Georgia Center for Assessment

Assessing the Validity and Reliability of the Teacher Keys Effectiveness System (TKES) and the Leader Keys Effectiveness System (LKES) of the Georgia Department of Education

Submitted by

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The Teacher Keys Effectiveness System (TKES) and the Leader Keys Effectiveness System (LKES) are the teacher and leader evaluation systems currently being implemented by the Georgia Department of Education (GaDOE). The TKES combines observations of actual classroom practice (Teacher Assessment on Performance Standards—TAPS) with measures of student growth and academic achievement. This year, for the first time, the measures of student growth include measures of subjects not included in the State testing program. These measures, developed locally, are called Student Learning Objectives (SLOs). Similarly, the LKES uses the score on the Leader Assessment on Performance Standards (LAPS) along with student growth and academic achievement measures as factors contributing to the evaluation of school leaders across the state. The report is designed so that the analysis for the TKES is presented first, followed by analysis for the LKES, respectively.

All analyses in this report including SLO data should be interpreted with care, as the standardized content and reliability of these measures are not yet available. Thus, the various SLO measures cannot be compared across school districts.

The current report relies on the Arguments-based approach to validity and reliability based primarily on the work of Kane (2009, 2013). This approach to validity is focused on the intended uses of the scores from a rating instrument. Any study geared at determining the quality of a rating instrument is charged with gathering and interpreting the validity evidence that is in line with the intended uses of the observation instrument under examination, as it is the uses of the scores from the instrument, and not the instrument itself, that is being

validated (Kane, 2009, 2013). The steps to determine the validity of a rating instrument using the arguments-based approach to validity are as follows:

- Outline the intended uses of the scores of the rating instrument.
- Determine the types of validity evidence relevant to these intended uses and gather the evidence.
- Assess the adequacy of the validity evidence to determine if the evidence suggests the intended uses of the instrument are warranted.

The TKES and LKES evaluation systems are newly designed with several primary purposes in mind. According to Barge (2013), uses of these evaluation systems include the planning of professional development plans, merit pay decisions, and talent management decisions, including interventions for teachers and leaders as well as renewal/retention and dismissal decisions. These intended uses of the evaluation systems provide the basis for the types of validity and reliability evidence required. As the potential uses of the evaluation systems may impact potential compensation and continued employment, gathering validity and reliability evidence is vital. If the components of each system (described below) are found to be reliable and valid for their intended uses based on the evidence, the use of the TKES and LKES evaluation systems would be supported.

For all measures for which individual responses are available, ordinal alpha is used as a measure of internal consistency. Ordinal alpha is conceptually equivalent to Cronbach's alpha except ordinal alpha is based on the polychoric correlation matrix and more accurately estimates reliability than Cronbach's alpha when data come from items with few response options and/or show skewness (Gadermann, Guhn & Zumbo, 2012). If the validity evidence gathered suggests some issue, further enhancements to the instrument should be considered. The data used in this report all come from the 2011-2012 academic year with the exception of SLO data, which is from the 2012-2013 academic year, due to the small SLO size in 2011-2012 (the SLO implementation year).

Evidence gathered about the TKES addressed in this report

I. Does the internal consistency of the TKES support the assumption that the TKES scores are reliable?

II. What are the contributions of the relevant demographic elements to the Teacher Effectiveness Measure (TEM) score?

III. Does evidence supporting the construct validity of the TEM score exist to suggest that it is psychometrically sound?

Teacher Keys Effectiveness System

In this section, we provide descriptive information about each of the component measures that comprise the TKES. Results follow addressing each of the questions depicted above.

Descriptions and Descriptive Statistics of Component Parts of the Teacher Effectiveness Measure (TEM)

TEM Score

The TEM is the overall effectiveness measure of the TKES. The purpose of the TEM is to provide information about the overall effectiveness of individual teachers across the state. The TEM is calculated based on three component parts of the TKES. These components are the TAPS score and measures of student growth and academic achievement (SGPs and SLOs). TEM scores are calculated on a 100-point scale and subsequently converted to a score on a 4-point scale. The calculation of the TEM scores are based on the score component parts listed above and done so based on the provisional method of TEM calculation used at the time these data were gathered. The process is as described below:

- The TAPS component of the TEM is based on the sum of the teacher ratings on ten performance standards (for more information on these standards see Barge, 2013). Teacher ratings were given for each performance standard using the following scale:

- Exemplary equals 3
- Proficient equals 2
- Needs Development equals 1
- Ineffective equals 0

The ten teacher ratings were then added together to form the TAPS score. This score varies from 0 to 30. The TAPS score is then divided by 30 and multiplied by 100 in order to convert it to a 100-point scale.

