Learning Strategies Instruction

Instructor's Manual

Mathematics & Statistics Department

8/16/2022

To Be Updated Based on Feedback from Professional Development Sessions

Funded by NSF HBCU-UP Broadening Participation Research Project HRD-2107285.

Contents

Chapter 1
Overview of the Project

1.1. Project Goals

Students' learning strategies are thoughts, behaviors, or beliefs that facilitate the acquisition, understanding, or transfer of new knowledge and skills. Learning strategies range from being as basic as re-reading the material to being as complex as synthesizing knowledge. In this Broadening Participation Research (BPR) Project, we propose to examine the effectiveness of integrating learning-strategy instruction within five gate-keeper math courses (MATH103-College Algebra I; MATH104-College Algebra II; MATH131-Calculus I; MATH132-Calculus II; MATH224-Intro to probability & Statistics) in fostering math growth mindset and Self-Regulated Learning (SRL) in underrepresented minority students (URM) students and improving students' performance in these courses. The project explores and employs innovative ways to seamlessly integrate different types of learning-strategies (cognitive, metacognitive and management strategies) instruction within gate-keeper math courses via presentation of course material, class discussions, assignments, and assessments. The theoretical model of this BPR project hypothesizes that the integration of learning-strategy instruction will have a direct effect on students' performance in gate-keeper math courses as well as an indirect effect through sparking growth mindset and self-regulatory aptitude in the math classroom. It also hypothesizes a bidirectional relationship between math growth mindset and SRL, where the students' belief that they can improve (thinking in a math growth mindset framework) is needed for making adaptive adjustments to their learning processes (practicing SRL), and through SRL students recognize that they can improve their task performance and learn at higher levels (thinking in a math growth mindset framework).

Learn more about the Math Learning Strategy Project through the project's website *here*.

1.2. Funding Source

The National Science Foundation (NSF) Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) through Broadening Participation Research (BPR) in STEM Education projects supports the development, implementation, and study of new theory-driven models and innovations related to the participation and success of underrepresented groups in STEM undergraduate education.

This project is supported by a grant from the NSF HBCU-UP BPR Projects Program under Grant No. HRD 2107285.

1.3. Project Team

The project team is composed of well-versed STEM education researchers, social science researchers, and mathematics and statistics faculty. The following is a description of the coordination of project activities among the team members.

Dr. Sayed Mostafa (PI and project coordinator), assistant professor of Statistics and course coordinator of MATH224, is responsible for overall project management, including concept development, project design, project delivery methods, oversight of project components, communications with external evaluator, institutional and agency personnel. He will work closely with the senior personnel, Dr. Tamer Elbayoumi, assistant professor of Statistics, on implementing project activities in the MATH224 course, survey data collection, and statistical analyses of survey and students' performance data.

Dr. Guoqing Tang (Co-PI), professor and chair of the Mathematics & Statistics Department, will manage the engagement of faculty and graduate research assistants and the scheduling of course sections included in the study.

Dr. Katrina Nelson (Co-PI), teaching associate professor of Mathematics, is responsible for Math103/104 control and treatment group activities, focus group study participant recruitment and student performance data collection, and training and coordination of other MATH103/104 control and treatment section instructors. She will work closely with two senior personnel to implement project activities in the college algebra courses: Dr. Kathy Cousins-Cooper, professor of Mathematics and MATH103/104 course coordinator and Dr. Nicholas Luke, associate professor of Mathematics.

Dr. Ling Xu (Co-PI), assistant professor of Mathematics, is responsible for MATH131/132 control and treatment group activities, focus group study participant recruitment and student performance data collection, and training and coordination of other MATH131/132 control and treatment section instructors. She will work closely with three senior personnel to implement project activities in the calculus courses: Dr. Paramanathan Varatharajah, associate professor of Mathematics and course coordinator of MATH131/132, Dr. Shea Burns, associate professor of Mathematics and Dr. Barbara Tankersley, associate professor of Mathematics.

Dr. Kalynda Smith (Co-PI), assistant professor of Psychology, is responsible for survey instrument and focus group protocol design and research methodologies implementation and refinement, and student focus group session facilitation, transcription and analysis.

Dr. Monique Matelski (External Evaluator), Director of Research & Evaluation, at Cobblestone Applied Research & Evaluation, Inc, is responsible for project evaluation and assessment.

Chapter 2
Introduction to Learning Strategies

This chapter will introduce the reader to 1) the main types of learning strategies and the importance of using these learning strategies when learning math and; 2) give the reader a brief description of the specific learning strategies utilized in the math learning strategy-instruction project.

2.1. Importance of Learning Strategies for Learning Math

The use of learning strategies has been repeatedly shown to be positively correlated with academic performance (e.g., Weinstein et al., 2000). However, research suggests that students at all educational levels often use ineffective learning strategies (McDaniel & Einstein, 2020). Several studies indicate that learning-strategy instruction has a positive impact on students' performance in the domains of mathematics, science, reading and writing (see the meta-analysis by Donker et al. (2014) and references therein), suggesting that students benefit from learning strategy training through learning strategy instruction

2.2. Types of Learning Strategies

Pressley et al. (1989) define learning strategies as "processes or sequences of processes that, when matched to the requirements of tasks, facilitate performance". There are numerous learning strategies that have been categorized according to various taxonomies. Donker et al.'s (2014) categorization classifies learning strategies into three main categories:

- Cognitive strategies,
- Metacognitive strategies, and
- Management strategies

2.2.1. Cognitive Learning Strategies

Cognitive strategies are domain- or task-specific as they refer to students' interaction with the material to be learned. Students use these strategies to increase their understanding of the material by changing or organizing the material either physically or mentally. Examples of cognitive strategies include elaborating prior knowledge, taking notes, grouping, making inferences, and using images to help understand material or solve problems. There are three sub-categories of cognitive strategies:

- Rehearsal strategies,
- Elaboration strategies, and
- Organization strategies.

An example of the ***rehearsal strategy*** in the mathematics domain is ***finding similarities*** between new problems and the ones solved earlier.

Summarizing and paraphrasing are examples of the ***elaboration strategy*** which help students store information into their long-term memory by building internal connections between the items to be learned and the existing knowledge.

