

**TABLE 1****Student and alumni demographics.**

		<b>Alumni</b>	<b>Bio 404</b>
<b>Demographic categories</b>		<b>2016 (N = 9)</b>	<b>2018 (N = 9)</b>
Gender	Female	7	8
	Male	2	1
Class standing	Sophomore	1	2
	Junior	3	3
	Senior	5	4
Major	Biology	4	4
	Molecular biology	4	5
	Neuroscience	1	0
Career path	MS	1	2
	PhD	3	2
	MD/DO/PA/PT	3	4
	Other	2	1

**TABLE 2****Comparison of Bio 404 student and alumni self-reported ability and confidence across several critical-thinking skills.**

	<b>Perceived ability in performing task</b>				<b>Confidence in performing task</b>			
	<b>Mean (SD)</b>				<b>Mean (SD)</b>			
<i>Student-rated ability</i>	<i>Pre</i>	<i>Mid</i>	<i>Post</i>	<i>Alumni</i>	<i>Pre</i>	<i>Mid</i>	<i>Post</i>	<i>Alumni</i>
Reading scientific journal articles	3.9 (0.6)	3.9 (0.8)	4.3 (0.9)	4.4 (0.7)	3.2 (0.6)	3.6 (1.2)	4.4 (0.7)*	4.7 (0.5)#
Analyzing/learning from scientific journal articles	3.7 (0.5)	3.8 (1.0)	4.3 (0.7)	4.2 (0.4)	2.9 (0.5)	3.6 (1.1)	4.3 (0.7)*	4.3 (0.5)#
Interpreting data in a figure from a scientific journal article	3.6 (0.5)	3.9 (0.8)	4.1 (0.6)	4.3 (0.5)	2.9 (0.5)	3.3 (1.0)	4.0 (0.8)*	4.3 (0.7)#
Comprehending data from methods that are new to me	3.0 (0.7)	3.3 (0.5)	3.8 (0.5)	4.1 (0.3)#	2.2 (0.7)	2.7 (1.1)	3.5 (0.8)*	3.7 (0.6)#
Identifying patterns in data	3.7 (0.5)	3.8 (1.0)	4.4 (0.5)*	3.8 (0.7)	2.7(0.5)	3.2 (1.3)	4.1 (0.6)*	3.7 (0.9)
Developing models using data from figures	3.1 (0.8)	3.3 (1.0)	4.1 (0.6)*	3.2 (1.0)	2.6 (0.8)	3.0 (1.1)	3.8 (1.0)	3.0 (0.7)
Presenting a scientific article	3.2 (0.8)	3.0 (1.2)	4.1 (0.6)*	4.2 (0.7)#	2.7 (0.8)	2.4 (1.2)	4.0 (0.8)*	4.1 (0.8)#
Contributing to a group discussion of a scientific article	3.7 (1.0)	4.0 (1.0)	4.4 (0.5)	4.4 (0.7)	3.1 (1.0)	3.4 (1.2)	4.3 (0.7)*	4.2 (0.8)
All statements	3.5 (0.7)	3.6 (0.9)	4.2 (0.6)*	4.1 (0.7)#	2.8 (1.0)	3.2 (1.2)	4.0 (0.8)*	4.0 (0.8)#

Note. p-values < 0.05 in\* Friedman test comparing pre, mid, and post or #Kruskal-Wallis test comparing pre, mid, post, and alumni. 1 = No ability/Confidence, 2 = Slight, 3 = Some, 4 = Strong, 5 = Very strong ability/Extremely confident.

**TABLE 3****Comparison of student and alumni ability versus confidence.**

	302 pre-semester mean (SD)	302 post-semester mean (SD)	404 pre-semester mean (SD)	404 mid-semester mean (SD)	404 post-semester mean (SD)	404 alumni mean (SD)
Ability	3.5 (0.7)	3.8 (0.7)	3.5 (0.7)	3.6 (0.9)	4.2 (0.6)	4.1 (0.7)
Confidence	3.0 (0.9)*	3.5 (0.8)	2.8 (1.0)	3.2 (1.2)	4.0 (0.8)	4.0 (0.8)
Difference	0.5	0.3	0.7	0.4	0.2	0.1
<i>p</i> -value	< 0.0001	0.0001	< 0.0001	0.022	0.5280	0.5250

Note. *p*-values in a Mann-Whitney test when comparing ability versus confidence.

