

Examining Relationships Between Choice, Affect, and Engagement in Informal STEM Programs

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Method
Results
Discussion



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Engagement and OST

STEM interest and engagement

Long-term benefits

Programs are optional



Choice as a Predictor of Engagement

Proximal choice

Self-Determination

Distal choice

Control-Value

Interest or Choice?

Attribution



Importance of Affect

Choice may impact experiences

Possible downstream consequences

Affect in science learning contexts?



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Research Questions

What is the relationship between choice in the decision to register for the program and momentary engagement in program activities?

What is the relationship between momentary affect (positive and negative) and momentary engagement in program activities?

Do choice and affect (positive and negative) have interactive associations with youths' momentary engagement?



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Context

Nine OST STEM Programs

Pre-survey

Experience sampling method (2968 responses)



Sample

203 adolescents (50% female; 10-16 years old)

6% White

7% Asian

36% African American

3% Multi-racial/other

48% Hispanic



Outcome Variable (from ESM)

Momentary engagement ($\alpha = .85$)

Concentration (How well were you concentrating?)

Effort (How hard were you working?)

Interest (Was the main activity interesting?)

Enjoyment (Did you enjoy what you were doing?)



Choice (Pre-Survey)

“Whose idea was it to sign up for this summer program?”

- 1) Student chose but somebody else also chose (45%)
- 2) Student chose and nobody else chose (22%)
- 3) Student did not choose (33%)



Affect (ESM)

Positive Affect

($\alpha = .86$)

Happiness (How happy were you feeling?)

Excitement (How excited were you feeling?)

Negative Affect

($\alpha = .87$)

Frustration (How frustrated were you feeling?)

Stress (How stressed were you feeling?)



Analytic Approach

Hierarchical Linear Modeling

Model 1 – Choice Predicting Engagement

Model 2 – Affect Predicting Engagement

Model 3 – Choice & Affect Predicting Engagement



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Choice, Positive Affect & Engagement

| <i>Fixed Effects</i> | Model 1 | | Model 2 | | Model 3 | |
|--------------------------------|------------|-----------|------------|-----------|------------|-----------|
| | <i>B</i> | <i>SE</i> | <i>B</i> | <i>SE</i> | <i>B</i> | <i>SE</i> |
| Intercept, β_{00} | 2.34*** | 0.18 | 2.56*** | 0.18 | 2.37*** | 0.18 |
| Program Interest, β_{01} | 0.06 | 0.04 | 0.08 | 0.04 | 0.06 | 0.04 |
| Minority, β_{02} | 0.29 | 0.18 | 0.30 | 0.19 | 0.25 | 0.18 |
| Female, β_{03} | -0.12 | 0.09 | -0.09 | 0.09 | -0.12 | 0.09 |
| Choice, β_{04} | 0.36*** | 0.09 | | | 0.36*** | 0.09 |
| Positive Affect, β_{10} | | | 0.46*** | 0.03 | 0.46*** | 0.05 |
| Choice x Affect, β_{11} | | | | | 0.0001 | 0.06 |
| Class, β_{20} | 0.09** | 0.03 | 0.10*** | 0.03 | 0.10*** | 0.03 |
| <i>Random Effects</i> | σ^2 | | σ^2 | | σ^2 | |
| Intercept, r_0 | 0.31*** | | 0.35*** | | 0.32*** | |
| Affect, r_1 | | | 0.06*** | | 0.07*** | |
| Level-1 error, e | 0.40*** | | 0.25*** | | 0.25*** | |

** $p < .01$, *** $p < .001$

Choice, Negative Affect & Engagement

| <i>Fixed Effects</i> | Model 1 | | Model 2 | | Model 3 | |
|--------------------------------|------------|-----------|------------|-----------|------------|-----------|
| | <i>B</i> | <i>SE</i> | <i>B</i> | <i>SE</i> | <i>B</i> | <i>SE</i> |
| Intercept, β_{00} | 2.34*** | 0.18 | 2.58*** | 0.18 | 2.38*** | 0.18 |
| Program Interest, β_{01} | 0.06 | 0.04 | 0.07 | 0.04 | 0.06 | 0.04 |
| Minority, β_{02} | 0.29 | 0.18 | 0.29 | 0.18 | 0.25 | 0.18 |
| Female, β_{03} | -0.12 | 0.09 | -0.09 | 0.09 | -0.11 | 0.09 |
| Choice, β_{04} | 0.36*** | 0.09 | | | 0.37*** | 0.09 |
| Negative Affect, β_{10} | | | -0.08** | 0.03 | -0.01 | 0.05 |
| Choice x Affect, β_{11} | | | | | -0.10 | 0.07 |
| Class, β_{20} | 0.09** | 0.03 | 0.08** | 0.03 | 0.09** | 0.03 |
| <i>Random Effects</i> | σ^2 | | σ^2 | | σ^2 | |
| Intercept, r_0 | 0.31*** | | 0.34*** | | 0.31*** | |
| Affect, r_1 | | | 0.08*** | | 0.07*** | |
| Level-1 error, e | 0.40*** | | 0.36*** | | 0.36*** | |

** $p < .01$, *** $p < .001$

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Implications

Choice matters

Choice vs. initial interest



Implications

Affect predicts engagement

Focus on positive experiences



Limitations & Future Directions

Generalizability

Low ESM response rate (63%)

Focus on activities and mechanism



For more information

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