- The Student Growth Percentile (SGP) score is the measure of a student's growth compared to other students with a similar achievement profile. Students receive a growth score for state-mandated assessments in applicable grades and content areas. The SGP score assigned to a teacher is the median SGP score of the students he/she instructed. The SGP score is reported on a 100-point scale.
- The Student Learning Objectives (SLO) score is a measure of students' academic growth based on locally-determined objectives for content areas not assessed at the state-level. Teachers were assigned an SLO score using a 4-point rubric based on their students' overall performance in meeting or exceeding the SLO standard. SLO scores are converted to 100-point scale using the following scale:
  - 0 equals 12.5
  - 1 equals 37.5
  - 2 equals 62.5
  - 3 equals 87.5
- If a teacher had only an assigned median SGP score or the SLO score, then the median SGP or the SLO, as expressed on the 100-point scale score was used as the teacher's achievement sub-score. If the teacher had both a median SGP score and an SLO 100-point scale score, the achievement sub-score was calculated as the weighted average of the SGP median and the SLO 100-point scale score where the weights were the number of students for whom each of these two scores was available.

- TEM scores were calculated as the average of the TAPS 100-point scale score and the achievement sub-score, whether it be either the SGP median score or the SLO 100-point scale score individually, or the combined measure for teacher's receiving both scores.
- TEM scores were converted to 4-point scale scores based on the following:
    - 0 to 24 was scored 0
    - 25 to 49 was scored 1
    - 50 to 74 was scored 2
    - 75 to 100 was scored 3

Descriptive statistics for TEM and the component parts of the TEM are shown in Table 1.

Table 1
Descriptive Statistics for TEM and TEM Components

		TAPS	SGP Median	SLO 4-point scale	SLO 100-point scale	Achievement Sub-score	TAPS 100-point scale	TEM 100-point scale	TEM 4-point scale
N	Valid	42,316	39,729	9,287	9,287	47,691	42,316	21,102	21,102
	Missing	26,589	29,176	59,618	59,618	21,214	26,589	47,803	47,803
Mean		20.696	49.276	0.874	34.340	46.789	68.985	56.747	2.815
Median		20	49	1	37.500	47	66.667	56.167	3
Mode		20	46	0	12.500	12.500	66.667	39.583	3
Std. Deviation		2.529	14.691	1.012	25.299	17.779	8.431	11.466	0.550
Variance		6.398	215.832	1.024	640.049	316.101	71.089	131.465	0.303
Range		30	96	3	75.000	96	100	87.250	3
Minimum		0	3	0	12.500	3	0	11.250	1
Maximum		30	99	3	87.500	99	100	98.500	4

TAPS: Teacher Assessment on Performance Standards
SGP: Student Growth Percentile
SLO: Student Learning Objectives
TEM: Teacher Effectiveness Measure

The average SGP median score of 49 is essentially the value one would expect of a median; an SGP Median of 50 represents average student growth. The SLO 100-point scale score mean of 0.874 and the variance of 1.024

suggest the variability may be indicative of inconsistent SLO measures or inconsistent scoring at the local level.

Missing Data

Missing data occurs when data were unavailable for any given variable under investigation. Missing data reduce the representativeness of the data as well as the amount of information available for analysis. This, in turn, affects the quality of the inferences which can be drawn from analyses on these data. The missing data rates for the variables presented in Table 1 were large; 39% for TAPS, 42% for SGP Median, 87% for SLO, 31% for Achievement Sub-score, and 69% for TEM. While these missing data rates are large, some of the values (SGP Median and SLO) are as expected as roughly four out of five teachers teach courses having just SGPs or SLOs. These missing data rates indicate that care should be taken in interpreting these scores as descriptive of all Georgia teachers.

I. Is the assessment of the internal consistency of the component parts of the TKES adequate to support an argument for the psychometric soundness of the reliability of the TKES?

Internal consistency is an indicator of the consistency of the scores obtained through the use of a measure. The general term for this consistency indicator is reliability.

Teacher Assessment on Performance Standards Instrument

The TAPS instrument included ten items, each representing a performance standard. Teacher ratings were given for each performance standard using the scale described above.

Reliability, specifically ordinal alpha, polychoric correlations, and item correlations, were calculated to assess the internal consistency of the TAPS instrument. The ordinal alpha for the ten item TAPS was .95, indicating the items are strongly associated with one another.

Polychoric correlations are appropriate when estimating the correlation between ordinal variables. The outcome from the TAPS instrument is ordinal and the polychoric correlations between the components of TAPS items and item-total correlations are given in Table 2 and Table 3. Item-total correlations based on the performance standards are calculated based on the polychoric correlation matrix.

