Work in Progress: Development of a Situational Judgment Inventory for Marginalized Student Support

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***Abstract*—We are developing a Situational Judgment Inventory (SJI) to reveal student strategies for navigating the undergraduate engineering learning environment. In this paper, we discuss the development of the SJI. As part of our development process, we identify nine categories that capture students' typical responses. Implementation of the SJI will a) allow students to become familiar with common scenarios they may encounter in engineering; and b) aid support practitioners, such as instructors and advisors, and administrators, such as associate deans and department heads, in better understanding common student navigation strategies for navigating their respective learning environment.**

Keywords—Situational Judgment Inventory

I. Introduction

In this work-in-progress research-to-practice paper, we describe the development of a Situational Judgment Inventory (SJI) to identify students' navigation strategies and improve student support. An SJI, also referred to as a situational judgment test, requires individuals to reflect on and respond to situation prompts by selecting a response from a list of multiple options.

Current undergraduate student support takes a one size fits all approach to responding to students needs within an engineering environment [1]–[3]. Rather than considering individual factors that influence students' choices within an engineering environment, support programming *assumes* all students will access the same support when faced with the same challenge in engineering.

We are interested in developing a more responsive approach to student support, which acknowledges that students' individual context as well their relationship with the engineering environment are relevant to the decisions they make when navigating the undergraduate engineering environment. To address this goal, we are developing an SJI that students can fill out and practitioners can assess to improve alignment between students' navigational tendencies and practitioners' assumptions about students.

This work is situated within a broader NSF CAREER project focused on creating more responsive support structures for marginalized students in engineering. As part of this project, we have developed and begun implementing an education plan to disseminate our research learnings, from review of the prior literature on support and ongoing data collection, to students and practitioners. Part of this dissemination process involves developing an SJI, which is a data driven instrument that practitioners can use to assess students' navigational tendencies to respond to their assumptions and needs more effectively. Our SJI includes scenarios commonly encountered by undergraduates in engineering.

The following question guided our development of the SJI: *How are undergraduate students' navigational tendencies captured through a scenario-based instrument that presents succinct scenarios and corresponding relevant response options?* In this paper, we present our process for developing an SJI to answer this question, providing examples of scenarios and response options that we developed through investigating prior literature on undergraduate student navigation and data collection from students in the form of semi structured interviews and workshop engagement.

II. Literature on Scenario-Based Assessment

We are interested in developing an instrument to quantitatively measure students' navigation tendencies as it relates to the undergraduate engineering learning environment. This goal is possible through developing a scenario-based assessment tool where student responses can be quantitatively assessed.

Scenario-based approaches to assessment have been used in previous work and research to measure a variety of skills and competencies. For example, scenario-based assessment is used to evaluate job candidates in industry [4]. Scenario-based assessment tools involve realistic situations to which test takers are asked to respond either through open ended responses or through selecting/rating responses from a provided list of response options. SJIs are a type of scenario-based assessment tool that involve selecting/rating responses from a provided list [5].

Scenario-based assessment, and specifically the SJI, is a less common approach in engineering education because the typical approach involves researchers quantitatively scoring responses to open-ended questions, rather than providing closed-ended responses for participants to select from [6]. More recent engineering education research has used SJIs to assess engineering skills and competencies. Specifically researchers have used SJIs to measure global engineering competency [6], [7], professional engineering competencies [8], and metacognition [9], and ethics [10].

Scenario-based assessment has not been previously used to study engineering student navigation. We believe development

of an SJI to measure this phenomenon will facilitate greater alignment between undergraduate engineering students and student support practitioners.

III. Literature Informing SJI Development

The literature we used to guide the SJI development was based on literature investigating the phenomenon of undergraduate student navigation in engineering. In recent work, Lee at al. (2023) present a conceptual model of navigation in the context of the undergraduate engineering environment that posits that a student's individual characteristics as well as the characteristics of the learning environment are relevant to their navigation and how they respond to obstacles, demands, and opportunities within the learning environment.

Specifically, we draw on the responding part of their model to inform the development of the SJI, with the understanding that students must use adaptive reasoning to coordinate their preferences and options while navigating curricular and co-curricular demands and decisions. This coordination also often involves activating some type of support infrastructure. The types of support infrastructure that the model identifies (i.e., university representatives, support programming, physical space, and personal relationships and resources) in part helped us develop our SJI response categories [3].

Given that students must coordinate their preferences with the support available in the learning environment, we are developing our SJI to surface this coordination process for practitioners. Helping practitioners understand how students respond in the learning environment will allow them to be more responsive to students' actual tendencies, rather than responding to their own assumptions about how students are navigating.