Establishing and visualizing connections among different parts of the material is an example of the ***organization strategy***.

In their meta-analysis of learning strategies, Donker et al. (2014) found elaboration strategies to be the most effective type of cognitive strategies for mathematics.

2.2.2. Metacognitive Learning Strategies

Metacognitive strategies are higher order strategies that regulate students' cognition by activating relevant cognitive approaches. A distinction can be made between three sub-categories of metacognitive strategies (Schraw & Dennison, 1994):

- Planning,
- Monitoring, and
- Evaluation.

An example of using ***planning strategies*** is when students ***set their learning goals*** before they start studying. ***Monitoring strategies*** are used to continuously assess the students' learning and includes the subprocesses of ***self-testing and adaptation of the learning approach***. ***Evaluation strategies*** are used for the evaluation of one's ***performance and the effectiveness*** of chosen learning methods.

2.2.3. Management Strategies

Lastly, **management strategies**, also known as social/affective strategies, are used to manage the contextual features that influence learning (Pintrich, 2000). This category of strategies consists of three subcategories:

- Management of effort,
- Management of peers, and
- Management of the environment.

Effort-management refers to strategies that reflect the ***commitment to completing one's study goals*** despite difficulties or distractions and it represents a form of actively motivating oneself to persist in studying (Pintrich et al., 1991).

2.3. Learning Strategies Used in the Project

The following section provides a brief description of the three learning strategies that the BPR project suggests incorporating into each course through ways detailed in Chapter 3.

i) Elaboration

Elaboration strategies can be quite effective for learning math as they help students form internal connections between existing knowledge and new material. Instructors can train students to use elaboration strategies by encouraging student explanation, sense making and justification using class discussions and discussion board assignments. Such discussions allow students to form a math growth mindset (e.g., Sun, 2015, p.37) and directly connect to the self-reflection phase of Zimmerman's SRL model (Zimmerman, 2000).

ii) Monitoring: Self-testing and Adaptation of Learning Approach

Self-testing and adaption of learning approach strategies are two metacognitive strategies that connect with both math growth mindset and SRL. By frequently encouraging self-testing and allowing for multiple attempts, instructors can help students develop a math growth mindset (e.g, Blackwell et al., 2007; Sun, 2015) and allow them to practice self-monitoring (the performance phase of SRL). Presenting mathematical tasks that allow for multiple solutions sends growth mindset messages and motivates students to adjust their learning strategies for better task performance (the self-reflection phase of SRL).

iii) Effort Management

Instructors who frequently make effort attributions about math tasks encourage students to practice using effort management strategies (forethought phase of SRL) and promotes math growth mindset.

References

Blackwell, L. S., Trzesniewski, K. H. and Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. Child Development, 78(1):246–63.

Donker, A. S., de Boer, H., Kostons, D., Dignath van Ewijk, C. C. and van der Werf, M. P. C. (2014). Effectiveness of learning strategy instruction on academic performance: A meta-analysis. *Educational Research Review*, 11:1–26.

McDaniel, M. A. and Einstein, G. O. (2020). Training learning strategies to promote self-regulation and transfer: The knowledge, belief, commitment, and planning framework. *Perspectives on Psychological Science,* 1–19.

Pressley, M., Goodchild, F., Fleet, J. and Zajchowski, R. (1989). The challenges of classroom strategy instruction. *Elementary School Journal*, 89:301–342.

Pintrich, P. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 451–502). San Diego: Academic Press.

Pintrich, P., Smith, D., Garcia, T., McKeachie, W. (1991). A Manual for the Use of the Motivated Strategies for Learning Questionnaire. Technical Report 91-B- 004. The Regents of the University of Michigan.

Schraw, G., and Dennison, R. S. (1994). Assessing meta-cognitive awareness. Contemporary Educational Psychology, 19, 460–475.

Sun, K. L. (2015). *There's no limit: Mathematics teaching for a growth mindset*. PhD Thesis, Stanford University.

Weinstein, C. E., Husman, J. and Dierking, D. R. (2000). Self-Regulation interventions with a focus on learning strategies. In M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds.), *Handbook of Self-Regulation*: *Theory, research, and applications*, 727–747. Academic Press, San Diego, CA.

Zimmerman, B.J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P.R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13-39). San Diego, CA: Academic Press.

Chapter 3

Learning-Strategy Instruction in Math Courses

In this chapter, we describe the various methods used in this BPR project to integrate learning-strategy instruction into the treatment sections of five gatekeeper math courses.

3.1. Methods of Integrating Learning-Strategy Instruction in Math Courses

It is crucial that learning-strategy instruction be integrated inherently within the course, as opposed to being provided independently from the course material, to avoid faculty and students perceiving such learning-strategy intervention as additional burden added to the course. Such inherent integration also ensures that learning strategies and, consequently, math growth mindset and SRL, are brought front and center in students' thinking as they work in the course. The literature suggests that information processing regularities and patterns of strategic action that occur within the context of regular classroom curricula are most impactful for developing self-regulatory aptitude for classroom learning. Moreover, perceived math instructor's growth mindset fosters beliefs that students can pursue their valued goals, and these in turn foster interest and engagement in math.

3.1.1. Discussion Board Posts/Reflections and Class Discussions

This section provides a detailed description of the five discussion board assignments and class discussions this BPR project proposes to incorporate into your treatment sections of the math course. Each discussion board assignment is posted in the learning management system (LMS, e.g., Blackboard) with its associated due date. Please modify the sections of the assignment that are italicized so that they align with your course.

Week a [First week of semester[1]]

Discussion Board #1: "Self-Introductions"
Due: Sunday at 11:59 PM EST
For your first discussion board assignment:

1. Download the "YouTube" App to your phone
2. Create a YouTube account using your ncat email.
3. Add your video (https://youtu.be/eaINcj1lE7U) response to the following prompts:
    i. Tell us your name, and if you have a nickname, let us know what you like to go by.
    ii. Tell us what your major is or what area of study you are interested in pursuing and your classification (freshman, senior, etc.).
    iii. If you feel comfortable, tell us a little about where you are from and any hobbies that you enjoy.
    iv. Prior to starting this course, how much you know about: *For Example [**Instructors adjust for their course**]: (i) solving equations; (ii) functions; (iii) systems of linear equations; and (iv) trigonometry identities.*

[1] See Table 6 below for a suggested course schedule integrating the learning-strategy instruction activities.

v. Why you are taking MATH**###**
vi. Tell us what you hope to get out of this class, and how you hope it will help you in your future courses.
vii. Anything else you would like to share!

