Table 1. Demographic characteristics for participating youth.

|  |  |
| --- | --- |
| Youth | Percentage |
| *Sex* |  |
| Male | 50 |
| Female | 50 |
| *Race/Ethnicity* |  |
| Hispanic | 48 |
| White | 6 |
| Black | 36 |
| Multi-racial | 3 |
| Asian/Pacific Islander | 7 |
| *Parent Education High School or Below* | 79 |
| Graduated from College (B.A. or B.S.) | 21 |

Table 2. Items for constructs measured through ESM

|  |  |
| --- | --- |
| Construct | Item |
| Cognitive engagement | As you were signaled, were you learning anything or getting better at something? |
| Behavioral engagement | As you were signaled, how hard were you working? |
| Affective engagement | As you were signaled, did you enjoy what you are doing? |
| Perceived challenge | As you were signaled, how challenging was the main activity? |
| Perceived competence | As you were signaled, were you good at the main activity? |

Table 3. Codes for the aspects of work with data.

|  |  |  |  |
| --- | --- | --- | --- |
| Code Name | Values | Description | Example |
| Asking questions | 1: Present; 0: Not Present | Discussing and exploring topics to investigate and pose questions. | Youth generated questions they investigated related to tide ponds in an estuary ecosystem. |
| Making observations | 1: Present; 0: Not Present | Watching and noticing what is happening with respect to the phenomena or problem being investigated. | Youth observed the projectile motion of an object launched with a catapult. |
| Generating data | 1: Present; 0: Not Present | Figuring out how or why to inscribe an observation as data and generating coding frames or measurement tools. | Youth wrote in a table the number of pieces of recyclables they collected in parts of local waterways. |
| Data modeling | 1: Present; 0: Not Present | Understanding and explaining phenomena using models of the data that account for variability or uncertainty. | Youth calculated the average number of plant species found across a number of sites in the field. |
| Interpreting and communicating findings | 1: Present; 0: Not Present | Discussing and sharing findings. | Youth presented the outcomes of an investigation or engineered design in light of a research question or problem. |

Table 4. Bivariate correlations among the study variables.

Pre-interest Cog. eng. Beh. eng. Aff. eng. Chall. Comp. Ask. Obs. Gen. Mod. Com.

Pre-interest

Cog. eng. .14

Beh. eng. .13 .60

Aff. eng. .12 .59 .57

Chall. .15 .30 .27 .27

Comp. .06 .40 .41 .47 .08

Ask. -.18 .02 .01 .01 -.01 -.01

Obs. .11 .01 .03 -.01 -.02 -.00 .38

Gen. -.08 .02 .02 -.03 -.01 -.05 .31 .30

Mod. -.03 .02 .01 .01 .03 -.00 .42 .19 .35

Com. -.10 .00 -.02 -.05 -.06 -.03 .42 .20 .38 .50

Table 5. Fit measures for candidate models.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n\_profile | model | LL | AIC | BIC | SABIC | CAIC | Entropy | VLMR\_val | VLMR\_p | LMR\_val | LMR\_p |
| 2 | 1 | -19894.141 | -19894.141 | 39916.157 | 39865.319 | 39820.466 | 0.807 | 3468.199 | 0 | 3397.353 | 0 |
| 3 | 1 | -19453.381 | -19453.381 | 39082.592 | 39012.689 | 38951.1068 | 0.794 | 881.519 | 0.0126 | 863.512 | 0.0136 |
| 4 | 1 | -19196.328 | -19196.328 | 38616.439 | 38527.472 | 38449.2095 | 0.811 | 514.107 | 0 | 503.605 | 0 |
| 5 | 1 | -18817.934 | -18817.934 | 37907.604 | 37799.573 | 37704.6812 | 0.913 | 756.788 | 0 | 741.329 | 0 |
| 6 | 1 | -18648.785 | -18648.785 | 37617.262 | 37490.167 | 37378.6954 | 0.888 | 338.296 | 0 | 331.386 | 0 |
| 7 | 1 | -18407.232 | -18407.232 | 37182.108 | 37035.948 | 36907.9484 | 0.886 | 523.141 | 0.0112 | 512.455 | 0.0121 |
| 2 | 2 | -19107.734 | -19107.734 | 38423.266 | 38340.654 | 38267.946 | 0.924 | 850.304 | 0 | 832.934 | 0 |
| 3 | 2 | -18897.062 | -18897.062 | 38049.877 | 37948.201 | 37858.8461 | 0.88 | 421.343 | 0 | 412.736 | 0 |
| 4 | 2 | -18659.676 | -18659.676 | 37623.057 | 37502.317 | 37396.3664 | 0.922 | 474.773 | 0 | 465.075 | 0 |
| 5 | 2 | -18474.834 | -18474.834 | 37301.328 | 37161.523 | 37039.0274 | 0.901 | 304.938 | 0 | 298.709 | 0 |
| 7 | 2 | -17035.006 | -17035.006 | 34517.58 | 34339.647 | 34184.2136 | 0.965 |  |  | -1374.094 | 0.8708 |

