

### APPENDIX 3. MEANINGFUL LEARNING IN THE LABORATORY INVENTORY (MLLI) PRE- AND POST-SURVEY ITEMS.

Items marked with a (-) are reverse coded. (Galloway & Bretz, 2015)

Item	(Pre) When performing experiments in my chemistry laboratory course this semester, I expect...	(Post) When I performed experiments in my chemistry course this semester, I...	Subscale classification
1	to learn chemistry that will be useful in my life.	learned chemistry that will be useful in my life.	C/A
2-	to worry about finishing on time.	worried about finishing on time.	A
3	to make decisions about what data to collect.	made decisions about what data to collect.	C
4-	to feel unsure about the purpose of the procedures.	felt unsure about the purpose of the procedures	C/A
5	to experience moments of insight.	experienced moments of insight.	C
6-	to be confused about how the instruments work.	was confused about how the instruments work.	C
7	to learn critical thinking skills.	learned critical thinking skills.	C
8	to be excited to do chemistry.	was excited to do chemistry.	A
9-	to be nervous about making mistakes.	was nervous about making mistakes.	A
10	to consider if my data makes sense.	considered if my data makes sense.	C
11	to think about what the molecules are doing.	thought about what the molecules are doing.	C
12-	to feel disorganized.	felt disorganized.	C/A
13	to develop confidence in the laboratory.	developed confidence in the laboratory.	A
14-	to worry about getting good data.	worried about getting good data.	C/A
15-	the procedures to be simple to do.	thought the procedures to be simple to do.	C
16-	to be confused about the underlying concepts.	was confused about the underlying concepts.	C
17	to "get stuck" but keep trying.	"got stuck" but kept trying.	C
18-	to be nervous when handling chemicals.	was nervous when handling chemicals.	A
19	to think about chemistry I already know.	thought about chemistry I already know.	C
20-	to worry about the quality of my data.	worried about the quality of my data.	C/A
21-	to be frustrated.	was frustrated.	A
22	to interpret my data beyond only doing calculations.	interpreted my data beyond only doing calculations.	C
23	<i>This item is used to remove the pre- and post-survey from the same individual, if answered incorrectly</i>		NA

Item	(Pre) When performing experiments in my chemistry laboratory course this semester, I expect...	(Post) When I performed experiments in my chemistry course this semester, I...	Subscale classification
	Please select forty percent for this question.	Please select sixty percent for this question.	
24-	to focus on procedures, not concepts.	focused on procedures, not concepts.	C
25	to use my observations to understand the behavior of atoms and molecules	used my observations to understand the behavior of atoms and molecules	C
26	to make mistakes and try again.	made mistakes and tried again.	C
27	to be intrigued by the instruments.	was intrigued by the instruments.	C/A
28-	to feel intimidated.	felt intimidated.	A
29-	to be confused about what my data mean.	was confused about what my data mean.	C
30	to be confident when using equipment.	was confident when using equipment.	A
31	to learn problem solving skills.	learned problem solving skills.	C