**Promoting an Agentic Orientation:**

**An Intervention in University Psychology and Physical Science Courses**

*Online Supplemental Materials (OSM)*

**Table S1**

*Factor Loadings for Confirmatory Factor Analyses of Agentic Mindset (AM)*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Study 1** | | |  | | **Study 2** | | |  | | **Study 3** | | |
| **Item** |  | Baseline | Post |  | | Baseline | | Mid |  | | Baseline | | Mid |
| AM1. I can influence how engaging my psychology (science) classes are. |  | .76 | .81 |  | | .82 | | .69 |  | | .80 | | .88 |
| AM2. I can influence how much instructors support my motivation. |  | .56 | .62 |  | | .41 | | .54 |  | | .49 | | .58 |
| AM3. I can change how engaging my psychology (science) course is. |  | .80 | .86 |  | | .84 | | .78 |  | | .79 | | .76 |
| Model fit | | | | | | | | | | | | | | |
| 2 (df) |  | 11.09 (8) | | |  | | 10.33 (8) | | |  | | 21.36 (8) | | |
| CFI |  | .99 | | |  | | .99 | | |  | | .99 | | |
| RMSEA [90% CI] |  | .04 [.00/.10] | | |  | | .04 [.00/.11] | | |  | | .05 [.02/.07] | | |
| SRMR |  | .03 | | |  | | .04 | | |  | | .03 | | |

*Notes*. Post = Post-intervention. Mid = Mid-semester. df = Degrees of freedom. CI = Confidence interval. Standardized factor loadings are reported. Mindset items submitted to a confirmatory factor analysis (CFA) to test our proposed single factor (at each time point) structure using full information maximum likelihood method to handle missing data (FIML; Enders, 2010) in Mplus Version 8 (Muthén & Muthén, 2017). In Study 3, we used maximum likelihood estimation with robust standard errors (ESTIMATOR = MLR) and the sandwich estimator implemented by TYPE = COMPLEX to adjust for the clustered nature of the data in which course lab sections were assigned to condition. For all studies, items were allowed to load only on the factor at the target time point (baseline, mid-semester or post-intervention) and factors were allowed to correlate. Cross-loadings and covariances among the errors were fixed to 0. All factor loadings are significant at *p* < .001. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

**Table S2**

*Factor Structure for Confirmatory Factor Analyses of Engagement in Study 1*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Factor Loadings** | | | | | | | |
| **Item** |  | **AE** | **BE** | | **EE** | | **CE** | | |
| AE1. I let my psychology instructor know what I need and want. |  | .86 |  | |  | |  | | |
| AE2. During my psychology course, I express my preferences and opinions. |  | .80 |  | |  | |  | | |
| AE3. When I need something in my psychology course, I'll ask the instructor for it. |  | .70 |  | |  | |  | | |
| AE4. During my psychology course, I ask questions to help me learn. |  | .84 |  | |  | |  | | |
| AE5. I let my psychology instructor know what I am interested in. |  | .85 |  | |  | |  | | |
|  |  |  |  | |  | |  | | |
| BE1. I try hard to do well in my psychology course. |  |  | .59 | |  | |  | | |
| BE2. In my psychology course, I work as hard as I can. |  |  | .72 | |  | |  | | |
| BE3. When I'm in my psychology course, I participate in class discussions. |  |  | .60 | |  | |  | | |
| BE4. I pay attention in my psychology course. |  |  | .87 | |  | |  | | |
| BE5. When I'm in my psychology course, I listen very carefully. |  |  | .92 | |  | |  | | |
|  |  |  |  | |  | |  | | |
| EE1. When I'm in my psychology course, I feel good. |  |  |  | | .79 | |  | | |
| EE2. When we work on something in my psychology course, I feel interested. |  |  |  | | .78 | |  | | |
| EE3. My psychology course is fun. |  |  |  | | .83 | |  | | |
| EE4. I enjoy learning new things in my psychology course. |  |  |  | | .74 | |  | | |
| EE5. When we work on something in my psychology course, I get involved. |  |  |  | | .76 | |  | | |
|  |  |  |  | |  | |  | | |
| CE1. When I study for my psychology course, I try to connect what I am learning with my own experiences. |  |  |  | |  | | .90 | | |
| CE2. I try to make all the different ideas fit together and make sense when I study for my psychology course. |  |  |  | |  | | .88 | | |
| CE3. When doing work for my psychology course, I try to relate what I'm learning to what I already know. |  |  |  | |  | | .83 | | |
| CE4. I make up my own examples to help me understand the important concepts I study for my psychology course. |  |  |  | |  | | .69 | | |
| **Correlations among Latent Factors** | | | | | | | | | |
| **AE** |  | 1 |  | |  | |  |
| **BE** |  | .56 | 1 | |  | |  |
| **EE** |  | .57 | .64 | | 1 | |  |
| **CE** |  | .34 | .52 | | .60 | | 1 |
| **Model fit** |  |  | |  | |  | | |  |
| 2 (df) |  | 269.07(139) | | | | | | | |
| CFI |  | .94 | | | | | | | |
| RMSEA [90% CI] |  | .08 [.06/.09] | | | | | | | |
| SRMR |  | .07 | | | | | | | |

*Notes*. AE = Agentic engagement. BE = Behavioral engagement. EE = Emotional engagement. CE = Cognitive engagement. df = Degrees of freedom. CI = Confidence interval. Standardized factor loadings are reported. Items submitted to a confirmatory factor analysis (CFA) to test our proposed four factor structure using full information maximum likelihood method to handle missing data (FIML; Enders, 2010) in Mplus Version 8 (Muthén & Muthén, 2017). Items were allowed to load only on their target factor and factors were allowed to correlate. All cross-loadings were fixed to 0. Seven covariances between errors were added to improve model fit. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at *p* < .001. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

**Table S3**

*Factor Structure for Confirmatory Factor Analyses of Need Satisfaction, Personal Interest, and Perceived Instructor Autonomy Support in Study 1*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Factor Loadings** | | | | |
| **Item** | **ANS** | **CNS** | **RNS** | **PI** | **IAS** |
| ANS1. During my psychology course, I feel free. | .72 |  |  |  |  |
| ANS2. During my psychology course, I feel I'm doing what I want to be doing. | .89 |  |  |  |  |
| ANS3. During my psychology course, I feel free to decide for myself what to do. | .62 |  |  |  |  |
|  |  |  |  |  |  |
| CNS1. During my psychology course, I feel capable. |  | .72 |  |  |  |
| CNS2. During my psychology course, I feel competent. |  | .67 |  |  |  |
| CNS3. During my psychology course, I feel my skills are improving. |  | .79 |  |  |  |
|  |  |  |  |  |  |
| RNS1. During my psychology course, I feel I belong and the people here care about me. |  |  | .75 |  |  |
| RNS2. During my psychology course, I feel involved with close friends. |  |  | .73 |  |  |
| RNS3. During my psychology course, I feel emotionally close to the people around me. |  |  | .90 |  |  |
|  |  |  |  |  |  |
| PI1. Psychology is practical for me to know. |  |  |  | .70 |  |
| PI2. Psychology helps me in daily life outside of school. |  |  |  | .76 |  |
| PI3. It is important to me to be a person who reasons scientifically. |  |  |  | .53 |  |
| PI4. Thinking about psychology is an important part of who I am. |  |  |  | .74 |  |
| PI5. I enjoy the domain of psychology. |  |  |  | .88 |  |
| PI6. I like psychology. |  |  |  | .91 |  |
| PI7. I enjoy applying psychology. |  |  |  | .86 |  |
| PI8. Psychology is exciting for me. |  |  |  | .87 |  |
|  |  |  |  |  |  |
| IAS1. I feel that my psychology instructor provides me choices and options. |  |  |  |  | .69 |
| IAS2. I feel understood by my psychology instructor. |  |  |  |  | .87 |
| IAS3. I am able to be open with my psychology instructor during class. |  |  |  |  | .79 |
| IAS4. My psychology instructor conveys confidence in my ability to do well. |  |  |  |  | .77 |
| IAS5. I feel that my psychology instructor accepts me. |  |  |  |  | .83 |
| IAS6. My psychology instructor makes sure I really understood the goals of the course and what I need to do. |  |  |  |  | .75 |
| IAS7. My psychology instructor encouraged me to ask questions. |  |  |  |  | .64 |
| IAS8. I feel a lot of trust in my psychology instructor. |  |  |  |  | .76 |
| IAS9. My psychology instructor answers my questions fully and carefully. |  |  |  |  | .69 |
| IAS10. My psychology instructor listens to how I would like to do things. |  |  |  |  | .67 |
| IAS11. My psychology instructor handles people's emotions very well. |  |  |  |  | .66 |
| IAS12. I feel that my psychology instructor cares about me as a person. |  |  |  |  | .67 |
| IAS13. I don't feel very good about the way my psychology instructor talks to me. |  |  |  |  | -- |
| IAS14.My psychology instructor tries to understand how I see things before suggesting a new way to do things. |  |  |  |  | .61 |
| IAS15.I feel able to share my feelings with my psychology instructor. |  |  |  |  | .73 |
| **Correlations among Latent Factors** | | | | | |
| **ANS** | 1 |  |  |  |  |
| **CNS** | .62 | 1 |  |  |  |
| **RNS** | .35 | .37 | 1 |  |  |
| **PI** | .60 | .59 | .17 | 1 |  |
| **IAS** | .63 | .51 | .42 | .40 | 1 |
| **Model fit** |  |  |  |  |  |
| 2 (df) | 701.74(406) | | | | |
| CFI | .92 | | | | |
| RMSEA [90% CI] | .07 [.06/.08] | | | | |
| SRMR | .06 | | | | |