4. ALSO, upload your photo ... How to insert a Picture into Blackboard Discussion Board
   i. Upload your picture into BlackBoard
   ii. Go to the top right corner of your BlackBoard screen where your name is printed.
   iii. Click the "down arrow"
   iv. Click "Settings"
   v. Click "Personal Information"
   vi. Click "Personalize My Setting"
   vii. Upload picture

Once you have created your post, respond to at least two of your classmates (in the comment section at the bottom of the video). See if there are others who have the same interests as you or who have posted something that you find interesting. Let's all talk a little as we get started!

***Note**:* No class discussion corresponding to Discussion Board #1.

Week b [Second week of semester]

Discussion Board #2: What do top students do differently?

Due: Sunday at 11:59 PM EST

You are required to post your own response and critique one other response(s). Please make your initial post by Friday at 11:59 PM EST, and then your 1 critique response to other student's postings by DATE at 11:59 PM EST.

For this week's discussion:

1. Watch this video about What Do Top Students Do Differently:
   https://youtu.be/Na8m4GPqA30
2. After watching the video, create a post reflecting on the video and include the following details:
   i. What must you do before you work on any practice tests to guarantee success in this course?
   ii. What are the important qualities in creating a practice test?
   iii. How can you predict your grade on a test?
   iv. Personal Worksheet: Rank the following strategies according to how important you think they will be to your success. Begin by arranging the numbers from the most important first and least important last:
      1) I will master all the topics on my topics list before I work on any practice tests.
      2) I will make a special effort to learn to solve problems on a test when they may appear in random order.

3) I will create and take a practice test that has the same form as the actual test that I am preparing to take. I will check my solutions to the practice test.
4) I will spend the last few hours of my test preparation eliminating my last few weaknesses.
5) I plan to walk into every test feeling that I have no weaknesses among the eligible topics.

Class Discussion #1: Effort Management on MATH Problems

Date: Third week of semester after Discussion Board #2 has been submitted.

Target Learning Strategy: Adaptation of Learning Approach – Metacognitive

During the week following discussion board # 2, instructors will communicate the importance of effort management when solving math problems through presenting multiple ways to solve math problems and discussing the pros and cons of the different ways/strategies. For **example**, instructor will present a math problem that can be solved in multiple ways (e.g., solving a quadratic equation), discuss the different pathways and strategies through solving the problem, and ask following discussion questions: "why would you choose one way over the others? How do the different ways work?". After discussing the pros and cons of the different ways of solving the problem, instructor will discuss general Step-by-Step Rubric for How to Effectively/Efficiently Solve MATH Problems (see Table 1). Hard copies of the rubric will be passed to students in class by instructor and posted in Bb.

Table 1. Mathematics Problem Solving Scoring Guide.

	Emerging	Developing	Proficiency	Exemplary
Strategies and Reasoning	1. Your strategies were not appropriate for the problem. 2. You didn't seem to know where to begin 3. Your reasoning did not support your work. 4. There was no apparent relationship between your representations and the task. 5. There was no apparent logic to your solution.	1. You used an over simplified approach to the problem. 2. You offered little or not explanation of your strategies. 3. Some of your representations accurately depicted aspects of the problem. 4. You sometimes made leaps in your logic that were hard to follow.	1. You chose appropriate, efficient strategies for solving the problem. 2. You justified each step of your work. 3. Your representation(s) fit the task. 4. The logic of your solution was apparent. 5. Your process would lead to a complete, correct solution of the problem.	1. You chose innovative and insightful strategies for solving the problem. 2. Your proved that your solution was correct and that your approach was valid. 3. Your provided examples and/or counterexamples to support your solution. 4. You used a sophisticated approach to

	6. Your approach to the problem would not lead to a correct solution.	5. Your process led to a partially complete solution.		solve the problem.
Computation and Execution	1. Errors in computation were serious enough to flaw your solution. 2. Your mathematical representations were inaccurate. 3. You labeled incorrectly. 4. Your solution was incorrect. 5. You gave no evidence of how you arrived at your answer.	1. You made minor computation errors. 2. Your representations were essentially correct but not accurately or completely labeled. 3. Your inefficient choice of procedures impeded your success. 4. The evidence for your solution was inconsistent or unclear.	1. Your computations were essentially accurate. 2. All visual representations were complete and accurate. 3. Your solution was essentially correct. 4. Your work clearly supported your solution.	1. All aspects of your solution were completely accurate 2. You used multiple representations for verifying your solution. 3. You showed multiple ways to compute your answer.

Week c [Third week of semester]

Discussion Board #3: Learning Strategies
Due: Sunday at 11:59 PM EST

You are required to post your own response and critique one other response. Please make your initial post by Friday at 11:59 PM EST, and then your 1 critique response to other student's postings by Sunday at 11:59 PM EST.

For this week's discussion: One way to improve your math grades is to become an effective MATH learner. Therefore, the focus of this discussion assignment is to introduce you to some effective strategies for learning MATH and any other subject in general.

1. Watch this video about the Study Cycle steps (preview, attend, review, study, and check) and strategies: https://www.youtube.com/watch?v=ppPIYbe3D68

2. After watching the video, you need to create a post reflecting on the video and including the following details:

ii. Which, if any, of the learning strategies discussed in the video do you use when you study MATH?
iii. Which, if any, of the learning strategies discussed in the video do you plan to start using when you study MATH? Why?

3. For responses, you can just use the reply button.

4. Initial posting and critique of other posting(s) should be on different dates.

Class Discussion #2: Learning Strategies

Date: Fourth week of semester after Discussion Board #3 has been submitted.

