

# Supplemental Material

*CBE—Life Sciences Education*

Walck-Shannon *et al.*

## Supplemental Item 1: Reflection exercise prompts.

### Post-exam survey: Exam 2

The following questions are about your habits leading up to Exam 2. This will take 5-10 minutes to complete. The purpose is to help you reflect on your study and healthy habits.

Please answer honestly, your instructor will not see the responses given by individual students.

1. Please report the following by inputting numbers into the fields. Don't include words like "hours" or "days."
  - What is the number of class days that you missed between the start of the semester and Exam 2? There were a total of 15 class days.
  - About what percent of the time were you distracted during class? (0-100%)
  - About what percent of the time were you distracted while studying? (0-100%)
  - In a typical **non-exam** week, how much time did you spend on this class (total number of hours per week)? Do NOT include in-class hours.
2. Please fill in the approximate number of hours you spent studying for Exam 2 on each of the following days. Use 15 minute increments (.25, .5, .75). Use a 0 if you did not study on a particular day. If you started studying earlier than Monday, March 18<sup>th</sup>, there will be another question about that next.

[Have 7 days with blanks next to them that students fill in.]

[Mon, 3/18: \_\_\_\_\_ hours

...]

3. If you started studying for the exam before Monday, March 18<sup>th</sup>, please estimate the total number of hours that you spent studying **BEFORE** that day. Please leave blank if this does not apply to you.
4. Which of the following did you do to prepare for Exam 2? (check all that apply)
  - a. Re-watched lecture videos
  - b. Re-read lecture slides or class notes
  - c. Re-wrote your class notes word for word
  - d. Paraphrased or outlined class notes (includes creating a study guide or writing out answers to the provided study guides)
  - e. Re-read textbook
  - f. Answered the Problem Set questions
  - g. Answered the old Exam questions
  - h. Made my own diagrams or comparison tables from lecture notes
  - i. Quizzed myself using ungraded weekly quizzes, quizlets, flashcards
  - j. Attended the Review Session
  - k. Explained concepts to myself or others
  - l. Other

If you selected "Other" on the previous question, please explain: \_\_\_\_\_.

5. For the strategies that you selected on the previous question, fill in the percent of your total study time that you spent on each one. Altogether it should add up to 100%.
  - a. Re-watched lecture videos
  - b. Re-read lecture slides or class notes
  - c. Re-wrote your class notes word for word
  - d. Paraphrased or outlined class notes (includes creating a study guide or writing out answers to the provided study guides)
  - e. Read textbook
  - f. Answered Problem Set questions
  - g. Worked on the old Exam questions
  - h. Made my own diagrams or comparison tables from lecture notes
  - i. Quizzed myself (using ungraded weekly quizzes, quizlets, flashcards) or had someone else quiz you
  - j. Attended the Review Session
  - k. Explaining concepts to yourself or others
  - l. Other
6. Did you spend at least part of your time studying with other students? [yes/no]
7. Did you ask your instructor or one of the AIs for help (can include office hours, drop-in sessions, or study hall)? [yes/no]

Supplemental Table 1: Comparison of participants and non-participants. For continuous variables, the mean and standard deviation (in parentheses) are reported. Student's T-tests were performed to obtain p-values. For categorical variables, percentages of total are shown. Chi-square tests were performed to obtain p-values. URM = under-represented minority (Black, Hispanic, Native American, Native Hawaiian, or Pacific Islander).

	Non-Participants	Participants	<i>p</i>
N	80	422	
ACT Math	32.65 (2.71)	32.93 (2.76)	0.398
Pre-Test %	44.06 (15.71)	45.32 (13.38)	0.476
Year			0.136
Freshman	75.00%	81.24%	
Sophomore	20.00%	14.96%	
Junior	2.50%	3.09%	
Senior or higher	2.50%	0.71%	
Sex = F	48.75%	59.72%	0.069
Race			0.066
Asian	35.90%	39.28%	
URM	33.33%	21.45%	
White	30.77%	39.28%	

Supplemental Table 2: Means and standard deviations for all continuous variables. The total number of consenting students was 502. Note that the N below includes all data available for each variable. The tables in the text include multiple variables and may differ.

