tie into ____?
Let's look that up in the text.
Let's write down everything we know about this topic/problem/theory.
How can you relate this to everyday life?
Okay, that's the book definition, but how do we define that (i.e. in your own words)?
So, how do *you* think you can redirect questions?

Practice Exercise

1. Have each participant write down a question that could be asked in a session for his/her discipline.
2. Make sure that the group is in a circle to avoid this evolving into a mini-lecture.
3. Select one participant to take the role of an SI Leader.
4. Have the participants ask the questions they have written down.
5. Have the Leader redirect the questions to the group. Group members should answer as naturally as possible.
6. After several exchanges, change who is taking the role of the Leader and repeat the process.

Questions to Consider:
How does this process attempt to break the *Dependency Cycle*?

_____

_____

What would you do if the response by the student after the Leader's redirect were "If I knew how to do this problem, I wouldn't have come to SI!"?

_____

_____

Are there some questions that should not be redirected? Give an example.

_____

_____

Directing Discussion Back to the Group

Take turns practicing redirecting the questions below (or make up some of your own) with a partner.

Hint: the phrases in the next column may be helpful.

Questions for person one:

1. Are proteins amino acids?
2. What is meant by the term "dialectical materialism"?
3. When was the Neanderthal period?
4. Where is the headquarters for the United Nations?
5. What are descriptive statistics?

Questions for person two:

1. What is the difference between organic and inorganic matter?
2. Who was William Blake?
3. Can you explain photosynthesis?
4. What is sickle-cell anemia?
5. What is the capital of Germany?

Suggested Phrases for Redirecting Questions

- Does anyone know the answer to that question?
- Can anybody help Mary answer that question?
- Can anyone find the answer to that in your notes?
- Let's look that up in the book.
- What do you think about that?
- How would you say that in a different way?
- What are we trying to find out?
- What do you need to do next?
- How did you do that?
- What do you mean by . . . ?
- Tell us more...
- What else did they do?
- Anything else?
- Can you be more specific?
- In what way?
- What are you assuming?
- Why would that be so?
- How can that be?
- How would you do that?
- Are you sure?
- Give an example of that.
- How is that related to . . . ?
- Can you summarize the discussion up to this point?
- How does your response tie into . . . ?
- If that is true, what would happen if . . .?
- What would _____ say about that?
- Let's see if we can figure out how to answer it together.
- Can you think of another way to think about this?
- Would any of you like to add something to this answer?
- How is your answer (point of view) different from _____?
- How could we phrase that into a question to ask Dr. X next class?"
- What do we need to know in order to solve the problem?
- Which words in the question do you not understand?
- Let's rephrase it on the board and figure out what information we will need to answer it.

Bloom's Taxonomy and Redirecting

One of the most important moments of an SI session happens when a member of the group asks the SI Leader a direct question. If the Leader answers the question for the group member, SI sessions will soon be reduced to the SI Leader answering questions and re-lecturing over the material. It is, therefore, critical to the overall goal of SI that questions be redirected to the group to be answered. This is more difficult than it sounds because it is counterintuitive not to answer a question for which you know the answer.

Questions that Require Students to Think: It's All in the Verbs.

Level One: Knowledge
define—repeat—record—list—recall—name—relate—underline

Level Two: Comprehension
translate—restate—discuss—describe—recognize—explain—express—identify
locate—report—review—tell

Level Three: Application
interpret—apply—employ—use—demonstrate—dramatize—practice—illustrate
operate—schedule—shop—sketch

Level Four: Analysis
distinguish—analyze—differentiate—appraise—calculate—experiment—test—compare
contrast—criticize—diagram—inspect—debate—relate—solve—examine—categorize

Level Five: Synthesis
compose—plan—propose—design—formulate—arrange—assemble—collect
construct—create—set up—organize—manage—prepare

Level Six: Evaluation
judge—appraise—evaluate—rate—compare—value—revise—score—select—choose
assess—estimate—measure

(Bloom, B. (1973). Taxonomy of Educational Objectives)

Checking for Understanding

Definition:
Checking for understanding means ensuring that students have learned the content. The learning strategies that SI Leaders use in their sessions are designed to promote student-to-student interactions. We cannot automatically assume, however, that the students are gaining understanding from their interactions. We must provide opportunities, through checking for understanding, for students to demonstrate their learning.

Rationale:
A common method of checking understanding is to ask the students a closed-ended question like, "Do you understand?" This question can be answered with a simple yes or no. This is not effective because students are sometimes uncomfortable admitting that they still do not understand a concept, especially if considerable time has just been spent on it during the session. Instead, questions that check for understanding should be open-ended and require higher-order thinking skills.

It is essential that students be able to explain the discussed topic in their own words so the Leader knows that students understand before proceeding to the next topic. If there is any doubt that the students did not "get" it, the concept should be discussed again. The Leader should make sure that the students have an opportunity to demonstrate their understanding and ensure that checks for understanding are integrated into every SI session. This will improve student preparation and learning.

Possible Ways to Check for Understanding:

1. Ask a student to summarize the concept just covered. If s/he struggles, ask the group to help him/her.
2. Ask for a volunteer to write the main points of the discussion on the board.
3. Ask a question that requires the student to understand the concept in order to answer correctly. For example, if you just reviewed the difference between the logical rules of inference, disjunctive syllogism and modus ponens, ask the group, "So I can use Disjunctive Syllogism on this argument, right?" when you cannot, based on the discussion. When they reply, "No, of course not," ask them *why not*.
4. Once in a while, intentionally make mistakes on the board or verbally. The students will catch you if they understand. If no one notices, probe the group about the content on the board until they discover the mistake. (Note: Frequent use of this strategy may confuse students.)
5. Ask the students to rephrase the question you asked originally or to rephrase the summary another student provided.
6. Ask for real-life examples or applications of the concept.
7. Ask for a similar problem, metaphor, or analogy.

Collaborative Learning Techniques

Definition:
Collaborative Learning Techniques involve groups of learners working together to solve problems, complete tasks, or learn new concepts. Collaborative Learning Techniques are designed to increase student-to-student interaction and build connections between learners in a session.

Group Discussion

A Group Discussion is, more or less, just like it sounds: a general discussion of an issue or topic by the group. Individual members are free to contribute or not contribute.

Hints
This is the most common form of collaborative learning. It is also the form that requires the most skill to use successfully. Ideally, everyone is actively involved in the discussion and the discussion topic is of equal interest to all group members. When Group Discussion is successful, it may be difficult to determine who is actually leading the discussion.

Clusters

In Clusters, group participants are divided into smaller groups for discussion. They may also be allowed to self-select the small group they want to be in. After discussing the assigned topic, the cluster may report their findings to the large group.

Hints
If possible, see that each group is provided a flip chart or a space on the blackboard to record the important points of their discussion. Allow time for each group to report back to the large group. You may have to assign someone from each group to report back.

Turn to a Partner

Group members work with a partner on an assignment or discussion topic.

Hints
This technique works best with group participants who have already been provided with enough background on a subject that they can immediately move to a discussion with their partner without previewing or reviewing concepts.

Think / Pair / Share

Group members work on an assignment or project individually and then share their results with a partner. After discussing with a partner, share findings with the larger group.

Hints

The goal of a Think/Pair/Share is to allow participants time to think BEFORE they discuss. Research shows that when people are given time to contemplate an answer to a question, their answers differ from those they would give if they responded immediately. When doing a Think/Pair/ Share, give participants a specific amount of time (30 seconds, five minutes, etc.) for the "think" portion.

Individual Presentation

An Individual Presentation is an uninterrupted presentation by one person to the group. Group members present on a topic, question, or issue to the group. Unlike an Assigned Discussion Leader, this is a formal presentation delivered to a captive audience.

Hint

Individual Presentations should typically be used sparingly and only when independent research is required.

Assigned Discussion Leader

One person in the group is asked to present on a topic or review material for the group and then lead the discussion for the group. This person should not be the regular group leader.

Hints

When assigning a discussion topic to individual members of the group, you may need to be prepared to allow a little time for the person leading the discussion to prepare for the discussion. This technique works best when everyone or nearly everyone in the group is given an assignment to be the "expert" on.

Jigsaw

Jigsaws, when used properly, make the group as a whole dependent upon all of them in subgroups. Each group provides a *piece of the puzzle*. Group members are broken into smaller groups. Each small group works on some aspect of the same problem, question, or issue. They then share their part of the puzzle with the large group.

Hints

When using a Jigsaw, make sure you carefully define the limits of what each group will contribute to the topic that is being explored.

Group Survey

Each group member is surveyed to discover their position on an issue, problem or topic. This process ensures that each member of the group is allowed to offer or state their point of view.

Hints

A survey works best when opinions or views are briefly stated. Be sure to keep track of the results of the survey.

Fishbowl

The group is separated into an “inside” and an “outside” the fishbowl. Students inside the fishbowl will participate in the activity or discussion. Students outside the fishbowl will listen to the discussion and observe the students engage in the activity. After the fishbowl, students inside are given the opportunity to reflect on their contribution to the activity and discussion. Students outside reflect on what they observed, provide feedback to those inside, and can contribute more to the discussion.

Hints

Fishbowl works well for medium to large groups. Fishbowl is also a great way to allow everyone in session to participate, regardless of their current understanding of or preparation for the content being covered in session. It is always helpful to provide a worksheet with prompts for the after fishbowl reflection.

Learning Strategies

Definition:

Learning Strategies refer to specific activities and techniques that SI leaders use to help students organize information to better understand course material and develop effective study habits. These activities are designed to foster a deeper understanding of the subject matter and course content.

1. **Outline Text Chapter:** Have students work in groups of 2-4 to make an outline using the headings from an important chapter from the text. Be sure to point out that the size and the placement of the heading are important for determining the main ideas and supporting details. After you have this "skeleton" outline of the chapter, have the students read to determine the important points under each heading. If the students have trouble determining the important points, have them turn the headings into questions and then read to find the answers. The answers are (most likely) the important points. Who, what, why, when, where, and how are good questions to begin with. Have groups compare important points with other groups.

   Online: Split students into breakout rooms of 2-4 people, ensuring that each group has access to either the physical copy or online version of the textbook. Have students use an online document (Google Docs, Microsoft Word, etc.) to create the headings and determine the important points that fall under each as above.

2. **Note Review:** This is a method of getting the students to work together to review and augment their lecture notes in an organized way. In small groups, have the students take turns reading a portion of his/her notes. Encourage other students to interject with details missed or questions about the topic. Give students time to add information to their notes between turns. Follow up with a short discussion in which students share what note-taking strategies they find effective. Suggest that when students take notes in their lecture they include "SI Questions" in the margin for the aspects of the lecture they would like to discuss in the SI session. Sometimes it is difficult to recall what those questions were if SI sessions are not right after the lecture!

   Online: Place students into breakout rooms. Encourage students to screen share their notes if taken electronically. Have students take turns reading their notes and adding missed details as above.

3. **Predict Test Questions:** Put students in groups of 2 or 3 and assign them to write a test question for a specific topic, ensuring that all topics have been covered. Ask students to write their questions on the board or on an overhead for discussion (would the professor ask the question? What is the answer? etc.) Students will have the benefit of learning to

think like the teacher and they'll be able to see additional questions that other students have written.

Online: Put students into breakout groups of 2 or 3. Have students write a test question for a specific topic on an online document (Google Docs, Microsoft Word, etc.). Ask students to share their screens in the main room to show their test questions. Alternatively, have students post their questions on the online platform's whiteboard feature/a shared online document so all students have access to all of the questions from each group.

4. **Identifying the "Big Idea":** Ask each student to tell what he thought was the most important concept, or idea of new information they learned during a particular lecture or even a session. "If you could only take one thing from the information present, what would it be? Ask each student to offer a different "take home." Students often feel overwhelmed by the sheer volume of information they have to deal with and this technique helps them identify and organize the information presented.

   Online: Have students work on the activity as described above. When they are ready, have students type their take-home messages into the chat and send them as a "chat storm," in which everyone sends their answers at the same time/the SI leader's discretion.

5. **Summarize Lecture:** As a group summarize the lecture from the previous class. You may have to provide prompts for the students. For example, "The first concept discussed was Civil Liberties and Public Policy, what did the professor highlight regarding this?" You may want to ask them to try summarizing without looking at their notes; however, if they are having a difficult time remembering, tell them to refer to their notes.

   Online: This learning strategy can be performed both in person and online without major modifications. With online sessions, students could write out their answers on the online platform's whiteboard or on a shared online document.

6. **Tik Tok It:** Create a 1-2 minute "Tik Tok" (skit) about a topic and then explain the relevance of the skit to the group. For example, have students act out a chemical reaction or biological process.

   Online: For this learning strategy, it is important to ask students to have their cameras on while they are acting out their skit. They should be encouraged to use online platforms (for example, TikTok) to create their skits.

7. **Boardwork Model:** This is a method of organizing boardwork in order to facilitate an understanding of problem-solving strategies. The board should be divided into 4 sections: 1) Prerequisite Knowledge, 2) Mathematical Steps, 3) Narrative of the Steps, 4)

Additional Sample Problem. Encourage one student to fill out section 1 on the board. Then encourage 2 students to simultaneously complete sections 2 and 3 on the board. Lastly, have another student complete section 4. Encourage the students to use this model when studying outside of the SI session.

Online: Instead of using a tangible, in-person whiteboard, use the online platform's whiteboard feature. Use the pen to divide the board into 4 sections, and have students fill out each section as above. Alternatively, PowerPoint or Google Slides can be used to create 4 different slides, one for each section.

8. **Grab Bag:** Gather a collection of items to be discussed (topics, prompts, vocabulary, questions, problems, etc.), each on separate pieces of paper or physical objects representing topics. Have students individually or in pairs draw an item and then elaborate on it (e.g., define the vocabulary word, solve the problem, elaborate how the item is related to the topic, etc.). Note: This started out as an MLA grab bag where each student had to pull out a magazine, textbook, paper, etc., and reference it properly as if they were writing a theme paper.

   Online: Ask for a volunteer to start. Then, private message them an important word or phrase that would have been in the grab bag had the session been in person. Students will elaborate on this word while other students try to guess what the word is. Either the student who got the answer correct goes next, or the student who just went can popcorn to another student.

9. **Summarizing the Procedure/Steps:** This technique reviews the process of the learning that has taken place. It is important to cover how an answer was obtained rather than just making sure the answer was correct. This technique will ensure that the students will be able to complete more of the same type of problems in their homework or on a test without the SIL to help them.

   Online: This learning strategy can be performed both in person and online without major modifications. With online sessions, ask students to write out their procedure/steps on the online platform's whiteboard or on a shared online document.

10. **Send a Problem:** Generate a list of problems. Assign a different problem to each student. Give the students a minute to complete the first step of their assigned problem. After the minute, students pass their problem to the students to their right, who then complete the second step of the problem. Continue passing the problem until the steps are completed. After, have the students present their originally-assigned problems with the completed solutions to the entire group.