Table 2
Polychoric Correlation Matrix of Component Parts of the TAPS

	PS2	PS3	PS4	PS5	PS6	PS7	PS8	PS9	PS10
PS1	.72	.72	.61	.69	.64	.64	.71	.64	.63
PS2		.73	.67	.72	.69	.59	.68	.58	.62
PS3			.73	.72	.67	.70	.77	.56	.59
PS4				.73	.73	.58	.72	.49	.56
PS5					.83	.60	.74	.56	.63
PS6						.51	.65	.53	.62
PS7							.69	.58	.61
PS8								.55	.59
PS9									.72

Note. N=42,316 PS= Performance Standards

Table 3
Item-Total Correlations for TAPS

	Not Corrected	Corrected
PS1	0.85	0.83
PS2	0.85	0.83
PS3	0.87	0.86
PS4	0.82	0.80
PS5	0.87	0.87
PS6	0.83	0.82
PS7	0.79	0.76
PS8	0.86	0.84
PS9	0.75	0.72
PS10	0.80	0.77

Note. N=42,316 PS= Performance Standards

These results indicate the TAPS item correlations range from moderate to high. The inter-item correlation values indicate that specific items may be redundant (i.e., the items are asking the same question and thus are not adding value to the measure). The item-total correlations based on individual standards are high (range of 0.75 – 0.87), indicating that all of the items are likely measuring the same construct.

Surveys of Instructional Practice

Surveys of Instructional Practice (SIP) were used to provide information about teacher performance on standards 3, 4, 7 and 8 (see Appendices A, B, and C). The SIP surveys provide ratings of the teacher as rated by students in his/her class. These survey responses inform the TEM score for individual teachers at the discretion of those (i.e., principals) rating teachers. SIP instruments were somewhat different for grades 3 through 5, 6 through 8, and 9 through 12. Therefore, the reliability analyses were conducted separately for each group.

SIP items were rated on a 4-point scale ranging from 0 to 3. The SIP ratings were averaged over students for each teacher on each item and ordinal alpha values were calculated based on the mean SIP ratings.

<u>Grades 3 – 5</u>

The ordinal alpha was .94 for the twenty item SIP instrument for grades 3-5. The high value of the alpha coefficient indicates a high level of internal consistency. Table 4 shows the corrected item-total correlations for the grades 3-5 SIP instrument. The values ranged from 0.458 to 0.787. The inter-item correlations (see Appendix A) ranged from 0.206 to 0.762. Items with high inter-item correlations may be indicative of item redundancy. While there are some items (Items 2, 8, 16, and 18) that, if deleted, would increase the alpha value, none of these would significantly impact the value of alpha and each of these items correlate well with

the composite score of the combined remaining items as evidenced by the Corrected Item-Total Correlation. As such, no items are recommended for removal.

Table 4
Reliability Analysis of SIP for Grades 3 - 5

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	29.978	11.143	.597	.940
Item2	30.016	11.152	.561	.941
Item3	29.897	11.046	.719	.938
Item4	29.822	10.978	.739	.938
Item5	30.201	10.982	.648	.939
Item6	29.860	11.543	.588	.940
Item7	29.742	11.183	.746	.938
Item8	30.146	11.137	.532	.942
Item9	29.961	10.924	.750	.937
Item10	30.068	11.006	.676	.939
Item11	29.608	11.570	.719	.939
Item12	29.947	11.067	.599	.940
Item13	29.757	11.243	.787	.938
Item14	30.005	11.179	.664	.939
Item15	29.759	11.089	.710	.938
Item16	30.233	11.501	.458	.942
Item17	29.805	11.205	.747	.938
Item18	29.866	11.349	.558	.941
Item19	29.795	11.146	.723	.938
Item20	29.779	11.242	.763	.938

Note. *N=7,914*

Grades 6 – 8

The ordinal alpha was 0.981 for the twenty item SIP instrument for grades 6-8. The high value of alpha indicates a high level of internal consistency. Table 5 shows the corrected item-total correlations for the grades 6-8 SIP instrument. The values ranged from 0.581 to 0.920. The inter-item correlations (see Appendix B) ranged from 0.42 to 0.894. Items with high inter-item correlations may be indicative of item redundancy. While there are some items (Items 10 and 16) that, if deleted, would increase the alpha value, none of these

would significantly impact the value of alpha and each of these items correlate well with the composite score of the combined remaining items as evidenced by the Corrected Item-Total Correlation. As such, no items are recommended for removal.