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev.</b>
ACT Math	502	32.888	2.747
Biology Pre-Test (%)	492	45.143	13.722
Number of Classes Missed before Exam 1	446	1.935	2.889
Number of Classes Missed between Exams 1 and 2	485	2.835	3.391
Total Exam 1 Study Hours	445	18.153	10.479
Total Exam 2 Study Hours	487	20.725	11.303
Proportion of Exam 1 Study Time Using Active Strategies	432	0.523	0.243
Proportion of Exam 2 Study Time Using Active Strategies	473	0.546	0.244
Number of Active Strategies Used for Exam 1 Studying	446	4.200	1.513
Number of Active Strategies Used for Exam 2 Studying	487	4.187	1.523
Days in Advance Exam 2 Studying Began	460	5.820	4.342
Number of Days Studied in the Week Before Exam 2	487	5.131	1.820
Percent of Time Distracted While Studying for Exam 1	447	20.714	16.440
Percent of Time Distracted While Studying for Exam 2	488	20.263	15.411
Exam 1 (%)	498	83.894	11.648
Exam 2 (%)	498	77.116	15.356
Final Exam (%)	501	72.659	13.294
Biology Post-Test (%)	430	69.731	16.096

Supplemental Table 3: Pairwise correlation table for all included continuous variables. Correlations with p-values less than or equal to 0.05 are indicated in bold.

	ACT Math	Bio. Pre-Test (%)	Bio. Post-Test (%)	Exam 1 (%)	Exam 2 (%)	Final Exam (%)	Exm 1_Classes Missed	Exm 2_Classes Missed	Exm 1_Total Study Hrs.	Exm 2_Total Study Hrs.	Exm 1_Active Proportion	Exm 2_Active Proportion	Exm 1_Number Active Strat.	Exm 2_Number Active Strat.	Exm 2_Advance Study Days	Exm 2_Number Study Days	Exm 1_Distracted Study (%)	Exm 2_Distracted Study (%)
ACT Math																		
Bio. Pre-Test (%)	<b>0.32</b>																	
Bio. Post-Test (%)	<b>0.34</b>	<b>0.60</b>																
Exam 1 (%)	<b>0.35</b>	<b>0.49</b>	<b>0.65</b>															
Exam 2 (%)	<b>0.30</b>	<b>0.37</b>	<b>0.61</b>	<b>0.69</b>														
Final Exam (%)	<b>0.33</b>	<b>0.42</b>	<b>0.63</b>	<b>0.74</b>	<b>0.78</b>													
Exm 1_Classes Missed	-0.02	-0.01	<b>-0.15</b>	<b>-0.18</b>	<b>-0.23</b>	<b>-0.28</b>												
Exm 2_Classes Missed	-0.03	0.00	-0.10	<b>-0.12</b>	<b>-0.12</b>	<b>-0.16</b>	<b>0.53</b>											
Exm 1_Total Study Hrs.	<b>-0.11</b>	-0.11	-0.07	0.08	<b>0.13</b>	0.08	-0.10	-0.11										
Exm 2_Total Study Hrs.	<b>-0.14</b>	<b>-0.13</b>	-0.09	-0.04	0.08	0.05	-0.04	-0.07	<b>0.66</b>									
Exm 1_Active Proportion	-0.01	0.04	<b>0.18</b>	<b>0.18</b>	<b>0.17</b>	<b>0.15</b>	<b>-0.21</b>	<b>-0.25</b>	<b>0.14</b>	0.09								
Exm 2_Active Proportion	-0.02	0.06	<b>0.14</b>	<b>0.17</b>	<b>0.19</b>	<b>0.20</b>	<b>-0.24</b>	<b>-0.28</b>	0.09	0.06	<b>0.59</b>							
Exm 1_Number Active Strat.	-0.07	-0.02	<b>0.13</b>	<b>0.26</b>	<b>0.19</b>	<b>0.21</b>	<b>-0.28</b>	<b>-0.20</b>	<b>0.36</b>	<b>0.20</b>	<b>0.52</b>	<b>0.37</b>						
Exm 2_Number Active Strat.	-0.06	-0.04	0.10	<b>0.17</b>	<b>0.29</b>	<b>0.22</b>	<b>-0.27</b>	<b>-0.25</b>	<b>0.24</b>	<b>0.28</b>	<b>0.39</b>	<b>0.53</b>	<b>0.55</b>					
Exm 2_Advance Study Days	<b>-0.14</b>	-0.08	0.02	-0.03	0.04	-0.02	-0.06	<b>-0.20</b>	<b>0.38</b>	<b>0.45</b>	<b>0.18</b>	<b>0.16</b>	<b>0.21</b>	<b>0.20</b>				
Exm 2_Number Study Days	<b>-0.18</b>	<b>-0.17</b>	<b>-0.17</b>	<b>-0.11</b>	-0.04	-0.07	<b>-0.12</b>	<b>-0.19</b>	<b>0.36</b>	<b>0.47</b>	0.06	0.03	<b>0.22</b>	<b>0.23</b>	<b>0.55</b>			
Exm 1_Distracted Study (%)	-0.04	0.00	<b>-0.17</b>	<b>-0.17</b>	<b>-0.16</b>	<b>-0.18</b>	0.09	<b>0.15</b>	<b>-0.11</b>	-0.05	-0.09	<b>-0.20</b>	<b>-0.24</b>	<b>-0.19</b>	<b>-0.11</b>	-0.07		
Exm 2_Distracted Study (%)	0.01	-0.04	<b>-0.11</b>	-0.10	<b>-0.16</b>	<b>-0.15</b>	0.03	0.06	<b>-0.14</b>	<b>-0.15</b>	<b>-0.15</b>	<b>-0.19</b>	<b>-0.24</b>	<b>-0.19</b>	-0.09	-0.04	<b>0.43</b>	

