The Universal Screeners for Number Sense
Validity and Reliability Study

About the Assessments:

The Universal Screeners for Number Sense, grades K-5, assess grade-level students' number sense. Assessment results are intended to help teachers identify skills and concepts indicating readiness for grade level content, to identify students who would benefit from additional support, and to monitor progress.

Findings from the USNS Validation Study

The USNS assess K-5 students' number sense in ways that are aligned to mathematics standards as described in the Common Core State Standards for Mathematics.

A content panel of 19 experts strongly agreed that the USNS reflects number sense topics described in the K-5 content standards. This is seen by the mean score of 3.62 units on a four-point score, such that a score of 4 was the highest value of agreement. Variance was low (standard deviation = 0.49), further indicating substantial agreement across the panel members. Qualitative feedback confirmed the quantitative results. As one panel member wrote: "It [USNS] confirms students' understanding of foundational concepts with place value, whole number operations and fractions that will allow the student to progress on to new grade level content in those domains."

The USNS assessments demonstrate effective construct development to reliably measure grade-level students' number sense.

Rasch reliability, a measure of consistency, was excellent for grades 3-5 and was good for grades K-2. Rasch separation, a measure of developmental groups defined by the assessments, was also excellent for grades 3-5 and was good for grades K-2. Cronbach alpha reliability was good to excellent across all USNS screeners, ranging from 0.82 to 0.94. Separation and reliability statistics are presented in Table 1 and Table 2.

The USNS assessment items function effectively in collectively measuring a single construct, students' number sense.

Both item fit and point-biserial statistics may be used to express the degree to which assessment items measure a single construct. Less than 5% of all grade-level assessment items (i.e., 9 items) were identified as potentially problematic and those 9 items possess mean-square (MNSQ) fit statistics between 1.5 and 2.0, which Linacre (2002) suggests is unproductive but not degrading to the measurement model. Positive point-biserial correlations are good, whereas negative point-biserial correlations are problematic. No USNS items possess a negative point biserial correlation, point biserial correlations ranged from 0.35 to 0.78 across all 212 USNS items. Taken collectively, analysis of fit statistics and point-biserial correlations suggests USNS screeners effectively measure a single construct (i.e., number sense).

USNS screeners are useful assessments for gathering information about K-5 students' number sense. USNS screeners produce data that can be used to interpret growth between time periods (e.g., beginning of year to mid-year to end-of-year).

A consistent theme resulting from qualitative analysis illuminated a finding that the USNS screeners provided useful information about K-5 students' number sense. USNS data can be used in ways to support instruction throughout an academic year because they provide a measure of growth during the academic year. There exists strong alignment between intended and actual use, which indicates that USNS can be used effectively and safely to foster students' learning and make instructional shifts to benefit learners. The USNS are a well-designed progress monitoring tool that produces valid and reliable findings, which educators can use to inform instruction.

Table 1

Rasch separation and reliability statistics for each grade-level assessment series

	Persons		Items	
	Separation	Reliability	Separation	Reliability
Kindergarten (n = 1,453)	2.36	0.85	14.42	1.00
Grade 1 (n = 1,675)	2.16	0.82	11.45	0.99
Grade 2 (n = 1,524)	2.79	0.89	14.08	0.99
Grade 3 (n = 1,408)	3.33	0.92	14.98	1.00
Grade 4 (n = 1,140)	3.45	0.92	13.63	0.99
Grade 5 (n = 319)	3.80	0.94	8.16	0.99

Concerning; **Approaching Acceptable**; Acceptable; **Good**; **Excellent**

Table 2

Cronbach alpha test reliability statistics

	Fall Screener	Midyear Screener	Spring Screener
Kindergarten	0.82	0.88	0.87
Grade 1	0.86	0.89	0.90
Grade 2	0.87	0.93	0.89
Grade 3	0.87	0.91	0.88
Grade 4	0.84	0.94	0.88
Grade 5	0.87	0.92	0.92

Poor; **Questionable**; Acceptable; **Good**; **Excellent**

Note: The complete results of this study are available upon request.
Please contact: screeners@forefront.education