IV. SJI Development

We began developing the SJI by first creating a list of commonly occurring scenarios in undergraduate engineering that have implications for how students navigate engineering. We developed this list by searching the literature for common obstacles in engineering. The scenarios were aggregated from a variety of sources about the demands of college and engineering [11]–[15] and were phrased to reflect an opportunity/challenge with a constraint/conflicting priority. We organized the scenarios into six domains: academic performance, faculty and staff interactions, extracurricular involvement, peer-group interactions, professional development, and special circumstances [2].

Next, we began uncovering suitable response options from incoming and current student data from a workshop and semi structured interviews. First, we facilitated a workshop involving 60 incoming engineering students. During this session, we presented a set of four concise scenarios (e.g. "Your first round of tests did not go well and your usual studying habits are not working") to each group of students. To elicit their responses, we employed three different approaches: individual written response, small group written response and discussion, and facilitated large group discussion. Our intention was to encourage them to articulate their hypothetical reactions to their four scenarios (i.e. "what would you do in response to this scenario"), prompting them to jot down their thoughts accordingly. Following the individual written responses to the given scenarios, the students were then grouped together, where they collectively generated a response to each scenario. We used both individual and group contributions, in the development of the SJI.

In addition to the workshop responses, we also asked incoming students and upper division students during virtual semi structured interviews (11) conducted over Zoom by Author 1 to respond to several scenarios. The interviewer showed each student the scenarios in the Zoom chat, asking them how they had responded in the past if they had encountered the scenario. Most students in these interviews saw the entire list of scenarios, time permitting, and provided responses to 4-6 scenarios of their choice. This interview data was analyzed through the auto generated transcripts from Zoom.

Then, we used the workshop and interview responses to aggregate responses into organized response options in the SJI that are realistic and reflective of current student behavior. Creating the SJI response options took place in three major steps: 1) digitizing the workshop responses, 2) developing the organized response options, and 3) converting the organized response options into categorized response options.

We digitized the workshop responses by reading the responses out loud and using Microsoft word speech to text to transcribe them digitally. Then, we verified that the digital transcription accurately represented the workshop responses. Once the responses were available in a digital format, we organized the responses in a spreadsheet, with each row being a scenario and each scenario having a group response column and up to five individual response columns.

To develop organized response options for each scenario, we read through the student responses and identified all the responses that were unique, compiling them into a list for each scenario. In this process, we followed the following rules: near duplicate responses were combined (e.g., go to career services and visit career services), similarly worded responses that could be interpreted in different ways were not combined (e.g., go to a professor for help and go to a professor for advice), responses restating the scenario or completely irrelevant were omitted (e.g., scenario: you are having a hard time talking to people, response: talk to people), responses related to taking no action or being unsure of what action to take were included, multiple actions within one response were separated into separate responses, and similar words were not necessarily combined (e.g., peer and friend or seek out vs talk to).

We will present a sample of scenarios with the organized responses, containing between 5 and 10 response options per scenario. Given the scope of this work-in-progress paper, we are presenting only a few scenarios and have chosen ones that will illuminate a variety of response options. We will present one scenario from the following domains: academic, peer, and professional.

Table 1 presents an academic scenario with the organized response options.

Table 1. Academic Scenario with Response Options

You are at the risk of failing a required course and the withdraw/drop deadline is approaching

- Figure out what is wrong
- Work harder
- Focus more on class
- Drop the course
- Make study groups
- Talk to
    - student services
    - instructor
        - in office hours
        - For advice
        - To ask for extra credit
    - Academic advisor
    - Counselor
    - Other students that have taken the course
    - Friends
    - Parent (s)

Table 2 presents a peer scenario with the organized response options.

Table 2. Peer Scenario with Response Options

You feel isolated socially and are having trouble finding engineering students with whom you relate

• Go to social events
• Join clubs
  o Join design team
• Try to say hi to 5 new people each day
• Get to know more than engineering students
• Go to lounge/public area of dorm
• Talk to
  o Campus counselor
  o Other students
  o Professional help (psychologist)
  o Family or friends from home

Table 3 presents a professional development scenario with the organized response options.

Table 3. Professional Scenario with Response Options

You are having a difficult time finding an internship or co-op opportunity and are unsure why

• Email rejected places to receive feedback
• Search online
  o Look on job recruiting websites
• Apply to many places
• Reach out to
  o Career counseling center
  o Advisor
  o Family for advice
  o Friends
  o Relevant faculty/staff

Due to the diverse range of topics covered by the scenarios, certain response options are specific to scenarios or their respective domains. Nevertheless, our analysis revealed the presence of response option categories that we could use to further refine our response options into categorized response options. In Table 4, we present the response option categories.