Online: Place students into breakout rooms of 2-3 people, and assign each group a practice problem via an online document that is shared with every group. Have each group only complete the first step of their assigned problem. After one minute, have each breakout room take the next problem down (i.e. Breakout 1 will take Problem 2) and complete the second step of the problem. After coming back to the main room, screen share the online document and have the students present their originally-assigned problems with the completed solutions to the entire group.

11. **Note Taking:** Make one set of notes on a topic. Then go through these notes, picking out important sentences/phrases and discarding unnecessary words. Create a new set of notes based on this. Repeat the process until you have notes with only key words and phrases. Going through the notes in this way will ensure information is taken in and when the phrase or word is looked at, it will trigger the previously learned information.

    Online: Have students individually use a piece of paper near them to draft their sets of notes. Alternatively, students working in pairs or small groups can use an online document in order to draft their sets of notes.

12. **Reciprocal Questioning:** This strategy improves students' questioning and reasoning skills by encouraging the students to consider the quality and type of question. The leader should prepare 10 - 12 varied questions over an important lecture or section of text. Once at the session, ask the students to read or review the assigned material to understand it 100%. Then, allow them to ask you questions. If students' questions extend beyond the reading, model your thinking process for them. After the students have finished asking their questions, begin by asking them questions directly from the text or lecture. Then move on to higher-order questions. Finally, lead a discussion concerning what type of questions were asked. What were the differences and similarities between the students' and SIL's questions?

    Online: This learning strategy can be performed both in person and online without major modifications. Invite students to turn on their cameras and unmute their microphones when asking questions.

13. **Learning Cells:** To engage students in thinking about the content, encourage them to generate thought-provoking questions and check for understanding. 1) Students develop a list of questions and answers over course material; 2) form pairs; 3) student A asks the first question and student B answers. Student A offers corrections, clarification, additional information if needed; 4) student B asks the next question and student A answers; 5) the process continues until all questions are answered. Encourage students to

ask a variety of open-ended questions. *Collaborative Learning Techniques;* Barkley, Cross, Major.

Online: Place students into pairs in breakout rooms. The rest of the activity can be performed as above.

14. **K-W-L:** Helps students to activate prior knowledge and link to new information to make connections with what is already known. Title 3 Columns: What I **K**now, What I **W**ant to Know, What I **L**earned. Can be used to help focus the session on particular concepts that students are having difficulties with. Towards the end of the session go back to the chart and have students go back to the K column to see if any info needs to be corrected, then see if there are any questions left unanswered, and then complete the L column.

    Online: For an individual activity, have students type their KWL into the chat and send them as a "chat storm," in which everyone sends their answers at the same time/the SI leader's discretion. For a group activity, use the online platform's whiteboard feature. Use the pen to divide the board into 3 sections as described above, and ask students to fill out each section with their KWL.

15. **Affinity Grouping:** This activity can help students break down a topic to identify and classify its parts. First, each student generates ideas about a specific concept and writes each item on a sticky note. Then,in small groups or one large group depending on the number of attendees, sort and organize slips into categories on the board or wall to identify common themes. Have students create a heading for each grouping. If using small groups, have each group review each other's or have them explain their categories. Make sure students are only writing one idea per sticky note.

    Online: Have students use the online platform's whiteboard feature to generate sticky notes, and have them write their ideas on the sticky notes. If using small groups, break students into breakout rooms and use online whiteboards (Miro, Vani) to create their affinity grouping.

16. **Write a Recipe:** Students will "solve" provided problems by writing recipe cards. They will need to specify the "ingredients" (needed prior knowledge, formulas, assumptions, theorems, etc.) and then list out step-by-step "instructions" to solve the problem. Students can then compile a "recipe book" for each topic/chapter.

    Online: Either project provided problems on the online platform's whiteboard or a shared online document. Students can write their "ingredients" and "instructions" on the whiteboard/online document or share them as a "chat storm." At the end of the activity, students could compile their "recipe book" on a PowerPoint/Google Slides presentation.

17. **Venn Diagram:** A Venn diagram can be used to compare the similarities and differences between two concepts, systems, or theories. Two overlapping circles are drawn on the board with each circle labeled as one of the two concepts. Students will then write the similarities in the overlapping portion and the differences in the appropriate outer portions of the circle. This is a good visual technique for reviewing similar yet contrasting concepts.

    Online: Have a student draw a Venn diagram using the online platform's whiteboard or Canva. Then, have students use text boxes to input information into each circle.

18. **Jeopardy:** This is a fun way to check to see if students know the material well enough for a test/quiz. The key is being well prepared with about 30 - 35 "answers" at different levels of difficulty and in different categories. Form small groups and let them know the rules: No books or notes. Designate a different person to answer each question but the team can discuss the concept before answering. If the question is missed, other teams can steal. Teams keep control of the board with correct "questions". (Variation: you can just have the teams alternate turns.)

    Online: For ease of online organization in this activity, individuals within groups can communicate with each other via private message (if groups are small) or out loud (with the other teams not being able to steal if the answer is wrong). If time permits, after a group chooses a category, they can be placed in breakout rooms for 15-30 seconds to discuss the correct "question" that corresponds to the "answer." JeopardyLabs can be used as an online template for Jeopardy.

19. **Matrices:** Information presented during lectures and from the test are usually related to other topics. A matrix is an excellent way for students to see the relationships between different topics throughout the course. Reference your leader's training manual for an example and exact directions for constructing a matrix. The SIL can initially provide the framework and a few clues for completing the matrix. Eventually the students should be responsible for designing the framework and complete the entire matrix.

    Online: The framework of a matrix can be created using a table on an online document such as Google Docs (Insert → Table → Choose your dimensions). Students can then fill this in by typing into the table.

20. **Concept Mapping:** This strategy will look like a big spider web on the board when you are finished. Have the students break into small groups and encourage them to identify the central word, concept, or question around which to build the map. Start with a circle in the middle of the board with the main idea. Continue to add branches with related topics and circle groups of branches that are linked. This mapping encourages students to

see the overall picture and helps bring focus away from the minute details and back to the main idea. End with an overall discussion of the topic.

Online: Assign students a main idea. Place students into breakout rooms. Have each group use an online whiteboard program (Miro, Vani) in order to add branches to the main idea. After returning to the main room, have all groups draw their branches on the online platform's whiteboard and circle groups of branches that are linked. End with an overall discussion of the topic.

21. **3-2-1:** This strategy can be very useful before the exam. Have each student come up with 3 topics that they know well enough to "teach" to other students, 2 topics that they do not understand and need further assistance with, and 1 possible test question. Then have each student write their 3:2:1 topics on the board. Most of the time, the students' topics will overlap allowing students to "teach" the other students who need additional assistance. Follow up with a discussion of the possible test questions. This strategy can be modified in a variety of ways by redefining the 3, 2, and 1.

    Online: For an individual activity, have students type their 3:2:1 into the chat and send them as a "chat storm." For a group activity, use the online platform's whiteboard feature. Use the pen to divide the board into 3 sections as described above, and ask students to fill out each section with their 3:2:1. Alternatively, use PowerPoint or Google Slides to create three slides: one for each section of the 3:2:1. Have students write out their answers on the slide presentation using text boxes.

22. **Memory:** This strategy works as a great opener for an SI session. The SIL should prepare 12 - 24 note cards. Half of the cards should have vocabulary terms and the other half should have corresponding definitions (feel free to be creative). At the session, the SIL should shuffle the cards and place them face down. Allow the first student/team to turn over 2 cards at a time until a match is found. Once a match is found, have the student remove that pair of cards and allow another student/team to take a turn finding a match. Allow the students to continue taking turns until all the cards have been paired together. (Note: Feel free to play Memory the traditional way where students/pairs turn over 2 cards. If a match is made, done. If not, the cards are re-turned over and it is the next student's/team's turn. Alternate students/teams.)

    Online: Use online memory game generators such as Educaplay or Interacty to generate a memory game. Share your screen and then allow the first student/team to choose two cards to turn over. The rest of the game will proceed as above.

23. **Double Timeline:** Construct a very general timeline of events pertaining to the same time as the dates presented in the lecture. Present this general timeline to the group and

have them construct a duplicate timeline pertaining to the lecture material directly below the one you have previously constructed.

Online: Use timeline makers such as Time.Graphics or SmartDraw to create the first timeline. Then, have students add to the timeline underneath the one previously constructed. Share your screen at the end of the activity to discuss the two timelines.

24. **Visuals:** Don't forget the importance of using visual study aids to emphasize important points. Visuals should be used to help students grasp the "big picture." The key idea is to visualize the information and use as few words as possible.

Online: Students can find images or visual aids online or create their own using PowerPoint, Canva, or another web resource.

25. **Round Robin:** The SI Leader creates a set of questions or problems and lays them out in small clusters or individually at different locations/stations around the room. After a set time interval, have students rotate around them until they have been to every station.

Online: Place students into breakout rooms, and assign each group a set of practice problems via an online document that is shared with every group. Have each group only complete their breakout room's assigned problems. Then, have each breakout room take and complete the next problem set. After coming back to the main room, discuss the completed solutions with the entire group, seeing if each breakout room got the same answer. Alternatively, have each breakout room work on the same set of practice problems. Then, rearrange the breakout rooms for the second set of practice problems. This allows more cooperation and helps to simulate an in-person round robin activity.

26. **Example Role Playing:** If the course has difficult, conceptual topics, have the students create their examples that are tangible to them. This can be effective because students make up their own unique scenario and then they will remember it better. If possible, having the students act out the concept or propose a story will help solidify the concept

and also explain it to their peers. To make it competitive, have students decide who gave the best example and presentation.

Online: This learning strategy can be performed both in person and online without major modifications. It is important to ask students to have their cameras on if they are role playing.

27. **Think Aloud:** Model for students the thought processes that take place when difficult material is read. Using the think aloud, verbalize your thoughts while you are reading orally or working out a problem. Students will understand comprehension strategies better because they can see how the mind can respond to thinking through trouble spots and construct meaning for themselves from the text.

    Online: This learning strategy can be performed both in person and online without major modifications. Ensure that the material being read or worked out is being screen shared so all participants can see the material.

28. **Heads Up:** Put a word, phrase, or problem on a notecard. In pairs, one person holds the notecard to their forehead, the other person gives them clues of what they are holding without using the word(s) on the cards.

    Online: Place the student going first into a breakout room. Tell all of the other students present what the word, phrase, or problem is. Then, bring the student back into the main room and have the other students give clues of the word without using the actual word, phrase, or problem. Repeat this as many times as time allows. Alternatively, if the session size is small, private message each student the word, phrase, or problem without placing the student going first into a breakout room.

29. **One-Minute Paper:** The one-minute paper is designed to help students realize what they know or do not know, i.e., "check for understanding." The SIL should ask the students to take out a piece of paper and write on it the topic presented by the SIL. Remind them it is important that they put their thoughts on paper in their own words, not that they produced polished pieces of writing. Then have each student share their responses with the group. Additionally, the SIL may choose to encourage conversation regarding similarities and differences between students' ideas.

    Online: If convenient, students can take out a piece of paper and write on it the topic presented by the SIL. If a student does not have paper nearby, they can type as much as they can during the “one minute” into the online platform’s chat and send it once the time is up.

30. **Informal Quiz:** The quiz should consist of 5 - 7 questions that are read aloud by the SIL. The questions should require short multiple answers and focus on particulars of major points. The students should not be encouraged to talk or share answers; however, they can refer to their notes or textbook. If they do not have the answers they can write down the question. The quiz should be followed by a debriefing where the short answers to the questions are expanded upon through discussion. Allow the students to answer the questions in any order, and have the students restate the question and give their answer. Allow time for other students to concur or disagree and encourage discussion.

    Online: This learning strategy can be performed both in person and online without major modifications. With online sessions, students could write out their answers on the online platform's whiteboard or on a shared online document.

31. **Make/Take a Practice Quiz:** Divide the students into two or more groups. Instruct each group to make a practice quiz for another group and provide the answers to their own quiz on a separate piece of paper. Be sure to provide examples but allow them to be creative. Ask the groups to exchange quizzes and give them time to complete the other group's quiz. Then, have each group compare their answers with the answers that the other group previously composed. Be sure to allow for time to discuss questions that remain unclear.

    Online: Place students into two or more breakout rooms. Instruct each group to make a practice quiz for another group on an online document and provide the answers to their own quiz on another online document. Then, collect the links to each of these documents. Once all groups are completed, send the link to the quizzes to different groups and give them time to complete the other group's quiz. Then, send the link to the answers and have each group compare their answers with the answers that the other group previously composed.

32. **Two Lies and a Truth:** This is a spinoff of an icebreaker game when you are introduced to someone new and you both tell two things about yourself that are true, and one false fact, and see if that person can guess which one is a lie. The leader prepares two false statements about a topic, and one true statement. These statements are then read aloud to the students, and they are asked to identify the true statement. The false statements are then discussed to determine why they are false, and how they could be made true. (This strategy works well to present, "Which of the following statements are true?" questions from old exams)

    Online: This learning strategy can be performed both in person and online without major modifications. With online sessions, the SI leader could project the questions on the online platform's whiteboard or on a shared online document.

33. **Around the World:** This is especially good for exam reviews and large groups. Before the session, the SI leader should make up a number of questions with simple answers (one word or a short phrase). The fun begins when you have two students stand up next to each other and ask a question; the first person to answer correctly moves on to the next student to try another question against a new opponent, while the other sits back down. To win the game, a student must travel "Around the World," or win against every other student in the classroom. If no one succeeds in going completely "Around the World," the winner is whoever went around the furthest from their original seat.

    Online: Before the session, the SI leader should make up a number of questions with simple answers (one word or a short phrase). Instead of having two students stand up next to each other, you can have students use the “Raise Your Hand” feature on the online platform; whichever two students raises their hand first gets to answer the question. You will then read off the question. The first person to answer correctly moves on, and the other student cannot raise their hand until the next round. Other students will raise their hand again, and whoever is first will try to answer the next question against the previous winner. To win the game, a student must travel "Around the World," or win against every other student in the classroom. If no one succeeds in going completely "Around the World," the winner is whoever answered the most questions correctly.

34. **Vocabulary Development:** Chunking related terms into meaningful groups can be more helpful than drilling students on exact definitions. Compose a list of key terms from the lecture ranging in levels of specificity. Scramble the terms and then encourage pairs of students to organize the terms into several categories that are meaningful to them. Then have them define or give an example of terms where appropriate. Finally, have each pair discuss their categories with the entire group. Get the students to check spelling.

    Online: Put students into breakout room pairs. Share an online document with the scrambled word list to each group. When the breakout rooms close, the students can write out their categories on the shared document or on the online platform’s whiteboard.

35. **Escape Room/Scavenger Hunt:** Set up a series of clues/problems/situations around the room (or hallway, perhaps). Students will be required to go through problems and solve their way out of the room. This can also be done in a “murder mystery” style game that ends when someone figures out who the murderer is or solves the last problem and gets the ticket out the door. Be sure to clean up after yourself. Be safe with this CLT. No crazy shenanigans and nothing that would put someone in danger (e.g., no climbing on bookcases/desks or moving large furniture, no going into lab spaces, you cannot hold someone captive or locking doors, not going through professor’s items, etc.)

