

SUPPLEMENTAL MATERIALS

Supplemental Material 1. Example of a research analysis worksheet (RAW) including the growth mindset intervention.

Research Analysis Worksheet

“Functional and Developmental Identification of a Molecular Subtype of Brain Serotonergic Neuron Specialized to Regulate Breathing Dynamics”
Brust et al. *Cell Reports* 2014

How to Approach Reading Research Articles

Research articles can be frustrating for novice readers. Reading such articles, however, will be key to your success in this class. We are going to practice reading, analyzing and presenting a research article in this course. Here is a sequence of steps to help you approach reading primary scientific literature:

- (1) Focus on the DATA!
- (2) You do not need to read a scientific article from start to finish straight through. Give yourself an idea of the big picture before you delve into the details.
 - a. Read the abstract
 - b. Skim the figures. Look at the figure legend titles, axes, techniques, etc.
 - c. Read the introduction
- (3) Work to understand each figure and fill out your FACTS table (pg.2) as you progress.
 - a. Use the written results portion to supplement your understanding of the figures
 - b. If you do not understand a technique or require clarification use the methods section (sometimes available online only)
 - c. Always check for supplemental figures or data
- (4) Read the discussion with a critical eye. Do the data support the authors' claims?

INSTRUCTIONS...

The following worksheet is due on Sakai 1 hour before the class the article will be discussed. This analysis will be used to cultivate your writing and critical thinking skills, ensure you understand the paper, and aid you in the journal club discussion (you may want to print a copy

for yourself during the class journal club). Keep reading to understand what items are required for your analysis!

Evaluation Method

- 40% – Analysis of two figures with the figure FACTS table.** (all aspects of the figures you choose must be addressed to receive any credit)
- 40% – Personal reflection** (your entire reflection should be limited to 250 words to receive any credit)
- 20% – Lay-audience abstract** (written in your own words, without jargon, in 4 sentences or less)

Use the next page as your template to complete the worksheet. Please submit your worksheet as a word document

Figure FACTS Analysis Table:

- Fill out the figure FACTS table for **at least two figures**. You may do more figures if you find the table useful, but this is not required and will not factor into your grade for the assignment. Only the first two will be graded.

Figure	Panel	Technique:	These data show:
Figure #		<i>Describe the technique and experimental paradigm in detail for each letter</i>	<i>Describe for each panel in the figure... (1) Literally what do the data show (2) What does it mean? What's the big picture?</i>
	A	A. Transfected of dopamine	
	B	neurons w/GFP	
	C	B. Immunostain for PSD95 (post synaptic density marker)	
	D	C. Counted stable vs. transient puncta	
		D. Stained for AMPA receptors	D. Stable synapses are AMPAR+. Long term potentiation occurred as a result of the treatment with caffeine
Figure 1			
Figure 2			

Personal Reflection:

Please answer the following questions...

- 1) Briefly describe the respiratory chemoreflex in your own words.
- 2) Do all serotonin neurons contribute to the chemoreflex? Use evidence from the paper to briefly support your answer.

- 3) Were you surprised to learn that there is functional specialization within the serotonin system? Why or why not?
- 4) Did you like the article? Why or why not? (don't worry I won't be offended!! It's not my work 😊)
- 5) Metacognitive Reflection: Reflect on your learning and your ability to analyze the research in this article. Are you improving in your research article analysis with our practice? What strategies are working best for you and how can you continue to improve?
- 6) Growth Mindset: Reading research articles is tough! We encourage a growth mindset. In other words, all of us can master research article analysis through hard work, good strategies and feedback. Discuss how well you are doing at applying a growth mindset as you tackle these research articles?

** here is an inspiring video about how to use a growth mindset to succeed in STEM-
[Reprogramming Your Brain to Overcome Fear](#) (15 min)**Here is a [practical short read](#) on
having a growth mindset and a [recent research article](#) on its benefits in education.

Lay Audience Abstract

Write a lay-audience abstract in 4 sentences or less. Write a paragraph to summarize the article in your own words at a level that any non-scientist could understand (**no jargon**). You will have to work to make the complex scientific concepts/techniques clear but remain accurate. As scientists, you should promote an accurate understanding by avoiding hyperbole and presenting only realistic interpretations of the potential of the work.

Supplemental Material 2. Research-related skills survey questions.

Self-efficacy. Please indicate the extent to which you agree or disagree with the following statements concerning your confidence in your research ability. (1 - Strongly disagree, 2 - Disagree, 3 - Neither agree nor disagree, 4 - Agree, 5 - Strongly agree)

1. I am confident that I can generate a research question to answer
2. I am confident that I can create explanations for the results of the study.
3. I am confident that I can use research literature and reports to guide my own research.
4. I am confident that I can develop theories (integrate and coordinate results from multiple studies).
5. I am confident in communicating my work through a poster and/or paper.

Research community. Please read each description and indicate the extent to which the person in the description is like you. (1 - Not like me at all, 2 - Not like me, 3 - A little like me, 4 - Somewhat like me, 5 - Like me, 6 - Very much like me)

1. A person who thinks discussing new theories and ideas between scholars is important.
2. A person who thinks it is valuable to conduct research that builds the world's knowledge.
3. A person who thinks that research can solve many of today's world challenges.
4. A person who feels discovering something new through research is thrilling.

Reading scholarly literature. Please indicate the extent to which you agree or disagree with the following statements concerning reading scholarly literature. (1 - Strongly disagree, 2 - Disagree, 3 - Neither agree nor disagree, 4 - Agree, 5 - Strongly agree)

1. I understand how to critically evaluate studies conducted by others.
2. I understood how to look at data and figure out what question the researchers were asking.
3. Presently, I can critically analyze literature from my discipline.
4. Presently, I can recognize a sound argument and appropriate use of evidence in scholarly literature.
5. Presently, I can interpret the complex language and jargon in scholarly literature.
6. Presently, I am confident I can interpret data presented in graphs, tables, or charts.
7. Presently, I am confident I can intelligently criticize others' ideas or proposals.
8. Presently, I am in the habit of thinking about whether I am fully understanding what I am reading when reading scholarly articles.