*Notes*. ANS = Autonomy need satisfaction. CNS = Competence need satisfaction. RNS = Relatedness need satisfaction. PI = Personal interest. IAS = Instructor autonomy support. df = Degrees of freedom. CI = Confidence interval. Standardized factor loadings are reported. Items submitted to a confirmatory factor analysis (CFA) to test our proposed five factor structure using full information maximum likelihood method to handle missing data (FIML; Enders, 2010) in Mplus Version 8 (Muthén & Muthén, 2017). Items were allowed to load only on their target factor and factors were allowed to correlate. One reverse-coded perceived instructor autonomy support item that loaded poorly on its factor (IAS13) was removed. All cross-loadings were fixed to 0. Eighteen covariances between errors were added to improve model fit. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at *p* < .001. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

**Table S4**

*Descriptive Statistics and Correlations among Manifest Variables for Study 1*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **M** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| 1. Baseline mindset | 3.25 | 0.86 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Post mindset | 3.38 | 0.86 | .38\*\* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Agentic engagement | 2.92 | 1.01 | .22\*\* | .33\*\* |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Behavioral engagement | 3.56 | 0.92 | .19\* | .28\*\* | .53\*\* |  |  |  |  |  |  |  |  |  |  |  |
| 1. Emotional engagement | 3.84 | 0.80 | .36\*\* | .44\*\* | .54\*\* | .58\*\* |  |  |  |  |  |  |  |  |  |  |
| 1. Cognitive engagement | 3.99 | 0.85 | .26\*\* | .34\*\* | .35\*\* | .50\*\* | .54\*\* |  |  |  |  |  |  |  |  |  |
| 1. Autonomy | 3.50 | 0.85 | .24\*\* | .38\*\* | .34\*\* | .36\*\* | .52\*\* | .52\*\* |  |  |  |  |  |  |  |  |
| 1. Competence | 3.93 | 0.73 | .16\* | .27\*\* | .36\*\* | .48\*\* | .55\*\* | .50\*\* | .43\*\* |  |  |  |  |  |  |  |
| 1. Relatedness | 2.57 | 0.96 | .33\*\* | .26\*\* | .39\*\* | .27\*\* | .34\*\* | .23\*\* | .35\*\* | .30\*\* |  |  |  |  |  |  |
| 1. Interest | 4.09 | 0.73 | .22\* | .29\*\* | .31\*\* | .43\*\* | .64\*\* | .52\*\* | .47\*\* | .50\*\* | .17\* |  |  |  |  |  |
| 1. Perceived autonomy support | 3.58 | 0.71 | .30\*\* | .43\*\* | .56\*\* | .45\*\* | .61\*\* | .48\*\* | .53\*\* | .41\*\* | .41\*\* | .39\*\* |  |  |  |  |
| 1. Additional course | 45% | -- | .11 | .16\* | .10 | .21\*\* | .25\*\* | .25\*\* | .37\*\* | .08 | .10 | .36\*\* | .21\* |  |  |  |
| 1. Age | 20.04 | 1.58 | .01 | .16\* | .26\* | -.01 | .09 | .06 | .02 | -.01 | .03 | .09 | .13 | .00 |  |  |
| 1. Female | 0.79 | 0.41 | .07 | .03 | .04 | .11 | .17\* | .13 | .04 | .08 | .02 | .18\* | .13 | .18\* | -.04 |  |
| 1. BIPOC | 0.64 | 0.48 | .12 | .13 | -.02 | -.05 | .02 | -.06 | .03 | -.14 | -.06 | -.10 | -.03 | -.04 | -.14\* | .01 |

*Notes.* \**p* < .05. \*\**p* < .01. Post = post-intervention. Additional course = intention to take additional psychology course(s) (0 = No/Not sure, 1 = Yes). Female (female = 1). BIPOC (White = 0; BIPOC = 1). *N* = 163 for correlations between baseline mindset and post measures. *N* = 199 for correlations between baseline mindset and age. N = 200 for correlations between baseline mindset, female, and BIPOC.

**Table S5**

*Goodness-of-fit for Structural Equation Models in Study 1*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Models | 2 | *df* | *p* | CFI | RMSEA  [90% CI] | SRMR |
| Engagement (no mediator) | 327.63 | 198 | .000 | .94 | .06 [.05/.08] | .06 |
| Engagement (with mediator) | 381.27 | 259 | .000 | .95 | .05 [.04/.07] | .05 |
| Need satisfaction, interest, and autonomy support (no mediator) | 824.51 | 510 | .000 | .91 | .06 [.05/.07] | .06 |
| Need satisfaction, interest, and autonomy support (with mediator) | 976.07 | 606 | .000 | .90 | .06 [.05/.07] | .06 |