Online: Websites like Genially or Room Escape Maker typically have templates that you can use to create an online escape room. Download the templates, edit the text boxes with your problems, and share the escape room with your students. In order to escape the room(s), students must accurately answer the questions. This can be done as an individual or small-group (in breakout rooms) race-to-the-finish activity. If the activity is being done in a small-group fashion, one student should share their screen for the whole breakout room so everyone is on the same page.

36. **Family Feud:** This will work well as a test or quiz review for concepts and making connections between terms. Have students write down one term that comes to mind when a broad category is given. Create a list of the top 4 or 5 and use those as the "answers" for the game. During the session, divide students into two groups. Given the topic (broad category from the survey), students can decide whether they want to play or pass. If they play, they alternate turns calling out a term they think is relevant. If they are correct, they get the points. If not, the next student attempts. Continue in this fashion until all terms are guessed and explained or three incorrect guesses are made. If three incorrect guesses occur, the other team gets the chance to finish the topic.

    Online: There are Family Feud PowerPoint/Google Slides templates online (similar to the escape room templates). Download these and create the list of the top 4 or 5 answers and edit the text boxes with these answers. Then, assign each student to be in Group 1 or Group 2 and share your screen with the template. Then, play as described above, ensuring a different student from the answering group goes each time.

37. **Brain Dump:** This is a great closer for students to sum up their knowledge on the topic(s) from the session. Have the students take out a blank piece of paper/Google Doc and write/type ("dump") everything they know relevant from the discussion that day. The SI Leader can look at their work to assess the students' understanding of the course material and have them compare it to each other. It is important to at least discuss it with the students so the SI Leader knows the students' comfort levels with the material.

    Online: Have students work on the activity using an online document or the online platform's whiteboard. This activity could also be used as a chat storm; to do this, have students "dump" all of their knowledge into the online platform's chat box but wait to hit send until you tell them to do so. Alternatively, websites like Mentimeter allow you to create a Word Cloud that shows every student's response to the brain dump prompt provided.

38. **Instagram Post:** For this activity, you will need to print out or draw an Instagram template. Give the students the template and have them create a username, post picture, caption, and comments for a person or thing (this pairs well with **Grab Bag**). Give the students some time to brainstorm and create their Instagram post, then have each student share and give feedback to each other (comment on the post).

    Online: Websites like Canva, Adobe, and Freepik have Instagram-like templates that students can use to create their Instagram post. Using one of these websites, have students create an Instagram post as above. They should be encouraged to create their own pictures or find images online describing the person or thing that they are assigned. After the Instagram posts are made, students can be put into breakout room pairs or small groups and tasked with commenting on each other's post, which they can do by sending a shareable link to their Instagram post to the other members of their group.

39. **Pete & Repeat:** 1) Only "Pete" gets to look at notes/book/class material. 2) Students will pair up with one acting as "Pete" and the other as "Repeat". "Pete" will read the material and summarize a section to "Repeat" who will then summarize back what was said to them. Because only "Pete" can look at the material, "Pete" must be specific in their summarization. 3) Students will then switch roles with new material. 4) This is good practice for summarizing what was read as well as what was heard.

    Online: This learning strategy can be performed both in person and online without major modifications. For online sessions, place students into breakout room pairs and perform the activity as above. Ensure both students have access to the same study material.

40. **3 Before Me:** When a student asks a question during a session, have 3 students (or less depending on the number of students in the session) comment on a unique feature of that idea. The SI leader will mediate correct responses and help fill in gaps in understanding. This is a good strategy to model at the beginning of the semester and use throughout. This can help with redirecting questions and to encourage student-to-student interaction.

    Online: This learning strategy can be performed both in person and online without major modifications.

Sample SI Session Planning Form

SI Leader:
Session Week:
Session #:
Instructor:
Old Plans (when using old plans, make sure to cite them correctly): here
Session Goal:

Opener:

Take Attendance

Collaborative Learning Techniques:	type here
Learning Strategy:	type here
Time:	type here
Materials (pencil, paper, notecards, expo, packets, etc)**:**	type here
Lecture/Textbook/Old Plans/Slide References:	type here

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

type here

Content (fully worked out problems & answers):

type here

Checking for Understanding (questions & answers):

type here

Activity #1:

Collaborative Learning Techniques:	type here
Learning Strategy:	type here
Time:	type here
Materials (pencil, paper, notecards, expo, packets, etc)**:**	type here
Lecture/Textbook/Slide References:	type here

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

type here

Content (fully worked out problems & answers):

type here

Checking for Understanding (questions & answers):

type here

Activity #2:

Collaborative Learning Techniques:	type here
Learning Strategy:	type here
Time:	type here
Materials (pencil, paper, notecards, expo, packets, etc)**:**	type here
Lecture/Textbook/Slide References:	type here

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

type here

Content (fully worked out problems & answers):

type here

Checking for Understanding (questions & answers):

type here

(Optional) Activity #3:

Collaborative Learning Techniques:	type here
Learning Strategy:	type here
Time:	type here
Materials (pencil, paper, notecards, expo, packets, etc)**:**	type here
Lecture/Textbook/Slide References:	type here

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

type here

Content (fully worked out problems & answers):

type here

Checking for Understanding (questions & answers):

type here

Closer:

Take attendance AGAIN if you had any late students

Collaborative Learning Techniques:	type here
Learning Strategy:	type here
Time:	type here
Materials (pencil, paper, notecards, expo, packets, etc)**:**	type here
Lecture/Textbook/Slide References:	type here

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

type here

Content (fully worked out problems & answers):

type here

Checking for Understanding (questions & answers):

type here

Plan Checklist (check off the things you've completed)

- Variety in CLTs and Learning Strategies
- Chapter/slide# where information is coming from
- Included Timestamps (and buffer time as needed)
- Details on how leader will break up students
- CFU questions
- Fully worked out problems and examples for each activity
- Necessary links required for online implementation (if applicable)
- Old plans correctly cited (if applicable)
- Plan is available for anyone to view

GUIDING QUESTIONS FOR PLANNING

1. **What is the most difficult content?** Remember, important is not the same as difficult. There will always be important concepts that you will not have time to address in the sessions. If you try to cover everything, you will create students dependent on you for their knowledge. Instead, we would like to create independent students who can take the study skills they learned in SI and apply them to their future courses.

2. **What collaborative learning techniques AND learning strategies will work well with these concepts?** I.e. think-pair-share, group discussion, turn to a partner, AND Note review, informal quiz, divide and conquer, think-pair-share, boardwork model, matrix etc) How much time do you expect to spend on each activity?

3. **How many students do you expect?** What will you need to adjust in the strategies you've chosen depending on how many students actually attend? How can you be ready for students who are not prepared? (no book, no notes, haven't read book etc) Make those plans now.

4. **What do you need to prepare to make these strategies successful?** (ie. Review your own lecture notes for a note review; write an informal quiz; divide a reading assignment for divide and conquer; select problems representative of important types to use for think pair share or boardwork model; form your own complete matrix etc.) NOTE: SI Leaders should submit these materials when they submit their planning sheet as part of their completed plan.

PLANNING TIPS

Opening the Session Tips:

Opening a session may just seem like a formality, but it can really set the tone for the session. Good openers should be short (no more than 10 minutes) but still allow the SI leader to prep the students for more difficult session material to come or gauge the students' understanding of previous material. Try varying the goal of openers until you find what you like best! Some strategies that generally work well for openers include one-minute papers, KWL, informal quiz, incomplete outline, brain dump, challenge yourself, and note review. Almost any strategy can be utilized, but some larger content categorization strategies may need to be modified for the shorter time span.

Closing the Session Tips:

Closing a session is just as important, if not more so, than any of the other activities in the session. Even if the session has run too long, it is crucial to ask a quick question to tie everything together. In general, good closers should be short (5 minutes or less) and allow the leader to do a final check for student understanding. This is a great time to make sure the content covered in session is now clear to students or ask them what they are still struggling with so future sessions can be planned for maximal student benefit. Some strategies that generally work well for closers include one-minute papers, summarize the session, informal quiz, challenge yourself, group survey, and brain dump. Again, almost any strategy can be utilized if modified properly.

Tips for Effective Use of Planning Time:

Many new leaders struggle with how to best utilize their planning time. Many times, in order to plan a quality session, leaders spend more than the paid planning time, but this is not always necessary! During lecture, while you are taking notes, begin to think about what material you may want to present in your sessions and what activities would be a good way to present that material. Then, when you return to the lecture notes while planning the session, you already have a "skeleton plan" and it will not take as long to elaborate and make a thorough session plan. If no students are present, use this time to think ahead to what sessions you have coming up and what material you might want to cover.

Tips for Planning for First Session(s):

Typically, first sessions do not need to cover much material. Many of them may occur before the class has even started! Regardless, you should still advertise these sessions, as people will want to get into a regular schedule of attending SI. A few good activities to do in first sessions include a get-to-know-you activity, to foster a comfortable learning environment for the semester; a syllabus review, so students are aware of what is expected of them; a survey of what the students are most anxious about in the course, so you can calm their fears and get an idea of what to focus on throughout the semester; and a review of prerequisite knowledge, so the students realize what they might want to brush up on to have a successful semester. If there is material to cover, feel free to jump right in!

EXAM REVIEW SESSION TIPS

Extended Session Planning Tips:

Many SI Leaders find it beneficial to offer an extended SI session leading up to an exam. The approach to planning these sessions can be challenging since the attendance of these sessions is typically significantly increased from regular sessions and there is a lot of information to get through. When approaching the extended session planning, it is helpful to go back to lecture notes or previous sessions and make a list of all the key concepts. Some people like to reuse all their previous session activities, but it is usually better to come up with new ways to present the material (especially because you have so much material to get through in a relatively short amount of time). Only focus on the critical tested information! Collaboration techniques may also need to be modified, depending on the session size. Generally, it works well to give the students an activity or page of activities and have them work in partners or clusters as you actively circulate through all groups. Make sure that you always bring the group back together and discuss the answers together so everyone leaves with the correct information.

Students at extendeds more than any other session are prone to not working until you provide the answers, so be firm in reminding them that actually participating will help them more than passively copying or taking a photo of the answers. At the end of the session, many people will also ask to take photos of your packet (if you put one together). It is best to either have them write it down from your answers or have them ask another student in the session. This is up to your discretion, but know that you will be establishing precedent for future sessions. Try not to get too stressed while executing your extended session, as your students will appreciate whatever you put together for them.

Post Exam Session Planning Tips:

Usually attendance directly after an exam is reduced, especially if no new lecture material has been covered. Post-exam surveys are a great strategy to use in these sessions, as it allows the students to introspectively evaluate their performance and decide what they would like to change for the next exam. This is also a great time to ask your students what they liked/would like to change about your SI sessions. Sometimes a specific strategy was especially helpful, so hearing this information allows you to incorporate it more frequently into future sessions. Regardless of whether the professor releases the exam questions, you can usually have the students work together through questions or topics they found most difficult on the exam. With time, you will find what works best for your course, and then you can generally run all of these after-exam sessions in the same way.

Planning for Flexibility

One of the most difficult parts of being an SI leader occurs when one has a great plan, but something occurs in session that makes it infeasible to execute as designed. Flexibility is key! There will be times when you expect 2 students to show up, and 30 do instead (or vice versa). This may cause you to need to adjust your collaboration techniques – so always have one in reserve to use in these situations (i.e. think pair share for a small group and divide and conquer for a large group).

Similarly, sometimes the students who show up to your sessions may not understand the prerequisite knowledge necessary for the activities you had planned to do. In this situation, try pulling out an activity from a previous session where you did cover the prerequisite material, and see if after doing that activity, you can continue with your plan. Another option is to execute the note taking strategy and have the students group up and break down the information they have written down from lecture.

Most commonly, activities will take way more or way less time than anticipated. Timing is one of the most difficult parts of planning and executing sessions, especially when students show up who are very advanced or very behind. The most important thing to remember is that sessions are supposed to be run in a way that is effective for the students who took time to show up. Thus, if they are very confused, you should spend extra time making sure they understand the information. This may mean you have to modify future activities to take less time (by removing information or reducing the initial work time) or save them for a future session. Again, having an effective session is more important than getting through all the activities, BUT make sure you are still doing a closer! Even if you don't get to do your planned closing activity, come up with a quick summation question that you can ask them even as they are walking out the door.

Effective session flexibility is something acquired over time, so do not be discouraged if it is difficult during your first few sessions. One way to make this easier is by incorporating some flexibility into your written plan. For example, you can write out how you might change an activity if there are fewer students, students are confused or if you are running out of time. It is also helpful to think through a few quick checking for understanding questions that you can sprinkle throughout the session or save for a quick closer. One way to help yourself remember these questions is to write them down as you are planning your session to ensure you don't forget the question, or more importantly the solution. Again, this becomes easier with time!

Sample Session Plan
Conceptual (in-person)

SI Leader: Makenzie Lyon
Session Week: Week 3
Session #: Session 2- Wednesday
Instructor: Wilfred, Rempfer, Hambrick
Old Plans (when using old plans, make sure to cite them correctly): here
Session Goal: Work on WT2, don't feel rushed. Everyone is here to learn to the best of their ability.

Opener:

Take Attendance

Collaborative Learning Techniques:	Think/Pair/Share
Learning Strategy:	Identify the Big Idea
Time:	10:00 - 10:10 am
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Expo, pencil, paper
Lecture/Textbook/Old Plans/Slide References:	Chapter 1

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

How are students being divided?
- Students will partner with the person next to them in groups of two or three, depending on group size

Students will have 5 minutes to work with their group/partner to write down 2-3 topics from chapter 1 that they feel need the most attention. After the 5 minutes are up, SI will announce that they should switch to chapter 1 and come up with 2-3 points that are most important. After the 10 minutes, everyone will have 5 minutes to present to the group why these are the most important topics.

Content (fully worked out problems & answers):

Potential Chapter 1 Topics:
List 3 differences between psychologists and psychiatrists.
Psychology
- the science of behavior and mental processes

- not all treat mental disorders
- broad field which includes mental processes and human behavior
- no medical training
- cannot prescribe medication in most states
- works with brain function, social interaction, mental well-being, and mental disorder
- hold doctoral degrees, but don't have to go to medical school

Psychiatry

- all psychiatrists treat mental disorders
- hold MD (doctor of medicine) degrees

can treat behavioral and mental issues, normally with medication

- medical specialty, not part of psychology
- tend to treat more severe mental health issues

What are the 3 classifications of psychological specialties?

- Experimental Psychologists
    - AKA research psychologists
    - perform research that create knowledge
    - Example
        - study effects of sugar on hyperactive children
        - most work at colleges where they teach
- Applied psychologists
    - use the knowledge developed by experimental psychs to tackle human problems
        - schools
        - clinics
        - social service agencies
- Teachers of psychology
    - universities
    - 2-4 year colleges
    - high schools

Can you give an example of an internal mental process and an external observable behavior?