Supplemental Table 4: Full output for the twelve, two-step hierarchical regression models per exam summarized in Table 3. The base model, which was used as step 1 of all models, is main text Table 2. In the second step, each study strategy was added to the model. Standardized  $\beta$  values, unstandardized  $b$  values, and standard errors (SE) are reported for each variable. Each model's  $R^2$  is also reported. Ranges of possible values for each variable are shown in brackets. The following symbols indicate significance, \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ .

<b>Step 2, Read Notes</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	37.14***	5.618	0.328	--	18.55*	8.063	0.221
Bio. Pre-Test % [0-100]	0.418***	0.339***	0.035		0.332***	0.363***	0.047	
ACT [0-36]	0.239***	0.96***	0.172		0.222***	1.243***	0.243	
Total Exam 1 or 2 Study Hours $\geq 0$	0.127**	0.132**	0.042		0.156***	0.207***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.63***	0.158		-0.1**	-0.45**	0.183	
Read Notes	-0.03	-1.23	1.954		-0.04	-2.63	2.705	
<b>Step 2, Completed Problem Sets</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	34.91***	5.455	0.345	--	14.37	7.8	0.255
Bio. Pre-Test % [0-100]	0.422***	0.342***	0.034		0.333***	0.364***	0.046	
ACT [0-36]	0.24***	0.963***	0.17		0.228***	1.273***	0.238	
Total Exam 1 or 2 Study Hours $\geq 0$	0.112**	0.117**	0.042		0.129**	0.171**	0.054	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.14***	-0.53***	0.159		-0.09*	-0.4*	0.18	
Completed Problem Sets	0.136***	4.32***	1.292		0.19***	7.678***	1.637	
<b>Step 2, Completed Old Exams</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.71***	5.503	0.330	--	18.89*	7.816	0.249
Bio. Pre-Test % [0-100]	0.415***	0.336***	0.035		0.325***	0.354***	0.047	
ACT [0-36]	0.236***	0.949***	0.172		0.211***	1.181***	0.239	
Total Exam 1 or 2 Study Hours $\geq 0$	0.119**	0.124**	0.043		0.133***	0.176***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.15***	-0.61***	0.159		-0.08*	-0.37*	0.181	
Completed Old Exams	0.05	1.444	1.177		0.174***	5.847***	1.373	
<b>Step 2, Self-Quizzed</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	35.14***	5.405	0.355	--	14.27	7.851	0.247
Bio. Pre-Test % [0-100]	0.412	0.334***	0.034		0.342***	0.373***	0.047	
ACT [0-36]	0.246	0.989***	0.168		0.233***	1.301***	0.239	
Total Exam 1 or 2 Study Hours $\geq 0$	0.096	0.1*	0.042		0.138***	0.182***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.13	-0.53***	0.157		-0.08	-0.34	0.182	
Self-Quizzed	0.17***	4.377***	1.042		0.168***	5.395***	1.317	