*Notes.* Model fit information is not provided for models using logistic functions. df = Degrees of freedom. CI = Confidence interval. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Agentic Engagement Model Factor Loadings** | | | |  | **Behavioral Engagement Model Factor Loadings** | | | |
| **Item** | **BAM** | **MAM** | **BAE** | **PAE** | **Item** | **BAM** | **MAM** | **BBE** | **PBE** |
| BAM1 | 0.84 |  |  |  | BAM1 | 0.85 |  |  |  |
| BAM2 | 0.41 |  |  |  | BAM2 | 0.40 |  |  |  |
| BAM3 | 0.82 |  |  |  | BAM3 | 0.81 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| MAM1 |  | 0.72 |  |  | MAM1 |  | 0.71 |  |  |
| MAM2 |  | 0.57 |  |  | MAM2 |  | 0.57 |  |  |
| MAM3 |  | 0.76 |  |  | MAM3 |  | 0.77 |  |  |
|  |  |  |  |  |  |  |  |  |  |
| BAE1 |  |  | 0.84 |  | BBE1 |  |  | 0.57 |  |
| BAE2 |  |  | 0.78 |  | BBE2 |  |  | 0.74 |  |
| BAE3 |  |  | 0.71 |  | BBE3 |  |  | 0.48 |  |
| BAE4 |  |  | 0.73 |  | BBE4 |  |  | 0.84 |  |
| BAE5 |  |  | 0.84 |  | BBE5 |  |  | 0.83 |  |
|  |  |  |  |  |  |  |  |  |  |
| PAE1 |  |  |  | 0.86 | PBE1 |  |  |  | 0.67 |
| PAE2 |  |  |  | 0.84 | PBE2 |  |  |  | 0.82 |
| PAE3 |  |  |  | 0.58 | PBE3 |  |  |  | 0.56 |
| PAE4 |  |  |  | 0.84 | PBE4 |  |  |  | 0.76 |
| PAE5 |  |  |  | 0.83 | PAE5 |  |  |  | 0.84 |
|  | **Emotional Engagement Model Factor Loadings** | | | |  | **Cognitive Engagement Model Factor Loadings** | | | |
| **Item** | **BAM** | **MAM** | **BEE** | **PEE** | **Item** | **BAM** | **MAM** | **BCE** | **PCE** |
| BAM1 | 0.85 |  |  |  | BAM1 | 0.84 |  |  |  |
| BAM2 | 0.40 |  |  |  | BAM2 | 0.40 |  |  |  |
| BAM3 | 0.80 |  |  |  | BAM3 | 0.82 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| MAM1 |  | 0.71 |  |  | MAM1 |  | 0.72 |  |  |
| MAM2 |  | 0.59 |  |  | MAM2 |  | 0.58 |  |  |
| MAM3 |  | 0.77 |  |  | MAM3 |  | 0.76 |  |  |
|  |  |  |  |  |  |  |  |  |  |
| BEE1 |  |  | 0.79 |  | BCE1 |  |  | 0.84 |  |
| BEE2 |  |  | 0.81 |  | BCE2 |  |  | 0.82 |  |
| BEE3 |  |  | 0.84 |  | BCE3 |  |  | 0.89 |  |
| BEE4 |  |  | 0.76 |  | BCE4 |  |  | 0.55 |  |
| BEE5 |  |  | 0.56 |  |  |  |  |  |  |
|  |  |  |  |  | PCE1 |  |  |  | 0.90 |
| PEE1 |  |  |  | 0.87 | PCE2 |  |  |  | 0.85 |
| PEE2 |  |  |  | 0.85 | PCE3 |  |  |  | 0.88 |
| PEE3 |  |  |  | 0.79 | PCE4 |  |  |  | 0.62 |
| PEE4 |  |  |  | 0.82 |  |  |  |  |  |
| PEE5 |  |  |  | 0.72 |  |  |  |  |  |

**Table S6**

*Factor Loadings for Latent Variables in Engagement Structural Equation Models in Study 2*

*Notes*. BAM = Baseline agentic mindset. MAM = Mid-semester agentic mindset. BAE = Baseline agentic engagement. PAE = Post-intervention agentic engagement. BBE = Baseline behavioral engagement. PBE = Post-intervention behavioral engagement. BEE = Baseline emotional engagement. PEE = Post-intervention emotional engagement. BCE = Baseline cognitive engagement. PCE = Post-intervention cognitive engagement. Standardized factor loadings are reported. Items were allowed to load only on their target factor and factors were allowed to correlate. All cross-loadings were fixed to 0. Covariances between errors as indicated by modification indices were added to improve model fit. Three covariances among errors were added to the agentic engagement model. Five covariances among errors were added to the behavioral engagement model. One covariance among errors was added to the cognitive engagement model. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at *p* < .001.

**Table S7**

*Factor Loadings for Latent Variables in Need Satisfaction, Personal Interest, and Autonomy Support Structural Equation Models in Study 2*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Need Satisfaction Model**  **Factor Loadings** | | | | |  | **Personal Interest Model Factor Loadings** | | |  | **Autonomy Support Model Factor Loadings** | | |
| **Item** | **BAM** | **MAM** | **PANS** | **PCNS** | **PRNS** | **Item** | **BAM** | **MAM** | **PPI** | **Item** | **BAM** | **MAM** | **PIAS** |
| BAM1 | 0.84 |  |  |  |  | BAM1 | 0.83 |  |  | BAM1 | 0.81 |  |  |
| BAM2 | 0.41 |  |  |  |  | BAM2 | 0.41 |  |  | BAM2 | 0.42 |  |  |
| BAM3 | 0.82 |  |  |  |  | BAM3 | 0.82 |  |  | BAM3 | 0.84 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MAM1 |  | 0.72 |  |  |  | MAM1 |  | 0.71 |  | MAM1 |  | 0.72 |  |
| MAM2 |  | 0.59 |  |  |  | MAM2 |  | 0.60 |  | MAM2 |  | 0.58 |  |
| MAM3 |  | 0.75 |  |  |  | MAM3 |  | 0.75 |  | MAM3 |  | 0.76 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PANS1 |  |  | 0.89 |  |  | PPI1 |  |  | 0.86 | PIAS1 |  |  | 0.75 |
| PANS2 |  |  | 0.86 |  |  | PPI2 |  |  | 0.84 | PIAS2 |  |  | 0.87 |
| PANS3 |  |  | 0.70 |  |  | PPI3 |  |  | 0.59 | PIAS3 |  |  | 0.80 |
|  |  |  |  |  |  | PPI4 |  |  | 0.71 | PIAS4 |  |  | 0.88 |
| PCNS1 |  |  |  | 1.00 |  | PPI5 |  |  | 0.92 | PIAS5 |  |  | 0.79 |
| PCNS2 |  |  |  | 0.94 |  | PPI6 |  |  | 0.90 | PIAS6 |  |  | 0.80 |
| PCNS3 |  |  |  | 0.72 |  | PPI7 |  |  | 0.88 | PIAS7 |  |  | 0.71 |
|  |  |  |  |  |  | PPI8 |  |  | 0.91 | PIAS8 |  |  | 0.76 |
| PRNS1 |  |  |  |  | 0.79 |  |  |  |  | PIAS9 |  |  | 0.74 |
| PRNS2 |  |  |  |  | 0.86 |  |  |  |  | PIAS10 |  |  | 0.69 |
| PRNS3 |  |  |  |  | 0.94 |  |  |  |  | PIAS11 |  |  | 0.72 |
|  |  |  |  |  |  |  |  |  |  | PIAS12 |  |  | 0.74 |
|  |  |  |  |  |  |  |  |  |  | PIAS13 |  |  | 0.48 |
|  |  |  |  |  |  |  |  |  |  | PIAS14 |  |  | 0.61 |
|  |  |  |  |  |  |  |  |  |  | PIAS15 |  |  | 0.67 |

*Notes.* BAM = Baseline agentic mindset. MAM = Mid-semester agentic mindset. PANS = Post-intervention autonomy need satisfaction. PCNS = Post-intervention competence need satisfaction. PRNS = Post-intervention relatedness need satisfaction. PPI = Post-intervention personal interest. PIAS = Post-intervention instructor autonomy support. Standardized factor loadings are reported. Items were allowed to load only on their target factor and factors were allowed to correlate. All cross-loadings were fixed to 0. A negative residual variance for PCNS1 was fixed to zero. Covariances between errors as indicated by modification indices were added to improve model fit. One covariance among errors was added to the personal interest model. Two covariances among errors were added to the perceived instructor autonomy support model. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at *p* < .001.