- Internal: remembering how to get to a certain location
- External: how you react to loud noises

The scientific method:

Independent variable:

- The variable manipulated by the experimenter

Dependent variable:

- The measured outcome of a study; the responses of participants in a study

Hypothesis:

- A statement predicting the outcome of a scientific study; a testable idea

Qualitative Data:

- Descriptive and different than quantitative data

Experiment:

- A scientific procedure undertaken to make a discovery, test a hypothesis, or demonstrate a known fact in which the researcher attempts to control conditions.

Empirical Investigation:

- An approach to research that relies on sensory experience and observation as research data

Theory:

- A testable explanation for a set of facts or observations.

Potential Chapter 2 Topics:

1. Biopsychology
    a. the branch of psychology concerned with its biological and physiological aspects.
2. Genes
    a.Biological "information" that is transferred from a parent to offspring and determines characteristics (DNA)
3. Adaptation
    a. A change that better suits an organism to survive in its environment
4. Evolution
    a. Process by which succeeding generations of organisms change as they adapt to changing environments
    b. As proposed by Charles Darwin
5. Natural Selection
    a. Organisms with adaptive traits are more likely to survive long enough to reproduce than those who have maladaptive traits (push toward the example in the book about the beetles)
6. Genotype
    a. The genetic code that is the underlying factor for several traits (cannot be directly observed)
7. Phenotype
    a. The observable physical and psychological characteristics
8. Epigenetics
    a. The environment changes how genes are expressed in the body, allowing some processes to adapt based on what is occurring in our environment.

Neurotransmitter Pathway Ordering

Place these actions in the correct order

1 An action potential reaches the end of a neuron (the axon)
2 The neurotransmitters flood out of the neuron and into the synaptic cleft/synapse
3 Some neurotransmitters bind to the next neuron's dendrite
4 They send another action potential through that neuron.

Checking for Understanding (questions & answers):

What are the 3 layers of the brain?

- Brainstem, limbic system, cerebrum

Can you give an example of an internal mental process and an external observable behavior?

- Internal: remembering how to get to a certain location
- External: how you react to loud noises

Activity #1:

Collaborative Learning Techniques:	Assigned Discussion Leader
Learning Strategy:	Peer Lessons/Practice Quiz
Time:	10:10 - 10:30 am
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Pencil, paper, expo
Lecture/Textbook/Slide References:	Chapter 2

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

How are students being divided?
- Students will remain with the same partner(s) for the previous activity

The students will have 5 minutes to create one question from chapters 1 and 2 to present to another group. The students must write down a question on the big whiteboard for everyone to see and have have discussion bullet points listed. Content can fall under the same categories as the opener. After the working time, students will write the questions on the board. Students will have 5 minutes to work on the problems and put the answer on the big board. Upon answering the questions, the Assigned Discussion Leader will have a discussion to see how they came up with and defend their answer.

Content (fully worked out problems & answers):

Same content as Opener Section!

Checking for Understanding (questions & answers):

Give an example of genotype versus phenotype.
- BB = purple, Bb = purple, and bb = white
- The genotypes are the B's and how they are associated genetically while the colors translate to physicalities.

Do you feel like a similar question will come up on the test? How will you study this material?
- I believe so, yes! I will adapt to my learning styles to give myself the best chance to learn the

material.

Activity #2:

Collaborative Learning Techniques:	Group Discussion
Learning Strategy:	Pass the Marker
Time:	10:30 - 10:45 am
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Pencil, paper, expo
Lecture/Textbook/Slide References:	Chapter 2

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

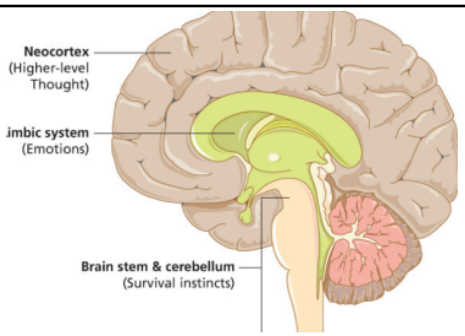
How are students being divided?
- Students will not be divided but rather work together as a group

Students will fill out the information as a group about the different parts of the brain, how they communicate, and what they do. Students will have 7 minutes to pass the marker and answer as many questions as possible then a discussion will be had for 7 minutes.

Content (fully worked out problems & answers):

Guide for neurotransmitter pathway:
1 An action potential reaches the end of a neuron (the axon)
3 Some neurotransmitters bind to the next neuron's dendrite
2 The neurotransmitters flood out of the neuron and into the synaptic cleft/synapse
4 They send another action potential through that neuron.

Photo of the brain layers:



Layers of the brain and their corresponding function:
- Higher order thinking: Cerebrum
- Regulates reaction to sad things: Limbic system
- Source of knee jerk reactions: Brain Stem
- In control of breathing: Brain Stem
- Retrieving information from your last vacation: Limbic System
- Sorting out your work schedule: Cerebrum

Checking for Understanding (questions & answers):

How did you come up with your definition for epigenetics?
- epi means disease and genetics are your internal map of how things work. disease has to adapt and change to their environment in order to survive so it is about how environmental changes affect ways that genes are expressed in your body.

How do you differentiate between genotype and phenotype?
- genotype sounds like genes so how genes are expressed. phenotype starts with ph and so does physical so it is the physical characteristics that we see.

Closer:

Take attendance AGAIN if you had any late students

Collaborative Learning Techniques:	Think/Pair/Share
Learning Strategy:	Pairing Wrap Up
Time:	10:45 am - 10:50 am
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Internet Access
Lecture/Textbook/Slide References:	N/a

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

How will students be divided?
- Students will pair with the person to their right

Students will have 3 minutes to discuss with their partner whether they think the example matches with Sensation or Perception

Content (fully worked out problems & answers):

- Sensation: A process by which a simulated receptor (eyes and ears) creates a pattern of
- neural messages that represents the stimulus in the brain.
- Perception: Process that elaborates and assigns meaning to incoming sensory patterns.
- Sensation: Transformation stimulus into a form our brains can understand.
- Sensation: Gives rise to our initial experience of the stimulus.
- Perception: Uses Gestalt Theory to organize incoming stimuli into meaningful patterns.
- Sensation: Physical experience
- Perception: Psychological experience

Checking for Understanding (questions & answers):

What is something troublesome you find in distinguishing between sensation and perception?
- Sensation is according to the senses and perception is mental patterns

Which is based on a physical experience?
- Sensation

Plan Checklist (check off the things you've completed)

- ~~Variety in CLTs and Learning Strategies~~
- ~~Chapter/slide# where information is coming from~~
- ~~Included Timestamps (and buffer time as needed)~~
- ~~Details on how leader will break up students~~
- ~~CFU questions~~
- ~~Fully worked out problems and examples for each activity~~
- ~~Necessary links required for online implementation (if applicable)~~
- ~~Old plans correctly cited (if applicable)~~
- ~~Plan is available for anyone to view~~

Sample Session Plan
Conceptual (Online)

SI Leader: Ross Dare
Session Week: 3
Session #: 1
Instructor: Dr. Cuddy/Wooten/Norgard
Old Plans (when using old plans, make sure to cite them correctly): here
Session Goal: Reflect on Exam 1 + Prepare for Exam 2

Opener:

Take Attendance

Collaborative Learning Techniques:	Individual/Group Discussion
Learning Strategy:	Exam Review/Reflection
Time:	6:30-6:45PM (**15 MIN**)
Materials (pencil, paper, notecards, expo, packets, etc):	Google Doc/Google Form: https://docs.google.com/document
Lecture/Textbook/Old Plans/Slide References:	N/A

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

2 MIN: I will have students log into attendance via RooLearning+, and I will give them access to the Google Doc (which contains the link to the Google Form).

5 MIN: Students will have five minutes to answer the questions on the Google Form, reflecting on how Exam 1 went and what they can do better in the future or maintain for future exams.

8 MIN: The remainder of the time will be a group discussion, and I will open up the floor for a Q&A session about future exams.

Content (fully worked out problems & answers):

Answers vary but can include:

- I felt like I had to learn a lot of material in one week. It was stressful, and I didn't do as well as I would have liked. In the future, I would like to start studying earlier so I do not feel overwhelmed.

Checking for Understanding (questions & answers):

Q: When is Exam 2?
A: Tuesday June 18th

Activity #1:

Collaborative Learning Techniques:	Pairs
Learning Strategy:	Explain it Like I'm Five!
Time:	6:45PM-7:15PM (**30 MIN**)
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Google Doc
Lecture/Textbook/Slide References:	Diuretics, ACE/ARB, inotropes, and centrally acting agents lectures

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

1 MIN: I will explain the activity. Students will be put into breakout room pairs and will be assigned to find as many drug classes as they can from the four lectures they have covered thus far in Unit 2. They should work together to take notes of their names, indications, and mechanisms of action.

14 MIN: Students will have 14 minutes to work on this.

15 MIN: We will come back as a big group. I will have the different pairs present medications of their choice as if they were talking to their younger brother/sister (see example in Content). I will also ask the CFUs.

Content (fully worked out problems & answers):

Acetazolamide
Loops
Thiazides
Triameterene/amiloride
Spironolactone
ACEs
ARBs
Aliskiren

Dobutamine
Digoxin - blocks Na+/K+ ATPase while also stimulating vagus nerve
Milrinone - PDE3 inhibitor → increased cAMP
a2 agonists – clonidine, guanfacine, methyldopa
Beta blockers
CCBs

ACE inhibitors inhibit angiotensin-converting enzyme, an enzyme that results in a raising of blood pressure. The RAAS says that, when the kidneys are not getting enough blood, they will secrete renin, which cleaves angiotensinogen produced by the liver into angiotensin I. Angiotensin I is then converted into angiotensin II by ACE in the lung. AngII can cause vasoconstriction, increase sympathetic tone, cause secretion of aldosterone (which results in Na+ and water retention), all of which lead to an increase in blood pressure. By inhibiting ACE, less AngI can become AngII, helping to lower blood pressure through the mechanisms above.

Checking for Understanding (questions & answers):

Q: What are the different mechanisms of action of furosemide, spironolactone, HCTZ, triamterene, and acetazolamide?
A: Furosemide - Loop diuretics that inhibits the Na+/2Cl-/K+ transporter in the loop of Henle → causes increased excretion of Na+ → water/fluid/volume loss. **Metabolic alkalosis.**
HCTZ - thiazide diuretic that inhibits the Na+/Cl- transporter in the DCT → causes increased excretion of Na+ → water/fluid/volume loss. Recommended for HTN treatment. Metabolic **alkalosis.**
Acetazolamide - carbonic anhydrase inhibitor in the PCT. By inhibiting CA, inhibit the creation of protons within the cell and no more can be exchanged for Na+ → increased Na+ excretion. Also leads to metabolic **acidosis.**
Triamterene - Blocks epithelial Na+ channels in the collecting duct, leading to increased Na+ excretion without increased K+ secretion.
Spironolactone - K+-sparing diuretic that is an aldosterone antagonist. By blocking aldosterone's function, less Na+ will be reabsorbed.

Activity #2:

Collaborative Learning Techniques:	Think/Pair/Share
Learning Strategy:	Practice Questions!
Time:	7:15PM-7:55PM (**40 MIN**)
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Google Doc
Lecture/Textbook/Slide References:	Unit 2 Material

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

2 MIN: I will explain the activity. Students will have 15 minutes to work on the practice questions individually, then 10 to work in their pair that I will put them in over Zoom. Then, we will spend the remainder of the time sharing as a big group.

15 MIN: Students work individually.

10 MIN: Students work in pairs and compare answers.

23 MIN: Students will share answers in the big group. I will ask CFUs periodically throughout.

Content (fully worked out problems & answers):

1. Which of the row describes the effects of ACEIs? C
   a.

	Renin	Angiotensin I	Angiotensin II	Aldosterone	Bradykinin
A.	↓	↓	↓	↓	No change
B.	↑	↓	↓	↓	No change
C.	↑	↑	↓	↓	Increase
D.	↑	↑	↑	↓	No change
E.	↑	↑	↑	↑	No change

2. Which of the row describes the effects of ARBs? D
3. Which of the row describes the effects of aliskiren? B
4. A 62-year-old man comes to the office due to progressive fatigue, dyspnea on exertion, and orthopnea. Medical history is significant for hypertension, hyperlipidemia, and myocardial infarction 2 years ago. The patient admits to poor medication compliance. Blood pressure today is 160/95 mm Hg and pulse is 94/min. Physical exam reveals bilateral lung crackles and lower extremity edema. The point of maximal impulse is displaced to the left. After this patient's condition has stabilized, long-term use of which of the following medications will most likely reduce mortality?
   a. Amlodipine
   b. Digoxin
   c. Furosemide
5. A patient comes into your office after attending a health fair because their blood pressure was 150/90. The reasonably concerned patient asks to be put on an ACE inhibitor or an ARB since they heard that those are the most popular drugs. Which of the following reasons would be an ABSOLUTE contraindication and would be a reason not to give one of the requested drugs.
   a. The patient has narrowing of the renal arteries in both kidneys
   b. The patient is an alcoholic and is suffering from liver cirrhosis
   c. The patient is African American
   d. The patient is Caucasian
   e. Both A and C
6. A 63-year-old male patient returns to your clinic 4 weeks after his last appointment with you.The

patient complains of a persistent cough which started 7 days ago and complains that it won't go away. The pt's history is positive for an MI six years ago. The pt denies smoking history, alcohol, or drug abuse. The patient's vitals consist of a pulse of 63, RR of 16, BP of 125/82, and temp 98.7F. The patient says he has not been coughing up any blood or mucus and sleeps very comfortably at night on one pillow. Which of the following is the most likely cause of his cough and what is the best next step in management?

a. Heart failure; refer patient to cardiology
b. Lisinopril; reassure patient that the cough will go away with time
c. Lisinopril; switch patient to valsartan
d. Valsartan; reassure patient that the cough will go away with time
e. Valsartan; switch patient to lisinopril

7. Which of the following would cause the following lab profile:

Na+ - 134
K+ - 3.0
Calcium - 8.0
Cl - 90
pH - 7.5

a. Torsemide
b. Acetazolamide
c. Triamterene
d. Spironolactone
e. Chlorthalidone

8. Which of the drugs below matches this description: Inhibits PDE3, leading to increased cAMP and increased muscle contraction

a. Digoxin
b. Milrinone
c. Dopamine
d. Dobutamine
e. Clonidine

Checking for Understanding (questions & answers):

See above.

Closer:

Take attendance AGAIN if you had any late students

Collaborative Learning Techniques:	Individual
Learning Strategy:	Brain Dump/Chat Storm
Time:	7:55PM-8:00PM (**5 MIN**)
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Zoom Chat
Lecture/Textbook/Slide References:	Unit 2 Material

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

3 MIN: Students will have three minutes to brain dump as much as they can about the information covered thus far in Unit 2 in the Zoom chat.

