



GUIDE TO BUILDING **METACOGNITIVE** **SKILLS**

The
EvaluateUR
Method

The **EvaluateUR** Method



This guide was written for researchers and educators using the EvaluateUR Method, which has been developed and maintained by collaborators at SUNY Buffalo State and the Science Education Resource Center (SERC) at Carleton College.

<https://serc.carleton.edu/evaluateur>

Provenance

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INTRODUCING METACOGNITION

This guide introduces metacognition and the optional learner-centered metacognitive exercises that encourage students to learn more about their own learning. The student exercises are designed to strengthen metacognitive habits. As students reflect, they begin to notice what is needed in a given situation, what is working, what is not, and when they need to make adjustments. This process is known as metacognition and it is characterized by an ongoing awareness of one's own thinking and a willingness to make adjustments based on that awareness. The exercises provided can help build metacognitive skills that support student growth in both coursework and research projects. Students can apply these skills as they continue their education and enter the workplace. This guide can help instructors determine when and how to provide students with opportunities to practice this important skill.

The research on metacognition demonstrates that students with gains in metacognition show improvements in reading comprehension, problem-solving, critical thinking, study skills, and exam performance. These gains are not surprising when you consider that metacognitive students set goals and plan for success. They monitor their progress and recognize when they need to adjust their approach. They have also learned how to be flexible and how to look at problems from different angles. They are willing to creatively troubleshoot when they can and ask for guidance when they get stuck. Metacognition supports undergraduate experiences both inside and outside the classroom because it prompts students to make a habit of the learning capacities necessary for successful research.

Being metacognitive need not mean that students are hyperaware all of the time. Rather, we are aware enough of our goals and methods for getting there that we can check-in as conditions merit. Developing metacognition includes developing an awareness of when check-ins are important and how to make meaningful adjustments. It can help students appreciate the need for learning strategies as well as the tools for locating them. Like other skills, developing metacognition takes time and ongoing practice.

OVERVIEW OF THE METACOGNITIVE EXERCISES

The metacognitive exercises provide students with opportunities to become more aware of their research process and opportunities to make meaningful adjustments. Each metacognitive exercise is self-contained and can be assigned separately or in combination with other exercises. Each exercise begins with a brief rationale about the importance of metacognition and instructions for the exercise are followed by several question prompts.

For those engaged in EvaluateUR, this guide can help student/mentor pairs deepen student self-assessment throughout the research process. For example, students can complete metacognitive exercises in conjunction with their pre-research reflection, their outcome category assessments, conversations with their mentors, or ongoing journal entries.

For those engaged in EvaluateUR-CURE, this guide can help instructors determine when and how to provide students with opportunities to build metacognitive skills. These exercises would typically be completed by students outside of class. Student answers need not be overly long. Consistent practice asking metacognitive questions is as (or more) important than in-depth engagement on a particular occasion. To reduce mentor workload, it is recommended that the activities be graded as "completed/incomplete."

In each case, strengthening metacognitive habits can help improve self-assessment of learning outcomes and focus additional efforts in specific areas. As with the knowledge and skills in each of the EvaluateUR categories, metacognitive habits will serve students long after their research projects are complete.

EvaluateUR: METACOGNITIVE EXERCISES

The EvaluateUR process encourages students to practice self-assessment across a list of competencies and skills. It builds student confidence and self-awareness. It also facilitates a consistent assessment of student strengths and weaknesses that enhances the mentoring process by focusing efforts on specific areas.

Below are some suggestions that can reinforce metacognitive practice within the EvaluateUR roadmap. Mentors should feel free to adapt these activities to the needs of their particular setting. These suggestions can be mixed and matched with each other. They can take as much or as little time as the mentor deems appropriate. The goal is to regularly reinforce the importance of metacognitive practice.



Pre-research self-reflection

As part of the pre-research process, students are asked to complete a self-assessment of their goals, interests, expectations, knowledge, and skills to establish a common starting point for both students and their mentors. The student reflection exercise gives students an opportunity to practice self-assessment and begin thinking about their learning process. Students could choose to complete any of the metacognitive exercises as a way to further explore items uncovered in their pre-research self-reflection.

Pre-research mentor feedback suggestion

Once students have submitted their self-reflection, mentors have the ability to edit the automated email template response. This could include the suggestion that students complete one (or more) of the metacognitive exercises. For example, if students express concerns about their ability to ask meaningful questions that add to existing knowledge in the field, then students could be directed to an exercise on asking meaningful research questions. If students express anxiety about their ability to sound smart enough to talk about their work, students could be directed to an exercise related to building effective communication.

