RESEARCH BRIEF

Using Research Measures as Learning Tools: The Development and Use of Student Profiles

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Background: Measuring Student Learning Outcomes

Undergraduate students often complete self-assessments and institutional surveys (e.g., CIRP, SERU, PSRI) about how college experiences affect their academic and psychosocial development. The main audience for these surveys is researchers and administrators who draw upon aggregated reports to improve programming or create interventions. Students seldom receive individualized reports on their learning and development. As part of the IINSPIRE LSAMP Alliance, students completed a survey that sought to understand their community engagement and socio-cognitive facets related to STEM and research. The purpose of this project was to develop profiles that translated research measures into a tool that students could use to link their IINSPIRE learning experiences with their individualized learning outcomes.

Online Survey

Participants. Eleven students who attended to the summer IINPIRE program participated in the survey. Available student demographics included gender (45% female, 55% male), race (64% African-American, 36% Hispanic/Latino(a), year in college (9% first-year, 45% sophomore, 18% junior, 18% senior), and affiliation (27% in community college, 27% in four-year college, and 27% in university). The mean age of the students was 21.7 years (SD = 2.7 years, range = 19-28).

Survey Questionnaire. Student completed the survey at the beginning of the summer program. Key survey measures included:

1. Community engagement: The importance of giving back to their community and being involved in improving their community.
2. STEM Self-Efficacy: Students' confidence in their abilities to perform different types of STEM related tasks.
3. STEM Interest: Whether students are interested in or like different tasks/activities within different types of STEM careers.
4. STEM Outcomes Expectations: Students' beliefs about how a participating in STEM activities may help them in their future career.
5. Research Self-Efficacy: Students' confidence in their abilities to do research related tasks.
6. Research Outcomes Expectations: Students' beliefs in whether doing research related tasks will help them in their future career.

Data Collection & Analysis. Survey data were collected May-July 2021 via Qualtrics survey. First, we recoded the item-level data and created composites for the key measures following the protocol established by the measures' authors. We only included data with less than 10% missing values in each scale. We conducted descriptive statistics on the measures to observe aggregate patterns. Second, we transformed the composites so that they were all on a 1-10 scale; these transformed measures were used to create the profiles. All analyses were run in SPSS version 27.

Preliminary Findings

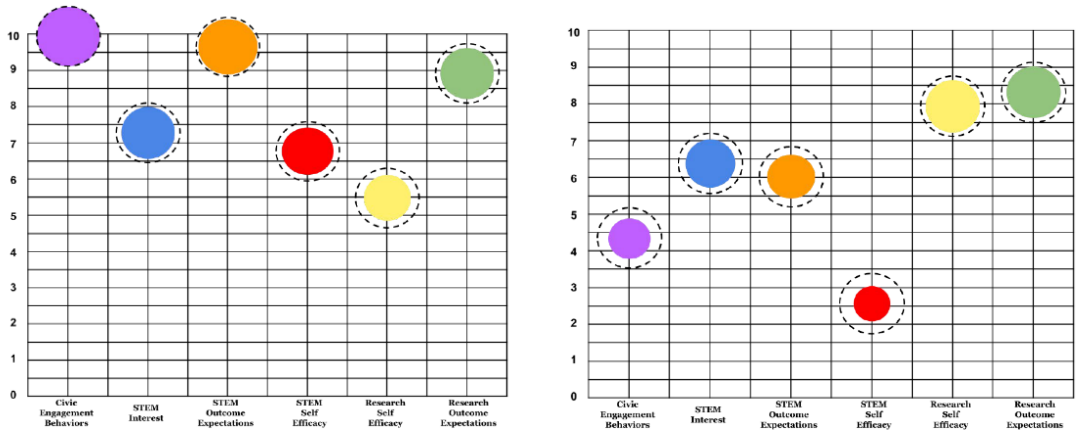
Overview. The table below summarizes the mean, standard deviation, range, and correlations among the 6 key variables. Overall, students rated themselves highly in the 6 areas, with averages across all variables between 7-8 (on a 1-10 scale). Research outcomes expectations had the highest average, while community engagement and STEM interest had the lowest averages. There was greater spread (more variation) in the scores for STEM Self-Efficacy, as evidenced by the standard deviation being twice that of the other variables. Finally, scores on STEM outcomes expectations were positively and significantly correlated with STEM interest and research outcomes expectations, meaning higher scores in STEM outcomes expectations are associated with higher scores on STEM interest and research outcomes expectations.