2 MIN: We will send the information as a chat storm.

Content (fully worked out problems & answers):

Answers vary. Could include any information from the four lectures covered so far, including:
MOA of ACE/ARBs
MOA of diuretics

Checking for Understanding (questions & answers):

Q: When is Ria's SI session this week?
A: Thursday instead of Wednesday!

Plan Checklist (check off the things you've completed)

- ~~Variety in CLTs and Learning Strategies~~
- ~~Chapter/slide# where information is coming from~~
- ~~Included Timestamps (and buffer time as needed)~~
- ~~Details on how leader will break up students~~
- ~~CFU questions~~
- ~~Fully worked out problems and examples for each activity~~
- ~~Necessary links required for online implementation (if applicable)~~
- ~~Old plans correctly cited (if applicable)~~
- ~~Plan is available for anyone to view~~

Sample Session Plan
Problem-Solving (In-Person)

SI Leader: Ririka Kamimura
Session Week: 7
Session #: 2
Instructor: Amy Donnelly
Old Plans (when using old plans, make sure to cite them correctly): here
Session Goal: Master Chapter 3

Opener:

Take Attendance

Collaborative Learning Techniques:	Group Discussion
Learning Strategy:	Formula Hunt
Time:	10:00-10:10
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Whiteboard and Dry erase markers
Lecture/Textbook/Old Plans/Slide References:	Ch.3 Slide 39-53

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

10:00-10:03 Take attendance
10:03-10:04 Explain the activity
I will provide students with the names of the formulas they learned on Tuesday and they will discuss to find the formulas. I will have one student come up and write down the formula on behalf of the classroom. They will start this activity without searching in a textbook, their notes, slides, and online and help each other to find all 4 formulas. If all students cannot recall the formulas, they can check their textbooks, notes and slides.
10:04-10:10 Formula hunt

Content (fully worked out problems & answers):

Liquidity ratios:
Current ratio=CA/CL
Acid test ratio (Quick ratio) = Quick assets(cash, short-term investments, A/R)/CL
Solvency Ratios

Debt-Equity ratio=TL/Shareholders' equity Times interest earned ratio=(NI+Interest expense+Income taxes)/Interest expense

Checking for Understanding (questions & answers):

What is the formula of acid test ratio (quick ratio)? **Acid test ratio (Quick ratio) = Quick assets/CL** What are the components of quick assets? **cash, short-term investments, A/R** Which is better, a higher or lower ratio for current ratio? **Higher** **Why? Because it means you have more current assets than you do current liabilities**

Activity #1:

Collaborative Learning Techniques:	Think/Pair/Share
Learning Strategy:	Find the ratios and favorable financial leverage
Time:	10:10-10:25
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Whiteboard and dry erase markers
Lecture/Textbook/Slide References:	Ch.3 Slide 39-53

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

10:10-10:11 Explain the activity I will provide the balance sheet on the screen and students will be asked to calculate the ratios (current ratio, quick ratio, and debt-equity ratio). Students will work on individually and then discuss the answer with the partner. After that we will share the answer to the class. We will do this cycle for 2 times. **10:11-10:16 First round** 10:11-10:13 Individual work time 10:13-10:14 Partner time 10:14-10:16 Share **10:16-10:25 Second round** 10:16-10:19 Individual work time 10:19-10:20 Partner time 10:20-10:25 Share

Content (fully worked out problems & answers):

https://www.canva.com/design

ANSWERS:
1. Current ratio=94,000/48,000=1.958
   Quick ratio=(30,000+25,000)/48,000=1.146
   Debt-Equity=92,000/96,000=.958
2. Income before interest and income taxes= 100M*20%=20M
   Interest expense=40M*5%=2M
   Income before income taxes=20M-2M=18M
   Income tax expense=18M*45%=8.1M
   NI=18M-8.1M=9.9M

Checking for Understanding (questions & answers):

What is the formula for time interest earned ratio? **(NI+Interest expense+Income taxes)/Interest expense**

Activity #2:

Collaborative Learning Techniques:	Think/Pair/Share
Learning Strategy:	Take a practice Quiz
Time:	10:25-10:45
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Pencil, paper, whiteboard, dry erase marker
Lecture/Textbook/Slide References:	Ch.3 Slide1-32

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

10:25-10:26 Explain the activity
Students will prepare a balance sheet for the company I will provide on the screen. I will give them to work on it for 8 minutes individually. They can use slides, notes or a textbook if they need. Then, they will check the answer with your partner for 4 minutes to prepare for answering in the classroom. Finally, we will discuss it in class by using the whiteboard.
10:26-10:34 Work on the problem individually
10:34-10:38 Discuss the answer with your partner
10:38-10:45 Share your answer with your classmates
I will ask students to come up and write down one balance sheet as a class on the whiteboard. I will check the answer once everyone agrees on the balance sheet.

Content (fully worked out problems & answers):

https://www.canva.com/design

Checking for Understanding (questions & answers):

How do you find RE? **Assets-Liabilities=Stockholders Equity Stockholders' equity- paid in capital=RE**
What number do you need to make sure whether you are doing right or not?
Assets=Liabilities+Stockholders Equity

Closer:

Take attendance AGAIN if you had any late students

Collaborative Learning Techniques:	Group Discussion
Learning Strategy:	K/W/L
Time:	10:45-10:50
Materials (pencil, paper, notecards, expo, packets, etc):	N/A
Lecture/Textbook/Slide References:	N/A

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

Students will be asked to think through the following questions for 1 minute before sharing them to classmates.

- What concept do you feel the most comfortable with?
- What would you like to understand more confidently?
- What is something that you learned in this session?

Content (fully worked out problems & answers):

N/A

Checking for Understanding (questions & answers):

What do you need to do over the weekend/ rest of the week? **HW, Project, review the ratios**

Plan Checklist (check off the things you've completed)

- ~~Variety in CLTs and Learning Strategies~~

- ~~Chapter/slide# where information is coming from~~
- ~~Included Timestamps (and buffer time as needed)~~
- ~~Details on how leader will break up students~~
- ~~CFU questions~~
- ~~Fully worked out problems and examples for each activity~~
- ~~Necessary links required for online implementation (if applicable)~~
- ~~Old plans correctly cited (if applicable)~~
- ~~Plan is available for anyone to view~~

Sample Session Plan
Problem-Solving (Online)

SI Leader: Savannah Stewart
Session Week: 7
Session #: 1
Instructor: Gladbach
Old Plans (when using old plans, make sure to cite them correctly): here

Opener:

Take Attendance

Collaborative Learning Techniques:	Individual/Group Discussion
Learning Strategy:	Note Review/Brain Dump
Time:	2:30 – 2:41
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Computer/Phone (Student Provided) Notes (Student Provided) Google Doc https://docs.google.com/document
Lecture/Textbook/Old Plans/Slide References:	2.1 – 2.7

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

Explain the Activity – 2 Minutes (2:32)
Students will be given time to review the previous week's notes for this class, paying attention to the material that they deem more important, feel like they need to personally remember, or are confused about. After the students have reviewed their notes, they will come back together as a group to discuss what they reviewed individually.

Allow Time for Attendance – 1 Minute (2:33)
Students will be given time to sign into RooLearning+ and sign into attendance. At the end of this section, each student should have filled out attendance.

Note Review – 4 Minutes (2:37)
Using their notes, both available through the course's Canvas page and their own resources, the students will review the information that will assist them with today's activities. During this time, they should be allowed to write down or take note of information that they deem important or they feel they need to remember. At the end of this section, each student should have reviewed the notes for the previous week of class.

Group Discussion – 4 Minutes (2:41)
Students will think through the different concepts that they found important when reviewing, writing them on the Google Doc or stating them aloud as they think. Students should be allowed to discuss with each other during this time. At the end of this section, each student should have contributed to the overall list

Content (fully worked out problems & answers):

N/A

Checking for Understanding (questions & answers):

What is the difference between proof by contradiction and proof by contrapositive? Contradiction shows that the negation of the original statement is false, therefore proving the original statement true. Contrapositive shows that the contrapositive of the original statement is true, therefore proving the original statement true.

Activity #1:

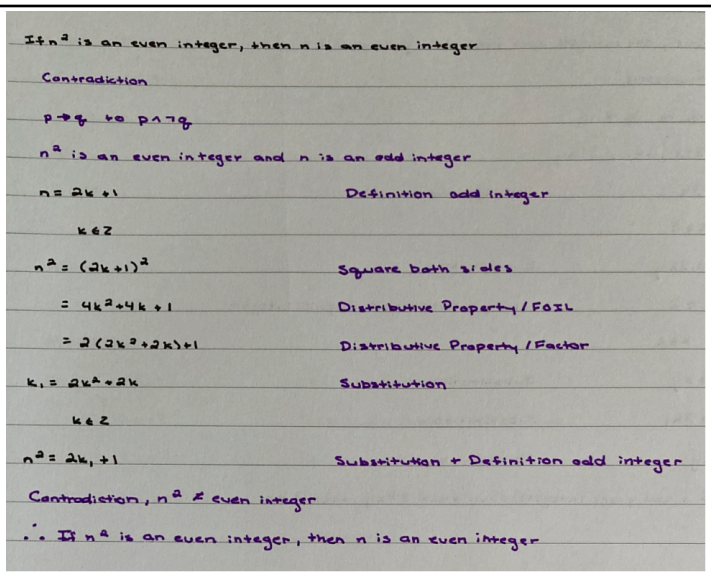
Collaborative Learning Techniques:	Group Discussion
Learning Strategy:	Structured Problem Solving
Time:	2:41 – 2:58
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Google Doc https://docs.google.com/document
Lecture/Textbook/Slide References:	2.6 Proof by Contradiction

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

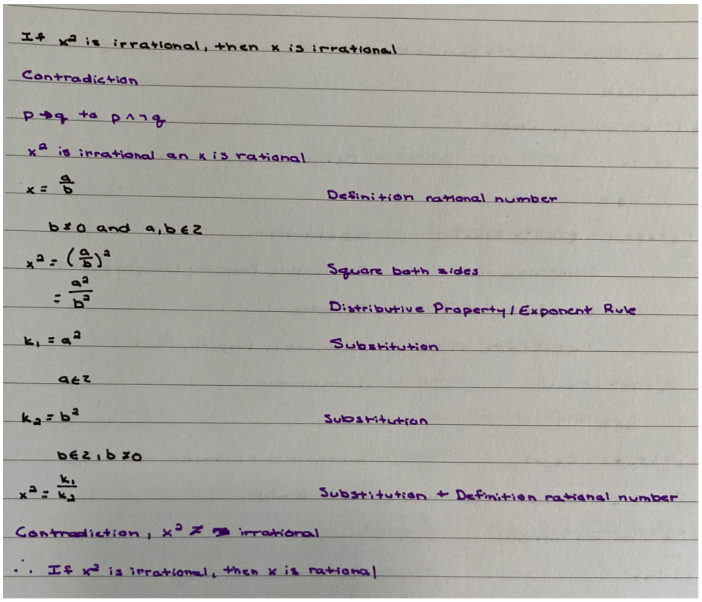
Explain the Activity – 1 Minute (2:42) As a group, students will discuss the problem(s) given to them, discussing the answer that they arrive at for each part of the problem(s). **Group Discussion** – 16 Minutes (2:58) For each part of the question(s), students will work together as a group to decide on the correct answer. The group should be allowed to ask questions and discuss as needed. At the end of this section, each student should feel comfortable proving or disproving mathematical statements using the proof by contradiction method.

Content (fully worked out problems & answers):

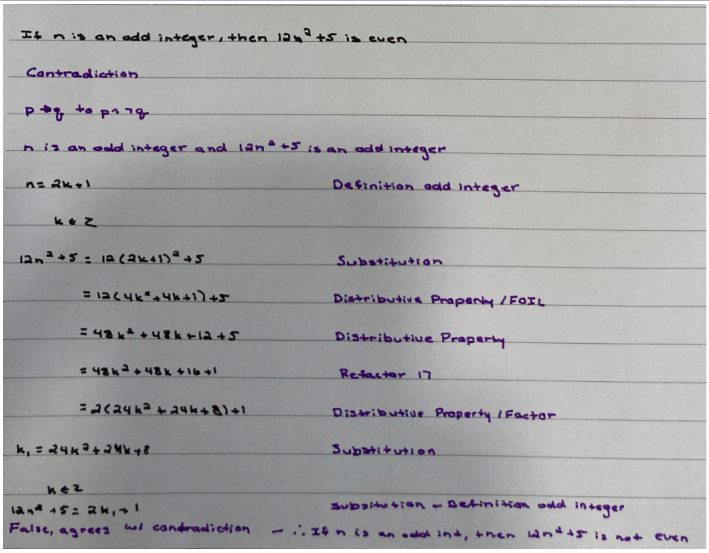
If n^2 is an even integer, then n is an even integer



If x^2 is irrational, then x is irrational



If n is an odd integer, then $12n^2 + 5$ is even



Checking for Understanding (questions & answers):

What do we want to prove when doing a proof by contradiction?

Want to prove that the contradiction of the original statement is false, therefore proving that the original statement is true

What is the form of a proof by contradiction?

Negation of conditional statement, or $p \wedge \neg q$

Activity #2:

Collaborative Learning Techniques:	Turn to a Partner
Learning Strategy:	Thinking Aloud
Time:	2:58 – 3:15
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Google Doc https://docs.google.com/document
Lecture/Textbook/Slide References:	2.7 Proof by Cases

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

Explain the Activity – 1 Minute (2:59)

Students will be placed into pairs and asked to work through the assigned problems together, writing each step of their answers down as they progress through the problems.

Turn to a Partner – 16 Minutes (3:15)

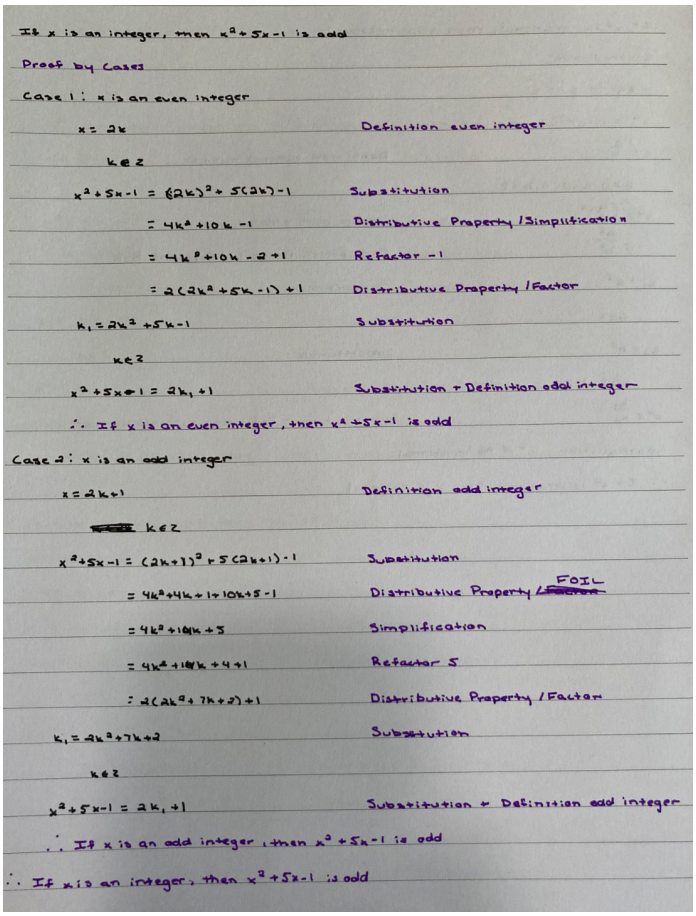
Students will be placed into pairs in breakout rooms and asked to work through the provided problems, discussing if there is any confusion and/or disagreements. As a pair, they should arrive at a definitive answer for each step of the

problem, writing down the agreed upon answer. At the end of this section, each student should feel comfortable proving or disproving mathematical statements using proof by cases.