**Table S8**

*Descriptive Statistics and Correlations for Manifest Outcome Variables in Study 2*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **M** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | | **8** | | **9** | |
| 1. Base mindset | 3.02 | 0.85 | -- |  |  |  |  |  |  |  | |  | |
| 2. Base agentic engagement | 2.66 | 1.02 | .17\* |  |  |  |  |  |  |  | |  | |
| 3. Base behavioral engagement | 3.66 | 0.82 | .17\* | .53\*\* |  |  |  |  |  |  | |  | |
| 4. Base emotional engagement | 3.80 | 0.76 | .24\*\* | .37\*\* | .57\*\* |  |  |  |  |  | |  | |
| 5. Base cognitive engagement | 4.03 | 0.76 | .19\* | .26\*\* | .44\*\* | .46\*\* |  |  |  |  | |  | |
| 6. Mid mindset | 3.29 | 0.77 | .38\*\* | .04 | .13 | .32\*\* | .17 |  |  |  | |  | |
| 7. Post agentic engagement | 3.03 | 0.97 | .30\*\* | .56\*\* | .41\*\* | .43\*\* | .17 | .22\* |  |  | |  | |
| 8. Post behavioral engagement | 3.51 | 0.89 | .20\* | .40\*\* | .72\*\* | .47\*\* | .35\*\* | .24\*\* | .55\*\* |  | |  | |
| 9. Post emotional engagement | 3.71 | 0.86 | .25\*\* | .17 | .35\*\* | .58\*\* | .33\*\* | .40\*\* | .40\*\* | .47\*\* | |  | |
| 10. Post cognitive engagement | 4.07 | 0.78 | .15 | .25\*\* | .40\*\* | .33\*\* | .52\*\* | .17 | .34\*\* | .45\*\* | | .43\*\* | |
| 11. Autonomy | 3.41 | 0.93 | .13 | .19\* | .27\*\* | .52\*\* | .25\*\* | .26\*\* | .41\*\* | .34\*\* | | .57\*\* | |
| 12. Competence | 3.94 | 0.86 | .17 | .24\*\* | .45\*\* | .35\*\* | .35\*\* | .25\*\* | .29\*\* | .40\*\* | | .49\*\* | |
| 13. Relatedness | 2.76 | 1.11 | .27\*\* | .31\*\* | .35\*\* | .33\*\* | .24\*\* | .21\* | .44\*\* | .37\*\* | | .30\*\* | |
| 14. Personal interest | 4.10 | 0.81 | .23\*\* | .10 | .34\*\* | .43\*\* | .41\*\* | .26\*\* | .22\* | .38\*\* | | .54\*\* | |
| 15. Perceived autonomy support | 3.46 | 0.79 | .25\* | .29\*\* | .19\* | .42\*\* | .23\*\* | .26\*\* | .57\*\* | .30\*\* | | .51\*\* | |
| 16. Additional courses | 61% | -- | .13 | .16 | .30\*\* | .35\*\* | .26\*\* | .19\* | .16 | .28\*\* | | .26\*\* | |
| 17. Intent major psychology | 35% | -- | .06 | .09 | .21\* | .29\*\* | .22\* | .23\* | .09 | .25\*\* | | .26\*\* | |
| 18. Age | 20.19 | 1.89 | .05 | .15 | .08 | -.02 | .06 | .10 | .09 | .09 | | .09 | |
| 19. Female | 0.79 | 0.41 | .02 | -.11 | .05 | .06 | .05 | -.05 | -.04 | .04 | | -.04 | |
| 20. BIPOC | 0.66 | 0.48 | .08 | .05 | -.04 | -.01 | -.01 | .01 | .15 | .01 | | -.04 | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** |
| 11. Autonomy | .36\*\* |  |  |  |  |  |  |  |  |  |
| 12. Competence | .47\*\* | .46\*\* |  |  |  |  |  |  |  |  |
| 13. Relatedness | .20\* | .38\*\* | .35\*\* |  |  |  |  |  |  |  |
| 14. Personal interest | .50\*\* | .40\*\* | .43\*\* | .18\* |  |  |  |  |  |  |
| 15. Perceived autonomy support | .37\*\* | .53\*\* | .39\*\* | .46\*\* | .30\*\* |  |  |  |  |  |
| 16. Additional courses | .23\*\* | .26\*\* | .27\*\* | .10 | .37\*\* | .11 |  |  |  |  |
| 17. Intent major psychology | .15 | .25\*\* | .18\* | .06 | .33\*\* | .06 | .53\*\* |  |  |  |
| 18. Age | .08 | .11 | .05 | -.02 | .02 | .10 | -.14 | -.02 |  |  |
| 19. Female | -.06 | -.13 | -.04 | .00 | -.05 | -.15 | .13 | -.01 | -.20\* |  |
| 20. BIPOC | -.14 | .11 | .00 | .20\* | -.04 | .24\* | -.17 | .01 | -.12 | -.15 |

*Notes.* \**p* < .05. \*\**p* < .01. Base = Baseline. Mid = Mid-semester. Post = post-intervention. Additional course = intention to take additional psychology course(s) (0 = No/Not sure, 1 = Yes). Intent major psychology = intention to major in psychology (0 = No/Not sure, 1 = Yes). Female (female = 1). BIPOC (White = 0; BIPOC = 1). *N* = 159 for correlations between baseline measures and between baseline measures, female, and BIPOC. *N* = 154 for correlations between baseline measures and age. *N* = 131 for correlations between baseline and mid-semester mindset and between mid-semester mindset, female, and BIPOC. *N* = 128 for correlation between age and mid-semester mindset. *N* = 130 for correlations between baseline and post measures, among post measures, and between post measures female, and BIPOC. *N* = 121 for correlations between mid-semester mindset and post measures. *N* = 127 for correlations between age and post measures.

**Table S9**

*Goodness-of-fit for Structural Equation Models in Study 2*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Models | 2 | *df* | *p* | CFI | RMSEA [90% CI] | SRMR |
| Agentic engagement (no mediator) | 60.74 | 58 | .37 | 1.00 | .02 [.00/.05] | .05 |
| Agentic engagement (with mediator) | 166.18 | 139 | .06 | .98 | .04 [.00/.05] | .06 |
| Behavioral engagement (no mediator) | 84.04 | 56 | .009 | .97 | .06 [.03/.08] | .05 |
| Behavioral engagement (with mediator) | 190.71 | 137 | .002 | .95 | .05 [.03/.07] | .06 |
| Emotional engagement (no mediator) | 96.12 | 60 | .002 | .96 | .06 [.04/.08] | .06 |
| Emotional engagement (with mediator) | 207.01 | 141 | .000 | .94 | .05 [.04/.07] | .07 |
| Cognitive engagement (no mediator) | 52.28 | 40 | .09 | .98 | .04 [.00/.07] | .05 |
| Cognitive engagement (with mediator) | 140.02 | 109 | .02 | .97 | .04 [.02/.06] | .06 |
| Need satisfaction (no mediator) | 77.61 | 43 | .001 | .96 | .08 [.05/.11] | .05 |
| Need satisfaction (with mediator) | 179.78 | 117 | .000 | .95 | .06 [.04/.07] | .06 |
| Personal interest (no mediator) | 67.64 | 40 | .004 | .97 | .07 [.04/.10] | .04 |
| Personal interest (with mediator) | 170.53 | 110 | .000 | .95 | .06 [.04/.08] | .06 |
| Autonomy support (no mediator) | 221.86 | 130 | .000 | .93 | .07 [.06/.09] | .05 |
| Autonomy support (with mediator) | 358.96 | 242 | .000 | .93 | .06 [.04/.07] | .06 |

*Notes.* Model fit information is not provided for models using logistic functions. df = Degrees of freedom. CI = Confidence interval. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