Table 5
Reliability Analysis of SIP for Grades 6 - 8

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	43.846	27.817	.887	.980
Item2	44.051	27.642	.861	.980
Item3	43.927	27.433	.907	.980
Item4	44.174	27.520	.831	.981
Item5	44.005	28.189	.760	.981
Item6	43.840	28.046	.882	.980
Item7	44.126	27.239	.894	.980
Item8	43.991	27.399	.908	.980
Item9	43.936	28.208	.847	.981
Item10	44.061	27.717	.733	.982
Item11	43.934	27.581	.858	.980
Item12	43.751	27.876	.918	.980
Item13	43.786	28.844	.737	.981
Item14	43.863	27.735	.915	.980
Item15	43.889	27.143	.867	.980
Item16	44.119	28.952	.581	.983
Item17	43.631	28.531	.852	.981
Item18	44.055	27.451	.920	.980
Item19	44.073	27.393	.907	.980
Item20	43.977	27.391	.915	.980

Note. *N=1,565*

Grades 9 – 12

The ordinal alpha was .991 for the twenty-one item SIP instrument for grades 9-12. The high value of the alpha coefficient indicates a high level of internal consistency. Table 6 shows the corrected item-total correlations for the grades 9-12 SIP instrument. The values ranged from 0.741 to 0.952. The inter-item correlations (see Appendix C) were also high ranging from 0.643 to 0.934. Items with high inter-item correlations may be indicative of item redundancy. While there is an item (Item 18) that, if deleted, would increase the alpha value,

removal of this item would not significantly impact the value of alpha and it correlates well with the composite score of the combined remaining items as evidenced by the Corrected Item-Total Correlation. As such, no items are recommended for removal.

Table 6
Reliability Analysis of SIP for Grades 9 - 12

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	44.650	55.015	.919	.991
Item2	44.811	54.043	.923	.991
Item3	44.796	54.425	.933	.991
Item4	44.915	54.407	.916	.991
Item5	44.864	54.779	.901	.991
Item6	44.820	54.203	.932	.991
Item7	44.867	54.115	.932	.991
Item8	44.894	53.954	.948	.991
Item9	44.797	54.401	.945	.991
Item10	44.743	55.007	.934	.991
Item11	44.857	54.243	.908	.991
Item12	44.600	55.117	.929	.991
Item13	44.744	54.346	.926	.991
Item14	44.636	55.705	.880	.991
Item15	44.663	54.540	.908	.991
Item16	44.690	54.530	.912	.991
Item17	44.683	54.795	.914	.991
Item18	44.7866	56.235	.741	.992
Item19	44.8397	54.122	.952	.991
Item20	44.8882	53.999	.949	.991
Item21	44.7958	54.09	.950	.991

Note. N=5,670

Correlation Between Component Parts

Student Growth Percentiles and Student Learning Objectives

The correlation between SGP Median score and SLO score was calculated for teachers having both scores. Compared to other analyses, the N (1,325) was low. To facilitate the analysis, SLO scores were converted to a 100 point scale using the conversion discussed above.

The Spearman's rho between SGP Median score and SLO score was found to be significant, *rs*(1325) = .09, *p* =.001. The polyserial correlation, appropriate when one of the variables is transformed, between SGP and SLO was found to be 0.13 and it was found to be significant based on the likelihood Ratio test $X^2(1, N = 1325) = 15.04$, p =.001. While this relationship was found statistically significant, the resulting effect size measure (R^2 = .02) is very small indicating that the relationship between these measures is minimal.

Examining Figure 1 shows that while the distribution of SGP scores covers the entire scale, the SLO scores are highly skewed with many of the values falling at the bottom of the scale.