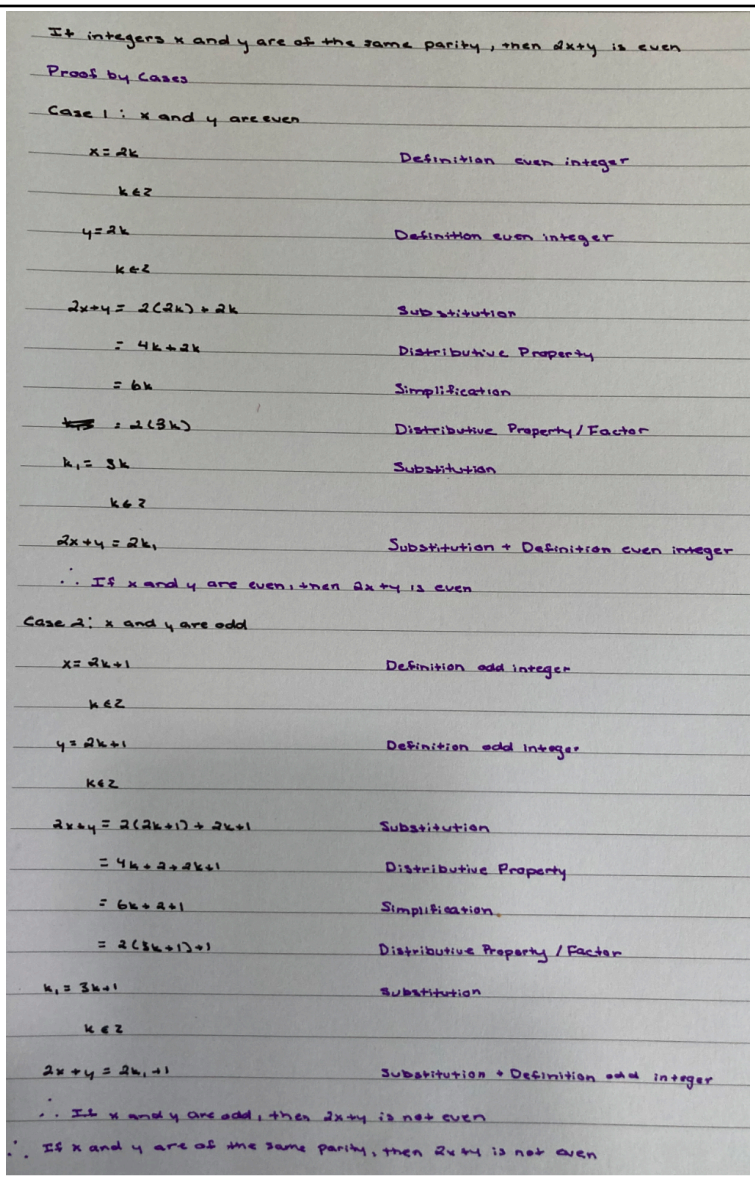
Content (fully worked out problems & answers):

Note: Questions with * are taken from textbook

If x is an integer, then $x^2 + 5x - 1$ is odd *



If integers x and y are of the same parity, then 2x + y is even



If integers x and y are of the same parity, then 2x+y is even

Proof by Cases

Case 1: x and y are even

$x = 2k$ — Definition even integer

$k \in \mathbb{Z}$

$y = 2k$ — Definition even integer

$k \in \mathbb{Z}$

$2x+y = 2(2k) + 2k$ — Substitution

$= 4k + 2k$ — Distributive Property

$= 6k$ — Simplification

$= 2(3k)$ — Distributive Property / Factor

$k_1 = 3k$ — Substitution

$k \in \mathbb{Z}$

$2x+y = 2k_1$ — Substitution + Definition even integer

∴ If x and y are even, then 2x+y is even

Case 2: x and y are odd

$x = 2k+1$ — Definition odd integer

$k \in \mathbb{Z}$

$y = 2k+1$ — Definition odd integer

$k \in \mathbb{Z}$

$2x+y = 2(2k+1) + 2k+1$ — Substitution

$= 4k + 2 + 2k + 1$ — Distributive Property

$= 6k + 2 + 1$ — Simplification

$= 2(3k+1) + 1$ — Distributive Property / Factor

$k_1 = 3k+1$ — Substitution

$k \in \mathbb{Z}$

$2x+y = 2k_1 + 1$ — Substitution + Definition odd integer

∴ If x and y are odd, then 2x+y is not even

∴ If x and y are of the same parity, then 2x+y is not even

Checking for Understanding (questions & answers):

When do we want to use the proof by cases method?

When the original statement could involve two different types of numbers (even or odd integers, for example). When proving or disproving a mathematical statement, should always aim to represent all possible values within the domain

Closer:

Take attendance AGAIN if you had any late students

Collaborative Learning Techniques:	Individual
Learning Strategy:	Access the Session
Time:	3:15 – 3:20
Materials (pencil, paper, notecards, expo, packets, etc)**:**	Zoom Survey
Lecture/Textbook/Slide References:	-

Instructions (please provide a DETAILED activity breakdown below (and/or attached):

Explain the Activity – 1 Minute (3:16)

Students will be allowed to respond with feedback on the sessions and ask any questions that they have concerning the SI session and/or material if needed.

Access the Session – 4 Minutes (3:20)

Students will have time to answer the given questions through the Zoom Poll. They will also have time to talk about topics outside of the questions asked to them and ask additional questions if needed. At the end of this section, each student should have responded once.

Content (fully worked out problems & answers):

On a scale of 1 – 5, how comfortable do you feel attending and participating in sessions?

1 – Not comfortable at all
2 – A little comfortable
3 – Neutral
4 – Decently comfortable
5 – 100% comfortable

On a scale of 1 – 5, how do you feel about the material that we covered today?

1 – Not confident at all
2 – A little confident
3 – Neutral
4 – Decently confident
5 – 100% confident

On a scale of 1 – 5, do you feel as though the way sessions are set up is helping you with your understanding?

1 – Not helping at all
2 – Helping a little
3 – Neutral
4 – Helping a decent amount
5 – Helping a lot

Is there anything else that I can do with sessions to make you feel more comfortable and/or process the material better?

More time on certain topics, more difficult questions, easier questions, etc.

Checking for Understanding (questions & answers):

When is your exam?
    Either on Friday or Thursday this week
What is the exam going to cover?
    Chapter 1 and Chapter 2
How might you prepare for this exam?
    Complete review packet that Gladbach provided, go over notes, complete extra problems, etc.

Plan Checklist (check off the things you've completed)

- ~~Variety in CLTs and Learning Strategies~~
- ~~Chapter/slide# where information is coming from~~
- ~~Included Timestamps (and buffer time as needed)~~
- ~~Details on how leader will break up students~~
- ~~CFU questions~~
- ~~Fully worked out problems and examples for each activity~~
- ~~Necessary links required for online implementation (if applicable)~~
- ~~Old plans correctly cited (if applicable)~~
- ~~Plan is available for anyone to view~~

Sample Learning Strategy Directions

Learning Strategies connect the students attending the session with the content the SI Leader has identified for coverage in the session. There are *many* Learning Strategies that can be used, and experienced Leaders can take part in creating new strategies for their programs.

Find example learning strategies on page 41 of this manual. Below are some tried-and-true Learning Strategies with step-by-step directions that are great foundational pieces to start from.

Lecture Review

1. During the first 10-15 minutes of the SI session, have the students summarize the most recent lecture, or have them identify the key words from that lecture.

2. Give students three minutes to find support in their lecture notes for a given generalization.

3. Have the students predict the direction of future lectures based upon the past lectures.

4. Have students arrange terms from lecture and text into a structured outline.

5. Reinforce new terms or important information by using clearly constructed handouts (can be complete or nearly complete at the beginning of the term but should gradually require more and more filling in as the group becomes more accustomed to working together).

6. Review material from previous sessions and lectures.

7. Take a couple of minutes at the end of the SI session to summarize the main idea covered during the session. Ask the students to help summarize.

8. Have students write a one paragraph summary of the lecture. List the new vocabulary terms introduced with this lecture.

9. Formulate potential exam questions based on the main ideas from the lecture.

10. Formulate potential answers from details in the lecture notes.

Tip: This is a great activity to get students familiarized with several different note-taking techniques. You can use Lecture Review to introduce Outlining (as stated above), the Cornell Method of Note Taking, Matrix, and Mind Mapping. Students can use these methods with all classes.

Note Review

Note Review is a good strategy to use early in the academic term because:

- Students see the importance of taking comprehensive notes.
- Students can fill in the gaps in their notes, as well as clear up discrepancies and misinformation.
- Each student in the session has a chance to participate.
- SI Leaders highlight and discuss the language of the discipline, and the new vocabulary. Students identify meaningful examples and check for understanding. Checking for understanding is a key facilitation skill that should be used in all SI's.

Procedure

1. Tell the group that you will begin reading from your lecture notes and will ask the student on your right or left to pick up where you stop. Let them know that the role of reader will move to each student in the circle.

2. Look at the students and encourage them to let everyone know if something is left out or inconsistent with what they have recorded. It is important to note that inconsistency does not mean that someone is necessarily right or wrong; moreover, members of the SI group will discover how to remedy the problem through the following:
    - Ask the student who disagrees to read from their notes.
    - Ask the group if their notes compare.
    - Check in the textbook for support; add the page number for specific questions to ask the instructor in the next class.

3. The pressure of reading may unnerve a student who believes that their notes are too rough to read.

    Since reading aloud is a form of performance, some students may be reluctant. Gently encourage the student, but if they is not comfortable, don't push. Perhaps note taking skills and confidence will improve as the term progresses and the usefulness of good notes becomes apparent.

4. As you approach the end of the SI session, if material has not been discussed, suggest to members of the group that they should finish reading through their notes. If they have questions or blanks in their notes, tell them to work with another student to find the answers or to bring these questions to the next SI session. If time does not permit the discussion of major concepts or vocabulary, draw attention to them.

    Encourage students to read over the items in their notes and to use the text to supplement their notes.

INCOMPLETE OUTLINE

The Incomplete Outline is an excellent means of helping students recognize the main points and the organizational pattern of information given in lecture. It can also be used for textbook information. Determining the major points can help to sort information and locate the ideas being communicated, making connections easier to find and understand. It helps the students to figure out what's important.

Procedure

Step 1: Tell students that the main points might not be clear from a specific lecture (or series of lectures) and present to the group an outline with some of the parts missing.

For example: Aspects of Medieval Life

I. _____
    a. _____
    b. _____
II. _____
    a. _____
    b. _____
III. _____
    a. _____
    b. _____

Step 2: The group must then work through their notes to figure out how to fill in the outline.

Note: This activity is an excellent way to gradually promote group independence. At the beginning of the term, provide outlines that are nearly complete with some of the items filled in and all of the numbers and letters filled in. As the term progresses make the outlines more and more incomplete, putting in fewer and fewer entries, then eliminating the notation. By the end of the term, students should be able to complete their own outlines without assistance. The best way to get students involved, even those students who are too shy to participate, is to have them write their own outline. You can use technology to put the Incomplete Outline on the board or the projector; then, students can copy it for their own notes.

Adapted from Onondaga Community College, Syracuse, New York

The Matrix

A Matrix is used when the same types of information are provided in the notes or text for a set of topics. A Matrix helps students organize information by showing its relationship to similar categories of information. It is a helpful tool for students to compare and contrast information.

Colonization

	Religious	Economic	Political
Dutch			
English			
French			
Spanish			

Sample Vocabulary Matrix

Term	Paraphrased Definition	Example from Lecture Notes	Example from Textbook	New Example
oligopoly	a market where a few firms produce all or most of the market supply of a good or service	airlines	soft drink manufacturers	domestic car makers (G.M., Ford, Chrysler)
monopoly	a firm that produces the entire market supply of a good or service	Niagara or Mohawk	none	New York telephone local service

Tip: The SI Leader should always have a completed Matrix to use as a guide. As the semester, progresses, the Matrix becomes less and less complete until the students are then determining the headings and content themselves.

Adapted from Onondaga Community College, Syracuse, New York

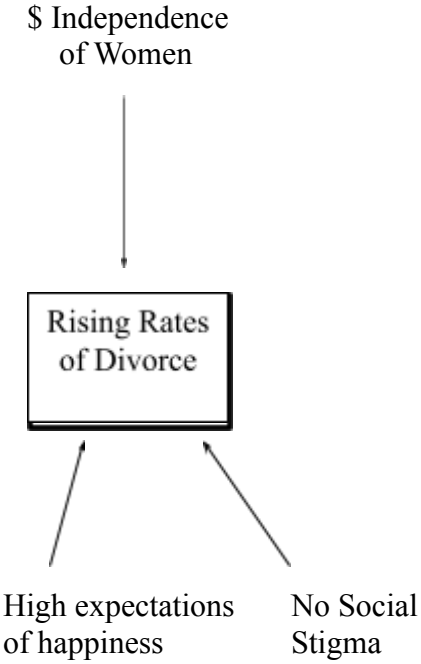
VISUAL TECHNIQUES

Some students learn well by creating visual study aids. This type of learner may actually picture the page of notes when answering essay questions on a test. Therefore, notes that are clear, concise, and well organized are essential. There are a variety of ways to summarize notes in a few words.

Some of these techniques include Mapping and Picturing. The best visual techniques do more than just condense notes; they help students understand the relationship between topics covered in various lectures and provide a "big picture." Students who simply memorize their notes as if they contained a series of several hundred unrelated facts may easily miss the point. Visual techniques help pull the ideas together.

Mapping and Picturing are used to illustrate the concept presented verbally in the lecture. The relationships between the topics are stressed in the map by the use of arrows. There are many types of Mapping and Picturing techniques. Two are shown on the following page. These should be adapted to the subject matter. The key idea is to visualize the information and to use as few words as possible.