Scholarly writing. Please indicate the extent to which you agree or disagree with the following statements concerning scholarly writing. (1 - Strongly disagree, 2 - Disagree, 3 - Neither agree nor disagree, 4 - Agree, 5 - Strongly agree)

1. The process of writing is helpful for understanding scientific ideas.
2. Writing helps me to develop stronger ideas and to explore complex issues in academic research.
3. I have sufficient experience and knowledge to write effectively in my field.
4. I often feel unclear about the principles and purposes of writing in my field.

Presenting research. Please indicate the extent to which you agree or disagree with the following statements concerning presenting your research. (1 - Strongly disagree, 2 - Disagree, 3 Neither agree nor disagree, 4 - Agree, 5 - Strongly agree)

1. Explaining scholarly research to others helps me understand the ideas better.
2. I am comfortable with presenting scholarly research in an informal setting.
3. I am comfortable with presenting scholarly research in a formal setting.
4. I am comfortable presenting scholarly research to my peers.
5. I am comfortable presenting scholarly research to other scholars (professors).
6. I am comfortable presenting scholarly research to people outside my discipline.

Supplemental Material 3. Mid-semester evaluation survey questions.

All questions are open-ended.

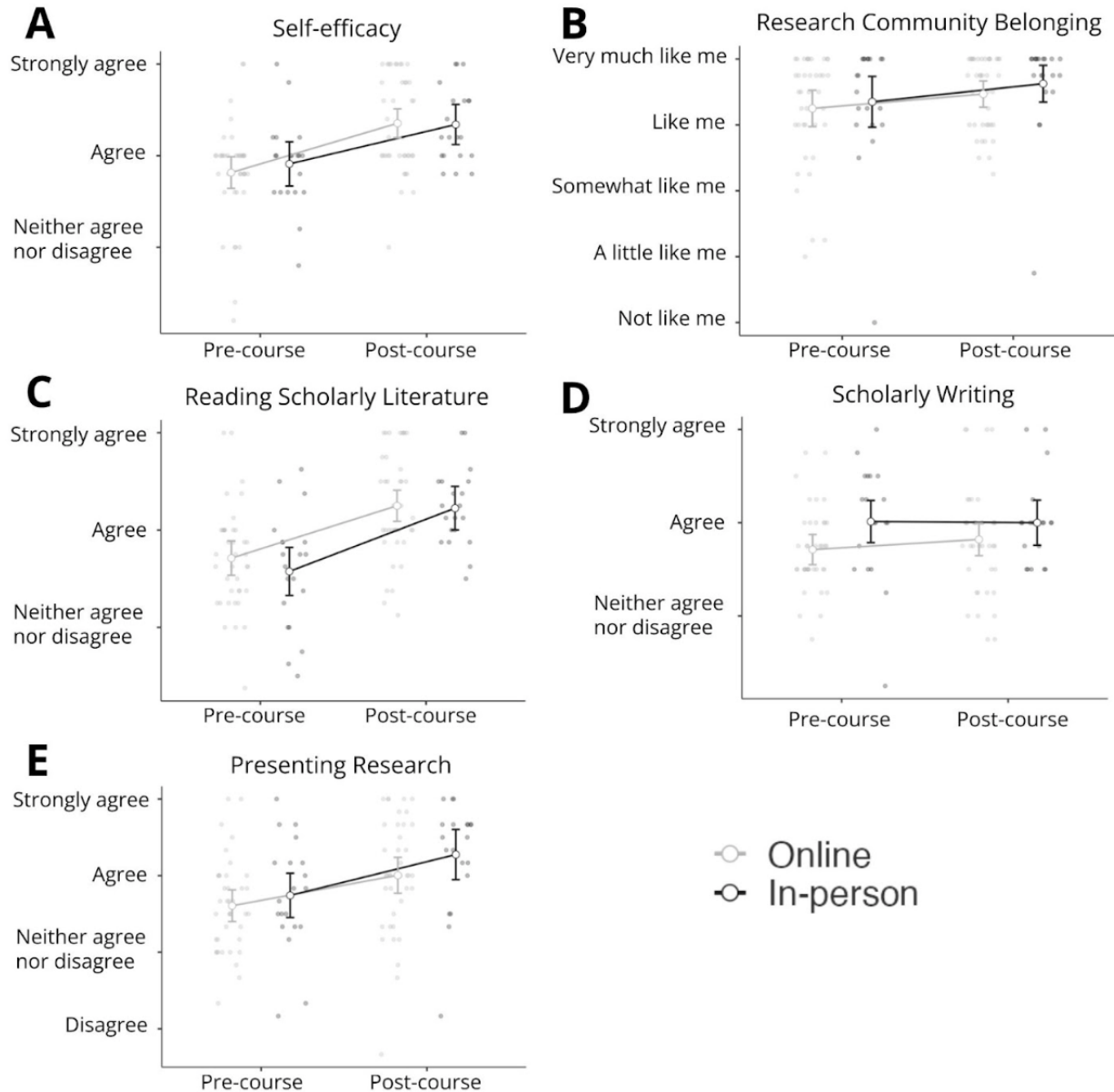
1. What has helped you to learn in this class?
2. What has hindered you from learning in this class?
3. What can I do to improve the learning environment?
4. What topics are you struggling with?
5. What additional comments do you have?

Supplemental Material 4. Codebook for qualitative coding of mid-semester evaluation responses.