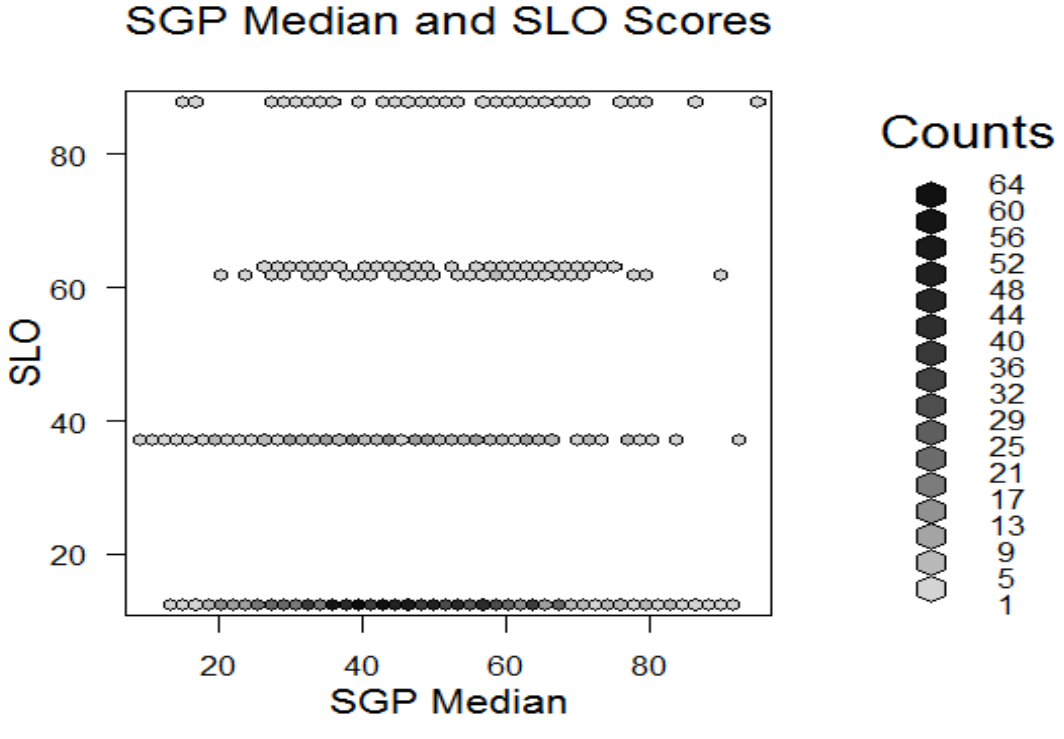

Figure 1. Scatter plot for correlation between SGP and SLO.

Teacher Assessment on Performance Standards and Student Growth Percentiles

The Pearson correlation between TAPS and SGP was found to be significant, $r(14,120) = .24$, $p<.001$. As these two measures partially form the basis of the TEM score, it is essential the measures be correlated. Although a significant correlation exists, just 6% of the variance in TAPS score was accounted for by the SGP median score ($R^2=.06$), suggesting a minimal relationship.

Figure 2 indicates the distribution of SGP median scores covered the respective scale, while the distribution of TAPS scores was skewed to higher scores.

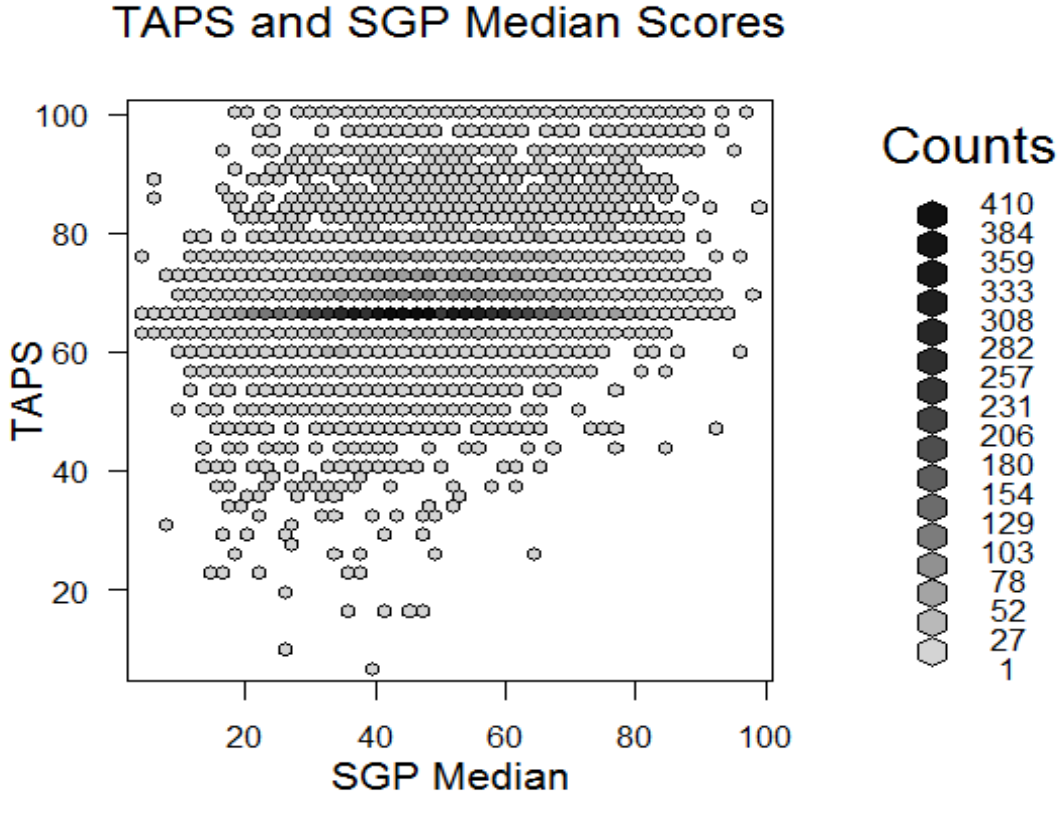

Figure 2. Scatter plot for correlation between TAPS and SGP.