Assessment discussions -- Pre-research, mid-research, end of research

At three separate points during the research process, student/mentor pairs meet to discuss the score reports based on their independent assessment of the outcome categories. The metacognitive exercises can extend those mentoring efforts and provide additional opportunities to practice self-assessment. For example, if the student/mentor pair find themselves discussing a student's difficulty dealing with obstacles, then the mentor could suggest the metacognitive exercises related to building research resilience. The exercise encourages students to take stock in their difficulties and strategies for managing them.

Students could be encouraged to complete metacognitive exercises as part of their own self-exploration or the student/mentor pair could choose to have an additional conversation to discuss the student response. In either case, the metacognitive exercises provide students with opportunities to deepen their understanding of their own strengths and weaknesses related to outcome categories.

Keeping a journal with metacognition

As part of an ongoing effort to promote student self-reflection, students are encouraged to keep a journal where they record their thoughts and experiences. The metacognitive exercises can be used in conjunction with these efforts. For example, students might find themselves journaling about how to ask for help, how to work with others, or improve time-management. The metacognitive exercises can provide students with structured opportunities to explore the issues captured in the journal.

Students' journals can also be used to collect topics to be discussed with mentors. The metacognitive exercises could be used after those student/mentor conversations and deepen student understanding. The exercises could also help students uncover evidence for their views. If they believe that they are struggling in particular ways and their mentor disagrees, then the exercises can prompt students to explore why they hold that belief and whether the evidence actually supports it.

EvaluateUR-CURE: METACOGNITIVE EXERCISES

In course-based settings, instructors may choose to set aside some class time to discuss the exercises. The discussion could be the subject of an entire class session or just a few minutes. But it is important to take at least some class time to discuss the exercises because it signals to students that exercises are integral to their learning in the course and the successful completion of their research projects. Below are some suggested in-class activities that can reinforce metacognitive practice. Instructors should feel free to adapt these activities to the needs of their particular setting. They can be mixed and matched with each other. They can take as much or as little class time as the instructor deems appropriate. The goal is to regularly reinforce the importance of metacognitive practice.



Batch instructor feedback – after students complete a metacognitive exercise, the instructor might read through the student responses looking for common themes. Are students finding success in similar places? Are they struggling in similar ways? Are there large difference among clusters of students? While not offering individual feedback to student responses, the instructor can use the identified themes as discussion points to celebrate success or offer possible strategies for overcoming the challenges identified by the students.



Think-pair-share – each of the optional metacognitive exercises contains several question prompts. Instructors might choose one of those prompts and ask students to turn to their neighbor to discuss their answer. The instructor could extend the activity by asking students to summarize their partner's insight.



Group-activity – instructors might break students into small groups where the goal of the group discussion is to generate a list of “take away tips” to be shared with the class based on that group's interaction with the metacognitive exercise. This could be recorded on a shared electronic document, a piece of paper, or reported out to the class verbally.



Metacognitive “time-outs” – instructors might take a moment to “pause” in class to explicitly make a connection to metacognition. For example, if topic is problem-solving, the instructor could remind students about the importance of being aware of how to root causes of problems and generate potential solutions. Or the instructor might point out how to recognize potential flaws or mistaken assumptions. The purpose of the time-out is to remind students that metacognitive practice can improve their ability to problem-solve by increasing their awareness of problem-solving elements and the importance of making meaningful adjustments.



Ticket out – some instructors use a “ticket out the door” as a way to take attendance and gauge student understanding. This could be as simple as “what's one thing you learned today?” Or “are there parts of today's class that you're shaky on?” Instructors using a ticket out could work-in a question connecting a metacognitive exercise with the day's session. For example, “where might you find answers to leftover questions from today's class?” Or “given what you learned in class today, how might you have prepared for class differently?” Tickets out typically take less than five minutes.

EvaluateUR Method: LIST OF METACOGNITIVE EXERCISES

- **Learning from past projects**

This exercise asks students to reflect on how they've navigated past projects and assignments. It can be used anytime or paired with [Developing project management skills](#). The goal is to help them learn from those experiences and develop the independence necessary for a research project.

- **Developing project management skills**

This exercise asks students to reflect on *how* they are currently navigating their research project. It is best given after the research process has begun, but before the project has concluded.

- **Thinking about how to ask good questions**

This exercise asks students to reflect on how they formulate questions as well as how they generate answers. This exercise can be used anytime or paired with [Thinking about how to ask good research questions](#). The aim is to prompt students to think about disciplinary modes of thinking and what constitutes appropriate evidence.

