

Supplemental Materials

Table S1.

Standardized Regression Coefficients for Instructional Practices Predicting Psychological and Cognitive Well-Being with Gender Interactions Included.

	Belonging		Positive Emotions			Negative Emotions			Cognitive Engagement			STEM Interest			
female			0.411			0.11			-0.028			-0.361			-0.224
			-0.43			-0.311			-0.307			-0.305			-0.269
zprerecorded	0.108	0.159	0.034	-0.126	-0.1	-0.088	0.270*	0.206	0.232	0.06	0.127	0.084	-0.197	-0.128	0.065
	-0.189	-0.188	-0.217	-0.155	-0.159	-0.208	-0.155	-0.149	-0.201	-0.158	-0.152	-0.204	-0.145	-0.135	-0.174
znoninteractive	-0.339*	-0.454**	-0.254	-0.066	-0.129	-0.103	-0.051	0.11	0.026	-0.084	-0.249	-0.138	-0.487***	-0.684***	-0.594***
	-0.192	-0.204	-0.237	-0.156	-0.174	-0.222	-0.155	-0.162	-0.214	-0.158	-0.166	-0.217	-0.147	-0.152	-0.186
zinteractive	-0.122	-0.093	-0.028	0.144	0.14	0.145	0.087	0.095	-0.013	0.106	0.097	0.161	-0.092	-0.104	-0.073
	-0.253	-0.248	-0.306	-0.192	-0.193	-0.285	-0.19	-0.18	-0.275	-0.195	-0.184	-0.28	-0.179	-0.164	-0.239
zdiscussion	-0.201	-0.095	-0.223	-0.085	-0.056	-0.023	0.021	-0.053	-0.238	0.167	0.242	0.336	0.178	0.279*	0.321
	-0.19	-0.199	-0.336	-0.181	-0.185	-0.32	-0.179	-0.172	-0.309	-0.183	-0.176	-0.314	-0.17	-0.16	-0.268
zbreakout	0.216	0.360*	0.352	0.440**	0.513**	0.304	-0.074	-0.259	-0.025	0.216	0.403**	0.214	-0.075	0.112	0.196
	-0.186	-0.207	-0.314	-0.171	-0.192	-0.272	-0.173	-0.182	-0.263	-0.173	-0.183	-0.267	-0.162	-0.163	-0.231
zindividual	-0.247	-0.095	0.062	0.166	0.221	-0.072	0.361**	0.221	0.227	0.314*	0.455**	0.371	0.235	0.371**	0.478*
	-0.23	-0.248	-0.337	-0.174	-0.186	-0.296	-0.176	-0.177	-0.286	-0.176	-0.178	-0.29	-0.165	-0.159	-0.248
zcov.threat		-0.379	-0.272		-0.166	-0.164		0.420**	0.392*		-0.429**	-0.384*		-0.476***	-0.490**
		-0.258	-0.3		-0.196	-0.209		-0.183	-0.203		-0.187	-0.205		-0.172	-0.186
zprerecorded:female			0.879			0.01			-0.098			0.161			-0.550*
			-0.598			-0.346			-0.34			-0.339			-0.29
female:znoninteractive			-0.759			-0.334			0.344			-0.408			-0.1
			-0.474			-0.353			-0.348			-0.347			-0.299
female:zinteractive			-0.459			-0.245			0.141			-0.161			0.163
			-0.634			-0.423			-0.409			-0.415			-0.357
female:zdiscussion			0.051			0.249			0.346			-0.077			-0.18
			-0.476			-0.429			-0.415			-0.421			-0.36
female:zbreakout			-0.164			0.379			-0.634			0.465			-0.003
			-0.461			-0.389			-0.39			-0.382			-0.331
female:zindividual			-0.496			0.654			0.038			0.138			-0.273
			-0.508			-0.387			-0.385			-0.38			-0.326
Constant	0.068	0.01	0.009	0	0	-0.037	0.004	0.003	0.004	0	0	0.153	0.01	0.024	0.124
	-0.173	-0.174	-0.218	-0.147	-0.148	-0.201	-0.147	-0.139	-0.194	-0.149	-0.141	-0.197	-0.139	-0.127	-0.168
Observations	34	34	34	43	43	43	42	42	42	43	43	43	42	42	42
Adjusted R2	0.033	0.073	0.038	0.071	0.064	0.043	0.09	0.189	0.106	0.047	0.148	0.078	0.196	0.325	0.33

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Coronavirus Threat & Impacts Questionnaire
Adapted from Conway, Woodard, and Zubrod (2020)

Instructions: Please rate your agreement with each statement.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Threat - Concern

1. Thinking about the COVID-19 disease makes me feel threatened.
2. I am afraid of the COVID-19 disease.
3. I am stressed around other people because I worry that I'll catch COVID-19.
4. I worry that someone I love or care about may catch COVID-19.

