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Developing and validating socio-emotional learning measures in DC

- The DCPS Chancellor's Strategic Plan for 2017–2022 has highlighted SEL readiness and competencies as key outcomes of the district's goal to "educate the whole child"

- To track progress, District of Columbia Public Schools (DCPS) administered a new district-wide survey developed by Panorama Education to measure socio-emotional learning (SEL)

- **Overall goal:** How to use the resulting data to support students and inform policy?

SEL is important but how to measure it?

- For success in many life outcomes, SEL competencies rival academic achievement in importance (e.g., Heckman & Kautz, 2012)

- SEL competencies are malleable through grades K–12 and can be developed through interventions (Kautz et al., 2014; Roberts & Jackson, 2008)

- DCPS's SEL survey covers a range of competencies

- How to go from results on the survey to inform policy?

Goals of the project

Coaching task: Support DCPS in its efforts to:

1. Validate SEL surveys of students, teachers, and parents

2. Develop an index of the extent to which DC students are "loved, challenged, and prepared" that DCPS can present to stakeholders and use to track progress

3. Develop measures that align with DCPS's SEL framework

4. Efficiently summarize parents' open-ended responses that provide feedback to their school and district

1. Validate SEL surveys of students, teachers, and parents

Why validate the survey?

- Validating the survey helps to ensure that the survey items are appropriate for inclusion in summary measures

- Panorama has conducted validation analyses of their surveys

- Additional analyses helped to ensure that the survey is valid for DCPS's students
  - DCPS has added to and modified the original survey
  - DCPS students might differ from those students included in earlier validation analyses

Overview of the survey

Topic	Topic covered by survey		
	Student	Parent	Teacher
Perseverance	X	X	X
Self-Management	X		
Self-Efficacy	X		
Sense of Belonging	X		
Social Awareness	X		
Cultural Competency	X		
Rigorous Expectations	X	X	X
Student/Parent Satisfaction	X	X	
Parent Communication		X	
Professional Learning about SEL			X
Educating All Students			X
Staff Engagement			X

Steps for validating survey

1. Pre-specify validity criteria
2. Calculate Cronbach's Alpha (a measure of reliability) and conduct analyses to estimate the number of underlying factors per scale

   – Ensure that each scale reliably captures a single factor

3. Conduct an initial confirmatory factor analysis

   – Assess overall fit

   – Investigate whether scales capture distinct factors (discriminant validity)

4. Make revisions to scales based on results of the analyses
5. Confirm that final scales meet pre-specified criteria

Summary of findings

- The student survey met all criteria for validity without any modifications

- The parent and teacher survey met all criteria for validity with some minor modifications

- For example, the analysis suggests that the Staff Engagement measure captures two different things:
  - Staff Engagement at an individual level ("I enjoy my work at DCPS.")
  - Staff Engagement as a team ("My colleagues treat me with respect.")

2. Develop an index of the extent to which DC students are "loved, challenged, and prepared"

Background

- DCPS set a goal that by 2022, 100 percent of students will feel "loved, challenged, and prepared"

- Administered the Panorama survey to track progress toward this goal

- Needed to develop business rules to go from survey responses to Loved, Challenged, and Prepared (LCP) Index

- **Proceeded in three steps**

  1. Mapped the survey topics to the loved, challenged, and prepared components

  2. Developed rules for converting topic-level scores to an overall index

  3. Provided evidence to inform key decisions

Mapping survey topics to LCP components

Loved

- *Sense of Belonging* (e.g., connections to adults at school and respect from other students)

Challenged

- *Rigorous Expectations* (e.g., teacher expectations and encouragement)

Prepared

- *Perseverance* (e.g., focusing on a goal and overcoming problems when reaching a goal)

- *Self-Management* (e.g., follow directions in class and not waiting until the last minute to do work)

- *Self-Efficacy* (e.g., confidence in ability to understand concepts and complete assigned work)

Summary of business rules for creating the LCP Index

1. Calculate average response within each component

2. For each component (separately), determine whether the component exceeds "3.5", which means a positive outcome

3. Define a student to be "loved, challenged, and prepared" if they have positive outcomes for each component

4. Average across students to determine the district-level LCP Index

- **Key consideration:** Defining the overall LCP Index using separate indices makes it possible to consider each separately and help to identify high priority areas for improvement

How to weight aspects of Preparedness?

Question: Should the three component scales in the Preparedness Index (Perseverance, Self-Management, and Self-Efficacy) be weighted differently?

- *Are the components equally important?*

Evidence:

- Survey data: Contemporaneous correlations between scales and student outcomes showed that Self-Management and Self-Efficacy were more predictive than Perseverance
- Literature: Perseverance tends to be most predictive of long-term outcomes

Decision: Weight each component equally

Adjust the index for low effort respondents?

Question: How do we identify low-effort respondents and their resulting impact or bias on the results?

- Straightlining
- Rapid completion

Evidence: Examine straightlining patterns

- The overall index is not sensitive to excluding them (difference is 0.4 out of 100)

Decision: Include students who straightline in the index

- Some students may be providing sincere responses

Account for non-response bias?

Question: Should the district-level index include nonresponse weights?