**Table S10**

*Factor Loadings for Latent Variables in Engagement Structural Equation Model in Study 3*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Factor Loadings** | | | | | | | | | |
| **Item** | **BAM** | **MAM** | **BAE** | **PAE** | **BBE** | **PBE** | **BEE** | **PEE** | **BCEG** | **PCEG** |
| BAM1 | 0.64 |  |  |  |  |  |  |  |  |  |
| BAM2 | 0.55 |  |  |  |  |  |  |  |  |  |
| BAM3 | 0.67 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| MAM1 |  | 0.85 |  |  |  |  |  |  |  |  |
| MAM2 |  | 0.60 |  |  |  |  |  |  |  |  |
| MAM3 |  | 0.77 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| BAE1 |  |  | 0.81 |  |  |  |  |  |  |  |
| BAE2 |  |  | 0.80 |  |  |  |  |  |  |  |
| BAE3 |  |  | 0.66 |  |  |  |  |  |  |  |
| BAE4 |  |  | 0.67 |  |  |  |  |  |  |  |
| BAE5 |  |  | 0.80 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| PAE1 |  |  |  | 0.85 |  |  |  |  |  |  |
| PAE2 |  |  |  | 0.86 |  |  |  |  |  |  |
| PAE3 |  |  |  | 0.75 |  |  |  |  |  |  |
| PAE4 |  |  |  | 0.74 |  |  |  |  |  |  |
| PAE5 |  |  |  | 0.86 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| BBE1 |  |  |  |  | 0.50 |  |  |  |  |  |
| BBE2 |  |  |  |  | 0.67 |  |  |  |  |  |
| BBE3 |  |  |  |  | 0.46 |  |  |  |  |  |
| BBE4 |  |  |  |  | 0.71 |  |  |  |  |  |
| BBE5 |  |  |  |  | 0.77 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| PBE1 |  |  |  |  |  | 0.57 |  |  |  |  |
| PBE2 |  |  |  |  |  | 0.70 |  |  |  |  |
| PBE3 |  |  |  |  |  | 0.58 |  |  |  |  |
| PBE4 |  |  |  |  |  | 0.89 |  |  |  |  |
| PBE5 |  |  |  |  |  | 0.91 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| BEE1 |  |  |  |  |  |  | 0.77 |  |  |  |
| BEE2 |  |  |  |  |  |  | 0.80 |  |  |  |
| BEE3 |  |  |  |  |  |  | 0.80 |  |  |  |
| BEE4 |  |  |  |  |  |  | 0.72 |  |  |  |
| BEE5 |  |  |  |  |  |  | 0.61 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| PEE1 |  |  |  |  |  |  |  | 0.79 |  |  |
| PEE2 |  |  |  |  |  |  |  | 0.86 |  |  |
| PEE3 |  |  |  |  |  |  |  | 0.80 |  |  |
| PEE4 |  |  |  |  |  |  |  | 0.80 |  |  |
| PEE5 |  |  |  |  |  |  |  | 0.72 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| BCE1 |  |  |  |  |  |  |  |  | 0.78 |  |
| BCE2 |  |  |  |  |  |  |  |  | 0.63 |  |
| BCE3 |  |  |  |  |  |  |  |  | 0.71 |  |
| BCE4 |  |  |  |  |  |  |  |  | 0.55 |  |
|  |  |  |  |  |  |  |  |  |  |  |
| PCE1 |  |  |  |  |  |  |  |  |  | 0.81 |
| PCE2 |  |  |  |  |  |  |  |  |  | 0.71 |
| PCE3 |  |  |  |  |  |  |  |  |  | 0.71 |
| PCE4 |  |  |  |  |  |  |  |  |  | 0.59 |

*Notes*. BAM = Baseline agentic mindset. MAM = Mid-semester agentic mindset. BAE = Baseline agentic engagement. PAE = Post-intervention agentic engagement. BBE = Baseline behavioral engagement. PBE = Post-intervention behavioral engagement. BEE = Baseline emotional engagement. PEE = Post-intervention emotional engagement. BCE = Baseline cognitive engagement. PCE = Post-intervention cognitive engagement. Standardized factor loadings are reported. Items were allowed to load only on their target factor and factors were allowed to correlate. All cross-loadings were fixed to 0. Seventeen covariances between errors were added to improve model fit. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at *p* < .001.

**Table S11**

*Factor Loadings for Latent Variables in Need Satisfaction, Personal Interest, Autonomy Support, and Class and Career Interest Structural Equation Model in Study 3*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Factor Loadings** | | | | | | | |
| **Item** | **BAM** | **MAM** | **ANS** | **CNS** | **RNS** | **PI** | **BIAS** | **PIAS** |
| BAM1 | 0.77 |  |  |  |  |  |  |  |
| BAM2 | 0.51 |  |  |  |  |  |  |  |
| BAM3 | 0.80 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| MAM1 |  | 0.86 |  |  |  |  |  |  |
| MAM2 |  | 0.59 |  |  |  |  |  |  |
| MAM3 |  | 0.76 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| ANS1 |  |  | 0.84 |  |  |  |  |  |
| ANS2 |  |  | 0.80 |  |  |  |  |  |
| ANS3 |  |  | 0.75 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| CNS1 |  |  |  | 0.94 |  |  |  |  |
| CNS2 |  |  |  | 0.91 |  |  |  |  |
| CNS3 |  |  |  | 0.71 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| RNS1 |  |  |  |  | 0.88 |  |  |  |
| RNS2 |  |  |  |  | 0.84 |  |  |  |
| RNS3 |  |  |  |  | 0.88 |  |  |  |
|  |  |  |  |  |  |  |  |  |
| PI1 |  |  |  |  |  | 0.66 |  |  |
| PI2 |  |  |  |  |  | 0.62 |  |  |
| PI3 |  |  |  |  |  | 0.68 |  |  |
| PI4 |  |  |  |  |  | 0.75 |  |  |
| PI5 |  |  |  |  |  | 0.87 |  |  |
| PI6 |  |  |  |  |  | 0.91 |  |  |
| PI7 |  |  |  |  |  | 0.88 |  |  |
| PI8 |  |  |  |  |  | 0.87 |  |  |
|  |  |  |  |  |  |  |  |  |
| BIAS1 |  |  |  |  |  |  | 0.74 |  |
| BIAS2 |  |  |  |  |  |  | 0.79 |  |
| BIAS4 |  |  |  |  |  |  | 0.73 |  |
| BIAS7 |  |  |  |  |  |  | 0.61 |  |
| BIAS10 |  |  |  |  |  |  | 0.78 |  |
| BIAS14 |  |  |  |  |  |  | 0.81 |  |
|  |  |  |  |  |  |  |  |  |
| PIAS1 |  |  |  |  |  |  |  | 0.75 |
| PIAS2 |  |  |  |  |  |  |  | 0.83 |
| PIAS3 |  |  |  |  |  |  |  | 0.70 |
| PIAS4 |  |  |  |  |  |  |  | 0.80 |
| PIAS5 |  |  |  |  |  |  |  | 0.79 |
| PIAS6 |  |  |  |  |  |  |  | 0.74 |
| PIAS7 |  |  |  |  |  |  |  | 0.70 |
| PIAS8 |  |  |  |  |  |  |  | 0.75 |
| PIAS9 |  |  |  |  |  |  |  | 0.74 |
| PIAS10 |  |  |  |  |  |  |  | 0.78 |
| PIAS11 |  |  |  |  |  |  |  | 0.76 |
| PIAS12 |  |  |  |  |  |  |  | 0.80 |
| PIAS13 |  |  |  |  |  |  |  | -- |
| PIAS14 |  |  |  |  |  |  |  | 0.76 |
| PIAS15 |  |  |  |  |  |  |  | 0.69 |

*Notes.* ANS = Autonomy need satisfaction. CNS = Competence need satisfaction. RNS = Relatedness need satisfaction. PI = Personal interest. BIAS = Baseline instructor autonomy support (short-version). PIAS = Post instructor autonomy support (long-version). Standardized factor loadings are reported. Items were allowed to load only on their target factor and factors were allowed to correlate. All cross-loadings were fixed to 0. One reverse-coded item (PIAS13) was dropped to improve model fit. Six covariances between errors were added to improve model fit. Adding error covariances did not meaningfully change factor loadings or correlations among latent factors. All factor loadings and correlations are significant at p < .001.