Part 1: Target Learning Strategy: Elaboration – Cognitive

On **Day 1** during the week following discussion board # 3, instructor will have in-class discussion about elaboration as an important MATH learning strategy by having students elaborate on certain course topic/problem. For **example**, after covering certain topic/problem, instructor can make the prompt: Let's elaborate on topic/problem "A" that we covered today. Describe
(i) what you already knew about this topic/problem prior to our class discussion,
(ii) the experiences you have had that might be related to this topic/problem, and
(iii) how this topic relates to other course topics?

Part 2: Target Learning Strategy: Self-Testing – Metacognitive

On **Day 2** during the week following discussion board, students will be given time to go through a short self-test about the topic that was covered in the lecture or earlier in the week. For **example**, instructor can display two or three knowledge check questions on screen and allow students time to think and answer the questions, then discuss the answers. Instructors then point to the availability of "Quiz Me" and "Practice" options in Pearson that students can use to go through this process of self-testing on their own as they study the course material.

Week d [Fourth week of semester]

Discussion Board #4: Time Management
Due: Sunday at 11:59 PM EST

For this week's discussion: Math knowledge is essential to your success in any major. Therefore, to succeed in your major and obtain a better career for yourself, one of your top priorities should be making time to study math. In general, students need to study between 8 and 10 hours a week to get an A or a B. The following are some general suggestions for making efficient use of your math study time [Source: Nolting, P. D. (2010). *Math Study Skills Workbook*, 4th Ed. Brooks/Cole, Cengage Learning]:

i. Set up a study time to review your notes or do your homework as soon as possible after math class

ii. Leave a 1-hour opening in your schedule right after math class.
iii. Go to the math lab or Learning Resource Center right after math class and/or right before math class.
iv. Study math right when you get home, when you are alert.
v. Review your problems right before you go to bed the night before your test (without watching TV or playing video games).
vi. Find the best time to study math according to your personal biological clock (morning, noon, early afternoon, night).

1. Take Time Management Quiz: To assess how you are currently doing in terms of study time management, complete the short study time management quiz. After answering all questions, click the "calculate" button in the page to calculate your score. Please note that scores between 1 to 3 are considered poor time management; 4 to 6 are average time management; and 7 to 10 are effective time management.

Time Management Quiz

2. Make a post reflecting on your quiz results:

i. What was your score on the time management quiz? Does your score indicate that you are making effective use of your study time? Write about the system (or lack of system) that you presently use to decide what you will do each day.
ii. What new time management techniques would you consider using to make better use of your study time?
iii. What do you do when you don't want to study? How do you get started?

3. Create your weekly study schedule:

i. Edit the template below to create your own weekly study schedule.

ii. Upload your study schedule to this discussion board (please note that your study schedule will NOT be visible to other students).

- study_schedule_template.docx (see Section 3.1.4)

Class Discussion #4: Time Management

Date: Fifth week of semester after Discussion Board #4 has been submitted.

Target Learning Strategy: Effort Management – Management

During the week following the submission of discussion board #4, start the class by asking students to "pass in their assignment". And then follow up with these questions:

★ Do important actions leak through your hands like water?
★ Do you sometimes give a half-hearted effort on important tasks or finish them late or not do them at all?

It's no easy matter getting everything done, especially if you're adding college to an already demanding life. BUT there are proven tools that can help you work more effectively and efficiently. These are called time management tools:

- ★ Develop a schedule
- ★ Determine what grade you want to make and write it on the schedule. It should be an A, B or C. Do not put down D, F or W because these grades mean you will not complete the course. The grade you select is now your GOAL.

Week e [Fifth week of semester]

Discussion Board #5: Test Taking Strategies
Due: Sunday at 11:59 PM EST

You are required to post your own response and critique one other response(s). Please make your initial post by Friday at 11:59 PM EST, and then your 1 critique response to other student's postings by Sunday at 11:59 PM EST.

For this week's discussion:

1. **Read the following tips on studying for a Math test**:

   i. Avoid studying at the last minute. Set aside time to study for the exam a little everyday over an extended period of time. This is the best technique for memorization and recall.
   ii. Review lecture notes, homework assignments, and old quizzes. Similar problems often re-appear on the test. Go over each section in your Math book and work through sample problems to refresh your memory.
   iii. Memorize the specific steps, formulas, and techniques you will need to master the material you learned in class.
   iv. Form a study group. One of the best ways to study Math is to explain the rules and concepts to other students.
   v. Recreate the test taking environment. Complete a timed practice exam in a quiet place using only the same resources permitted for the actual test.
   vi. Attend your instructor's exam review.
   vii. Meet with your instructor, TA, and/or tutor to ask last minute questions and review any difficult concepts.

2. **Watch this video about Math test-taking strategies**:
   https://www.youtube.com/watch?v=2SkO7BLo4aw

3. **Create a post including the following details**:
   i. List three reasons why only attending class and doing your homework may not be enough to pass your math course.
   ii. List and explain three general "pretest" rules that best apply to you.

4. **Post a critique of at least one other post**.

Class Discussion #5: Test Taking Strategies

Date: Sixth week of semester after Discussion Board #5 has been submitted or during first exam review session.

Target Learning Strategy: Effort Management – Management

Instructors can conclude the review session by the following class discussion or similar. Suppose it is the day of the test and you have concluded all of your test preparation. Is there anything more you can do to attain the highest possible grade? The answer is YES!

- ★ When should you arrive for a test? (ans: Arrive early)
- ★ What should you do as soon as you receive the test? (ans: Read the directions carefully. Look through the test quickly to estimate how much time to allot each question).
- ★ Which questions should you answer first (if you allow students to "go back to previous questions" in MyLab Math or BlackBoard)? (ans: The easiest questions)
- ★ What should you do if you are unsure of your answer? (ans: Rethink the answer. The first answer is not always automatically correct)
- ★ What should you do if you finish early? (ans: Check your answers)

3.1.2. Study Plans and Self-Assessments

Pearson has tools for students that focus on Study Plans and Self-Assessments. Instructors can introduce these tools to the students in class. Although this class discussion can be given easily at the beginning of the course, delivering this information a week before each test might have more impact once students plainly see the results from their test or quiz.