Teacher Assessment on Performance Standards and Student Learning Objectives

The Spearman's rho between TAPS and SLO was found to be significant, $rs(8,206) = .17$, $p < .001$, though the actual value of the correlation was low. There was a significant correlation between the TAPS and SLO measures but support for combining TAPS and SLO measures was weaker than support for combining the TAPS and SGP Median measures. The variation in how SLOs were created and defined at local levels may have impacted these results.

The polyserial correlation between TAPS and SLO was 0.17 and was determined to be significant based on the likelihood Ratio test, $X^2(1, N = 8206) = 185.175$, $p < .001$. While a statistically significant relationship was observed, the effect size $R^2 = .03$ suggests that the actual relationship between these measures is minimal.

Figure 3 indicates the distribution of SLO scores were skewed toward lower SLO scores while the TAPS ratings were skewed to more positive ratings.

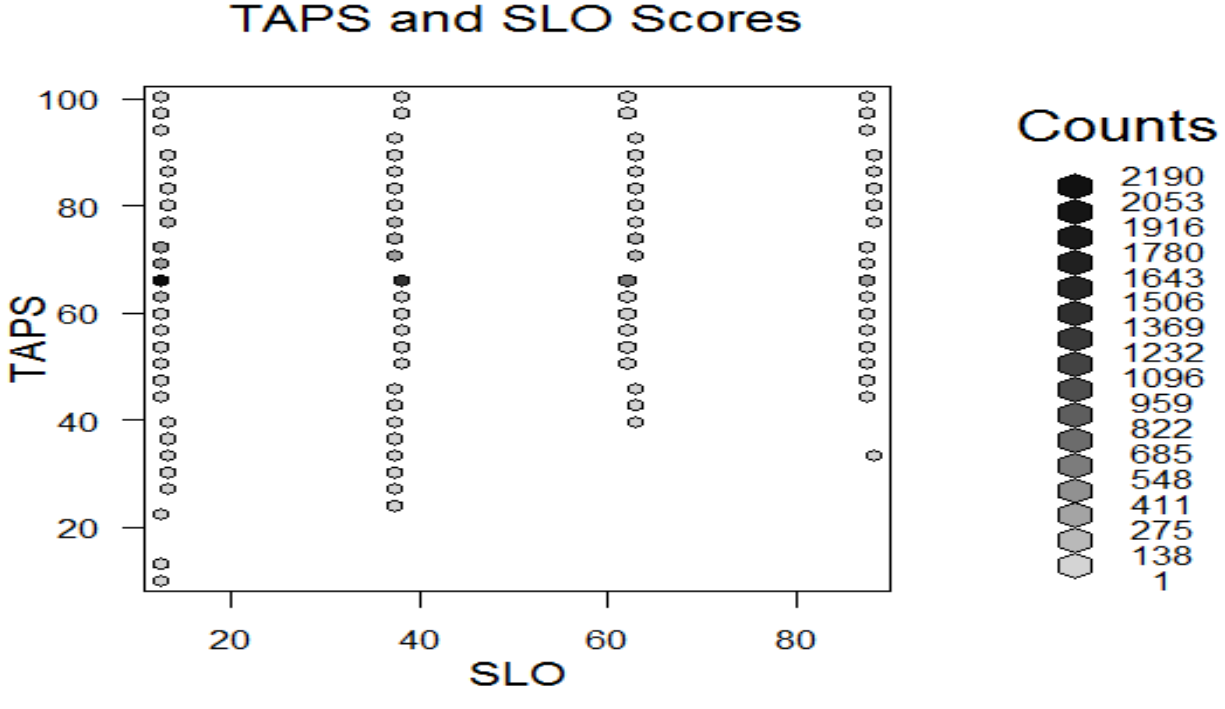

Figure 3. Scatter plot for correlation between TAPS and SLO.