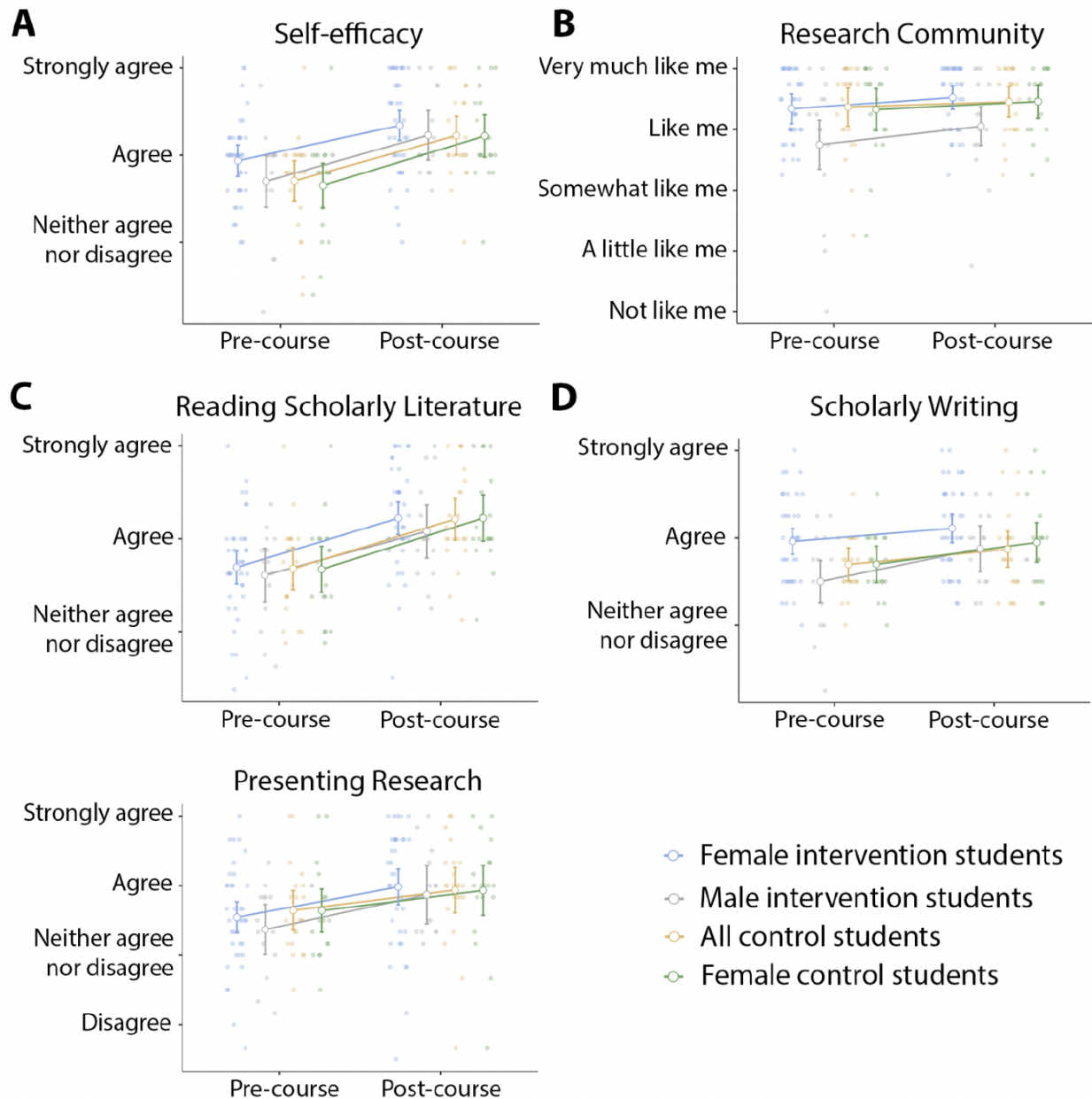
Code	Definition	Example
Growth mindset positive	Student demonstrates a growth mindset by discussing a challenge they have overcome or an improvement they have made over time (in any survey question)	"c-fos makes sense to me but has not fully clicked in my brain which I think is just because I haven't hammered it into memory yet. I actually did not understand fluorescence that well originally but am much more confident in my analysis abilities now."
Instructor trust positive	Student demonstrates trust in the course instructor by discussing how the instructor understands, accepts, and/or cares for them (in any survey question)	"I appreciate the personal feedback she gives on everything. Makes me feel like she actually cares about our learning."
Research article negative	Student mentions reading research articles as detrimental to their learning or course experience (in any survey question)	"Reading wikipedia articles is helpful but trying to learn about technologies from journal articles is not because they assume you already know what that technology is so they don't waste time on a thorough explanation."
Research article positive	Student mentions reading research articles as beneficial to their learning or course experience (in any survey question)	"I think that the rate at which we read papers has helped me become more comfortable doing so (especially when the assignments are low stakes at first)"
RAW negative	Student mentions completing the research analysis worksheets as detrimental to their learning or course experience (in any survey question)	"Sometimes I feel overwhelmed with doing RAW's before class (mainly when there are tables to be analyzed too)"
RAW positive	Student mentions completing the research analysis worksheets as beneficial to their learning or course experience (in any survey question)	"The RAWs are very helpful in understanding the articles that we have to read. They make it so I have to pay attention to specific parts of the paper which helps me to understand the main ideas."
Discussion negative	Student mentions engaging in class discussions, typically about research articles, as detrimental to their learning or course experience	"I want you to talk more about what you know instead of having class discussions."