<b>Step 2, Explained Concepts</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.32***	5.283	0.381	--	16.18*	7.762	0.258
Bio. Pre-Test % [0-100]	0.413***	0.335***	0.033		0.333	0.363***	0.046	
ACT [0-36]	0.239***	0.96***	0.165		0.227	1.267***	0.237	
Total Exam 1 or 2 Study Hours $\geq 0$	0.091*	0.095*	0.041		0.124	0.165**	0.054	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.11**	-0.45**	0.155		-0.07	-0.32	0.181	
Explained concepts	0.24***	5.538***	0.917		0.201	6.288***	1.28	
<b>Step 2, Synthesized Notes</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	35.53***	5.53	0.331	--	15.96*	7.946	0.226
Bio. Pre-Test % [0-100]	0.421***	0.341***	0.035		0.337***	0.368***	0.047	
ACT [0-36]	0.247***	0.992***	0.172		0.228***	1.276***	0.243	
Total Exam 1 or 2 Study Hours $\geq 0$	0.111**	0.116**	0.044		0.136***	0.18***	0.056	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.15***	-0.59***	0.16		-0.09*	-0.41*	0.184	
Read Notes	1.402	0.957	0.062		0.086*	2.813*	1.375	
<b>Step 2, Made Diagrams</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	35.95***	5.488	0.334	--	16.51*	7.95	0.224
Bio. Pre-Test % [0-100]	0.416***	0.337***	0.034		0.333***	0.363***	0.047	
ACT [0-36]	0.247***	0.992***	0.172		0.226***	1.264***	0.243	
Total Exam 1 or 2 Study Hours $\geq 0$	0.103**	0.108**	0.044		0.144***	0.19***	0.056	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.61***	0.158		-0.09*	-0.4*	0.186	
Made Diagrams	0.084*	1.855*	0.926		0.066	2.102	1.341	
<b>Step 2, Reviewed Online Outside Content</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.75***	5.484	0.334	--	18.44*	7.989	0.223
Bio. Pre-Test % [0-100]	0.423***	0.342***	0.035		0.328***	0.358***	0.047	
ACT [0-36]	0.233***	0.937***	0.172		0.218***	1.216***	0.244	
Total Exam 1 or 2 Study Hours $\geq 0$	0.138***	0.144***	0.043		0.159***	0.21***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.62***	0.158		-0.11**	-0.47**	0.184	
Reviewed Online Outside Content	-1.84*	0.91*	-0.08		-0.06	-1.73	1.256	
<b>Step 2, Watched Lecture</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.45***	5.508	0.328	--	17.21*	7.922	0.226
Bio. Pre-Test % [0-100]	0.419***	0.34***	0.035		0.327***	0.357***	0.047	
ACT [0-36]	0.24***	0.965***	0.172		0.222***	1.238***	0.242	
Total Exam 1 or 2	0.125**	0.13**	0.043		0.17***	0.225***	0.056	