1. In Pearson's MyLab Math the instructor can assign a Companion Study Plan Study Plan for a Module Test
2. In Pearson's MyLab Math the student can:
    i. View Video Resource Library, make your selection(s) below:
        - ★ Choose a Chapter:
        - ★ Section:
        - ★ Media Type:
        - ★ Activity
        - ★ Animation
        - ★ Chapter Test Prep Videos
        - ★ Essential Video
        - ★ Guided Visualizations
        - ★ Interactive Figure
        - ★ Multimedia Textbook
        - ★ PowerPoint
        - ★ Video
    ii. Study Plan
        - ★ Practice
        - ★ Quiz Me - (will show up in their Student Gradebook)

3.1.3. Study Calendars

In Discussion Board #4, around the fourth week of semester, students in the treatment sections are provided with the below sample weekly study schedule, and they will be asked to customize the schedule to build their own study schedules which they will submit as part of the discussion board deliverables. ***Instructors will frequently remind students to follow the study schedules that they built at the beginning of semester.*** This will help students develop time management skills that are essential for success in math classes and college in general.

Table 2. Sample weekly study schedule.

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00am							
7:30am	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast		
8:00am		PHYS201		PHYS201			
8:30am		PHYS201		PHYS201			
9:00am	MATH101	PHYS201	MATH101	PHYS201	MATH101	Do PHYS201 HW	
9:30am	MATH101		MATH101		MATH101	Study ENG103	
10:00am		Gym		Gym		Do ENG103 HW	
10:30am	Study PHYS201	Gym	Study PHYS20	Gym	Study PHYS201	Study HIST120	
11:00am	Study PHYS201	Gym	Do PHYS201 HW	Gym	Study PHYS201	Study HIST120	
11:30am						Do HIST120 HW	
noon	Lunch	Lunch	Lunch	Lunch	Lunch		
12:30pm							
1:00pm	HIST120		HIST120		HIST120	Work	
1:30pm	HIST120		HIST120		HIST120	Work	
2:00pm		ENG103		ENG103		Work	Study MATH101
2:30pm	Study MATH101	ENG103	Study MATH101	ENG103	Study MATH101	Work	Study MATH101
3:00pm	Study MATH101	ENG103	Study MATH101	ENG103	Study MATH101	Work	Study MATH101
3:30pm	Do MATH101 HW		Do MATH101 HW		Do MATH101 HW	Work	Study ENG103
4:00pm	Do MATH101 HW		Do MATH101 HW	LAB	Do MATH101 HW	Work	Study ENG103
4:30pm		Study MATH101		LAB		Work	Study ENG103
5:00pm	Gym	Study MATH101		LAB			
5:30pm	Gym	Study MATH101		LAB			
6:00pm	Gym	Study MATH101		LAB			Club
6:30pm							Club

7:00pm	Dinner	Dinner	Dinner	Dinner	Dinner		Club
7:30pm							
8:00pm	Study	Study	Study	Study	Study		Study
8:30pm	Study	Study	Study	Study	Study		Study
9:00pm	Study	Study	Study	Study	Study		Study
9:30pm	Study	Study	Study	Study	Study		Study
10:00pm	Study	Study	Study	Study	Study		Study
10:30pm	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep
11:00pm	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep
11:30pm	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep
Midnight	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep

Table 3. Blank weekly study schedule for students to fill out to develop their own study schedules.

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00am							
7:30am							
8:00am							
8:30am							
9:00am							
9:30am							
10:00am							
10:30am							
11:00am							
11:30am							
Noon							
12:30pm							
1:00pm							
1:30pm							
2:00pm							
2:30pm							
3:00pm							
3:30pm							
4:00pm							
4:30pm							
5:00pm							

5:30pm							
6:00pm							
6:30pm							
7:00pm							
7:30pm							
8:00pm							
8:30pm							
9:00pm							
9:30pm							
10:00pm							
10:30pm							
11:00pm							
11:30pm							
Midnight							

3.1.4. Presentations about Learning Strategies by Peer Tutors

Student tutors from the Quality Enhancement Program (QEP) will be invited to give 5-minute presentations to students in the treatment sections about the effective learning strategies they used for learning math when they took the course. Those student tutors are high-achieving students who have taken the same math course at NC A&T in a previous semester. The goal is to get current students in the treatment sections to recognize and appreciate the importance of learning strategies for success in math. Since it is well-known that students tend to get more influenced by their peers, we expect that these peer presentations will significantly improve students' utilization of learning strategies. We will coordinate with the QEP program director to invite and schedule student tutors to give the presentations.

3.2. Student Learning Outcomes

Table 4 describes how the integration of learning-strategy instruction in each of the five math courses maps to students' course learning objectives and expected learning-strategy outcomes.

Table 4. Integration of learning-strategy instruction in math courses and expected outcomes.

Course Topic(s) (Module)	Learning Objective	Integrated Learning Strategy	Integration Method(s)	Expected Outcomes
MATH103: College Algebra I				
• Algebra Essentials • Rational Expressions, Radicals, Linear and Quadratic	Students will apply quantitative and mathematical reasoning skills in examining, evaluating, and solving problems involving order of operation, factoring,	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will learn to **use self-testing to assess** their understanding of how to simplify, factor, and perform basic operations on algebraic expressions, including polynomials, rational and radical expressions, and complex fractions/numbers.