- **Thinking about how to ask good research questions**

This exercise asks students to reflect on *how* they formulate questions central to their research as well as what counts as adequate evidence. This exercise is best given at the beginning of the research process. The aim is to prompt students to connect disciplinary modes of thinking with research projects.

- **Building resilience**

This exercise is intended to help students reflect on how they can overcome obstacles. It asks them to think back to a prior experience and draw out lessons that might help them succeed in their research projects. This exercise can be used anytime or paired with [Building research resilience](#).

- **Building research resilience**

This exercise asks students to reflect on *how* they're coping with setbacks related to the research process. It is best given after the research process has begun, but before the project has concluded.

- **Reading with a purpose**

This activity is designed to be used in conjunction with a reading assignment. The aim is to prompt students to read more intentionally and draw out lessons that might help them succeed in their research projects. This activity can be used more than once. It could, in principle, be given in conjunction with every reading assignment. It can also be used in conjunction with [Reading for research](#).

LIST OF METACOGNITIVE EXERCISES

- **Reading for research**

This exercise asks students to reflect on *how* they're doing the reading related to their research project. It is best given towards the beginning of the research process.

- **Thinking about the self-assessment process**

This exercise encourages students to think back on how they completed the self-assessment to consider whether it was fair and accurate.

- **Better together: teamwork and collaboration**

This exercise asks students to reflect on *how* teams can function effectively as well as how they can get collaborations back on track when they run into trouble. The aim is to prompt students to think about how to have a good research team experience. This exercise can be used anytime.

- **Thinking about how you communicate**

This exercise asks students to reflect on how to effectively express your work to a disciplinary audience. The aim is to encourage students to develop clear, concise, and organized modes of communication. This exercise can be used anytime.

- **Thinking about how you communicate across audiences**

This exercise asks students to reflect on *how* they communicate with others about their research project. The aim is to prompt students to express ideas in a clear and concise manner using discipline-specific language.

SUGGESTIONS FOR USING METACOGNITIVE EXERCISES

SCAFFOLDING EXERCISES



Paired Exercises

The first exercise is a general introduction, and the second exercise applies it to the research process

- Learning from past project
- Developing project management skills
- Thinking about how to ask good questions
- Thinking about how to ask good research questions
- Building resilience
- Building research resilience
- Reading with a purpose
- Reading for research

RECOMMENDED TIMING IN THE RESEARCH PROCESS



Near the beginning of the research experience

- Thinking about how to ask good research questions
- Reading for research



After research has been going on for several weeks

- Developing project management skills
- Building research resilience
- Thinking about the self-assessment process



Anytime during the research experience

- Learning from past projects
- Thinking about how to ask good questions
- Building resilience
- Reading with a purpose (could be given with every reading assignment)
- Better together: teamwork and collaboration
- Thinking about how you communicate

EXERCISE GUIDE | Learning from past projects

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on how you've navigated past projects and assignments with multiple parts, such as research papers and class presentations. The goal is to help you learn from those experiences and develop learning independence as you engage in large projects, like research projects. Metacognitive students are effective learners because they are flexible in their thinking and willing to make adjustments. This exercise provides an opportunity to practice learning about your own learning.

Instructions

Consider past projects and assignments that have had multiple parts, such as a research papers or class presentations. Think about how you went about doing those projects and assignments. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 How did you organize your time? Was it effective? If so, what lessons might you use in your research? If not, how would you do things differently as you conduct your research?
- 2 What did you do when you encountered setbacks? Did you use available resources? Were you comfortable asking for help? Are you able to locate additional resources on your own?
- 3 What was the most useful feedback you've received on a project or assignment? Why was it helpful? How did you use it to improve your work?
- 4 Based on your past experience, what advice would you give to a classmate about how to be successful with projects and assignments with multiple parts?

EXERCISE GUIDE | Building Project Management Skills

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on *how* you're currently navigating your research project. Metacognitive students are effective learners because they are flexible in their thinking and willing to make adjustments. This exercise provides an opportunity to practice learning about your own learning and the opportunity to make adjustments if necessary.

Instructions

Consider your research project. Think about how you're going about doing the work. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 Are you confident that you have the knowledge and skills to complete your research project? If so, what's your greatest strength? If not, where are you struggling?
- 2 Have you used your time effectively? If so, what's the secret to your success? If not, what would you do differently?
- 3 Have you experienced setbacks? What are they? Have you found ways to overcome them or are you still struggling?
- 4 Have you used all the resources at your disposal? Where might you find resources that will help you work more effectively?
- 5 What's the biggest surprise about the research process so far?
- 6 What's one adjustment that you can make to more effectively complete your research project?