Study Hours $\geq 0$								
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.64***	0.167		-0.08	-0.34	0.19	
Watched Lecture	0.009	0.194	0.968		-0.09*	-2.66*	1.305	
<b>Step 2, Read Textbook</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
Intercept	--	36.13***	5.498	0.331	--	16.56*	7.982	0.221
Bio. Pre-Test % [0-100]	0.423***	0.342***	0.035		0.335***	0.365***	0.047	
ACT [0-36]	0.24***	0.963***	0.171		0.224***	1.252***	0.243	
Total Exam 1 or 2 Study Hours $\geq 0$	0.129**	0.135**	0.042		0.156***	0.206***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.64***	0.158		-0.1*	-0.45*	0.183	
Read Textbook	-0.06	-1.35	0.911		-0.04	-1.43	1.525	
<b>Step 2, Attended Review Sessions</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	37.3***	5.384	0.358	--	18.27*	7.936	0.227
Bio. Pre-Test % [0-100]	0.412***	0.334***	0.034		0.327	0.357***	0.047	
ACT [0-36]	0.247***	0.994***	0.168		0.228	1.275***	0.242	
Total Exam 1 or 2 Study Hours $\geq 0$	0.101**	0.106**	0.042		0.143	0.189***	0.055	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.15***	-0.58***	0.155		-0.09	-0.39*	0.185	
Attended Review Session/Help Sessions/Office Hours	0.178***	4.6***	1.028		0.087	3.961*	1.897	
<b>Step 2, Rewrote Notes</b>	<b>Exam 1, n=424</b>				<b>Exam 2, n=471</b>			
<b>Term</b>	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.14***	5.523	0.328	--	16.92*	7.905	0.230
Bio. Pre-Test % [0-100]	0.42***	0.34***	0.035		0.326	0.356***	0.047	
ACT [0-36]	0.239***	0.96***	0.172		0.217	1.212***	0.242	
Total Exam 1 or 2 Study Hours $\geq 0$	0.133**	0.139**	0.044		0.171	0.226***	0.056	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.16***	-0.63***	0.158		-0.1	-0.46**	0.182	
Rewrote Notes	-0.03	-0.85	1.232		-0.1	-4.18**	1.659	

Supplemental Table 5: Full output for the two, two-step hierarchical regression models per exam summarized in Table 4 [pooled active strategies]. The base model, which was used as step 1 in both models, is reported in A. The second step, where the proportion of active study time (B) or the number of active strategies (C) variables were added is also given. Standardized  $\beta$  values, unstandardized  $b$  values, and standard errors (SE) are reported for each variable. Each model's  $R^2$  is also reported. Ranges of possible values for each variable are shown in brackets. The following symbols indicate significance, \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ .

A)

Step 1, Base Model	Exam 1, n=422				Exam 2, n=456			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	37.61***	5.514	0.322	--	14.49	7.85	0.238
ACT [0-36]	0.224***	0.891***	0.170		0.241***	1.323***	0.240	
Bio. Pre-Test % [0-100]	0.420***	0.345***	0.035		0.343***	0.370***	0.047	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.161***	-0.607***	0.153		-0.100*	-0.428*	0.183	
Total Exam 1 or 2 Study Hours $[\geq 0]$	0.157***	0.187***	0.049		0.165***	0.214***	0.054	

B)

Step 2, Prop. Active	Exam 1, n=422				Exam 2, n=456			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	34.79***	5.546	0.336	--	8.004	7.914	0.262
ACT [0-36]	0.226***	0.901***	0.169		0.248***	1.362***	0.237	
Bio. Pre-Test % [0-100]	0.413***	0.339***	0.035		0.330***	0.356***	0.046	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.140***	-0.520***	0.154		-0.050	-0.220	0.187	
Total Exam 1 or 2 Study Hours $[\geq 0]$	0.143***	0.171***	0.049		0.157***	0.204***	0.054	
Proportion of Exam Study Time Using Active Strategies [0-1]	0.122**	5.499**	1.857		0.163***	9.967***	2.587	

C)