Table 4. Response Option Categories

- No support, no action
- Self-support
- Academic advising support
- Academic peer support
- Faculty support
- Campus resource
- Social support
- Mental support
- No support, action

We developed these categories through combining emergent categories from the organized response options and a priori categories from the literature. “Academic advising support”, “academic peer support,” and “faculty support” were categories identified in [1] that we believed were relevant to organized response options. We then modified some categories from the support infrastructure portion of the conceptual model in [3] such that “university representatives” became “campus resource” and “mental support,” and “personal relationships and resources” became “social support.”

After we identified the response option categories, translating the organized response options into categorized response options was our last step to developing our preliminary instrument. Using the response option categories, we sorted the organized responses into categorized responses and translated them into complete sentences. Not all categories are relevant to all scenarios, so we used our prior knowledge about student support to fill in response options in categories where there was no existing organized response option. Furthermore, we did not limit the response options to one option per category and we did not want response options that contained multiple steps, so some scenarios have multiple response options that are in the same category. We also removed response option categories that were irrelevant to each scenario.

As a result of our process, we developed a preliminary SJI with 24 scenarios and a varying number of response options per scenario.

V. PRELIMINARY INSTRUMENT

In this section, we present a sample of our SJI. We hope that this instrument can be valuable to practitioners in the engineering learning environment by helping them better understand how students respond to various situations, rather than assuming how they respond. Those who take this assessment in its current form will respond to each scenario in the context of the following question: *“What are you most likely to do in response to this scenario?”*

We present the sample of our SJI in the form of one scenario from the academic, peer, and professional domains with their corresponding categorized response options. Table 5

presents an academic scenario with the categorized response options.

Table 5. Academic Scenario with Categorized Responses

You are at the risk of failing a required course and the withdraw/drop deadline is approaching
A. Wait and see how you are doing in the course once the deadline is closer (no support, no action)
B. Focus more in class (self-support)
C. Spend more time studying for the course (self-support)
D. Go to the instructor's office hours to get help with the material you are struggling with (faculty support)
E. Talk to your instructor about dropping the course (faculty support)
F. Ask your instructor for extra credit opportunities to bring up your grade (faculty support)
G. Seek out help from a peer who has taken the course before (academic peer support)
H. Make a study group with peers in the course (academic peer support)
I. Ask your academic advisor for advice about dropping the course (academic advising support)
J. Visit the student success center to learn how to improve your grade (campus resource)
K. Call/text a friend who has been in a similar situation to hear what they did (social support)
L. Call/text your family or a trusted adult to confide in them and get support (mental support)
M. Drop the course immediately (no support, action)

Table 6 presents a peer scenario with the categorized response options.

Table 6. Peer Scenario with Categorized Responses

You feel isolated socially and are having trouble finding engineering students with whom you relate
A. Take no action (no support, no action)
B. Learn a new hobby that you can enjoy by yourself (self-support)
C. Spend more time in office hours with instructor or teaching assistants (faculty support)
D. Join a student organization outside of engineering (campus resource)
E. Attend the student organization social events (campus resource)
F. Talk to family and friends from home (social support)
G. Make an appointment with [the campus counseling center] to manage your feelings of isolation (mental support)
H. Join a [campus support group] hosted by [campus wellness center] to talk about your feelings of isolation with peers (mental support)

Table 7 presents a professional development scenario with the categorized response options.

Table 7. Professional Scenario with Categorized Responses

You are having a difficult time finding an internship or co-op opportunity and are unsure why
A. Take no action (no support, no action)
B. Expand your search by looking on job websites (self-support)
C. Apply to all the positions you qualify for, even if you are not interested (self-support)
D. Visit the career and professional development services in the [campus career center] to get help with reviewing your resume (campus resource)
E. Talk to your friends about their strategies for finding an internship or co-op (social support)
F. Ask your family for advice or help with getting an internship or co-op (social support)
G. Email places that reject you to receive feedback about your application (no support action)

Developing a structure from the organized response options helped us to refine our SJI by increasing standardization in response option formatting across the scenarios and anchoring our response options in categories identified in prior literature.

VI. CONCLUSION

We developed an SJI to improve alignment between undergraduate student navigation and practitioner support of undergraduate students. Through analyzing student data and developing our SJI, nine categories of typical student responses to scenarios emerged. These were using no support and no action, self-support, academic advising support, academic peer support, faculty support, campus resource, social support, mental support, and no support and action.

Implementation of our SJI will a) allow students to become familiar with common scenarios they may encounter in engineering; and b) aid support practitioners, such as instructors, advisors, and administrators in better understanding common student navigation strategies for navigating their respective learning environment.

Moving forward, we plan to refine our SJI by piloting the instrument with incoming engineering students and upper division engineering students. Piloting the instrument will help us understand which scenarios and response options are most relevant to students, which will allow us to select the final set of scenarios and response items for broad dissemination of the SJI.

VII. ACKNOWLEDGEMENTS

This material is based upon work supported by the National Science Foundation under Grant No. 1943811. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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