	(in any survey question)	
Discussion positive	Student mentions engaging in class discussions, typically about research articles, as beneficial to their learning or course experience (in any survey question)	"Continue to allow time for group discussion..."
Journal club negative	Student mentions participating in journal club discussions or presenting in journal clubs as detrimental to their learning or course experience (in any survey question)	"Journal clubs are good to promote critical thinking but most of class time feels unproductive because the content is difficult and we are not experts."
Journal club positive	Student mentions participating in journal club discussions or presenting in journal clubs as beneficial to their learning or course experience (in any survey question)	"The journal clubs [...] have taught me so much! I really like the more "hands-on" or applied learning."
Learning objectives negative	Student mentions the listing of the learning objectives in the course materials (lecture slides/assignments) in response to the survey question asking what hindered their learning	"I do think that there were a ton of learning objectives to learn that I was more concerned about just remembering those for the exam than trying to actually learn it, even with studying everyday for a week and a half beforehand."
Learning objectives positive	Student mentions the listing of the learning objectives in the course materials (lecture slides/assignments) in response to the survey question asking what helped their learning	"The learning objectives are really helpful to me because it makes everything super clear on what is expected of me."
Annotated slides negative	Student mentions the lecture slides with annotations/detailed captions in response to the survey question asking what hindered their learning	"Sometimes there is a lot of information on in-class PPT slides which makes it difficult to know where to focus my attention."
Annotated slides positive	Student mentions the lecture slides with annotations/detailed captions in response to the survey question asking what helped their learning	"...especially the notes in the presentations have been very helpful."
Lesson format negative	Student mentions the format of the lessons in response to the survey question asking what hindered	"I think tickets out the door every class take away really valuable time that we could be hearing more in

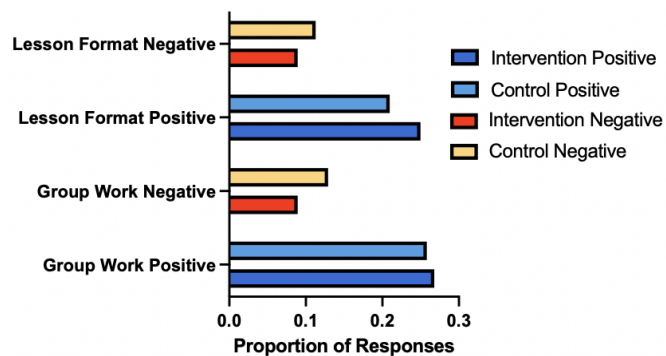
	their learning	depth about the topic from your lecture.”
Lesson format positive	Student mentions the format of the lessons in response to the survey question asking what helped their learning	“The active learning format of this class helps me learn!”
Group work negative	Student mentions working with a group in response to the survey question asking what hindered their learning	“It is hard to find a time to meet when everyone is available, and even then it is hard to work on something together and have everyone on the same page.”
Group work positive	Student mentions working with a group in response to the survey question asking what helped their learning	“It has helped me in this class to have a group to work with...”



Supplemental Figure 1. Students in online and in-person sections show comparable reported gains in research skills. The research-related skills (RRS) survey was implemented at pre- and post-course. Repeated measures ANOVAs were used to compare online ($n = 39$) and in-person ($n = 20$) students' perceived research-related skills for each of 5 categories of questions. No RRS survey categories revealed a significant difference between groups.

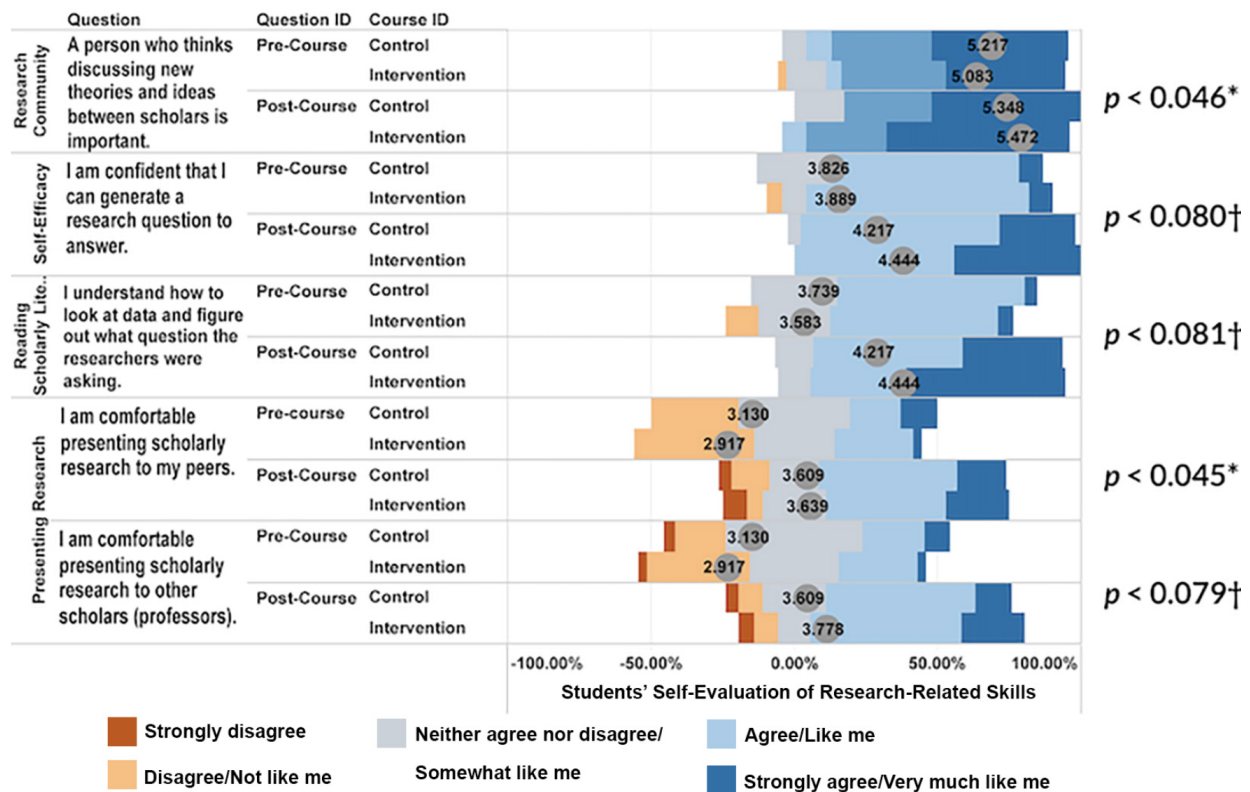


Supplemental Figure 2. Differences in self-evaluation of research-related skills over time between female and male students in intervention and control groups. The research-related skills (RRS) survey was implemented at pre- and post-course. Repeated measures ANOVAs were used to compare female intervention ($n = 38$), male intervention ($n = 14$), total control ($n = 23$), and female control ($n = 19$) students' perceived research-related skills for each of 5 categories of questions. No RRS survey categories revealed a significant difference between groups.



