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## Supplemental Materials

for

### Student Engagement Declines in STEM Undergraduates during COVID-19–Driven Remote Learning

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## Appendix 1. Survey Questions

Student demographic survey questions administered using Qualtrics

	Question:	Available Answers:
Gender	“How would you describe your gender identity?”	<ul style="list-style-type: none"><li>· Woman</li><li>· Man</li><li>· Gender variant/non-binary</li><li>· Other (Please specify)</li><li>· Prefer not to answer</li></ul>
Race	“How would you describe your race/ethnicity?”	<ul style="list-style-type: none"><li>· White or Caucasian</li><li>· Hispanic or Latinx</li><li>· Black or African American</li><li>· Filipinx</li><li>· American Indian or Alaska Native</li><li>· Middle Eastern or North African</li><li>· Native Hawaiian or Other Pacific Islander</li><li>· Other (please specify)</li><li>· Prefer not to answer</li></ul>

## Appendix 2. Student engagement calculations

To calculate student engagement we first calculated normalized sums for each engagement construct by adding up the scores for each of the parameters within the construct and dividing it by the total possible positive points. In the case where there were negative and positive questions, such as with the CLASS attitude survey, the sum of the negative questions was subtracted by the sum of the positive questions for an overall score. Note that the behavioral engagement choices ran from 0-4, while the emotional and cognitive behavior choices ran from 1-5.

Normalized behavioral engagement=(class participation+mtg with prof+study group)/12

Normalized emotional engagement=(attitude+value+stress)/70

Normalized cognitive engagement=(self-efficacy+SOB)/100

Then we calculated the overall engagement from these normalized values:

Overall engagement=Normalized behavioral engagement\*normalized emotional engagement\*normalized cognitive engagement

### Appendix 3: List of survey questions

#### Self-Efficacy: General Self-Efficacy Scale (42)

From your experience this current academic semester, to what extent do you agree or disagree with the following statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I can always manage to solve difficult problems if I try hard enough. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If someone opposes me, I can find the means and ways to get what I want. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to stick to my aims and accomplish my goals. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I could deal efficiently with unexpected events. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thanks to my resourcefulness, I know how to handle unforeseen situations. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can solve most problems if I invest the necessary effort. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can remain calm when facing difficulties because I can rely on my coping abilities. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am confronted with a problem, I can usually find several solutions. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can usually handle whatever comes my way. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sense of Belonging: Ingram Sense of Belonging Survey (43)

From your experience this current academic semester, to what extent do you agree or disagree with the following statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I can really be myself in this class. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel I am a member of this class. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students at this class are friendly with me. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable asking a professor for help if I did not understand course-related material. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students here treat me with respect. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel comfortable contributing to class discussions. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel very different from most other students here. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I interact with the professor in this class, I feel they care about how I'm doing. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would find it easy to join study groups with other students if I wanted to. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer to study on my own. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most students in this class have values and attitudes different from my own. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Professors make me question whether I should be here. (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a lot in common with other students here. (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could call another student from class if I had a question about an assignment. (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel comfortable asking a question in class. (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Behavior:**

How often do you do the following for this class:

	Never (0)	Once a semester (1)	1-2 times a month (2)	Once a week (3)	More than once a week (4)
Participate in class discussions (including discussion boards/forums) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meet with professors outside of class time (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Study with other students outside of class time (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Student Anxiety (value vs stress): Papanastasiou Survey (45)**

From your experience this current academic semester in your science class, to what extent do you agree or disagree with the following statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
This class is interesting (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like this class (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class scares me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is useful for my career (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to understand the concepts of this class (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am interested in this class (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is connected to my field of study (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is stressful (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class makes me nervous (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use this class in my daily life (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The skills I have acquired in this class will be helpful to me in the future (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is useful to every professional (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is irrelevant to my life (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is complicated (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is difficult (22)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This class is a complex subject (23)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Attitude: Colorado Learning Attitudes about Science (CLASS) (44)

From your experience this current academic semester in your science class, to what extent do you agree or disagree with the following statements:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
My curiosity about the living world led me to study science (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think about the science I experience in everyday life. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
After I study a topic in class and feel that I understand it, I have difficulty applying that information to answer questions on the same topic. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am answering a biology question, I find it difficult to put what I know into my own words. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to study science because I want to make a contribution to society (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I don't remember a particular approach needed for a question on an exam, there's nothing much I can do (legally!) to come up with it. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We use this statement to discard the survey of people who are not reading the questions.-click Strongly Disagree (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy figuring out answers to science questions. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I had plenty of time, I would take a science class outside of my major requirements just for fun. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I get stuck on a science question, there is no chance I'll figure it out on my own (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is usually only one correct approach to solving a science problem. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning science that is not directly relevant to or applicable to human health is not worth my time. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy explaining science ideas that I learn about to my friends. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>