Impacts - Financial

5. The COVID-19 pandemic has impacted me negatively from a financial point of view.
6. I have lost job-related income due to the COVID-19 pandemic.

Impacts - Resource

7. I have had a hard time getting needed resources (food, toilet paper) due to the COVID-19 pandemic.
8. It has been difficult for me to get the things I need due to the COVID-19 pandemic.

Impacts - Psychological

9. I have become depressed because of the COVID-19 pandemic.
10. The COVID-19 pandemic has negatively impacted my mental health.

Teaching Practices
Researcher created

What portion of the live online class time in the course was...

(six point scale: Not apply, 0 to 20%, 20 to 40%, 40 to 60%, 60 to 80%, 80 to 100%)

1. Pre-recorded lecture (e.g., power-point voiceover).
2. Non-interactive lecture (e.g., live zoom lecture where mainly the instructor is talking).
3. Interactive Lecture (e.g., live lecture that includes polls, chats, or questions).
4. Whole class discussion.
5. Small group work or discussion in breakout rooms.
6. Individual work.

Differential Emotions Scale (DES) - Modified

Adapted from Fredrickson, Tugade, Waugh, & Larkin (2003)

Instructions: Please rate how often you've experienced the following emotions since the virtual transition to online teaching.

During [General Physics/Calculus II] lecture sessions online (whether synchronous or asynchronous), I tend to feel...

1	2	3	4	5	6	7
Never			Sometimes			Always

The Negative Emotions

1. Angry, irritated, annoyed.
2. Sad, downhearted, unhappy.
3. Scared, fearful, afraid.
4. Disgust, distaste, revulsion.
5. Contemptuous, scornful, disdainful.
6. Embarrassed, self-conscious, blushing.
7. Repentant, guilty, blameworthy.
8. Ashamed, humiliated, disgraced.

The Positive Emotions

9. Grateful, appreciative, thankful.
10. Interested, alert, curious.
11. Love, closeness, trust.
12. Amused, fun-loving, silly.
13. Glad, happy, joyful.
14. Hopeful, optimistic, encouraged.
15. Sexual, desiring, flirtatious.
16. Proud, confident, self-assured.
17. Content, serene, peaceful.
18. Awe, wonder, amazement.

Other Emotions

19. Sympathy, concern, compassion.
20. Surprised, amazed, astonished.
21. Nervous, anxious, stressed.
22. Hopeless, depressed, gloomy.

The Psychological Sense of School Membership (PSSM) Scale

Items 1-18 adapted from Goodenow (1993)

Items 19-21 adapted from Zumbrunn, McKim, Buhs, & Hawley (2014)

Instructions: For the items below, rate your experience in [General Physics/Calculus II] lecture session BEFORE the virtual transition to online teaching (January 17th until March 17th)? Please indicate how true each statement is for you.

- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------------|---|---|---|---|---|--------------|----|
| Not at all
true | | | | | | Very
true | DK |
1. I felt like a real part of [General Physics/Calculus II].
 2. My instructors and peers in [General Physics/Calculus II] noticed when I was good at something.
 3. It was hard for people like me to be accepted in [General Physics/Calculus II]. (R)
 4. Students in [General Physics/Calculus II] took my opinions seriously.
 5. I felt that my [General Physics/Calculus II] instructor liked me.
 6. Sometimes I felt as if I didn't belong in [General Physics/Calculus II]. (R)
 7. There was at least one person (instructor or peer) in [General Physics/Calculus II] that I could talk to if I had a problem.
 8. Students in [General Physics/Calculus II] were friendly to me.
 9. I was included in a lot of activities in [General Physics/Calculus II].
 10. I was treated with as much respect as other students in [General Physics/Calculus II].
 11. I felt very different from most other students in [General Physics/Calculus II]. (R)
 12. I could really be myself in [General Physics/Calculus II].
 13. I felt that my [General Physics/Calculus II] instructor respects me.
 14. Students in [General Physics/Calculus II] knew that I can do good work.
 15. I wished I was in a different section of [General Physics/Calculus II]. (R)
 16. I felt proud of belonging to [General Physics/Calculus II].
 17. Students in [General Physics/Calculus II] liked me the way I am.
 18. I felt accepted by my [General Physics/Calculus II] instructor.
 19. I could talk to my peers in [General Physics/Calculus II] if I had a problem.
 20. I could talk to my instructor in [General Physics/Calculus II] if I had a problem.
 21. I was included in group work with my peers in [General Physics/Calculus II].