Supplemental Figure 3. *Mid-semester evaluation reveals additional course components identified as helpful by all students.* At the middle of the semester, students responded to an open-ended survey evaluating what had helped and hindered their learning, what they were struggling with, and what could be improved. Responses were qualitatively coded by the course components that students mentioned (Gin et al., 2018; Limeri et al., 2020a; Limeri et al., 2020b). Codes were denoted positive or negative based on the nature of the student's comment. Student articulations of a growth mindset and instructor trust were also coded. Displayed codes were only assigned to the survey questions asking explicitly about what helped and hindered students' learning. Quantitative comparison of the proportion of students whose responses included each course component was conducted across intervention (56 students) and control groups (62 students).

Photoshop file:  Mid semester eval supp figure.psd
Size: 7.5 x 4 cm (1 column)



Supplemental Figure 4. Students' self-evaluation of research-related skills development. The RRS survey was implemented at pre- and post-course. Repeated measures ANOVAs were used to compare intervention ($n = 36$) and control ($n = 23$) students' perceptions for 35 questions across 5 categories after comparisons of the subscales showed no significance. A significant increase was seen for students in both groups for all RRS categories. Two questions revealed significant differences across time and between groups (research community category ($p = 0.046$) and presenting research category ($p = 0.045$)). Three questions showed marginally significant differences, in self-efficacy ($p = 0.080$), reading scholarly literature ($p = 0.081$), and presenting research ($p = 0.079$). All other questions revealed no difference between overall intervention and control groups.

JPG file: Supplemental Figure 4 RRS general.jpg

Supplemental Table 1. Control and intervention groups show no significant differences in self-reported research skills at pre-course baseline.

Comparison by Section to ensure sections are not different (Pre-course)

		Independent samples t-test				Group-descriptives						
	Survey Question	Test	Statistic	df	p	Group	N	Mean	Median	SD	SE	
Self-efficacy	I am confident in communicating my work through a poster and/or paper.	Student's t	0.2315	57	0.818	Control	23	3.96	4	0.475	0.099	
		Mann-Whitney U	403		0.831	Intervention	36	3.92	4	0.732	0.122	
	I am confident that I can generate a research question to answer.	Student's t	-0.3889	57	0.699	Control	23	3.83	4	0.576	0.1201	
		Mann-Whitney U	375		0.443	Intervention	36	3.89	4	0.622	0.104	
	I am confident that I can use research literature and reports to guide my own research.	Student's t	-0.0964	57	0.924	Control	23	3.87	4	0.626	0.1304	
		Mann-Whitney U	390		0.673	Intervention	36	3.89	4	0.82	0.137	
	I am confident that I can create explanations for the results of the study.	Student's t	-0.3478	57	0.729	Control	23	3.65	4	0.775	0.1616	
		Mann-Whitney U	406		0.894	Intervention	36	3.72	4	0.741	0.124	
	I am confident that I can develop theories (integrate and coordinate results from multiple studies).	Student's t	-0.938	57	0.352	Control	23	3.74	4	0.689	0.1436	
		Mann-Whitney U	341		0.192	Intervention	36	3.94	4	0.893	0.149	
Research Community	A person who thinks discussing new theories and ideas between scholars is important.	Student's t	0.5037	57	0.616	Control	23	5.22	5	0.951	0.1984	
		Mann-Whitney U	384		0.617	Intervention	36	5.08	5	1.025	0.171	
	A person who thinks it is valuable to conduct research that builds the world's knowledge.	Student's t	0.7365	57	0.464	Control	23	5.52	6	0.665	0.1387	
		Mann-Whitney U	382		0.579	Intervention	36	5.36	6	0.899	0.15	
	A person who thinks that research can solve many of today's world challenges.	Student's t	0.6296	57	0.532	Control	23	5.39	6	0.941	0.1962	
		Mann-Whitney U	374		0.495	Intervention	36	5.22	5	1.045	0.174	
	A person who feels discovering something new through research is thrilling.	Student's t	1.3974	57	0.168	Control	23	5.52	6	0.73	0.1523	
		Mann-Whitney U	350		0.268	Intervention	36	5.14	6	1.175	0.196	
	Reading Scholarly Literature	Presently, I can critically analyze literature from my discipline.	Student's t	0.9778	57	0.332	Control	23	3.65	4	0.714	0.1489
			Mann-Whitney U	357		0.328	Intervention	36	3.44	4	0.843	0.141
I understand how to critically evaluate studies conducted by others.		Student's t	0.3864	57	0.701	Control	23	3.96	4	0.475	0.099	
		Mann-Whitney U	405		0.873	Intervention	36	3.89	4	0.747	0.125	
I understand how to look at data and figure out what question the researchers were asking.		Student's t	0.8451	57	0.402	Control	23	3.74	4	0.541	0.1128	
		Mann-Whitney U	381		0.56	Intervention	36	3.58	4	0.77	0.128	
Presently, I can recognize a sound argument and appropriate use of evidence in scholarly literature.		Student's t	-0.4752	57	0.636	Control	23	3.74	4	0.619	0.1291	
		Mann-Whitney U	386		0.631	Intervention	36	3.83	4	0.811	0.135	
Presently, I am confident I can interpret data presented in graphs, tables or charts.		Student's t	0.16	57	0.873	Control	23	3.26	3	0.81	0.1689	
		Mann-Whitney U	407		0.908	Intervention	36	3.22	3	0.959	0.16	
Presently, I am in the habit of thinking about whether I am fully understanding what I am reading when reading scholarly articles.		Student's t	-1.1303	57	0.263	Control	23	3.7	4	0.876	0.1826	
		Mann-Whitney U	353		0.297	Intervention	36	3.94	4	0.791	0.132	
Presently, I can interpret the complex language and jargon in scholarly literature.		Student's t	0.6297	57	0.531	Control	23	3.52	4	0.846	0.1764	
		Mann-Whitney U	381		0.592	Intervention	36	3.36	4	1.018	0.17	
Scholarly Writing	The process of writing is helpful for understanding scientific ideas.	Student's t	-0.3715	57	0.712	Control	23	4.22	4	0.518	0.1081	
		Mann-Whitney U	384		0.601	Intervention	36	4.28	4	0.659	0.11	
	Writing helps me to develop stronger ideas and to explore complex issues in academic research.	Student's t	0.5537	57	0.582	Control	23	4.22	4	0.6	0.1251	
		Mann-Whitney U	393		0.725	Intervention	36	4.11	4	0.785	0.131	
	I have sufficient experience and knowledge to write effectively in my field.	Student's t	-0.4779	57	0.635	Control	23	3.35	3	0.935	0.1949	
		Mann-Whitney U	381		0.588	Intervention	36	3.47	4	1	0.167	
	I often feel unclear about the principles and purposes of writing in my field.	Student's t	3.0438	57	0.004	Control	23	3	3	0.905	0.1886	
		Mann-Whitney U	244		0.004	Intervention	36	2.31	2	0.822	0.137	