**Table S12**

*Descriptive Statistics and Correlations for Manifest Variables in Study 3*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **M** | **SD** | **1** | **2** | **3** | | **4** | | **5** | | **6** | | **7** | **8** | **9** | **10** | **11** |
| 1. Base mindset | 2.99 | 0.88 | -- |  |  | |  | |  | |  | |  |  |  |  |  |
| 2. Base agentic engagement | 2.70 | 0.97 | .29\*\* | -- |  | |  | |  | |  | |  |  |  |  |  |
| 3. Base behavioral engagement | 3.97 | 0.67 | .13\*\* | .35\*\* | -- | |  | |  | |  | |  |  |  |  |  |
| 4. Base emotional engagement | 3.72 | 0.79 | .28\*\* | .40\*\* | .45\*\* | | -- | |  | |  | |  |  |  |  |  |
| 5. Base cognitive engagement | 3.72 | 0.82 | .24\*\* | .31\*\* | .30\*\* | | .45\*\* | | -- | |  | |  |  |  |  |  |
| 6. Base autonomy support | 3.42 | 0.82 | .33\*\* | .44\*\* | .17\*\* | | .43\*\* | | .26\*\* | | -- | |  |  |  |  |  |
| 7. Mid mindset | 3.11 | 0.89 | .45\*\* | .24\*\* | | .08\* | | .27\*\* | | .20\*\* | | .28\*\* | -- |  |  |  |  |
| 8. Post agentic engagement | 2.74 | 1.02 | .21\*\* | .48\*\* | .25\*\* | | .30\*\* | | .24\*\* | | .33\*\* | | .28\*\* | -- |  |  |  |
| 9. Post behavioral engagement | 3.74 | 0.85 | .14\*\* | .28\*\* | .57\*\* | | .35\*\* | | .24\*\* | | .16\*\* | | .11\*\* | .40\*\* | -- |  |  |
| 10. Post emotional engagement | 3.44 | 0.93 | .25\*\* | .31\*\* | .27\*\* | | .52\*\* | | .30\*\* | | .33\*\* | | .32\*\* | .50\*\* | .54\*\* | -- |  |
| 11. Post cognitive engagement | 3.76 | 0.84 | .22\*\* | .22\*\* | .20\*\* | | .29\*\* | | .51\*\* | | .24\*\* | | .22\*\* | .35\*\* | .35\*\* | .44\*\* | -- |
| 12. Autonomy | 3.04 | 1.04 | .25\*\* | .28\*\* | .16\*\* | | .46\*\* | | .26\*\* | | .33\*\* | | .33\*\* | .47\*\* | .35\*\* | .71\*\* | .39\*\* |
| 13. Competence | 3.49 | 1.02 | .21\*\* | .24\*\* | .21\*\* | | .39\*\* | | .27\*\* | | .25\*\* | | .28\*\* | .41\*\* | .38\*\* | .67\*\* | .39\*\* |
| 14. Relatedness | 3.07 | 1.15 | .17\*\* | .28\*\* | .17\*\* | | .25\*\* | | .20\*\* | | .25\*\* | | .24\*\* | .41\*\* | .25\*\* | .44\*\* | .29\*\* |
| 15. Personal interest | 4.07 | 0.76 | .09\*\* | .16\*\* | .22\*\* | | .40\*\* | | .34\*\* | | .19\*\* | | .17\*\* | .26\*\* | .28\*\* | .55\*\* | .43\*\* |
| 16. Post autonomy support | 3.34 | 0.77 | .23\*\* | .31\*\* | .05 | | .24\*\* | | .18\*\* | | .46\*\* | | .33\*\* | .57\*\* | .25\*\* | .52\*\* | .33\*\* |
| 17. Science course interest | 3.66 | 1.23 | .10\* | .09\* | .06 | | .26\*\* | | .20\* | | .18\*\* | | .22\*\* | .22\*\* | .11\*\* | .36\*\* | .23\*\* |
| 18. Science career interest | 3.59 | 1.41 | .04 | .06 | -.01 | | .17\*\* | | .10\* | | .16\*\* | | .16\*\* | .21\*\* | .04 | .25\*\* | .17\*\* |
| 19. Age | 19.12 | 1.94 | -.01 | .07 | -.00 | | -.02 | | .03 | | .03 | | -.02 | .08 | -.02 | .00 | -.02 |
| 20. Female | 0.56 | 0.50 | -.03 | -.12\*\* | .09\* | | -.12\*\* | | -.06 | | -.10\* | | -.05 | -.13\*\* | .02 | -.13\*\* | -.07 |
| 21. URM | -0.65 | 0.76 | .07 | -.05 | .00 | | .04 | | -.07 | | -.03 | | .06 | -.07 | .00 | .00 | -.08\* |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| 13. Competence | .71\*\* | -- |  |  |  |  |  |  |  |
| 14. Relatedness | .41\*\* | .37\*\* | -- |  |  |  |  |  |  |
| 15. Personal interest | .43\*\* | .45\*\* | .28\*\* | -- |  |  |  |  |  |
| 16. Post autonomy support | .51\*\* | .43\*\* | .41\*\* | .26\*\* | -- |  |  |  |  |
| 17. Science course interest | .36\*\* | .32\*\* | .19\*\* | .50\*\* | .25\*\* | -- |  |  |  |
| 18. Science career interest | .29\*\* | .24\*\* | .16\*\* | .33\*\* | .26\*\* | .73\*\* | -- |  |  |
| 19. Age | -.01 | -.02 | -.05 | -.02 | .07 | -.03 | -.00 | -- |  |
| 20. Female | -.14\*\* | -.16\*\* | -.06 | .01 | -.15\*\* | -.01 | -.06 | -.08\* | -- |
| 21. URM | .05 | -.01 | -.07 | -.06 | .00 | -.02 | .02 | -.02 | -.08\* |

*Notes.* Base = Baseline. Mid = Mid-semester. Post = post-intervention. Female (female = 1). URM (White = 0; Asian = 0; URM = 1). *N* = 706 for correlations between baseline measures. *N* = 667 for correlations between baseline and mid-semester mindset. *N* = 629 for correlations between mid-semester mindset and post measures. *N* = 644 for correlations with post measures. *N* = 701, *N* = 703, *N* = 666 for correlations between baseline measures and age, female, and URM, respectively. *N* = 662, *N*= 664, *N* = 630 for correlations between mid-semester mindset and age, female, and URM, respectively. *N* = 640, *N* = 642, *N* = 610 for correlations between post measures and age, female, and URM, respectively. \**p* < .05. \*\**p* < .01.

**Table S13**

*Goodness-of-fit for Structural Equation Models in Study 3*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Models | 2 | *df* | *p* | CFI | RMSEA [90% CI] | SRMR |
| Engagement (with mediator) | 2002.32 | 1016 | .000 | .93 | .04 [.04/.04] | .06 |
| Engagement (no mediator) | 1671.05 | 769 | .000 | .93 | .04 [.04/.05] | .07 |
| Need satisfaction, personal interest, autonomy support, class and career interest (with mediator) | 2148.43 | 1058 | .000 | .93 | .04 [.04/.04] | .07 |
| Need satisfaction, personal interest, autonomy support, class and career interest (no mediator) | 1811.52 | 804 | .000 | .93 | .04 [.04/.05] | .08 |

*Notes.* df = Degrees of freedom. CI = Confidence interval. Values greater than .90 for the comparative fit index (CFI) and less than or equal to .08 for the root mean square error of approximation (RMSEA) and the standardized root mean squared residual (SRMR) are generally considered indicative of good fit.

**Group Differences in Intervention Effects on Student Outcomes via Agentic Mindset**

***Description of Analytic Approach***

We tested whether the models varied for female and URM students compared to their counterparts using multigroup measurement and structural invariance testing. This method involved the comparison of increasingly restrictive models to determine whether the same items measured each construct across groups (called configural invariance), whether factor loadings were equal across groups (i.e., whether constructs have the same meaning across groups; called metric or weak invariance) and whether intercepts (or starting values of the scales) were equal across groups (called scalar or strong invariance). Once at least partial measurement invariance was established, we tested whether the structural paths (i.e., the relationships between the variables) varied across groups (called structural invariance). To compare models, we conducted Satorra-Bentler scaled chi-square difference tests, which adjusted for the use of MLR. For these multigroup comparison models, a separate model for each outcome was conducted in order to locate measurement and structural differences. Thus, in total, 18 models were examined (9 comparing women and men, and 9 comparing URM and WR students).