Step 2, Number Active	Exam 1, n=422				Exam 2, n=456			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	29.49***	5.49	0.373	--	2.673	7.72	0.304
ACT [0-36]	0.241***	0.958***	0.164		0.248***	1.362***	0.23	
Bio. Pre-Test % [0-100]	0.406***	0.333***	0.034		0.342***	0.368***	0.045	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.100*	-0.370*	0.153		-0.030	-0.14	0.18	
Total Exam 1 or 2 Study Hours $[\geq 0]$	0.069	0.082	0.050		0.093*	0.121*	0.054	
Number of Active Strategies Used for Exam Studying [0-6]	0.253***	1.858***	0.320		0.277***	2.759***	0.420	

Supplemental Table 6: Regression model incorporating all active strategies simultaneously for Exam 1 (n=424) or Exam 2 (n=471) when controlling for preparation, class absences, and total study hours (base model). This Table summarizes one two-step hierarchical model per assessment. The first step adjusted for the base model (see main text Table 2), and the second step included all active strategies simultaneously. Unstandardized *b* values, standard errors (SE), and the change in  $R^2$  relative to the base model are reported. The following symbols indicate significance, \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ . See Table 1 for wording of prompts.

Step 2, Combined Active Strategies	Exam 1, n=424				Exam 2, n=471			
	Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$ ( $\Delta R^2$ ^)	$\beta_{std.}$	$b_{unstd.}$	SE
Intercept	--	34.02 ***	5.265	0.407 (0.080***)	--	14.83**	7.555	0.309 (0.090***)
ACT [0-36]	0.247***	0.993***	0.164		0.222***	1.238***	0.230	
Bio. Pre-Test % [0-100]	0.413***	0.335***	0.033		0.333***	0.364***	0.045	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.085*	-0.334*	0.156		-0.041	-0.181	0.179	
Total Exam 1 or 2 Study Hours [ $\geq 0$ ]	0.060	0.062	0.043		0.083*	0.110*	0.054	
Completing Old Exams	-0.017	-0.502	1.147		0.125**	4.183**	1.356	
Completing Problem Sets	0.085*	2.713*	1.286		0.128**	5.136**	1.647	
Explain concepts	0.210***	4.857***	0.940		0.158***	4.943***	1.303	
Make Diagrams	0.010	0.213	0.937		-0.012	-0.368	1.395	
Synthesize Notes	0.016	0.364	0.945		0.038	1.224	1.427	
Self-quizzing	0.126**	3.229**	1.040		0.086*	2.736*	1.325	

^ Relative to a base model with  $R^2 = 0.327$  that included ACT score, Bio. Pre-Test %, Number of Classes Missed Before Exam 1, and Total Exam 1 Study Hours. See Table 2 for base model details.

& Relative to a base model with  $R^2 = 0.219$  that included ACT score, Bio. Pre-Test %, Number of Classes Missed Between Exams 1 and 2, and Total Exam 2 Study Hours. See Table 2 for base model details.

Supplemental Table 7: Full output for the two, two-step hierarchical regression models per assessment summarized in Table 5 [study timing]. The base model, which was used as step 1 in both models, is reported in A. The second step, where the days in advance studying began (B) or the number of days studied in the week before exam 2 (C) variables were added is also given. Standardized  $\beta$  values, unstandardized  $b$  values, and standard errors (SE) are reported for each variable. Each model's  $R^2$  is also reported. Ranges of possible values for each variable are shown in brackets. The following symbols indicate significance, \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ .

A)

Step 1, Base Model	Exam 2, n=447				Post-Test, n=392				Final Exam, n=450			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	15.49	8.224	0.231	--	9.029	8.124	0.396	--	19.76**	6.9	0.273
ACT [0-36]	0.226***	1.28***	0.252		0.176***	1.038***	0.251		0.222***	1.087***	0.212	
Bio. Pre-Test % [0-100]	0.34***	0.376***	0.049		0.539***	0.617***	0.049		0.378***	0.361***	0.041	
Number of Classes Missed between Exams 1 and 2 [0-12]	-0.1*	-0.45*	0.189		-0.07	-0.36	0.197		-0.15***	-0.59***	0.158	
Total Exam 2 Study Hours $[\geq 0]$	0.155***	0.209***	0.057		0.005	0.007	0.056		0.124**	0.144**	0.048	