EXERCISE GUIDE | Thinking About How to Ask Good Questions

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on *how* you formulate questions as well as *how* you generate answers. The aim is to prompt you to think about disciplinary modes of thinking and what constitutes appropriate evidence.

Instructions

Consider the subject matter (such as the topics explored, questions asked, kinds of evidence offered). Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 What does it mean to think like an expert in this field (such as biologist, chemist, engineer)? What kinds of questions do they ask?
- 2 Choose one of the topics raised. What was the question being asked? Give an example.
- 3 What sorts of evidence was used to answer the question? How were those data collected and/or generated?
- 4 Did those data adequately answer the question? If so, how? If not, why not?

EXERCISE GUIDE | Thinking About How to Ask Good Research Questions

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on *how* you formulate questions central to your research as well as what counts as adequate evidence. The aim is to prompt you to connect disciplinary modes of thinking with research projects.

Instructions

Think about your research project. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 What is the central question raised by your research project?
- 2 What evidence do you hope to collect in order to answer that question?
- 3 How do you plan to collect it?
- 4 What might an expert in the field think about your plan (your question, method, data collection)?
- 5 How might the results of your research contribute to the ongoing conversation in the field?

EXERCISE GUIDE | Building Resilience

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise is intended to help you reflect on how you can overcome obstacles in conducting research. Metacognitive students are effective learners because they are flexible in their thinking and willing to make adjustments. This exercise asks you to think about and build upon prior successes.

Instructions

Consider an activity that you have invested time into (such as, playing sports, making music, playing video games, making art). Think about a time when you encountered difficulty and successfully rose to the challenge. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 Name the activity and describe the nature of the obstacle you encountered while engaged in this activity.
- 2 Describe how the difficulty appeared. For example, did it appear all at once or develop over time?
- 3 How did you respond to the obstacle?
- 4 How did you know how to respond to the obstacle?
- 5 Did your strategy work the first time, or did you need to try different strategies?
- 6 Looking and reflecting back on this, was there anything you could have done differently to have avoided the difficulty?
- 7 What are the positive lessons from the experience that might help you when you face challenges in your research project?

EXERCISE GUIDE | Building Research Resilience

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on *how* you're coping with setbacks that you might be experiencing in the research process. The goal is to help you develop strategies for overcoming research obstacles. Metacognitive students are effective learners because they are flexible in their thinking and willing to make adjustments. This exercise provides an opportunity to practice learning about your own learning.

Instructions

Consider your research project. Think about how things have been going. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 Describe an obstacle you've encountered while engaged in your research project.
- 2 How did the obstacle appear? For example, did it appear all at once or develop over time?
- 3 How have you responded so far? Is it working? Or are you still looking for solutions?
- 4 What from your previous experience might help you respond?
- 5 What are the positive lessons that you'll draw upon when you face future setbacks in the research process?

EXERCISE GUIDE | Reading with a Purpose

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise is intended to help improve reading comprehension. Metacognitive students are effective as learners because they plan for success, monitor their progress, and make adjustments when needed.

Instructions

This exercise is being done in conjunction with a reading assignment. It comes in two parts. Answer the first set of questions **before you do the reading** and the second **after you have completed the reading**.

PART 1 (*Complete before you do the reading*):

- 1 What is your approach to completing assigned readings? Do you have a particular reading strategy? If so, please describe how it works.
- 2 In your experience, how do reading assignments differ in different classes. For example, how does reading history differ from biology or literature differ from sociology?
- 3 How much time should you budget for completing the reading assignment?
- 4 Why do you think this reading might have been assigned? What do you think your instructor/research mentor hopes you will learn?
- 5 How will you know if you have been successful?

MORE QUESTIONS: [SEE PART 2 > > >](#)

EXERCISE GUIDE | Reading with a Purpose cont.

PART 2 (*Complete after you completed reading*):

- 1 What did you learn from the reading (be specific)?
- 2 How did you learn it (that is, what was your approach)? Did you use a particular strategy? If so, please explain.
- 3 What kind of thinking was the reading asking you to do? How is that type of thinking different than that being asked in other classes?
- 4 As you were reading, did you find yourself engaged in the material or distracted? If engaged, what was interesting about it? If distracted, then what might you do next time to limit distractions?
- 5 Did you budget enough time to complete the reading? If so, how do you know it was enough? If not, what might you do differently next time?
- 6 Identify the lessons will you take with you to the next reading assignment?