Table 1. *Descriptive statistics and correlations among key variables*

	1	2	3	4	5	6
1. Civic Eng.	-					
2. STEM Self	0.15	-				
3. STEM Int.	0.15	0.35	-			
4. STEM Out.	0.30	0.51*	0.24	-		
5. Research Self.	0.06	0.42	0.20	0.12	-	
6. Research Out.	0.34	0.32	0.24	0.64**	0.30	-
Mean (SD)	7.02 (1.89)	8.11 (2.09)	7.02 (1.29)	8.08 (1.10)	7.34 (1.85)	8.57 (0.87)
Min	4.05	2.22	4.28	5.89	2.14	7.14
Max	10	10	8.86	10	9.88	10

Note. * $p < .05$, ** $p < .01$

Profiles. The two figures illustrate sample graphics presented in the student profiles. In the profile, each measure is represented with a circle that represents students' current score compared to a dotted line that represents the max score (of 10). Circles that are smaller than the dotted circle reflect areas for growth. We reasoned that if students know where they start, they can more intentionally connect their IINSPIRE activities to their learning.



Most importantly, when explaining the profiles, students should see the scores as malleable and specific to their own strengths (not compared to the group); the profiles should be used as a learning tool rather than a diagnostic assessment or something that shows how they compare to their peers. If students indicated high levels of any of these measures than we hope they maintain that by continuing to participate in activities like IINSPIRE. If they are

lower, then they can increase these beliefs by participating in different activities that help them to better understand STEM majors and research.

Discussion

Researchers utilize establish scales to obtain psychometrically reliable and valid scores that reflect attributes of interest. In this project, we were interested in students' confidence in their abilities to do STEM and research-related tasks as well as their beliefs that performing these tasks would help them in their future career. Most often, researchers will examine the scores in the aggregate to determine the average and variation in each score and how the variation in scores are correlated with one another; Table 1 illustrates how the scores are typically presented. These results are a type of variable-centered approach: the focus is on the scores, not necessarily the individual student behind the scores. While helpful when conducting statistical analyses to determine if or how scores change due to an intervention or learning experiences such as those in the IINSPIRE program, the scores do not help students understand their own potential for learning and growth.

For example, in Table 1, we see that the students rated themselves highly on all the key measures. As educators and researchers, we may assume that students will respond to the learning experiences similarly or have similar areas of improvement. By only considering the group average, we miss opportunities to recognize individual differences. Indeed, when comparing the two figures, which represent two different students, we see that students differ in what their scores are and where scores are high/low. While both students had scores like the group average on research outcomes expectations (green circle), there was variation within each student and with the group average on all the other measures. When students can visualize their own data, separate from the class average, it may offer a sense of agency to explore areas they want to grow from their time in the program. This practice reifies Vygotsky's (1978) Zone of Proximal Development (ZPD) concept, which proposes that individuals learn best when they are given interesting and meaningful tasks that are slightly more challenging than their current level of development. The profiles provide students with information about where they currently are and what is possible under guidance or in collaboration with more capable peers.

Implications

This research yields some implications for LSAMP program evaluation and assessment.

- When creating a student survey or assessment instrument, educators and administrators should ensure that questions align with the proposed program learning outcomes as well as tap into the cognitive and psychosocial characteristics that influence or can be influenced by the learning activities and outcomes. When administering surveys or assessments, be sure to discuss with students the reasoning for them and how the information will be used/shared.

- Results from surveys and assessments are typically used by educators, researchers, and administrators. While the data are important to inform programming decisions, consider how the data could also help students become more engaged with the program. Let students become more active consumers of survey and assessment data to enhance their learning.

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