B)

Step 2, Days in Advance	Exam 2, n=447				Post-Test, n=392				Final Exam, n=450			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	15.41	8.329	0.231	--	6.54	8.266	0.399	--	21.15**	6.975	0.275
ACT [0-36]	0.227***	1.281***	0.254		0.186***	1.095***	0.253		0.217***	1.063***	0.212	
Bio. Pre-Test % [0-100]	0.34***	0.376***	0.049		0.535***	0.612***	0.049		0.378***	0.36***	0.041	
Number of Classes Missed between Exams 1 and 2 [0-12]	-0.1*	-0.45*	0.194		-0.06	-0.3	0.201		-0.16***	-0.63***	0.161	
Total Exam 2 Study Hours $[\geq 0]$	0.154***	0.207***	0.064		-0.02	-0.03	0.062		0.149**	0.174**	0.053	
Days in Advance Exam 2 Studying Began $[\geq 0]$	0.003	0.011	0.168		0.071	0.252	0.162		-0.06	-0.18	0.14	

C)

Step 2, Number of Days	Exam 2, n=447				Post-Test, n=392				Final Exam, n=450			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	18.55*	8.672	0.233	--	13.5	8.697	0.399	--	23.74**	7.252	0.278
ACT [0-36]	0.221***	1.247***	0.254		0.167***	0.98***	0.254		0.214***	1.047***	0.213	
Bio. Pre-Test % [0-100]	0.336***	0.372***	0.049		0.535***	0.612***	0.049		0.372***	0.354***	0.041	

Number of Classes Missed between Exams 1 and 2 [0-12]	-0.11**	-0.49**	0.193		-0.08*	-0.42*	0.2		-0.17***	-0.64***	0.161	
Total Exam 2 Study Hours [≥0]	0.18***	0.242***	0.064		0.034	0.047	0.063		0.161***	0.187***	0.054	
Number of Days Studied in Week Before Exam 2 [0-8]	-0.05	-0.46	0.418		-0.070	-0.59	0.413		-0.08	-0.61	0.348	

Supplemental Table 8: Full output for the two-step hierarchical regression models summarized in Table 6 [distraction]. The base model, which was used as step 1 in the model is reported in A. The second step, where the percent of time students reported being distracted when studying was added is also given. Standardized  $\beta$  values, unstandardized  $b$  values, and standard errors (SE) are reported for each variable. Each model's  $R^2$  is also reported. Ranges of possible values for each variable are shown in brackets. The following symbols indicate significance, \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ .

A)

Step 1, Base Model	Exam 1, n=435				Exam 2, n=473			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	36.98***	5.406	0.328	--	17.69*	7.898	0.219
ACT [0-36]	0.234***	0.932***	0.168		0.222***	1.236***	0.242	
Bio. Pre-Test % [0-100]	0.420***	0.344***	0.034		0.333***	0.364***	0.047	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.158***	-0.608***	0.153		-0.100*	-0.445*	0.183	
Total Exam 1 or 2 Study Hours [ $\geq 0$ ]	0.134***	0.141***	0.042		0.152***	0.202***	0.055	

B)

Step 2, Distraction	Exam 1, n=435				Exam 2, n=473			
Term	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$	$\beta_{std.}$	$b_{unstd.}$	SE	$R^2$
Intercept	--	39.75***	5.394	0.347	--	21.00**	7.910	0.234
ACT [0-36]	0.229***	0.913***	0.166		0.222***	1.236***	0.240	
Bio. Pre-Test % [0-100]	0.420***	0.344***	0.034		0.325***	0.354***	0.047	
Number of Classes Missed before Exam 1 [0-15] or between Exams 1 and 2 [0-12]	-0.146***	-0.564***	0.152		-0.094*	-0.418*	0.181	
Total Exam 1 or 2 Study Hours [ $\geq 0$ ]	0.118**	0.125**	0.042		0.132**	0.174**	0.055	
Percent of Time Distracted While Studying [0-100]	-0.139***	-0.093***	0.027		-0.123**	-0.119**	0.040	