EXERCISE GUIDE | Reading for Research

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on *how* you're doing the reading related to your research project. Metacognitive students are effective learners because they are flexible in their thinking and willing to make adjustments. This exercise provides an opportunity to learn about your own learning and make importance adjustments to your reading strategies when necessary.

Instructions

Consider the reading you're doing related to your research project. Think about how you're going about it. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 How is reading for research, such as reading journal articles, different from reading for class?
- 2 Have you changed your approach to the reading? Do you read differently? If so, how? If not, do you think you need to change your approach?
- 3 How has your reading informed your research project? For example, how has it shaped how you think about your research question?
- 4 Are you able to identify the parts of your reading that are most relevant to your research project? If so, how do you know? If not, what have you tried?
- 5 What's one piece of advice that you'd give to a classmate about reading for research?

EXERCISE GUIDE | Thinking about the Self-Assessment Process

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

The overall goal of the self-assessment of process is to help you and your instructor better understand your views, expectations, interests, and skills related to the research process. This exercise encourages you to think back on how you completed the self-assessment to consider whether it was fair and accurate.

Instructions

Consider your recent scoring on the self-assessment and the scores offered by your instructor. Think about how the scores are related and what you might learn about how you approach the self-assessment process. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 Now that you've had a chance to review the scores, are there places where you and your instructor came to different conclusions? Why do you think scores differ?
- 2 As you think back on the self-assessment process, do you think you were being too hard (or too easy) on yourself? Does this happen in other situations (other classes, at your job, extracurricular activities)?
- 3 Can you point to evidence that supports your instructor's scoring? Would you now change your assessment in light of that evidence? Why or why not?
- 4 Moving forward, how do you plan to strengthen the items addressed in the self-assessment? What's the plan? Can you identify the resources you might need to strengthen your skills?
- 5 After reflecting on this most recent self-assessment, what lessons will you take to the next time you go through the process of self-assessment?

EXERCISE GUIDE | Better Together: Teamwork and Collaboration

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on how teams can function effectively as well as how you can get collaborations back on track when they run into trouble. The aim is to prompt you to think about how to have a good research team experience.

Instructions

Think about your research project. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 In your view, what does effective teamwork look like? What are the signs that things are going well?
- 2 What are three ways you might distribute tasks between team members? Which do you consider the best?
- 3 What are three ways you might distribute tasks between team members? Which do you consider the best?
- 4 What's the best part of being on a team?
- 5 What do you hope to get out of the research team experience?

EXERCISE GUIDE | Thinking About How You Communicate

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks you to reflect on how to communicate effectively to a disciplinary audience. The aim is to encourage you to develop clear, concise, and organized modes of communication.

Instructions

Think about how you communicate ideas related to your research project. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 What does effective communication look like? How do you know it is effective?
- 2 How does communicating with a disciplinary specific audience (biologists, chemists, engineers) differ from communication with other groups? Please give an example.
- 3 What's your process for organizing ideas and figuring out what is most important?
- 4 How do you determine if your message is clear and reaching your audience as you intend?

EXERCISE GUIDE | Thinking About How You Communicate Across Audiences

Background

The goal of this exercise is to help you learn how to learn about your own learning and how to make adjustments to learn more effectively. This process, called 'metacognition,' has been shown to improve student success in all sorts of ways, including boosts in reading comprehension, exam performance, and problem-solving. This exercise gives you an opportunity to learn about your own learning and apply those lessons to your research project.

Purpose of the exercise

This exercise asks students to reflect on *how* they communicate with others about their research project. The aim is to prompt students to express ideas in a clear and concise manner using discipline-specific language.

Instructions

Consider how you talk about and write about your research project. Answer the following questions. Your answers do not need to be overly long, but you should try to provide enough detail so that you explain your responses.

- 1 How does communication between professionals in your field differ from conversations with others, like friends and family?
- 2 What do you do if you encounter discipline-specific language that you don't know? For example, do you ask your instructor, mentor, or classmates? Do you go to the internet? Do you "fake it until you make it"?
- 3 When you find yourself using discipline-specific language, do you feel empowered, or do you feel like an imposter? Does this feeling accurately capture how you're using discipline-specific language?
- 4 How do you go about organizing your ideas? Briefly describe each step in your process.
- 5 How do you know when your message has been clearly and concisely communicated.

RESOURCES

Foundational Work on Metacognition

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