Table 6. Descriptions of the six profiles

|  |  |  |
| --- | --- | --- |
| Profile | Percentage of All Responses | Description |
| Universally Low | 22.55 | Low levels of working hard, learning something new, and enjoying the activity, and perceptions challenge and competence. |
| Only Behaviorally Engaged | 12.51 | Moderate levels of enjoyment, low levels of hard work, and moderate levels of learning something new, challenge, and competence. |
| Only Affectively Engaged | 11.66 | Moderate levels of enjoyment, low levels of hard work, and moderate levels of learning something new, challenge, and competence. |
| All Moderate | 21.57 | This profile was characterized by moderate levels of the three indicators of working hard, learning something new, enjoying the activity, challenge, and competence. |
| Engaged and Competent But Not Challenged | 15.21 | This profile was characterized by high levels of working hard, learning something new, enjoying the activity, and competence, but low levels of challenge. |
| Full | 16.50 | This profile was characterized by high levels of working hard, learning something new, enjoying the activity, challenge, and competence. |

Table 7. Findings for relations between the aspects of work with data and youth characteristics and the profiles of engagement.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Universally low (*SE*) | Only behavioral (*SE*) | Only affective (*SE*) | Eng. and comp., not chall. (*SE*) | All moderate (*SE*) | Full (*SE*) |
| Intercept | 0.356 (0.086)\* | 0.107 (0.045)\* | 0.354 (0.075)\* | 0.022 (0.063) | 0.09 (0.04)\* | 0.094 (0.083) |
| Pre-interest | -0.047 (0.022) | -0.013 (0.012) | -0.012 (0.019) | 0.039 (0.016)\* | 0.007 (0.01) | 0.018 (0.021) |
| Gender-Female | 0.06 (0.037)+ | 0.019 (0.019) | -0.038 (0.033) | 0.025 (0.028) | -0.02 (0.018) | -0.035 (0.037) |
| URM status | -0.01 (0.052) | 0.031 (0.026) | -0.076 (0.046) | -0.012 (0.04) | 0.018 (0.025) | 0.043 (0.053) |
| Asking | -0.015 (0.018) | 0.015 (0.015) | 0.023 (0.017)+ | -0.011 (0.015) | 0.004 (0.014) | -0.019 (0.016) |
| Observing | 0.003 (0.018) | 0.013 (0.015) | 0.007 (0.017) | 0.009 (0.015) | -0.017 (0.014) | -0.025 (0.016) |
| Generating | 0.004 (0.019) | -0.023 (0.016) | -0.004 (0.018) | 0 (0.015) | -0.012 (0.015) | 0.034 (0.017)\* |
| Modeling | -0.014 (0.017) | 0.014 (0.014) | 0.012 (0.016) | -0.014 (0.014) | -0.02 (0.013) | 0.027 (0.015)\* |

*Note.* + p < .10; p < .05