- The usefulness of the LCP Index depends on whether it represents all students
- If only a select type of person responds, then the resulting LCP Index could paint a misleading picture

Evidence: Examine sensitivity of results to nonresponse

- Some evidence of differential response rates
- Overall index is not sensitive to using weights

Decision: Weight all respondents equally

- Increased transparency to stakeholders

Results and DCPS's dissemination

GOAL 4
100 PERCENT OF STUDENTS FEEL LOVED, CHALLENGED, & PREPARED.

of students feel **loved, challenged, and prepared**

of students feel **prepared**

of students feel **loved**

of students feel **challenged**

59%

45%

67%

79%
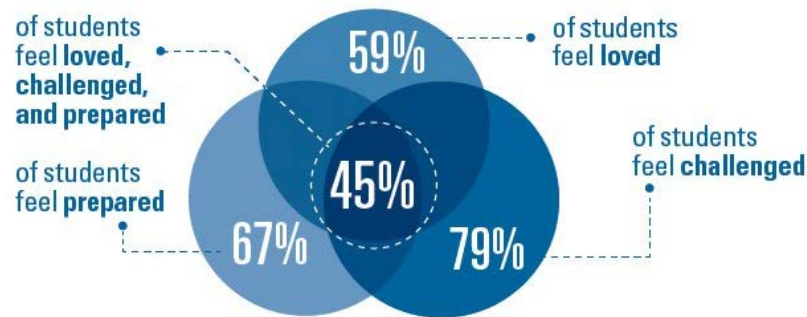
Students who feel loved are more likely to attend school, be engaged, and take the risks associated with tackling challenging content. DCPS has developed a social emotional and academic development (SEAD) framework that also emphasizes the importance of family partnerships in supporting our students. DCPS also provided professional learning for all educators including trauma-informed practices and culturally responsive pedagogy, all of which aim to strengthen our schools' cultures.

3. Develop measures that align with DCPS's SEL framework

DCPS's SEL framework

- DCPS's SEL framework was adapted from the widely-used CASEL Framework
    - The Panorama SEL survey was selected because it covered key competencies in DCPS's framework but was not configured to map to it exactly

- Measures based on the survey will be most useful if aligned closely with DCPS's framework

- Goal: to develop valid and reliable measures that align with the framework

SEL AT DCPS: 5 KEY COMPETENCIES

Social & Cultural Awareness

Self-Management

Relationship Skills

Responsible Decision-Making

Self-Awareness

Approach to mapping items to framework

1. Map each item to one or more of the competencies in DCPS's framework

2. Test whether this mapping fits the data using a confirmatory factor analysis

3. Make revisions to the mapping based on the results of the analysis

Conceptual mapping

- Three researchers (including CASEL's Director of Assessment and Continuous Improvement) independently categorized each item into one or more of the five SEL competencies

- With input from DCPS, these categorizations were combined to finalize a conceptual mapping

- Allowed items to relate to more than one competency

Summary of revised final mapping

- Based revisions on both conceptual and empirical considerations

  - For any item that related to more than one competency, selected the competency with the strongest relationship (factor loading)

- Final model meets standard criteria for fit and reliability

- Successfully covered *aspects* of all five of DPCS's SEL competencies

  - A reliable scale corresponds to each competency

4. Efficiently summarize parents' open-ended responses

Analyzing open-ended parent responses

- DCPS's parent survey includes two open-ended questions asking for feedback
  - 1,400+ responses on the district
  - 2,000+ responses for their child's school
- Infeasible to review responses manually
- DCPS is currently using a word cloud to display frequently used words
  - Lacks precision and is difficult to interpret

Exploring natural language processing (NLP) as an analysis tool

- DCPS and REL team explored NLP as an alternate option to analyze this data

- NLP is a way to extract information from sentences

- For this review, the project team explored:

  1. Sentiment – is the tone/content of the response positive or negative?

  2. Topic – what content did the response cover?

     - E.g., attendance policy, classroom environment, teachers and staff

Sentiment approach

- Applied the Unsupervised Sentiment Neuron (USN) algorithm

- Estimates the sentiment by analyzing the sequence of letters in a response

- Was developed using 82 million Amazon reviews

- Has outperformed methods that assign sentiment based on whether individual words appear to be positive or negative

- Validated its performance in DC data by comparing to a human rater

Topic categorization approach

- Applied the Latent Dirichlet Allocation (LDA)

- Groups the data into topics based on common words or phrases

- Humans assign a name to the topic based on the common words and phrases

- Produces a score related to the extent to which each response likely falls in each topic

- Validated its performance in DC data by comparing to a human rater

Topics identified by the NLP approach

District	School
Teachers	Classroom environment
Parental communication	School culture
School funding	Parental communication
Safety and support	Community/leadership
Attendance/calendar policy	Student needs
Specific individuals	Teachers
Student needs	Specific individuals
School options	Time usage
Hard/good work	School and staff
Time usage	

Follow-on activities

Follow-on activities

- Study how SEL competencies predict key educational outcomes, such as grade transition and graduation

- Investigate the extent to which reports of SEL skills change across grades

- Explore the extent to which student, teacher, and parent responses align

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