**TABLE 4****Postgraduation benefits.**

Alumni: Does your current position involve the following tasks?	Mean (SD)	
Reading scientific journal articles on a regular basis	3.9 (1.1)	-
Data analysis on a regular basis	3.3 (1.3)	-
Has Bio 404 positively impacted your success in your current position?	4.9 (0.3)	-
Does/will the skill benefit you in your chosen career path?	Alumni	Bio 404 Post
The ability to read and analyze scientific articles	4.8 (0.4)	5 (0)
The ability to present a scientific article	4 (0.9)*	5 (0)
The ability to participate in discussions about a scientific article	4.6 (0.7)	5 (0)

Note. \**p*-values < 0.05 in a Mann-Whitney test when comparing alumni to Bio 404 students postcourse. 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

**TABLE 5**

**Themes in students' open-ended responses.**

<b>Theme 1: Progression of confidence</b>
<b>Pre-semester Bio 404 students hope to increase confidence.</b>
<ul style="list-style-type: none"> <li>• <i>I hope to become more confident in not only analyzing other's research, but also in presenting it.</i></li> <li>• <i>I hope to gain any confidence at all.</i></li> </ul>
<b>Mid-semester Bio 404 students feel more confident.</b>
<ul style="list-style-type: none"> <li>• <i>I feel much more confident presenting research articles and participating in journal club.</i></li> <li>• <i>I am more confident in proposing ideas as to what data is portraying.</i></li> </ul>
<b>Post-semester Bio 404 students and alumni have the confidence to take on new tasks.</b>
<ul style="list-style-type: none"> <li>• <i>I think I am more capable of synthesizing models and new ideas from papers and data.</i></li> <li>• <i>The course gave me the ability and confidence to read articles outside of my discipline.</i></li> <li>• <i>I think that becoming comfortable with finding information on my own and collaborating with other students in small groups positively impacted my current study habits and definitely contributes to my success.</i></li> </ul>
<b>Theme 2: Transition from reading to understanding and analyzing</b>
<b>Pre-semester Bio 404 students combine reading and analysis together.</b>
<ul style="list-style-type: none"> <li>• <i>It will prepare me... when it comes to reading and analyzing papers.</i></li> <li>• <i>It will make me confident in being able to read and analyze a paper.</i></li> </ul>
<b>Mid-semester Bio 404 students distinguish analysis from reading.</b>
<ul style="list-style-type: none"> <li>• <i>The more practice I have with reading scientific articles the more confident I feel with understanding and analyzing scientific data.</i></li> <li>• <i>Bio 404 has definitely enhanced my ability to interpret the main points from the figures of a scientific article, which has helped me to better analyze the data.</i></li> </ul>
<b>Post-semester Bio 404 students and alumni identify analysis as an important skill set.</b>
<ul style="list-style-type: none"> <li>• <i>This course has taught me how to interpret data and understand a scientific article.</i></li> <li>• <i>I gained the skills to be able to pick out the main points in articles and effectively critique them.</i></li> </ul>
<b>Theme 3: Postgraduation preparation and advantages</b>
<b>Pre-semester Bio 404 students predict preparation.</b>
<ul style="list-style-type: none"> <li>• <i>I feel it (Bio 404) will prepare me for grad school.</i></li> <li>• <i>This (Bio 404) will help with... being successful in medical school.</i></li> </ul>
<b>Post-semester Bio 404 students emphasize a feeling of preparation.</b>
<ul style="list-style-type: none"> <li>• <i>I feel this course has really prepared me well for future courses in grad school.</i></li> <li>• <i>I think that our group sessions during WIO Wednesdays, as well as our Journal Club discussions on Friday, will be very beneficial in med school, where collaboration and being able to communicate is key.</i></li> </ul>
<b>Bio 404 alumni indicate preparation and advantages over peers.</b>
<ul style="list-style-type: none"> <li>• <i>Because I've learned how to correctly and efficiently break down these articles, I feel that I have an advantage over some of my peers. Thank you Work it Out Wednesdays!</i></li> <li>• <i>Bio 404 was my first major experience with the concept of journal clubs and that is something we participate in weekly in med school. I feel as if my ability to grasp the concepts presented within the paper is superior to that of my current peers.</i></li> <li>• <i>In medical school they throw a lot at you and the ability to interpret and learn on your own is extremely important. I feel as though this course prepared me and put me in a significant advantage.</i></li> </ul>