Equations, and Complex Numbers	solving equations, and functions.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **choose the most direct/efficient method** to solve linear, absolute value, rational, radical, and quadratic equations by symbolic methods.
• Equations and Inequalities	Students will evaluate quantitative information using a variety of methods.	**Metacognitive** (Self Testing)	In- and out-of-class self-test quizzes	Students will be able to **self-assess** their comprehension of how to solve various types of equations and inequalities.
• Graphs and Functions	Students will organize, analyze, present, and communicate quantitative information in diverse ways.	**Cognitive** (Elaboration)	Class discussions/ discussion-board assignments	Students will learn to **use elaboration to identify, summarize, and connect between** key features of a graph (intercept; slope; intervals where function is increasing/decreasing/+/-; relative max/min; symmetry; and end behavior).
MATH104: College Algebra II				
• Polynomials • Exponential and Logarithmic Functions	Students will apply mathematical reasoning skills to examine, evaluate, and solve problems about polynomials, and exponential and logarithmic functions.	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will learn to **self-evaluate their competence to work with** polynomial, exponential, and logarithmic functions.
		Metacognitive (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **modify their solution approaches to efficiently** find the zeroes of polynomial, exponential, and logarithmic functions.
		Cognitive (Elaboration)	Class discussions/ discussion-board assignments	Students will use **elaboration to distinguish** between the characteristics of polynomial, exponential and logarithmic functions/ graphs; and use **paraphrasing** to write their own interpretations of these functions/graphs.
• Systems of Equations and Matrices	Students will organize and evaluate quantitative information using a variety of methods.	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will learn to **self-test** their ability to work with systems of equations and matrices.
		Metacognitive (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **choose an efficient method** (e.g., elimination, substitution, etc.) to solve linear equations in 2 or 3 variables as well as nonlinear systems of eqs.
• Trigonometric Functions	Students will apply mathematical	**Cognitive** (Elaboration)	Class discussions/	Students will use elaboration to **summarize** the features of

• Trigonometric Identities and Their Applications	reasoning skills to examine, evaluate, and solve problems about trigonometric functions and learn how to apply these functions in different situations.		discussion-board assignments	trigonometric functions and identities; **identify** trigonometric functions by right triangle for any angle; and **categorize** the various trigonometric identities (identities of co-functions, identities of negative angles, etc.).
MATH131: Calculus I				
• Functions	Students will accurately communicate mathematical information in graphical, verbal, or equation forms.	**Cognitive** (Elaboration)	Class discussions/ discussion-board assignments	Students will learn to **use elaboration** (summarization and paraphrasing) to enhance their conception of the mathematical notation for various sets of real numbers, and the descriptions of lines, circles, and other basic sets in the coordinate plane.
• Limits	Students will develop mathematical skills to formulate the instantaneous rate of change of a function.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **choose and adapt** an efficient way (graphical, numerical, or algebraic) to evaluate limits of different kinds of functions.
		Metacognitive (Self-Testing)	In- and out-of-class self-test quizzes	Students will **self-assess** their understanding of the concept of continuity and their ability to examine the continuity of functions at a point or on an interval.
• Derivatives	Students will learn the definition of the derivative and be fluent with the concept of slope of a tangent line and instantaneous rate of change of a function.	**Cognitive** (Elaboration)	Class discussions/ discussion-board assignments	Students will use **paraphrasing** to make their own intuitive interpretation of derivatives and will learn to use **summarization** to organize the derivative rules and **connect** these rules with their applications.
		Metacognitive (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **adapt** their approach when computing derivatives of different kinds of functions via introducing them to the different ways in which derivatives arise.
• Integration	Students will learn the connection between derivatives and integrations.	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will **self-evaluate** their ability to apply integration techniques to compute areas under curves, surface areas, and volumes.
		Cognitive (Elaboration)	Class discussions/ discussion-board assignments	Students will **use elaboration** to draw meaningful connections between derivatives and integrations.
MATH132: Calculus II				

• Techniques and Applications of Integration	Students will accurately evaluate integrals using a variety of methods.	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will **practice self-testing** to evaluate and enhance their understanding of basic techniques for evaluating integrals (e.g., slice-and-sum strategy) and geometric applications of integration.
		Metacognitive (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **select and adapt** the most efficient/ appropriate method to evaluate any given integral.
• Sequences and Infinite Series • Power Series	Students will tell the distinction between a sequence and an infinite series, apply quantitative and mathematical reasoning to solve problems using series.	**Cognitive** (Elaboration)	Class discussions/ discussion-board assignments	Students will **use elaboration** to **distinguish** between sequences and series, to **summarize and group** the different methods for evaluating limits of sequences and determining convergence of series, and to **connect** betw. concepts of limits and convergence.
		Metacognitive (Self-Testing)	In- and out-of-class self-test quizzes	Students will **practice self-testing** to assess and consolidate their mastery of power series and their properties and applications for approximating functions.
• Parametric and Polar Curves	Students will efficiently communicate quantitative or mathematical information in graphical or equation forms.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **adapt their learning approach** via introducing them to the various alternative ways for generating curves and representing functions.
MATH224: Introduction to Probability & Statistics				
• Descriptive Statistics (Graphical & Numerical Summaries of Data)	Students will learn to explore and summarize data using various graphical techniques, and to compute summary statistics for describing central tendency, variability, and associations.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **select and adapt** the most relevant graphical display (histogram, stem-and-leaf plot, box plot, bar chart, or scatterplot) to visualize the given data, and the most relevant set of numerical summaries (e.g., mean and standard deviation vs median and quartiles) to summarize the given data.
• Probability Rules & Probability Models	Students will use the basic laws of probability to estimate the probability of events	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will learn to **self-test and self-evaluate** their comprehension of the basic probability laws as they are applied to estimating

	and their unions, intersections, and complements.			probabilities of events arising from daily life situations.
	Students will learn to use discrete and continuous probability models to describe the long-run behavior of random phenomena.	**Cognitive** (Elaboration)	Class discussions/ discussion-board assignments	Students will learn to **summarize** the behavior of random variables using probability models, use **paraphrasing** to write their own definition of probability models, and **draw connections** between the requirements of probability models and the basic probability laws learned earlier in the module.
• Inference About One Population	Students will use confidence intervals to estimate population means and proportions.	**Metacognitive** (Self-Testing)	In- and out-of-class self-test quizzes	Students will learn to **self-test and self-evaluate** their understanding of the construction of confidence intervals and the statistical interpretation of confidence.
	Students will perform and interpret statistical tests of significance to test claims about one population mean or proportion.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **choose** the appropriate statistical formulation of hypotheses that fits the specific research question about the population mean or proportion.
• Inference for Comparing Two populations	Students will use confidence intervals and hypothesis tests to compare two population means or proportions.	**Metacognitive** (Adaptation of Learning Approach)	Class presentations/ discussions	Students will learn to **choose** the appropriate statistical test for the given hypothesis testing scenario (e.g., paired vs independent samples).
		Cognitive (Elaboration)	Class discussions/ discussion-board assignments	Students will **draw connections** between the significance of a statistical test and the concept of confidence intervals. They will also **distinguish** between statistical and practical significance.