***Description of Results***

We tested whether the effects of condition on outcomes via mindset varied for women compared to men using a multigroup measurement and structural invariance approach. Each outcome was examined in a separate path model. Weak invariance was established for all models, except for the emotional engagement model (partial weak invariance was achieved). Strong invariance was established for cognitive engagement, personal interest, perceived autonomy support, class interest, and career interest models. Partial strong invariance was achieved for the agentic engagement, behavioral engagement, emotional engagement, and need satisfaction models. After (partial) measurement invariance was established, results indicated structural differences between women and men in the agentic engagement, need satisfaction, and perceived instructor autonomy support models. First, the direct effect of the agentic orientation condition (compared to the study skills condition) on end-of-semester agentic engagement was negative and statistically significant for men (*β* = -0.13, *SE* = .06, *p* = .02), but positive and nonsignificant for women (*β* = 0.07, *SE* = .05, *p* = .23), Wald χ2 = 8.43, df = 1, *p* < .01. Second, the direct effect of the agentic orientation condition (compared to the study skills condition) on competence need satisfaction was positive and significant for women (*β* = 0.10, *SE* = .05, *p* = .05) and negative and nonsignificant for men (*β* = -0.05, *SE* = .06, *p* = .40), Wald χ2 = 7375, df = 1, *p* = .01. Third, the direct effect of the agentic orientation condition (compared to the study skills condition) on end-of-semester instructor autonomy support was negative and nonsignificant for men (*β* = -0.10, *SE* = .08, *p* = .22), and positive and nonsignificant for women (*β* = 0.04, *SE* = .06, *p* = .53), Wald χ2 = 5.65, df = 1, *p* = .02.

Using the same approach, we tested whether the effects of condition on outcomes via mindset varied for URM students compared to WR students. Weak invariance was established for all models, except for agentic engagement and behavioral engagement. Partial weak invariance was achieved for agentic engagement; however, partial invariance could not be achieved for behavioral engagement, and therefore, this model was excluded from further analysis. Strong invariance was established for three models (cognitive engagement, personal interest, and instructor autonomy support) and partial strong invariance was achieved for all remaining models. After (partial) measurement invariance was established, results indicated structural differences between URM and WR students in the agentic engagement and cognitive engagement models. First, the direct effect of the agentic orientation condition (compared to the study skills condition) on end-of-semester agentic engagement was negative and nonsignificant for WR students (*β* = -0.06, *SE* = .05, *p* = .22), but positive and statistically significant for URM students (*β* = 0.22, *SE* = .10, *p* = .03), Wald χ2 = 6.82, df = 1, *p* = .01. Second, results also indicated that baseline agentic engagement more strongly predicted end-of-semester agentic engagement for WR students (B = 0.51, *SE* = .04, *p* < .01) compared to URM students (*β* = 0.30, *SE* = .10, *p* < .01), Wald χ2 = 6.53, df = 1, *p* = .01. Third, the direct effect of the agentic orientation condition (compared to the study skills condition) on end-of-semester cognitive engagement was negative and nonsignificant for WR students (*β* = -0.02, *SE* = .05, *p* = .73), but positive and statistically significant for URM students (*β* = 0.23, *SE* = .10, *p* = .02), Wald χ2 = 5.78, df = 1, *p* = .02. Fourth, the effect of mid-semester agentic mindset to cognitive agentic was positive and significant for WR students (*β* = 0.20, *SE* = .05, *p* < .01), but negative and significant for URM students (*β* = -0.22, *SE* = 10, *p* = .03), Wald χ2 = 11.96, df = 1, *p* < .01. These results are summarized in Tables S14 and S15 in the online supplemental materials (below).

**Table S14**

Measurement and Structural Invariance Results for Gender.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | AIC | BIC | *χ2* | *df* | *Scaling factor* | *Scaling correction* | *Δ SBS χ2* | *Δ df* | *P* |
| Agentic Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 28974 | 29493 | 448.75 | 254 | 1.13 |  |  |  |  |
| Metric | 28963 | 29428 | 462.21 | 266 | 1.13 | 1.13 | 13.46 | 12 | .34 |
| Scalar | 28960 | 29352 | 491.21 | 282 | 1.12 | 0.95 | 29.21 | 16 | .02 |
| Partial Scalar | 28955 | 29352 | 484.86 | 281 | 1.12 | 0.94 | 22.01 | 15 | .11 |
| Structural | 28957 | 29321 | 500.04 | 288 | 1.12 | 1.12 | 15.18 | 7 | .04 |
| Behavioral Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 26716 | 27254 | 530.65 | 250 | 1.06 |  |  |  |  |
| Metric | 26708 | 27191 | 544.58 | 262 | 1.06 | 1.06 | 13.93 | 12 | .31 |
| Scalar | 26715 | 27125 | 583.80 | 278 | 1.06 | 1.06 | 39.22 | 16 | .00 |
| Partial scalar | 26701 | 27134 | 560.05 | 273 | 1.06 | 1.06 | 15.47 | 11 | .16 |
| Structural | 26691 | 27092 | 565.24 | 280 | 1.06 | 1.06 | 5.19 | 7 | .64 |
| Emotional Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 26736 | 27256 | 473.44 | 254 | 1.10 |  |  |  |  |
| Metric | 26750 | 27214 | 509.14 | 266 | 1.10 | 1.10 | 35.70 | 12 | .00 |
| Partial Metric | 26729 | 27203 | 487.18 | 264 | 1.10 | 1.10 | 13.74 | 10 | .19 |
| Scalar | 26742 | 27143 | 532.48 | 280 | 1.09 | 0.93 | 48.11 | 16 | .00 |
| Partial Scalar | 26725 | 27162 | 500.60 | 272 | 1.09 | 0.76 | 12.84 | 8 | .12 |
| Structural | 26721 | 27167 | 509.37 | 279 | 1.09 | 1.09 | 8.77 | 7 | .27 |
| Cognitive Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 24932 | 25397 | 340.91 | 192 | 1.07 |  |  |  |  |
| Metric | 24921 | 25340 | 346.90 | 202 | 1.08 | 1.27 | 7.77 | 10 | .65 |
| Scalar | 24914 | 25270 | 367.71 | 216 | 1.08 | 1.08 | 20.81 | 14 | .11 |
| Structural | 24910 | 25233 | 376.12 | 223 | 1.08 | 1.08 | 8.41 | 7 | .30 |
| Need Satisfaction |  |  |  |  |  |  |  |  |  |
| Configural | 25662 | 26218 | 355.56 | 208 | 1.03 |  |  |  |  |
| Metric | 25655 | 26165 | 367.38 | 218 | 1.03 | 1.03 | 11.82 | 10 | .30 |
| Scalar | 25652 | 26094 | 396.24 | 233 | 1.03 | 1.03 | 28.86 | 15 | .02 |
| Partial Scalar | 25649 | 26095 | 390.37 | 232 | 1.03 | 1.03 | 22.99 | 14 | .06 |
| Structural | 25649 | 26041 | 415.09 | 244 | 1.03 | 1.03 | 24.72 | 12 | .02 |
| Personal Interest |  |  |  |  |  |  |  |  |  |
| Configural | 21173 | 21620 | 415.00 | 196 | 1.16 |  |  |  |  |
| Metric | 21160 | 21556 | 417.32 | 207 | 1.18 | 1.54 | 7.18 | 11 | .78 |
| Scalar | 21147 | 21480 | 433.77 | 221 | 1.17 | 1.02 | 14.75 | 14 | .40 |
| Structural | 21139 | 2144 | 439.32 | 227 | 1.16 | 0.79 | 2.65 | 6 | .85 |
| Autonomy Support |  |  |  |  |  |  |  |  |  |
| Configural | 41557 | 42395 | 1366.84 | 674 | 1.16 |  |  |  |  |
| Metric | 41539 | 42277 | 1396.15 | 696 | 1.15 | 0.84 | 23.75 | 22 | .36 |
| Scalar | 41524 | 42144 | 1438.01 | 722 | 1.14 | 0.87 | 38.70 | 26 | >.05 |
| Structural | 41525 | 42113 | 1453.56 | 729 | 1.14 | 1.14 | 15.55 | 7 | .03 |
| Class Interest |  |  |  |  |  |  |  |  |  |
| Configural | 13179 | 13425 | 66.77 | 44 | 0.98 |  |  |  |  |
| Metric | 13173 | 13401 | 68.64 | 48 | 0.99 | 1.10 | 2.29 | 4 | .68 |
| Scalar | 13171 | 13371 | 78.38 | 54 | 0.99 | 0.99 | 9.74 | 6 | .14 |
| Structural | 13164 | 13338 | 83.03 | 60 | 1.00 | 1.09 | 4.99 | 6 | .55 |
| Career Interest |  |  |  |  |  |  |  |  |  |
| Configural | 13358 | 13604 | 61.88 | 44 | 1.01 |  |  |  |  |
| Metric | 13353 | 13581 | 64.00 | 48 | 1.01 | 1.01 | 2.12 | 4 | .71 |
| Scalar | 13351 | 13551 | 73.64 | 54 | 1.01 | 1.01 | 9.64 | 6 | .14 |
| Structural | 13349 | 13522 | 84.00 | 60 | 1.01 | 1.01 | 10.36 | 6 | .11 |