II. What are the contributions of the relevant demographic elements to the Teacher Effectiveness Measure (TEM) score?

Teacher Effectiveness Measure

Multiple regression analyses were conducted to determine whether the TEM score could be predicted by available demographic variables and by teacher years of experience. The demographic variables included were: Economically Disadvantaged (ED), Students with a Disability (SWD), and Limited English Proficient (LEP). Table 7 shows the parameter estimates from the regression analysis.

Table 7 *Parameter Estimates*

Variable	DF	b	SE	t	Pr > |t|
Intercept	1	64.179	0.223	287.46	<.0001
ED	1	-0.113	0.003	-41.99	<.0001
SWD	1	-0.026	0.003	-7.67	<.0001
LEP	1	0.027	0.005	5.20	<.0001
Teacher Experience	1	-0.033	0.009	-3.51	0.0004

Each of these parameter estimates were very small and in total explained only 9% (R^2=.09) of the variability in TEM score. The results suggest there is a substantial amount of variability in TEM score not accounted for by the variables in the regression model and there may be other variables which may explain a higher percentage of the variability in TEM score.

III. Does evidence supporting the construct validity of the TEM score exist to suggest it is psychometrically sound?

Factor Analysis

TAPS

Ordinal factor analysis based on polychoric correlation matrix (see Table 2) was conducted for assessing the construct validity of the TAPS instrument.

Iterative principal factor analysis indicated one underlying factor by the Kaiser-Guttman rule, meaning there was only one eigenvalue greater than one. Additionally, the scree plot suggested one underlying factor as well. The proportion of variance explained by first factor was almost 1 indicating that almost all the variance was explained by this one factor. The scree plot as well as the variance explained can be seen in Figure 4.

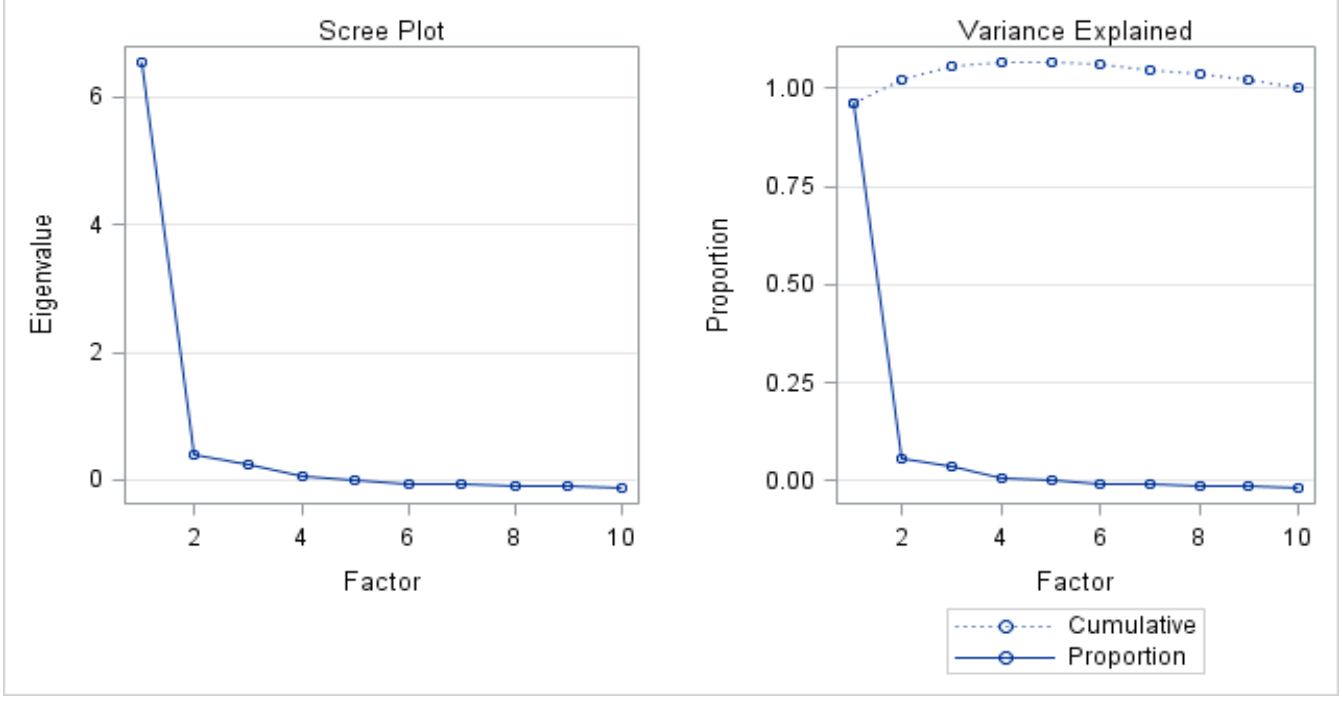

Figure 4. Scree Plot and Variance Explained Plot or Factor Analysis on TAPS Instrument

The factor loadings can be seen in Table 8. The loadings of each of the performance standards also suggested that all items were loaded on one factor which could be named "teacher performance".