3.3. Grade Allocation for Project-Related Activities

As presented in the previous section, the integration of learning-strategy instruction in the math courses will require students to engage in several class discussions and discussion board assignments about learning strategies. Additionally, the evaluation of the effectiveness of project activities and the research component of the project requires collection of students data at the beginning and end of the course.

Table 5 provides a guide for assigning course grades to these project-related activities as incentives to ensure reasonable engagement and participation from students in these activities.

Table 5. Incentives for students' participation in project-related activities.		
Project-related Activity	**Grade Category**	**Notes**
Diagnostic pre-test	N/A	1 participation

Pre- and post-surveys	Participation	1 participation for pre-survey and 1 participation for post-survey
Discussion board assignments	Participation	1 participation each (full credit for submission) • Graduate Assistant will create summary of main points in students posts • Instructor will read some of the posts and the summary of main points to prepare for the follow-up class discussion
Diagnostic post-test	Final Exam/Quiz	• MATH103/104: it counts as final exam • MATH131/132/224: it counts as comprehensive quiz (possibly with higher weight than other topic-specific quizzes) – Graded based on completeness but students shouldn't know about this.

3.4. Example Course Schedule Integrating Learning-Strategy Instruction

The following two tables show a sample course schedule of MATH131 in Spring 2022 and Fall 2022, to illustrate how to integrate learning-strategy instruction within the MATH course. All project-related activities are in blue font. Instructors are free to modify and adapt the table based on their own course schedule. However, to enable comparisons among courses and sections, all instructors need to cover the same number of activities as described in this sample course schedule. ***While the timing of activities can be slightly altered depending on the course needs, it is important that these activities take place as early as possible in the semester so that students are given the time to adopt the learning strategies in their courses early on.***

Table 6. Sample Spring-Term course schedule integrating learning-strategy instruction activities.

Date		Subject, Exam	Activity	Due Date
Week 1		Discussion Board #1: Self-Introduction		
Jan.10	M	Syllabus Announce Pre-Test & Pre-Survey Review of Inequalities	Module 1.1	
Jan.11	T	Graphs and equations	Module 1.2	
Jan.12	W	Functions Allow class time for Pre-Survey (Qualtrics) & Pre-Test (Blackboard)	Module 2.1	
Jan.14	F	Functions	Module 2.1	**HW1;** DB#1 Post
Jan. 16	Su	See **Due Date**		DB#1 Response; Pre-Survey, Pre-Test Due
Week 2		Discussion Board #2: What do top students do differently?		
Jan.17	M	**Martin Luther King**		
Jan.18	T	Functions	Module 2.1	
Jan.19	W	Inverse, expo, and log functions	Module 2.2	
Jan.21	F	Inverse, expo, and log functions	Module 2.2	**HW2;** DB#2 Post
Jan. 23	Su	See **Due Date**		DB#2 Response

Table 6. Sample Spring-Term course schedule integrating learning-strategy instruction activities.				
Date		**Subject, Exam**	**Activity**	**Due Date**
Week 3		Discussion Board #3: Learning Strategies		
		In-Class Discussion on DB#2		
Jan.24	M	Trig functions and their inverses	Module 2.3	
Jan.25	T	Trig functions and their inverses	Module 3.1	
Jan.26	W	Intro and definitions of limits	Module 3.1	
Jan.28	F	Techniques for computing limits	Module 3.2	**HW3;** DB#3 Post
Jan. 30	Su	See **Due Date**		DB#3 Response
Week 4		Discussion Board and Reflection: Time Management		
		First In-Class Discussion on DB#3		
Jan.31	M	Infinite limits and limits at infinity	Module 4.1	
Feb.01	T	Precise definitions of limits (optional)	Module 4.1	
		Second In-Class Discussion on DB#3		
Feb.02	W	Continuity	Module 4.2	
Feb.04	F	Continuity	Module 4.2	**HW4;** DB#4 Post
Feb. 06	Su	See **Due Date**		DB#4 Response
Week 5		Discussion Board and Reflection: Test-Taking Strategies		
		In-Class Discussion on DB#4		
Feb.07	M	TEST REVIEW		
Feb.08	T	Introducing the derivatives	Module 5.1	
Feb.09	W	Basic differentiation rules and rate of change	Module 5.2	
Feb.11	F	**TEST 1**		**HW5;** DB#5 Post
Feb. 13	Su	See **Due Date**		DB#5 Response
Week 6		In-Class Discussion on DB#5		
Feb.14	M	The Product and Quotient rules	Module 5.2	
Feb.15	T	The Product and Quotient rules	Module 5.3	
Feb.16	W	The Chain rule	Module 5.3	
Feb.18	F	The Chain rule	Module 6.1	**HW6**
Week 7 – Week 16		Normal Class Schedule		
Week 17				
May 02	M	Announce Post-Test & Post-Survey REVIEW		
May 03	T	Allow class time for Post-Survey (Qualtrics) & Post-Test (Blackboard)		
May 04	W	REVIEW		
May 06	F	**No Class**		Post-Test, Post-Survey Due
		Final Exam		