Mapping:



Picturing:

Positions of Theorists on Basic Assumptions

Freedom Maslow, Rogers, Freud, Skinner **Determinism**

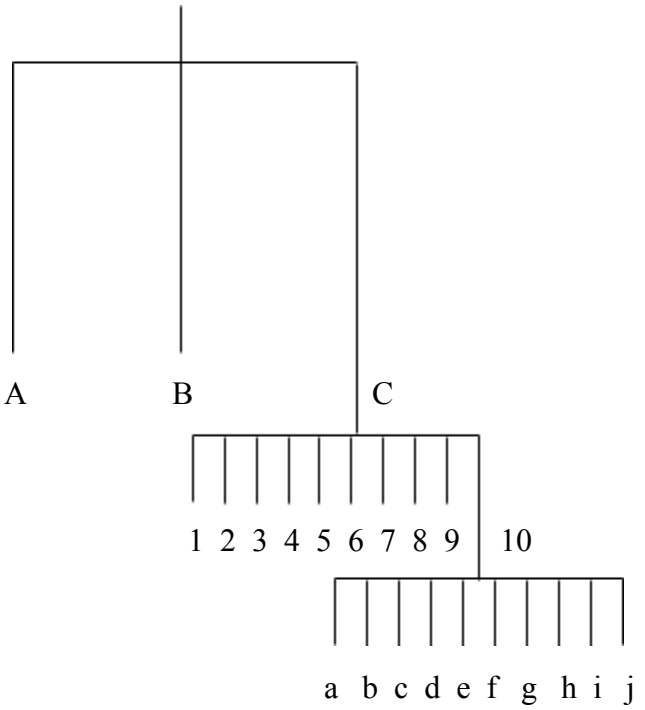
Good Rogers, Maslow, Freud **Evil**

Holistic Jung, Rogers, Maslow, Freud **Atomistic**

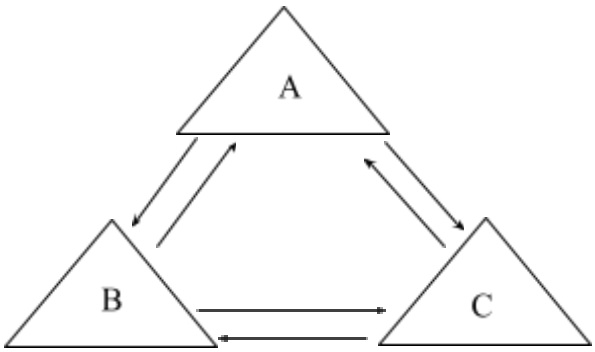
Environment Skinner, Erickson, Freud, Jung **Heredity**

Identify courses or disciplines in which these visual models might be useful.

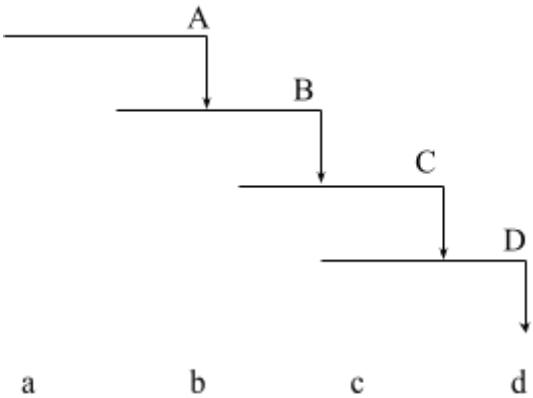
(1)



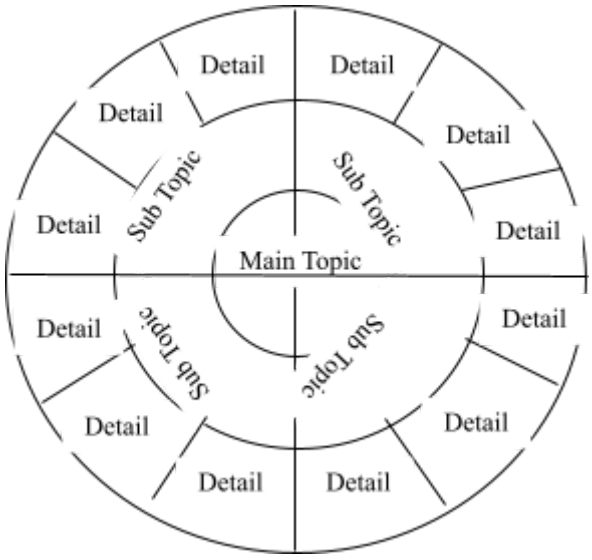
(2)



(3)



a	b	c	d



THE INFORMAL QUIZ

The Informal Quiz is a procedure, used in small group study sessions, which is educationally compatible with the goals and objectives of SI. Although the title implies a testing tool, this quiz is not intended to be used as a method of formally evaluating student work. The focus is on thinking and discussing rather than grading.

In general, the Informal Quiz is used to develop and reinforce comprehension, improve retention of information, stimulate interest in a subject area, and promote student participation in the study session.

More specifically the Informal Quiz enhances an educational experience in the following manner:

1. Allows weaker students to participate equally with stronger students, in the same session, since questions are designed to have more than one correct answer.

2. Permits each student an opportunity to demonstrate competence. Allowing the random answering of questions, it lets the shy or unsure students volunteer to answer the one or two questions for which they have answers.

3. Promotes student self-testing of their comprehension level.

4. Provides the SI Leader an opportunity to reinforce student participation.

5. It allows students to work with test material in a cooperative rather than competitive way.

6. Facilitates students' ability to interpret, answer and predict test questions.

7. This is a nonthreatening activity because:
    a. everyone is writing, even if they do not know the answer; they can write down the question instead
    b. uses scrap paper
    c. paper is not turned in or seen by other students

8. Provides a mind-set for the SI session.

The goals may appear to be excessive for what is feasible within an SI session; however, these goals can be accomplished in a small way each time the procedure is used. The Informal Quiz frequently is used at the beginning of the session. The whole procedure may take no more than 10 to 15 minutes. However, the discussion generated by one or more questions may become the focus of the SI session. The Informal Quiz is a powerful way to allow Leaders to Check for Understanding – a key facilitation skill.

The Informal Quiz Procedure

1. Use scrap paper or half sheets.

2. Ask a majority of questions requiring short multiple answers (e.g., “Name one of the three ways to....”)

3. Focus on current material, but include two or more concepts the instructor will want the students to understand.

4. Most questions should not be too difficult, but should emphasize recall of key points or of minor points related to key points. One or two questions should require use of higher order thinking skills.

5. Use a variety of questions formats, including fill-in-the-blank, multiple choice, T/F, etc.:
   (a) "The answer is _____; what is the question?"
   (b)"True or False: The theory behind …”

6. If there are students who aren’t writing answers, say, “If you don’t know the answer, write the question so you will remember what it was you didn’t know.”

7. In answering questions, ask who would like to answer a question—any question. Starting with any question instead of the first question contributes to the informality of the quiz and allows a student who only answered a few questions accurately to participate immediately.

8. Call on the weaker students first, whenever they have raised a hand.

9. Restate the question before the answer is given.

10. If possible, find something complimentary to say about wrong answers. “That’s a very good guess. If I weren’t sure, I might have guessed that.” Don’t let wrong answers stand.

11. Keep it light and short. Ask a maximum of ten questions.

VOCABULARY ACTIVITIES

All disciplines have technical terms which have precise definitions in that subject matter, and may mean something quite different in another context. One of the purposes of most introductory courses is to teach students to speak “the language of the discipline.” Therefore, a clear understanding of the technical vocabulary in the course is essential for the students in your SI session. Students must be able to do more than simply “parrot back” rote definitions of terms. They must be able to paraphrase the meaning of the term, and understand how it fits in with the topic under discussion.

Vocabulary Activity Goals

1. Identify key technical terms in their notes and text and be able to generate a precise definition.

2. Paraphrase the definitions in their notes and text.

3. Understand the relationship between one term and other key terms which fall under the same topic.

4. Create a parallel example to the one given in the notes or text.

5. Be comfortable enough with the terms to “speak” the language of the course, both in the group and on tests.

Procedure

Here is a list of suggestions for working with course vocabulary in SI sessions:

1. Don’t “translate” - use the term yourself. For example, if a student in an economics session were to talk about “product satisfaction,” the SI Leader might ask, “And what is the economic term that means satisfaction?” Then, the student will use the economic term "utility," rather than the equivalent translation, “satisfaction.” Remember, on essay tests, one of the things instructors looking for is whether the students can use terms correctly.

2. Before a test, copy from the textbook a few pages that cover important material; pass out red pens and suggest that they circle all key terms in red. Then, have one of the students record the complete list on the board. Put students in groups of two or three. Ask that they refer to their definitions of all of the terms and pair together terms that they feel are connected in some way. Then, report back to the larger group.

3. Create a Vocabulary Matrix. Get students to work together to fill in the Matrix (see example below). One student can work with lecture notes and the other with the text. They may also work together to create a new example.

Term	Meaning	Example from Notes	Example from Text	New Example

4. Create Vocabulary Note Cards for a quick review.

5. When appropriate, introduce the meaning of Greek or Latin roots that will help students remember their technical terms. For example, in sociology, students who know that the root "gam" means "marriage" have an advantage on a test question which asks about "exogamy". A good way to present key roots is to put the root on the board and then ask students to name as many words as they can think of that come from the root.

Example: "GAM"--bigamy; polygamy; exogamy; endogamy; monogamy

Ask what the words all have in common. This way the group figures out the meaning of the root themselves. They can use this same procedure once they become proficient when faced with an unfamiliar word on a test or in a textbook.

Vocabulary - Summary

1. Continually use and review vocabulary words from previous lectures and from the text.

2. Have students predict vocabulary words that might be used in a lecture from text readings.

3. Work with students on application of terms. Instead of saying "What does _____ mean?" say "Here is a situation....This is a good example of what?"

Time Lines

Time Lines can be an effective way to show a continuum of events or ideas. Students can use Time Lines as a frame on which they can hang additional information.

Double Time Lines

It is important that students understand the relationship between new material they are learning and what they already know. A historical perspective on key dates in the notes and text can be very helpful. For example, if a psychology instructor mentions a study which was completed in Germany in 1939, the student should automatically place this information in the context of Nazi Germany. More recent information can often be related to events in the student's own life to make it more meaningful.

Procedure

Make sure that the dates are truly important before using this procedure. Then, make a brief, very general Time Line of events happening in the U.S. and/or world at approximately the same time as the dates presented. Give this general Time Line to the group at the beginning of the session.

Then, have the students draw a duplicate Time Line directly below the one they have previously constructed. They should work in pairs to find key dates from the notes and text and place them on the new line. Discussion should center on events which were happening at the same time as the dates which were presented in class. Have students write a sentence to explain the significance of particular entries on the Time Line.

Remember, Time Lines do not necessarily need to be organized around dates; Time Lines can also cover processes or events in a series. (e.g. mitosis, a bill becoming a law, etc.)

Samples

1. U.S. Events: (Initial Time Line)

Erie	Canal Railroads	Civil War	Industrialization	WWI
1825	1850	1860-65	1900	1917

2. European Immigration to the U.S.: (Secondary Time Line)

Wave I	Wave II	Wave III	
Irish & German	N.W. Europe	S.E. Europe	Quotas

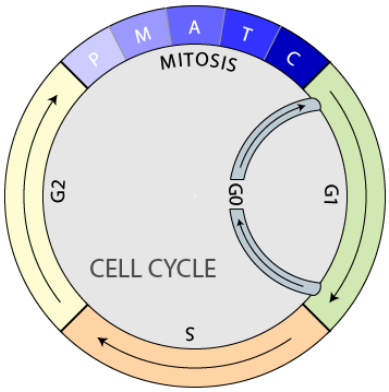
1840 1880 1915 1921

3. The Timeline of Mitosis

Prophase Prometaphase Metaphase Anaphase Telophase
Telophase

0 20 40 60 80
Time (Minutes)

[G2][----------Mitosis----------[Cytokinesis]----------][G1]



Preparing for Exams

Students often become anxious about the language in a test question. It is important that students in your group begin to develop the skill of predicting test questions. Once they discover that the origin of test questions is not always mysterious, they will feel much more confident going into their test. You can help students develop this confidence and skill by creating practice exams in the SI sessions. This type of activity is good shortly before an exam when you have a large number of non-regular participants in the group. Plan to work together to create review sheets for each predicted question at the next session before the test. It is important not to cover practice exams created by the instructor during sessions; they are provided for students to utilize outside of class. The students in the SI session should create their own practice exam using their notes/textbook, or the SI Leader should offer students problems similar to those on the practice exam.

Review Dates
The dates of exams should be reviewed regularly so that students are reminded to start studying early.

Identify Exam Format
Discuss with the students the kinds of questions to expect on exams. Also explore the amount of emphasis that will be placed on the text, lecture, and/or outside readings. For example, one half of the points are earned through multiple choice items that focus on information from the lecture and text; the other half of the possible points are earned through two essay questions that focus on the supplemental readings, i.e. assigned novels.

Develop Practice Exams
Have students submit 3 to 5 questions. These questions can be assembled into a practice or review exam and returned to students for study. If appropriate, periodically present practice essay questions. Ask students to outline the answer first. Initially, have the students use their book and lecture notes, but work toward a normal test situation. The summary sheet could be written by the SI participants as a group. If the instructor distributes a sample question or has a file of previous tests on reserve in the library, discuss the wording of the questions in SI.

Using a Practice Exam in the SI Session
Ask the instructor if they feels comfortable looking over the students' questions and making suggestions. With the instructor's permission, announce to the class that the practice exam, developed by the students, will be used in the next SI session. Make sure the students understand that the questions were developed by the students and are not developed by the instructor. It is also a good idea to reiterate that the practice test may or may not cover content that will be on the exam. If providing a practice exam/study guide, make sure there is a time to debrief and discuss the information. Also, do not hand out an answer key since the study guide was student created; the group should be working together to find the answers.

MATH SI SESSIONS

Structure the SI Sessions
At the beginning of the academic term, SI Leaders must provide structure to the SI sessions; don't expect to arrive at SI sessions with the intention of "answering questions." You may want to write an agenda of the session on the chalkboard for each session. Some students find this very helpful.

Syllabus
Review the syllabus with the students early in the academic term. Take note of the homework assignments, exam dates, and grading policy. Is the homework graded? If it is graded, announce that you are not allowed to work homework problems, but that problems similar to the homework will be discussed and worked on during the SI sessions.

Pre-Lecture Note Preparation
Use the titles on the syllabus to guide you to what are the important parts of the text chapters. Note which problems are assigned as homework. Look at chapter headings, subtitles, diagrams and captions, and scan the text briefly. When appropriate, have students turn the headings and subtitles into questions and make a brief outline of what is being presented. In the margins of your outline, list significant terms and attempt a brief definition. Say the terms out loud. Leave space in your outline so that you will have room to incorporate lecture notes with your pre-lecture notes.