Presenting Research	Explaining scholarly research to others helps me understand the ideas better.	Student's t	1.1833	57	0.242	Control	23	4.48	5	0.593	0.1237
		Mann-Whitney U	348		0.257	Intervention	36	4.28	4	0.659	0.11
	I am comfortable with presenting scholarly research in an informal setting.	Student's t	0.5128	57	0.61	Control	23	4	4	0.674	0.1406
		Mann-Whitney U	404		0.87	Intervention	36	3.89	4	0.887	0.148
	I am comfortable presenting scholarly research to my peers.	Student's t	0.8437	57	0.402	Control	23	3.13	3	1.014	0.2114
		Mann-Whitney U	369		0.466	Intervention	36	2.92	3	0.906	0.151
	I am comfortable presenting scholarly research to people outside my discipline.	Student's t	-0.6681	57	0.507	Control	23	3.83	4	0.778	0.1622
		Mann-Whitney U	355		0.304	Intervention	36	3.97	4	0.845	0.141
	I am comfortable presenting scholarly research to other scholars (professors).	Student's t	0.8437	57	0.402	Control	23	3.13	3	0.968	0.2018
		Mann-Whitney U	362		0.401	Intervention	36	2.92	3	0.937	0.156
	I am comfortable with presenting scholarly research in a formal setting.	Student's t	-0.9491	57	0.347	Control	23	3.57	4	0.896	0.1868
		Mann-Whitney U	348		0.281	Intervention	36	3.81	4	0.98	0.163

Supplemental Table 2. Control and intervention groups show no significant differences in self-reported research skills at post-course.

Comparison by Section to ensure sections are not different (Post-course)

		Independent samples t-test				Group-descriptives					
	Survey Question	Test	Statistic	df	p	Group	N	Mean	Median	SD	SE
Self-efficacy	I am confident in communicating my work through a poster and/or paper.	Student's t	-2.2330 *	57	0.029	Control	23	4.17	4	0.491	0.102
		Mann-Whitney U	299		0.036	Intervention	36	4.47	4	0.506	0.0844
	I am confident that I can generate a research question to answer.	Student's t	-1.6691	57	0.101	Control	23	4.22	4	0.518	0.108
		Mann-Whitney U	328		0.118	Intervention	36	4.44	4	0.504	0.084
	I am confident that I can create explanations for the results of the study.	Student's t	-0.7469	57	0.458	Control	23	4.35	4	0.647	0.135
		Mann-Whitney U	372		0.464	Intervention	36	4.47	5	0.609	0.1015
	I am confident that I can create explanations for the results of the study.	Student's t	-1.1797	57	0.243	Control	23	4.09	4	0.733	0.153
		Mann-Whitney U	350		0.273	Intervention	36	4.31	4	0.668	0.1114
I am confident that I can develop theories (integrate and coordinate results from multiple studies).	Student's t	-0.8495	57	0.399	Control	23	4.3	4	0.703	0.147	
	Mann-Whitney U	377		0.52	Intervention	36	4.44	4	0.558	0.093	
Research Community	A person who thinks discussing new theories and ideas between scholars is important.	Student's t	-0.555	57	0.581	Control	23	5.35	6	0.775	0.162
		Mann-Whitney U	362		0.361	Intervention	36	5.47	6	0.878	0.1463
	A person who thinks it is valuable to conduct research that builds the world's knowledge.	Student's t	-0.162	57	0.872	Control	23	5.61	6	0.583	0.122
		Mann-Whitney U	385		0.575	Intervention	36	5.64	6	0.762	0.1269
	A person who thinks that research can solve many of today's world challenges.	Student's t	-1.3485	57	0.183	Control	23	5.43	6	0.662	0.138
		Mann-Whitney U	328		0.111	Intervention	36	5.67	6	0.632	0.1054
	A person who feels discovering something new through research is thrilling.	Student's t	-0.175	57	0.862	Control	23	5.43	5	0.59	0.123
		Mann-Whitney U	356		0.3	Intervention	36	5.47	6	0.91	0.1516
Reading Scholarly Literature	Presently, I can critically analyze literature from my discipline.	Student's t	0.6044	57	0.548	Control	23	4.26	4	0.541	0.113
		Mann-Whitney U	389		0.635	Intervention	36	4.17	4	0.609	0.1016
	I understand how to critically evaluate studies conducted by others.	Student's t	-1.7478	57	0.086	Control	23	4.22	4	0.736	0.153
		Mann-Whitney U	333		0.154	Intervention	36	4.5	4.5	0.507	0.0845
	I understand how to look at data and figure out what question the researchers were asking.	Student's t	-1.2404	57	0.22	Control	23	4.22	4	0.671	0.14
		Mann-Whitney U	334		0.174	Intervention	36	4.44	5	0.695	0.1158
	Presently, I can recognize a sound argument and appropriate use of evidence in scholarly literature.	Student's t	0.2765	57	0.783	Control	23	4.22	4	0.6	0.125
		Mann-Whitney U	405		0.878	Intervention	36	4.17	4	0.737	0.1228
	Presently, I am confident I can interpret data presented in graphs, tables or charts.	Student's t	0.5741	57	0.568	Control	23	4.13	4	0.694	0.145
		Mann-Whitney U	370		0.437	Intervention	36	4.03	4	0.654	0.109
	Presently, I am in the habit of thinking about whether I am fully understanding what I am reading when reading scholarly articles.	Student's t	-0.6536	57	0.516	Control	23	4.3	4	0.765	0.159
		Mann-Whitney U	396		0.759	Intervention	36	4.42	4	0.554	0.0924
	Presently, I can interpret the complex language and jargon in scholarly literature.	Student's t	0.1824	57	0.856	Control	23	4.09	4	0.668	0.139
		Mann-Whitney U	393		0.707	Intervention	36	4.06	4	0.63	0.105
	Presently, I am confident I can intelligently criticize other's ideas or proposals.	Student's t	-0.1948	57	0.846	Control	23	4.26	4	0.689	0.144
		Mann-Whitney U	369		0.444	Intervention	36	4.31	5	0.951	0.1585
Science Writing	The process of writing is helpful for understanding scientific ideas.	Student's t	-1.6236	57	0.11	Control	23	4.3	4	0.703	0.147
		Mann-Whitney U	323		0.111	Intervention	36	4.58	5	0.604	0.1006
	Writing helps me to develop stronger ideas and to explore complex issues in academic research.	Student's t	-1.686	57	0.097	Control	23	4.3	4	0.635	0.132
		Mann-Whitney U	330		0.14	Intervention	36	4.56	5	0.504	0.084
	I have sufficient experience and knowledge to write effectively in my field.	Student's t	-0.8005	57	0.427	Control	23	3.78	4	0.951	0.198
		Mann-Whitney U	369		0.45	Intervention	36	3.97	4	0.845	0.1408
	I often feel unclear about the principles and purposes of writing in my field.	Student's t	1.1254	57	0.265	Control	23	2.91	3	1.203	0.251
		Mann-Whitney U	338		0.218	Intervention	36	2.56	2	1.182	0.197