Table 7. Sample Fall-Term course schedule integrating learning-strategy instruction activities.				
Date		**Subject, Exam**	**Activity**	**Due Date**
Week 1		Discussion Board #1: Self-Introduction		
Aug.17	W	Syllabus Announce Pre-Test & Pre-Survey Review of Inequalities	Module 1.1	
Aug.19	F	Allow class time for Pre-Survey (Qualtrics) & Pre-Test (Blackboard)	Module 1.2	**HW1;** DB#1 Post
Aug. 21	Su	See **Due Date**		DB#1 Response; Pre-Survey, Pre-Test Due
Week 2		Discussion Board #2: What do top students do differently?		
Aug.22	M	Graphs and equations		
Aug.23	T	Functions	Module 2.1	
Aug.24	W	Inverse, expo, and log functions	Module 2.2	
Aug.26	F	Inverse, expo, and log functions	Module 2.2	**HW2;** DB#2 Post
Aug. 28	Su	See **Due Date**		DB#2 Response
Week 3		Discussion Board #3: Learning Strategies		
		In-Class Discussion on DB#2		
Aug.29	M	Trig functions and their inverses	Module 2.3	
Aug.30	T	Trig functions and their inverses	Module 3.1	
Aug.31	W	Intro and definitions of limits	Module 3.1	
Sep. 02	F	Techniques for computing limits	Module 3.2	**HW3;** DB#3 Post
Sep. 04	Su	See **Due Date**		DB#3 Response
Week 4		Discussion Board #4: Time Management		
Sep. 05	M	Labor Day		
		First In-Class Discussion on DB#3		
Sep. 06	T	Infinite limits and limits at infinity	Module 4.1	
Sep. 07	W	Precise definitions of limits (optional)	Module 4.1	
		Second In-Class Discussion on DB#3		
Sep. 09	F	Continuity	Module 4.2	**HW4;** DB#4 Post
Sep. 11	Su	See **Due Date**		DB#4 Response
Week 5		Discussion Board #5: Test-Taking Strategies		
		In-Class Discussion on DB#4		
Sep. 12	M	TEST REVIEW		
Sep. 13	T	Introducing the derivatives	Module 5.1	
Sep. 14	W	Basic differentiation rules and rate of change	Module 5.2	
Sep. 16	F	**TEST 1**		**HW5;** DB#5 Post
Sep. 18	Su	See **Due Date**		DB#5 Response
Week 6		In-Class Discussion on DB#5		
Sep. 19	M	The Product and Quotient rules	Module 5.2	
Sep. 20	T	The Product and Quotient rules	Module 5.3	
Sep. 21	W	The Chain rule	Module 5.3	
Sep. 23	F	The Chain rule	Module 6.1	**HW6**

Table 7. Sample Fall-Term course schedule integrating learning-strategy instruction activities.				
Date		**Subject, Exam**	**Activity**	**Due Date**
Week 7 – Week 14		Normal Class Schedule		
Week 15				
Nov. 21	M	Announce Post-Test & Post-Survey		
Nov. 22	T	REVIEW		
Nov. 23 - 25	W-F	THANKSGIVING Break		
Nov. 28	M	Allow class time for Post-Survey (Qualtrics) and Post-Test (Blackboard)		
Nov. 29	W	REVIEW		Post-Survey & Post-Test Due
Dec. 02	F	**Reading Day**		
		Final Exam		

Chapter 4
Surveys and Assessments

Data collection is a major part of this BPR project to enable the associated research study and guide the process of improving the implementation of learning-strategies instruction in the targeted MATH courses.

Multiple types of students' data will be collected from students in the control and treatment sections.

- The first type is data collected directly from students through **Qualtrics surveys and diagnostic tests** given at the beginning and the end of the semester.
- Students course performance data in the form of students' **final course grades** from the instructors' gradebooks.
- Qualitative data collected from students through **focus groups**.

4.1. Qualtrics Pre- and Post-Surveys

All surveys will be administered using the survey software Qualtrics. Survey invitations will be sent students directly by Dr. Mostafa through Qualtrics. To link students' data from multiple sources, survey invitations will be sent using unique students' usernames. During the week before start of semester, instructors will download the list of students' names (first and last names) and usernames (the part of email address before @aggies.ncat.edu) from Blackboard or from course rosters in Aggie Access Online and share the list for each section with the PI, Dr. Mostafa, in a .csv file. Instructors will repeat this process during third to last week of semester for the post-surveys. The lists of usernames will be used to generate unique survey invitations in Qualtrics. For the sake of assigning participation points for students who complete the surveys, Dr. Mostafa will provide instructors with lists of survey completers.

The following Qualtrics survey will be administered at the beginning and end of semester in both control and treatment sections.

4.1.1. Identities, Math Mindset, and Self-Regulated Learning Survey

This survey collects data about various students' identities including gender, racial and math identities and students' math mindset and self-regulated learning (SRL). Most items are Likert scale type items, and the pilot study shows that it takes about 15 to 20 minutes to complete the survey.

4.2. Diagnostic Pre- and Post-Tests

Diagnostic pre- and post-tests, developed from well-established concept inventories or in previous BPR projects, will be used to assess students' learning gains in control and treatment sections of the five target math courses. The same pre- and post-tests will be used in control and treatment sections. For the two College Algebra courses (MATH103 and 104), both pre-test and post-test are completed in Pearson and proctored by the course instructor in the computer lab. The pre-test counts as 1 regular participation assignment and the post-test counts as the course final exam for these two courses. For the Calculus (MATH131 and 132) and Statistics (MATH224) courses, both the pre-test and post-test are completed in Blackboard outside of class using Respondus Lockdown Browser with Webcam. For these courses, the pre-test counts as 1 regular participation assignment and the post-test counts as a comprehensive quiz

(possibly with higher weight than other quizzes and graded based on completeness) that helps students review for their final exam. The pre-test will take place during first week of semester (due by Sunday before second week starts) and post-test will take place during pre-finals week for MATH131/132/224 and during the final exam week for MATH103/104.

4.3. Focus Groups

A subset of the study participants (students) will be recruited to participate in focus group interviews. First round of focus group interviews will be conducted around the fourth week of Fall 2022 semester with subset of students from the control/treatment sections of Spring 2022. In this round, there will be 10 focus groups of up to five participants each. The focus groups will be administered by a trained researcher. Participants will be asked questions about their experiences in their math courses, specifically: (1) what strategies they used to pass the course; (2) beliefs about their math growth mindset; (3) if and how they used SRL and; (4) their social identities. This focus groups design will continue for four rounds (Round 2 in Spring 2023, Round 3 in Fall 2023, and Round 4 in Spring 2024). Instructors will help with recruiting the focus group participants.

Chapter 5
Faculty Professional Development

5.1. Learning-Strategy Instruction Workshop

5.2. Learning-Strategy Instruction Certification

Frequently Asked Questions

To be developed based on Q/A from professional development sessions and surveys.