*Notes.* Scales with 3 items (autonomy, competence, relatedness need satisfaction) were combined for model identification. All other scales were tested separately to locate specific measures that may be variant across gender group. Because the Mplus estimator MLR was used, we compared model fit using the Satorra-Bentler Scaled (SBS) Chi-Square Difference Test. Cut off of p < .05 was used to determine whether the model was variant across gender group.

**Table S15**

Measurement and Structural Invariance Results for Racial Group.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | AIC | BIC | *χ2* | *df* | *Scaling factor* | *Scaling correction* | *Δ SBS χ2* | *Δ df* | *p* |
| Agentic Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 27412 | 27925 | 506.14 | 254 | 1.12 |  |  |  |  |
| Metric | 27417 | 27876 | 534.27 | 266 | 1.13 | 1.34 | 27.46 | 12 | .01 |
| Partial Metric | 27408 | 27872 | 525.11 | 265 | 1.11 | 0.88 | 18.20 | 11 | .08 |
| Scalar | 27418 | 27809 | 562.64 | 281 | 1.11 | 1.11 | 37.53 | 16 | .00 |
| Partial Scalar | 27404 | 27814 | 544.20 | 277 | 1.11 | 1.11 | 19.09 | 12 | .09 |
| Structural | 27413 | 27791 | 566.58 | 284 | 1.11 | 1.11 | 22.38 | 7 | .00 |
| Behavioral Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 25339 | 25870 | 520.62 | 250 | 1.06 |  |  |  |  |
| Metric | 25341 | 25818 | 544.70 | 262 | 1.07 | 1.28 | 24.23 | 12 | .02 |
| Partial Metric | 25340 | 25831 | 538.71 | 259 | 1.07 | 1.35 | 18.22 | 9 | .03 |
| Emotional Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 25412 | 25925 | 505.07 | 254 | 1.08 |  |  |  |  |
| Metric | 25402 | 25861 | 517.91 | 266 | 1.08 | 1.08 | 12.84 | 12 | .38 |
| Scalar | 25401 | 25788 | 548.59 | 282 | 1.07 | 0.90 | 30.59 | 16 | .02 |
| Partial Scalar | 25399 | 25800 | 540.78 | 279 | 1.07 | 0.87 | 22.29 | 13 | >.05 |
| Structural | 25394 | 25763 | 549.86 | 286 | 1.07 | 1.07 | 9.08 | 7 | .25 |
| Cognitive Engagement |  |  |  |  |  |  |  |  |  |
| Configural | 23572 | 24032 | 352.91 | 192 | 1.07 |  |  |  |  |
| Metric | 23564 | 23978 | 364.36 | 202 | 1.07 | 1.07 | 11.45 | 10 | .32 |
| Scalar | 23558 | 23909 | 385.38 | 216 | 1.06 | 0.92 | 20.35 | 14 | .12 |
| Structural | 23567 | 23887 | 407.26 | 223 | 1.06 | 1.06 | 21.88 | 7 | .00 |
| Need Satisfaction |  |  |  |  |  |  |  |  |  |
| Configural | 24424 | 24973 | 352.32 | 208 | 1.06 |  |  |  |  |
| Metric | 24412 | 24916 | 362.51 | 218 | 1.05 | 0.84 | 8.52 | 10 | .58 |
| Scalar | 24410 | 24846 | 390.57 | 233 | 1.05 | 1.05 | 28.06 | 15 | .02 |
| Partial Scalar | 24407 | 24852 | 383.12 | 231 | 1.05 | 1.05 | 20.61 | 13 | .08 |
| Structural | 24398 | 24790 | 398.92 | 243 | 1.05 | 1.05 | 15.80 | 12 | .20 |
| Personal Interest |  |  |  |  |  |  |  |  |  |
| Configural | 20111 | 20552 | 420.95 | 196 | 1.12 |  |  |  |  |
| Metric | 20103 | 20495 | 431.63 | 207 | 1.13 | 1.31 | 12.44 | 11 | .33 |
| Scalar | 20097 | 20425 | 454.11 | 221 | 1.12 | 0.97 | 21.46 | 14 | .09 |
| Structural | 20090 | 20392 | 460.62 | 227 | 1.12 | 1.12 | 6.51 | 6 | .37 |
| Autonomy Support |  |  |  |  |  |  |  |  |  |
| Configural | 39488 | 40316 | 1353.84 | 674 | 1.13 |  |  |  |  |
| Metric | 39459 | 40189 | 1368.56 | 696 | 1.13 | 1.13 | 14.72 | 22 | .87 |
| Scalar | 39440 | 40053 | 1402.14 | 722 | 1.13 | 1.13 | 33.58 | 26 | .15 |
| Structural\*\*\* | 39432 | 40013 | 1408.95 | 729 | 1.12 | 0.09 | -- | -- | -- |
| Class Interest |  |  |  |  |  |  |  |  |  |
| Configural | 12497 | 12740 | 63.64 | 44 | 1.09 |  |  |  |  |
| Metric | 12496 | 12721 | 70.80 | 48 | 1.07 | 0.85 | 7.52 | 4 | .11 |
| Scalar | 12498 | 12696 | 84.34 | 54 | 1.07 | 1.07 | 13.54 | 6 | .04 |
| Partial Scalar | 12496 | 12699 | 80.63 | 53 | 1.07 | 1.07 | 9.83 | 5 | .08 |
| Structural | 12488 | 12664 | 85.18 | 59 | 1.07 | 1.07 | 4.55 | 6 | .60 |
| Career Interest |  |  |  |  |  |  |  |  |  |
| Configural | 12665 | 12908 | 63.01 | 44 | 1.08 |  |  |  |  |
| Metric | 12664 | 12889 | 70.46 | 48 | 1.06 | 0.84 | 7.90 | 4 | .10 |
| Scalar | 12666 | 12864 | 84.01 | 54 | 1.06 | 1.06 | 13.55 | 6 | .04 |
| Partial Scalar | 12662 | 12865 | 78.15 | 53 | 1.06 | 1.06 | 7.69 | 5 | .17 |
| Structural | 12654 | 12830 | 83.59 | 59 | 1.04 | 0.86 | 4.74 | 6 | .58 |

*Notes.* Scales with 3 items (autonomy, competence, relatedness need satisfaction) were combined for model identification. All other scales were tested separately to locate specific measures that may be variant across racial group. Because the Mplus estimator MLR was used, we compared model fit using the Satorra-Bentler Scaled (SBS) Chi-Square Difference Test. Cut off of p < .05 was used to determine whether the model was variant across racial group. \*\*\*The SBS method returned a negative chi-square, which is a drawback of the method. Instead, we directly tested for group differences of each path using the MODEL TEST command in Mplus. All 7 path comparisons were nonsignificant (*p* < .05).