Presenting Research	Explaining scholarly research to others helps me understand the ideas better.	Student's t	-1.2496	57	0.217	Control	23	4.35	4	0.573	0.119
		Mann-Whitney U	326		0.124	Intervention	36	4.56	5	0.652	0.1087
	I am comfortable with presenting scholarly research in an informal setting.	Student's t	-1.6227	57	0.11	Control	23	4.17	4	0.778	0.162
		Mann-Whitney U	307		0.065	Intervention	36	4.5	5	0.737	0.1228
	I am comfortable presenting scholarly research to my peers.	Student's t	-0.1008	57	0.92	Control	23	3.61	4	1.076	0.224
		Mann-Whitney U	403		0.863	Intervention	36	3.64	4	1.15	0.1917
	I am comfortable presenting scholarly research to people outside my discipline.	Student's t	-1.7616	57	0.083	Control	23	4	4	0.953	0.199
		Mann-Whitney U	290		0.035	Intervention	36	4.42	5	0.841	0.1402
	I am comfortable presenting scholarly research to other scholars (professors).	Student's t	-0.6088	57	0.545	Control	23	3.61	4	0.988	0.206
		Mann-Whitney U	361		0.375	Intervention	36	3.78	4	1.072	0.1787
	I am comfortable with presenting scholarly research in a formal setting.	Student's t	-1.8133	57	0.075	Control	23	3.87	4	0.92	0.192
		Mann-Whitney U	288		0.034	Intervention	36	4.31	5	0.889	0.1481

* Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Supplemental Table 3. Student demographics by course section are statistically comparable.

Variable	Fall 2020 (n = 32)	Spring 2021 section 001 (n = 31) *	Spring 2021 section 002 (n = 32)	Fall 2021 (n = 31) *	Fall 2022 (n = 32) *
Sex					
Female	21	19	23	23	24
Male	11	12	9	8	8
χ^2	0.74				
Race/ethnicity					
Underrepresented minority	5	4	7	5	6
Non-URM	27	27	25	26	26
χ^2	0.95				
Parents' education					
First generation	3	11	5	10	5
Continuing generation	29	20	27	21	27
χ^2	7.086				

Gray cells indicate course sections that were taught online due to the COVID-19 pandemic.

* indicates course sections that received the mindset intervention.

All of the χ^2 test statistic values are less than the critical value of 9.488 ($\alpha = 0.05$, $df = 4$).

Supplemental Table 4. Pre- to post-course increase in all students' research-related skills.