*Note: DK stands for "I don't know".

UCLA Loneliness Scale

Items 1-6 adapted from Russell, Peplau, & Ferguson (1978)

Instructions: What has your experience been in [General Physics/Calculus II] since the virtual transition to online teaching? Please indicate how true each statement is for you.

1	2	3	4	5	6	7	8
Not at all true						Very true	DK

In [General Physics/Calculus II] :

1. I have no one to talk to in [General Physics/Calculus II].
2. I lack friends in [General Physics/Calculus II].
3. There is no one to turn to in [General Physics/Calculus II].
4. I feel completely alone in [General Physics/Calculus II].
5. My social relationships are superficial in [General Physics/Calculus II].
6. I feel isolated from others in [General Physics/Calculus II].

Items Created by Our Team

7. I study (virtually) with a group of students outside of class.
8. I consult online resources to help me study (e.g., YouTube).

*Note: DK stands for “I don’t know”.

STEM Interest Scale

(Hulleman, Godes, Hendricks, & Harackiewicz, 2010)

Instructions: Please rate your agreement with each statement.**Since the virtual online transition for [General Physics/Calculus II] on March 18th...**

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Situational Interest

1. I just don't find physics/math interesting.
2. Physics/Math fascinates me.

Cognitive Engagement Measure

(Miller & Greene, 1996 1-13; Pintrich, Smith, Garcia, & McKeachie, 1991 for #14)

Instructions: Please rate your agreement with each statement.**Since the virtual online transition for [General Physics/Calculus II] on March 18th...**

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

1. When learning in [General Physics/Calculus II] , I summarize the content in my own words.
2. I put together ideas or concepts and drew conclusions that are not directly stated in [General Physics/Calculus II].
3. I compare and contrast different concepts.
4. While learning new concepts, I try to think of practical applications.
5. I mentally combine different pieces of information from [General Physics/Calculus II] into some order that makes sense to me.
6. I try to learn new material by mentally associating new ideas from [General Physics/Calculus II] with similar ideas that I already know.
7. I evaluate the usefulness of the ideas presented in [General Physics/Calculus II].
8. I make sure I understand material that I learn in [General Physics/Calculus II].
9. I try to memorize the content from [General Physics/Calculus II].
10. I develop memory tricks (mnemonics) to help me remember the content from [General Physics/Calculus II].
11. I try to remember exactly what my [General Physics/Calculus II] instructor states in lecture.
12. I type or write out notes capturing the main ideas from [General Physics/Calculus II].
13. I copy down details exactly as they are taught in [General Physics/Calculus II].
14. I am very interested in the content area of [General Physics/Calculus II].
15. I am able to stay focused during [General Physics/Calculus II].
16. I have an easy time paying attention during [General Physics/Calculus II].

Collegiate Teaching Proficiency Scale

Adapted from Barnes, Engelland, Matherne, Martin, Orgeron, Ring, Smith, & Williams (2008) and Suldo, Friedrich, White, Framer, Minch, & Michalowski (2009)

Instructions: Please rate your agreement with each statement.

1	2	3	4	5	6	7	8
Strongly Disagree			Neutral			Strongly Agree	DK

Since the virtual online transition for [General Physics/Calculus II] on March 18th...

My instructor...

Teaching Readiness – Preparation Facet

1. ...has continued to communicate course objectives since the virtual transition.

Teaching Readiness - Professionalism Facet

2. ...has implemented the stated course objectives.
3. ...has appropriate control of the class.

Teaching Readiness – Evaluation Facet

4. ...has adapted grading policies to evaluate all students objectively.
5. ...expects academic excellence from students.

Teaching Excellence – Rapport Facet

6. ...seems to care whether students learned the material.
7. ...is responsive to students.
8. ...is good at resolving issues that arise in class.

Teaching Excellence – Enthusiasm Facet

9. ...makes the online course interesting.
10. ...motivates students to learn online.

Teaching Excellence – Delivery Facet

11. ...conveys online class material in a way that is easy to understand.
12. ...presents online course material in a manner that made sense.

Teaching Excellence – Excellence Facet

13. ...is excellent.
14. ...has organized presentations well online.

Teaching Excellence – Promoting Student Well-Being Facet

15. ...cares about me.
16. ...treats students fairly.
17. ...makes me feel comfortable asking questions.