Try taking your pre-lecture notes from the text in one color of ink and lecture notes in another color of ink. Be sure to read the chapter summary (read it first if you are short on time). During the lecture, add the pre-lecture notes to the class lecture notes. Work the problems along with the instructor. After the lecture, work homework problems which relate to the activity. Reread the text book sections which apply. These practices impact what you retain and can retrieve.

Lecture Notes
During the first week, talk about lecture notes for the math course. If possible, look around the room during the lecture to see how students are reacting to the material being presented. For example, if the instructor is discussing graphs, the students may have difficulty copying the graphs while taking notes about them. You may want to distribute copies of your lecture notes one time so that students can see your strategies for note taking. This can provide a basis for a discussion of note taking skills. If an SI participant has good notes, have them model/demonstrate how they took their notes.

During the discussion on note taking, you can suggest that they use the Cornell method of note taking. This system makes use of Summary Margin paper or graphic paper with a three-inch margin on the left-hand side for important notations. You can also share, for example, how you concentrate on what the instructor is doing, and how to get as many details as possible without getting distracted by trivia. Students will see the benefit of using Summary Margin paper when

you suggest they take notes during the SI sessions in the margin of their lecture notes. Encourage students to rewrite their lecture notes as soon as possible after the lecture. Remember to ask for other students to share their strategies as well.

Textbook
Share with the students your method for reading the textbook. Focus on the different parts of the chapter, sample problems, new symbols and vocabulary, discussion, and homework problems.

Strategies
Math SI sessions focus on getting students to work on problems. We encourage SI Leaders to have the students first write problems on the board. Then ask students, "What do we do first?" or "Where do we start?" Promote interaction and encourage students to help each other. For example, to start the session, have students work on a word problem or statement problem for about five minutes. Then have them pair up and discuss the problem. This technique helps students discover different ways to work similar problems while helping each other. SI Leaders need to help students see the progression of mathematics. For example, the SI Leader might point out that a student will see a new application for a familiar concept when moving from Algebra to Calculus.

Additionally, SI Leaders will want to consider strategies that are particularly well-suited for math sessions, such as:

Boardwork Model – **Vocabulary Activities –** SThis is particularly useful in Math SI sessions because instructors and textbooks often use discipline-specific language.

Time Line – This technique utilizes visual representation to improve the processing of material. Begin with a horizontal line that represents the continuum of time. Important events are inserted relative to each other, creating points on the line. Definitions or examples of terms on the Time Line should be added when appropriate. While often used in Humanities SI sessions, Time Line can be helpful in Math SI sessions for plotting steps important in solving a problem or completing a process.

First Line Only – This strategy is use for students who need to be encouraged to take the first step toward finding the solution. In order to complete this exercise, the following is recommended: Firstly, you need to present a variety of types of problems so that the learner builds confidence in addressing the first level of the problem. Secondly, you will also need to give a strict time limit so that only the first step towards the solution is addressed, e.g. for Calculus, *Instructions: Examine the problems below and tell how you would begin the solution to each one:*

1. $\lim_{x0+} \sin x^x$

2. $\lim_{x0+} \frac{\sin x^x}{x}$

Send a Problem – This strategy can work in pairs or individually depending on the size of the group. Generate a list of problems and assign each a different problem. Have students complete the first step. After a minute, have the students pass their problems to the right and have those students complete the next step. Continue the process until all steps are complete.

THE BOARDWORK MODEL

Definition

Well-organized board work in SI sessions is crucial to helping students understand how to solve specific problems. The Boardwork Model is a method of organizing information in order to facilitate an understanding of problem-solving strategies as a process. It requires four types of information to be collected for each problem; (1) prerequisite knowledge; (2) mathematical steps; (3) a narrative of the steps; and (4) identification, solution, or construction of a similar problem. SI Leaders use the Boardwork model when: (a) students don't know how to solve a problem; (b) students are stuck within a problem/solution; (c) to check student understanding of how to solve each type of problem; or (d) to help organize and "chunk" different types of problems.

Rationale

Problem-solving courses like chemistry, physics, or mathematics are major obstacles for many students. Students often don't know how to begin to attack a problem or do not know what to do when they encounter difficulty in the midst of finding a solution. In general, SI creates a safe space for students to learn general problem-solving skills. In SI sessions, attendees help each other by actively exchanging strategies for problem-solving. Students need to become part of a collaborative, mutual-help team, attacking a common problem and solution together by pooling resources. When students get stuck, the manner in which SI Leaders handle the situation determines whether the student gains an understanding of the process or merely gets a right answer.

Please note that the problem solving SI sessions are not a venue for students to work on homework assignments. The SI Leader should come up with problems—and test them before sessions—that are new to students but similar to those covered in class or on homework.

Procedure

1. Arrive early and organize the board into four columns. Label like the diagram on the next page. Allow enough room for two people to write at once.
2. Ask for a volunteer to write on the board. If you encounter reluctance, reassure them that the group will tell the scribe what to write. (They don't need to know what to do already.)
3. As a group, brainstorm all formulas, equations, rules, etc. required to solve the problem.
4. Ask for another volunteer scribe.
    a. The first volunteer will list the mathematical steps in the solution; the second will write out the narrative of the steps in the solution. This should be done simultaneously, and the students need to verbalize the steps in their own words.
    b. Encourage students whose skills are verbal to try the mathematical steps and vice-versa. Remember, the group will help them.
    c. Depending on the ability level of the group, identify, solve, or construct and solve a similar problem. Generally, weaker students should begin by identifying similar problems, but do not underestimate their ability

to or how much they will benefit from constructing a problem. If they can get inside a problem enough to construct another one, it will help them understand problem solving more thoroughly.

This is the standard Boardwork Model. The model can be adapted to fit various problem-solving disciplines.

Prerequisites	Mathematical Steps in the Solution	Narrative of Mathematical Steps	Similar Problem: Identify, Construct, Solve
Include relevant equations, formulas, charts, and general rules for solving the type of problem. Include the source of this information (notes, text, previous course) For example: % yield = actual / theoretical	Solve the problem step-by-step. Number each step. 1. 2. 3. 4.	Describe what is happening in each step of the solution and why the group decided to do it. Use the students' own words initially, but use this column to introduce students to the language of the discipline. 1. 2. 3. 4	Check understanding by asking students to identify, construct, and solve similar problems. Provide the answer and the source of any problems used.

Below are examples of how the Boardwork Model could be used in a math course or a chemistry course. Notice that the columns serve a slightly different purpose here than they do above. However modified, it is always important to include the narrative of the steps taken to solve the problem.

Problem: There is a line whose slope is 1 and whose y-intercept is 17. What is its equation in slope-intercept form?

Prerequisites	Mathematical Steps in the Solution	Narrative of Mathematical Steps	Similar Problem: Identify, Construct, Solve

Slope-intercept equation y=mx+b m=slope b=y-intercept	1. Write down the slope-intercept equation. 2. Plug in the slope value. (m=1) y=1x+b 3. Plug in the y-intercept value. (b=17) y=1x+17 4. Simplify the equation. y=x+17	1. Recall the slope-intercept equation. 2. Identify that m is the slope. (m=1) 3. Identify that the y-intercept is b. (b=17) 4. Plug in the values in their correct order and orientation. Simplify the Equation because the 1 is not needed in front of the x.	There is a line whose slope is 3 and whose y-intercept is 16. What is its equation in slope-intercept form?

Boardwork for Balancing Equations:

_____CH_4 + _____O_2 → _____ CO_2 +_____ H_2O

Prerequisites	Steps in the Solution	Narrative of Steps	Similar Problem:
-Identify elements in an equation	1. Identify the elements found on	1. See if the equation	Balance the following equation:

-Understand molecules -Perform simple multiplication of coefficients	either side of the equation. (C, H, O) 2. Identify the elements that are not balanced on either side of the equation. The left side has 4 hydrogens and the right side has 2 hydrogens. There are 2 oxygens on the left and 3 oxygens on the right. 3. Plug in a value to try and balance the hydrogens and oxygens. (A coefficient will distribute to each atom in a molecule.) $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$ 4. Check the make sure the equation is balanced. (Are there the same number of atom on each side of the equation?) 5. Simplify if you can. (In our example we do not need to simplify.)	is balanced to begin with. 2. If the equation is not balanced, write down the number of atoms on each side of the equation. 3. Try to think of coefficients that would balance an equation and plug them in. 4. Balancing equations takes a lot of practice but you can check your work as you go. 5. Simplify to the smallest multiples for each coefficient.	$SnO_2 + H_2 \rightarrow Sn + H_2O$

HUMANITIES SI SESSIONS

Differences
The humanities provide a way of seeing and knowing that is different from the sciences. In the sciences, students learn to use words like: *reliability, verifiability, clarity, empirical evidence, correspondence with natural laws, research methods, and graphic presentation.* In the humanities, students are more likely to encounter words like: *ambiguity, uncertainty, intuition, insight, self-knowledge, truths, process, symbolic representation.* In the humanities, aesthetic forms--such as metaphor, image, sound, narrative--lead to understanding rather than empirical research.

Elaboration Rather Than Reduction
The scientific method assumes that truth may be discovered independently of "context" or "time." Physicists, for example, are used to having a high level of certainty, and may find it difficult to pick out what is important in a literature class. Knowledge in physics is arranged vertically (certain things must be learned before others); whereas knowledge in the study of literature is not as vertical and the order in which one takes the courses may not be important.

The tendency for science instructors is to simplify complex ideas, while literature instructors tend to favor probing for complexity. Instructors in the humanities complain that students want certainty rather than enjoying the struggle with complexity. Even the artist who occupies a central position in their own discipline may struggle with the issues of certainty and judgment. Students are not comfortable with questioning ambiguities, and lack a map or framework from which to build judgments. SI Leaders must help students move beyond simple answers in the humanities. The Leaders need to design sessions that encourage elaboration rather than reduction of information. Students may struggle with the fact that, while there may be no one right answer, just any answer will not do either.

Reliance on Language
Speaking and writing are methods of presentation most prevalent in the humanities. Language is valued; a well-turned phrase is applauded. In humanities classes there may not be much information written on the board and in the textbooks there may be few illustrations or diagrams. This lack of visual presentation may be disconcerting for those used to having it. Because so many lectures in the humanities rely on words, SI sessions need to provide visual models. These visual models should help show how concepts are related to each other.

Because the content of the humanities is particular, students must pay close attention to what is said, how it is said, and by whom it is said. Students new to the discipline may not pay sufficient attention to the author of a statement. Instructors frequently summarize various scholars' positions ("according to Tillich") but students may not write down the name of the scholar or critic and then when asked to discuss a position that is identified by the scholar's name, they cannot do so.

Original Thought
Students who expect to do well in the humanities should, as one instructor of literature said, find out all that is out there and then write something different. SI Leaders must help students develop positions that go beyond, "I like it" or "I feel good about this text." Beginning students may feel that they cannot write anything new about the text, and thereby, have trouble writing anything at all. Or they may feel their arguments must agree with the instructor, not appreciating that the instructor often welcomes an opposing point of view which is clearly developed.

Writing Skills
Writing itself can pose special challenges for students in the humanities. SI in the humanities is often attached to a course in which students are graded and tested by essay (either essay exam or papers) because the course material requires more than a recognition knowledge of the material.

When writing is intensive, the SI Leader must respond with appropriate help in order for students to succeed. Although the SI session is not the place for one-on-one help with individual writing problems, it is a place where ideas can be generated and where students can practice predicting and answering possible test questions. One way this works well is to create a question, then ask students to brainstorm all the ideas and facts they know about the question. Students can put similar ideas together and state which facts support the ideas. The group can then write the first sentence or two of the proposed essay. Individuals can be encouraged to finish the practice essay on their own, and read them to each other.

Additionally, SI Leaders will want to consider strategies that are particularly well-suited for Humanities SI sessions, such as:

Visual Techniques, Time Lines, Vocabulary Activities, and Matrix

Identify the "Big Idea" – Ask each student to tell what they thought was the most important concept, idea, or new information students learned during a particular lecture or even a session. Ask each student to offer a different "take home" concept. Students often feel overwhelmed by the sheer volume of information they have to deal with and this technique helps them identify and organize the information presented.

One Minute Paper – The One Minute Paper is designed to help students realize what they know or do not know. The SI Leader should ask the students to take out a piece of paper and write on the topic presented in the SI session. Remind them it is most important that they put their thoughts on paper in their own words, not that they produce a polished piece of writing. Additionally, the SI Leader may choose to encourage conversation regarding similarities and differences between students' ideas.

Condensed from "Supplemental Instruction in the Content Areas: Humanities" by Sandra Zerger in Supplemental Instruction: Increasing Achievement and Retention (Deanna C. Martin and David R. Arendale, editors) Jossey Bass Publishers, Number 60, Winter 1994.

POST-EXAM SESSION

Following are some questions students might like to think about after taking an exam. Answers to these questions could help them focus on effective exam preparation strategies. Research suggests that each student has their own pattern of the types of errors they commit during examinations. Helping students to discover those patterns will help them self-correct. One goal is to identify correct answers and associate them with learning strategies that worked for the student; students can also identify incorrect answers and discover study skills that might be helpful. Asking students these questions may identify areas where the students excelled or where they need to focus their energies more for the next exam.

1. Which part of the exam was the easiest for you? Why?

2. Which part of the exam was the most difficult? Why?

3. Which of the following activities did you complete prior to the exam?
    a. All required reading assignments.
    b. Preparation and review of reading notes.
    c. Review of lecture notes.
    d. Self-testing of material to be covered by the exam.
    e. Prediction of possible questions by you prior to the exam.
    f. Study with friends.
    g. Others.

4. Which of the above did you find most helpful in preparing for this exam?

5. How much time (in hours) did you spend preparing for the exam?

6. Did you feel prepared when you walked into the exam? Why or why not?

7. Which questions did you miss/lose points on? Do you notice any patterns? Are you able to identify why you got this question wrong?

8. What changes might you make in the way you prepare for the next exam in this course?

Post-Exam Survey

Score yourself in terms of preparation for the exam.

	Did	Did Not	Score
I read the material when assigned.	7	0	
I read the regular textbook and *understood* this material adequately.	7	0	
I read the supplemental textbook and had a good understanding of it.	12	0	
I reviewed the readings carefully before the exam.	4	0	
I have good, complete notes, and when I review them, I can understand them.	24	0	
I studied my notes thoroughly before the exam (until I knew them well enough that I could have told someone what was in them). Just reading through them is not a good score.	24	0	
I attended lecture regularly. (missed 2 to 3 times = 0)	12	0	
I attended SI sessions. (1 or 2 times = 1; regularly = 8)	10	0	
	Add up your score.		

Note from an SI Practitioner: I observed a humanities class in which the professor read these questions to the class before he handed back the exam. He had them score themselves. Then he told them that the score they gave themselves should be the score on they received on the exam—big sighs! He handed back the exams and asked them to raise their hands if their survey score was more than five points higher than the exam score; surprisingly, only a handful raised their hands. So, it appeared that they had answered honestly on the survey. If their score on the exam was lower than five points from their survey score, he asked them to come see him so they could talk about study strategies.

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