

## **Work-in-Progress: Survey Development to Examine Connections Between Engineering Identity and Engineering Student Support**

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## **Introduction**

Several instruments have been developed to assess students' science, technology, engineering and mathematics (STEM) identity (e.g., [1], [2]). These instruments include evaluation components like recognition, performance and competence, interest and belonging. For example, the instrument developed by Goodwin and Kirn [1] for evaluating engineering role identity includes elements that evaluate perceptions of engineering role identity and future time perspectives. Three items are related to engineering role identity (i.e., interest, recognition, performance/competence).

In addition, multiple instruments seek to identify student support needs of college students in STEM (e.g., [3], [4]). Lee and Matusovich [5] developed an empirically based concept model of co-curricular support (MCCS) for undergraduate engineering students which identified six essential areas of student support in engineering: i) academic support, ii) faculty-interaction support, iii) extra-curricular support, iv) peer-interaction support, v) professional development support, and vi) additional support. Lee et al. [3] then developed the STEM Student Perspectives of Support Instrument (STEM-SPSI) to measure the perceptions of a student population in STEM. The instrument includes twelve factors of student support (academic advising support, academic peer support, faculty support, STEM faculty connections, student affairs support, out-of-class engagement, STEM peer connections, general career development, cost-of-attendance support and planning, and diversity and inclusion).

This work-in-progress paper describes the development of a survey to examine the connections between engineering identity and engineering student support services in civil and environmental engineering (CEE) undergraduate students. The questionnaire is based on Godwin and Kirn's [1] instrument for evaluating engineering role identity and the STEM Student Perspectives of Support Instrument (STEM-SPSI) developed by Lee et al. [3].

## **Civil and environmental engineering (CEE) questionnaire development**

Two existing validated surveys were used in the development of our CEE questionnaire: Godwin and Kirn's [1] instrument for evaluating engineering role identity and the STEM Student Perspectives of Support Instrument (STEM-SPSI, Lee et al. [3]). Demographic items were also included. The first iteration of our survey included all survey items from the existing surveys. This iteration resulted in a survey that was expected to take an average of over 10 minutes to complete. To encourage participation and completion by undergraduate civil engineering students, our overall intent was to revise this iteration of the questionnaire so that it could be completed in 5-10 min. The following sections describe the main portions CEE survey instrument, and the major changes made to the existing survey instruments.

### *Engineering identity*

We followed the definition of engineering role identity reported by Godwin and Kirn [1] and

began with their instrument for evaluating engineering role identity. The published instrument includes elements that evaluate perceptions of engineering role identity and future time perspectives. We began by including only items related to engineering role identity (i.e., interest, recognition, performance/competence to define). The current version of the survey includes the single item of a students' overall engineering identity (i.e., "I see myself an engineer.") with a Likert scale response (i.e., 1=Does not apply to me; 2=Completely disagree, 3=disagree; 4=Neither agree nor disagree; 5=Agree, 6=Completely agree).

### *Student support services*

We adapted the STEM Student Perspectives of Support Instrument (STEM-SPSI) developed by Lee et al. [3] First, survey questions were changed to focus on engineering experiences rather than STEM. "STEM" in the variable names was edited to "Engineering". Overall, the number of items was reduced from 70 to 35 (Table 1). The same Likert scale was used for all survey items (i.e., 1=Does not apply to me; 2=Completely disagree, 3=Disagree; 4=Neither agree nor disagree; 5=Agree, 6=Completely agree).

Table 1. Number of Variables and Survey Items in STEM-SPSI Survey [3] and the CEE Instrument in Development

| Variable                                | Number of survey items |                |
|-----------------------------------------|------------------------|----------------|
|                                         | STEM-SPSI [3]          | CEE Instrument |
| Academic advising support               | 3                      | 3              |
| Academic peer support                   | 4                      | 3              |
| Faculty support                         | 8                      | 5              |
| STEM* faculty connections               | 7                      | 5              |
| STEM* peer connections                  | 5                      | 4              |
| Graduate student connections            | 5                      | 0              |
| Out-of-class engagement                 | 8                      | 5              |
| Student affairs support                 | 3                      | 0              |
| STEM* career development                | 10                     | 6              |
| General career development              | 5                      | 4              |
| Cost-of-attendance support and planning | 7                      | 0              |
| Diversity and inclusion                 | 5                      | 0              |

\*STEM changed to "Engineering" for CEE instrument

### *Demographic data*

Demographic data collection was positioned at the end of the survey to avoid stereotype threat and priming [6]. Guidance by Fernandez et al. [6] was used to inform comprehensive and data collection, and questions were informed from a survey presented by McEldowney et al. [7]. Items related to academic major, academic classification, transfer student status, and general demographic data were included.

## Progress and future work

The surveys will be online-based and administered through Qualtrics. The questionnaire was reviewed by faculty prior to distribution. WVU Institutional Review Board (WVU IRB) approval is on file. Flyers for participation were distributed in November 2024; participation recruitment and data collection will continue in spring 2025.

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