Teaching Excellence – Online Adaptiveness Facet

18. ...has made consistent efforts to adapt this course during the transition to online learning.
19. ...has done a great job easing the transition to online learning.
20. ...has revised the syllabus as a result of the transition to online learning.

Flourishing Scale
(Diener & Biwas-Diener, 2009)

Instructions: Please rate your agreement with each statement.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Since the virtual online transition for [General Physics/Calculus II] on March 18th I feel that:

1. I lead a purposeful and meaningful life.
2. My social relationships are supportive and rewarding.
3. I am engaged and interested in my daily activities.
4. I actively contribute to the happiness and well-being of others.
5. I am competent and capable in the activities that are important to me.
6. I am a good person and live a good life.
7. I am optimistic about my future.
8. People respect me.

Student Group-Interview Prompts

(Note, sub-items represent potential follow-up questions.)

1. **How has your life changed as a result of the pandemic?**
 - a. How are you coping with these changes?
 - b. How are you feeling?
2. **[Name of university] went to virtual instruction starting on March 18th. Since then, how has this transition been for your [Physics/Calculus] class?**
 - a. How is your professor teaching class: Zoom or PowerPoint voiceover?
 - b. What is going well?
 - c. What is not going well? Why?
3. **How has this virtual transition affected your...**
 - a. Academic performance?
 - b. Your motivation in the class?
 - c. Career interests?
4. **In what ways has your classroom community (classroom, study groups, office hours) changed as a result of the outbreak?**
 - a. How have you been able to stay connected with your peers during this time (if at all)?
 - b. How have you been able to stay connected with your professor during this time (if at all)?
5. **What accommodations has your professor made to maintain community and support interpersonal connections (if any)?**
 - a. How is [this accommodation/no accommodation] working for you?
6. **To what extent do you feel that you belong in PHY 1510/Math 1150 class?**
 - a. How has the pandemic changed these feelings of belonging (if at all)?
7. **How are your other classes going with the virtual transition?**
 - a. What is going well?
 - b. What is not going well? Why?
8. **What can be done to improve your experience?**
9. **Are there any obstacles that you are facing in succeeding in school?**
 - a. Internet connectivity
 - b. Space to do homework
 - c. Anything else?
10. **Have your plans for the future changed since the pandemic? What are your future plans...**
 - a. Summer term?
 - b. Fall?
 - c. Next year?
11. **We would love to hear anything else you think is important for us to know about your academic experiences in [Physics/Calculus] during the transition to online learning?**

Potential Probing Questions Applicable to ALL Items
a. Can you tell me more about...? b. Can you give me an example? c. How do you know? d. I don't understand

Codebook for Student Interviews

Sources of Belonging

Campus Communities

Evidence that the student has maintained positive interpersonal relationships through campus communities OR derives feelings of acceptance, inclusion, or belonging from formal campus communities (e.g., clubs, sororities, etc.).

Connected with peers

Evidence that the student has positive interpersonal relationships with peers OR derives feelings of acceptance, inclusion, or belonging from peers OR Feelings of positive emotions and personal connection with students in physics or math class (e.g., feels personally supported or cared for by other students) OR Feelings of positive academic connections with students in physics or math class (e.g., feels academically supported/helped by other students).

Connection to professor

Evidence that the student has positive interpersonal relationships with professor OR derives feelings of acceptance, inclusion, or belonging from professor. OR Feelings of personal identification with professor (e.g., identifies positive personality characteristics of professor, “He’s funny”, “Shows class home/chickens/dogs”) OR Feelings of being *personally* supported and cared for by professor (e.g., student expresses that professor really understands and sympathizes with their individual pandemic-related situations) OR Feelings of being *academically* supported and cared for by professor (e.g., student expresses that professor extends self to support students academically in response to the pandemic).

Competency Belonging

Evidence that the student had positive prior experiences in STEM courses leading to their feeling of belonging.

Negative Experiences (Cognitive/Affective)

Patronizing professor

Feelings of condescension from professor or students (e.g., feelings of being talked down to by professor or peers after asking a question)

Unsupported

Feelings of being unsupported by the professor or peers during the online transition (e.g., “my professor is not helping me enough,” “something was on the test that wasn’t covered in class”)

Abandonment

Feelings of being completely unsupported by the professor or peers during the online transition, or left to own devices to be successful (e.g., “no one is helping me since the transition,” “my professor completely dropped off the map!”)

Isolated

Feeling of isolation or loneliness.