		Paired samples t-test				Group Descriptives				
Question Comparison		Test	Statistic	df	p	N	Mean	Median	SD	SE
PITS Self-Efficacy_1 (PRE)	PITS Self-Efficacy_1 (POST)	Student's t	-4.495	58	< .001	59	3.93	4	0.64	0.083
		Wilcoxon W	21.00 ^a		< .001	59	4.36	4	0.52	0.067
PITS Self-Efficacy_2 (PRE)	PITS Self-Efficacy_2 (POST)	Student's t	-5.025	58	< .001	59	3.86	4	0.6	0.078
		Wilcoxon W	9.50 ^a		< .001	59	4.36	4	0.52	0.067
PITS Self-Efficacy_3 (PRE)	PITS Self-Efficacy_3 (POST)	Student's t	-5.39	58	< .001	59	3.88	4	0.75	0.097
		Wilcoxon W	64.00 ^b		< .001	59	4.42	4	0.62	0.081
PITS Self-Efficacy_4 (PRE)	PITS Self-Efficacy_4 (POST)	Student's t	-4.817	58	< .001	59	3.69	4	0.75	0.098
		Wilcoxon W	50.00 ^d		< .001	59	4.22	4	0.7	0.091
PITS Self-Efficacy_5 (PRE)	PITS Self-Efficacy_5 (POST)	Student's t	-4.94	58	< .001	59	3.86	4	0.82	0.107
		Wilcoxon W	70.00 ^e		< .001	59	4.39	4	0.62	0.08
PITS Research Comm_1 (PRE)	PITS Research Comm_1 (POST)	Student's t	-2.975	58	0.004	59	5.14	5	0.99	0.129
		Wilcoxon W	67.50 ^f		0.006	59	5.42	6	0.84	0.109
PITS Research Comm_2 (PRE)	PITS Research Comm_2 (POST)	Student's t	-2.353	58	0.022	59	5.42	6	0.81	0.106
		Wilcoxon W	63.00 ^g		0.024	59	5.63	6	0.69	0.09
PITS Research Comm_3 (PRE)	PITS Research Comm_3 (POST)	Student's t	-2.381	58	0.021	59	5.29	6	1	0.13
		Wilcoxon W	84.50 ^h		0.026	59	5.58	6	0.65	0.085
PITS Research Comm_4 (PRE)	PITS Research Comm_4 (POST)	Student's t	-1.646	58	0.105	59	5.29	6	1.04	0.135
		Wilcoxon W	148.50 ^b		0.104	59	5.46	6	0.8	0.104
Reading Scholarly Li_1 (PRE)	Reading Scholarly Li_1 (POST)	Student's t	-6.916	58	< .001	59	3.53	4	0.8	0.104
		Wilcoxon W	12.50 ⁱ		< .001	59	4.2	4	0.58	0.076
Reading Scholarly Li_2 (PRE)	Reading Scholarly Li_2 (POST)	Student's t	-4.854	58	< .001	59	3.92	4	0.65	0.085
		Wilcoxon W	37.00 ^j		< .001	59	4.39	4	0.62	0.08
Reading Scholarly Li_3 (PRE)	Reading Scholarly Li_3 (POST)	Student's t	-6.004	58	< .001	59	3.64	4	0.69	0.09
		Wilcoxon W	82.50 ^k		< .001	59	4.36	4	0.69	0.09
Reading Scholarly Li_4 (PRE)	Reading Scholarly Li_4 (POST)	Student's t	-3.29	58	0.002	59	3.8	4	0.74	0.096
		Wilcoxon W	120.50 ⁱ		0.003	59	4.19	4	0.68	0.089
Reading Scholarly Li_5 (PRE)	Reading Scholarly Li_5 (POST)	Student's t	-6.99	58	< .001	59	3.24	3	0.9	0.117
		Wilcoxon W	30.00 ^l		< .001	59	4.07	4	0.67	0.087
Reading Scholarly Li_6 (PRE)	Reading Scholarly Li_6 (POST)	Student's t	-4.404	58	< .001	59	3.85	4	0.83	0.108
		Wilcoxon W	60.00 ^d		< .001	59	4.37	4	0.64	0.083
Reading Scholarly Li_7 (PRE)	Reading Scholarly Li_7 (POST)	Student's t	-4.654	58	< .001	59	3.42	4	0.95	0.124
		Wilcoxon W	79.50 ^b		< .001	59	4.07	4	0.64	0.083
Reading Scholarly Li_8 (PRE)	Reading Scholarly Li_8 (POST)	Student's t	-2.699	58	0.009	59	3.93	4	0.81	0.105
		Wilcoxon W	145.50 ⁱ		0.011	59	4.29	4	0.85	0.111
Scholarly Writing I_1 (PRE)	Scholarly Writing I_2 (POST)	Student's t	-2.188	58	0.033	59	4.25	4	0.6	0.079
		Wilcoxon W	100.50 ^m		0.036	59	4.46	4	0.57	0.074
Scholarly Writing I_2 (PRE)	Scholarly Writing I_2 (POST)	Student's t	-2.804	58	0.007	59	4.15	4	0.72	0.093
		Wilcoxon W	135.00 ^a		0.008	59	4.46	4	0.57	0.074
Scholarly Writing I_3 (PRE)	Scholarly Writing I_3 (POST)	Student's t	-3.301	58	0.002	59	3.42	4	0.97	0.126
		Wilcoxon W	111.50 ^a		0.003	59	3.9	4	0.89	0.115
Scholarly Writing I_4 (PRE)	Scholarly Writing I_4 (POST)	Student's t	-0.687	58	0.495	59	2.58	2	0.91	0.119
		Wilcoxon W	250.00 ⁱ		0.579	59	2.69	2	1.19	0.155
Presenting Research_1 (PRE)	Presenting Research_1 (POST)	Student's t	-1.187	58	0.24	59	4.36	4	0.64	0.083
		Wilcoxon W	133.00 ^m		0.243	59	4.47	5	0.63	0.082
Presenting Research_2 (PRE)	Presenting Research_2 (POST)	Student's t	-3.626	58	< .001	59	3.93	4	0.81	0.105
		Wilcoxon W	137.50 ^a		0.001	59	4.37	5	0.76	0.099
Presenting Research_3 (PRE)	Presenting Research_3 (POST)	Student's t	-3.71	58	< .001	59	3	3	0.95	0.123
		Wilcoxon W	164.00 ^p		< .001	59	3.63	4	1.11	0.145
Presenting Research_4 (PRE)	Presenting Research_4 (POST)	Student's t	-2.534	58	0.014	59	3.92	4	0.82	0.106
		Wilcoxon W	183.00 ^o		0.013	59	4.25	4	0.9	0.117
Presenting Research_5 (PRE)	Presenting Research_5 (POST)	Student's t	-4.488	58	< .001	59	3	3	0.95	0.123
		Wilcoxon W	163.00 ^r		< .001	59	3.71	4	1.04	0.135
Presenting Research_6 (PRE)	Presenting Research_6 (POST)	Student's t	-2.997	58	0.004	59	3.71	4	0.95	0.123
		Wilcoxon W	169.00 ^s		0.004	59	4.14	4	0.92	0.12