Table 8
Factor Loadings and communalities based on iterative principal factor analysis for TAPS items

	Factor1	Communality
PS1	.83	.69
PS2	.83	.69
PS3	.86	.74
PS4	.81	.65
PS5	.87	.75
PS6	.81	.66
PS7	.75	.56
PS8	.85	.72
PS9	.71	.50
PS10	.76	.58

Note. N=42,316 PS= Performance Standards

Teacher Experience Hypotheses

TEM score and Years of Experience

The hypothesis that teachers with more experience would have higher Teacher Effectiveness Measures (TEM) scores was tested. Teachers with less than one year of experience were coded in the dataset as having 1 year of experience. The years of experience variable for all remaining teachers was therefore increased by one year for analysis purposes.

The Pearson correlation between the TEM and a teacher's years of experience was not found to be significant, $r(20{,}382) = .01$, $p = .29$. Figure 5 displays the relationship between TEM score and a teacher's years of experience. Results suggest that a teacher's TEM score varies, regardless of experience.

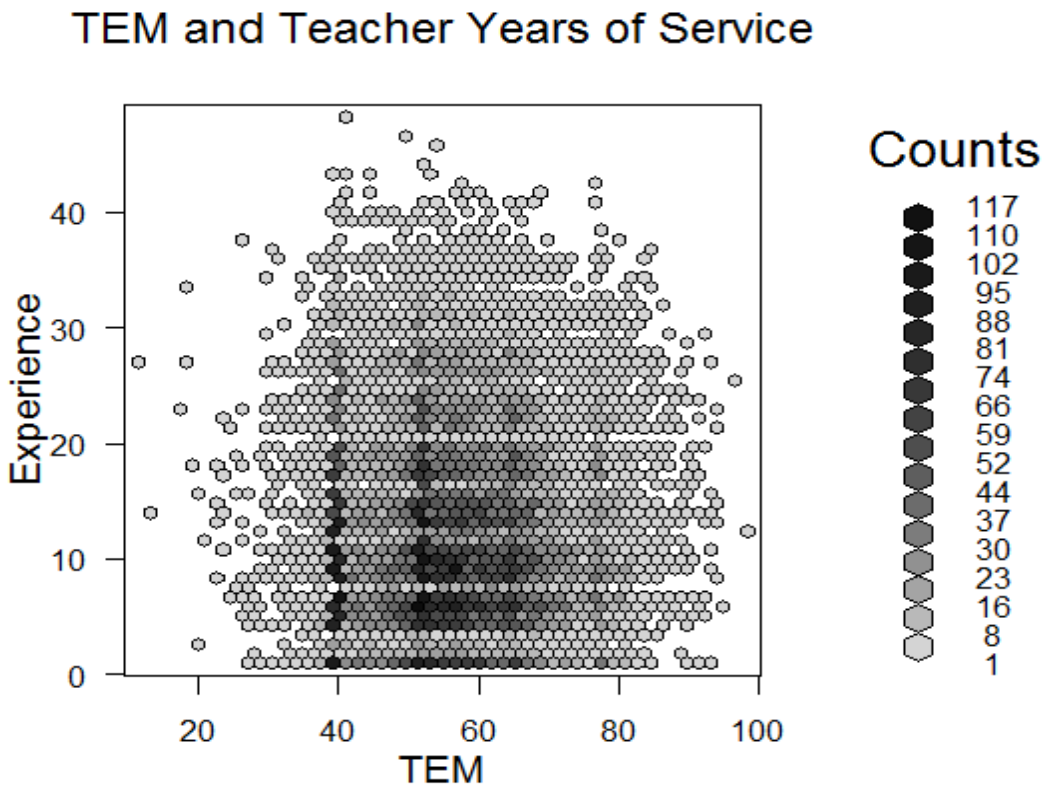

Figure 5. Correlation between TEM and Teacher Years of Service (*N*=20,384)

Student Achievement Data and Years of Experience

The hypothesis that teachers with more experience would have higher student achievement scores was not supported when examining student achievement data.

The Pearson correlation between teacher years of experience and the SGP median score was not found to be significant, $r(20{,}893) = -.003$, $p = .71$, indicating that a teacher's years of experience has no statistically significant impact on the SGP median score. The data are represented in Figure 6, and indicates no discernible pattern.

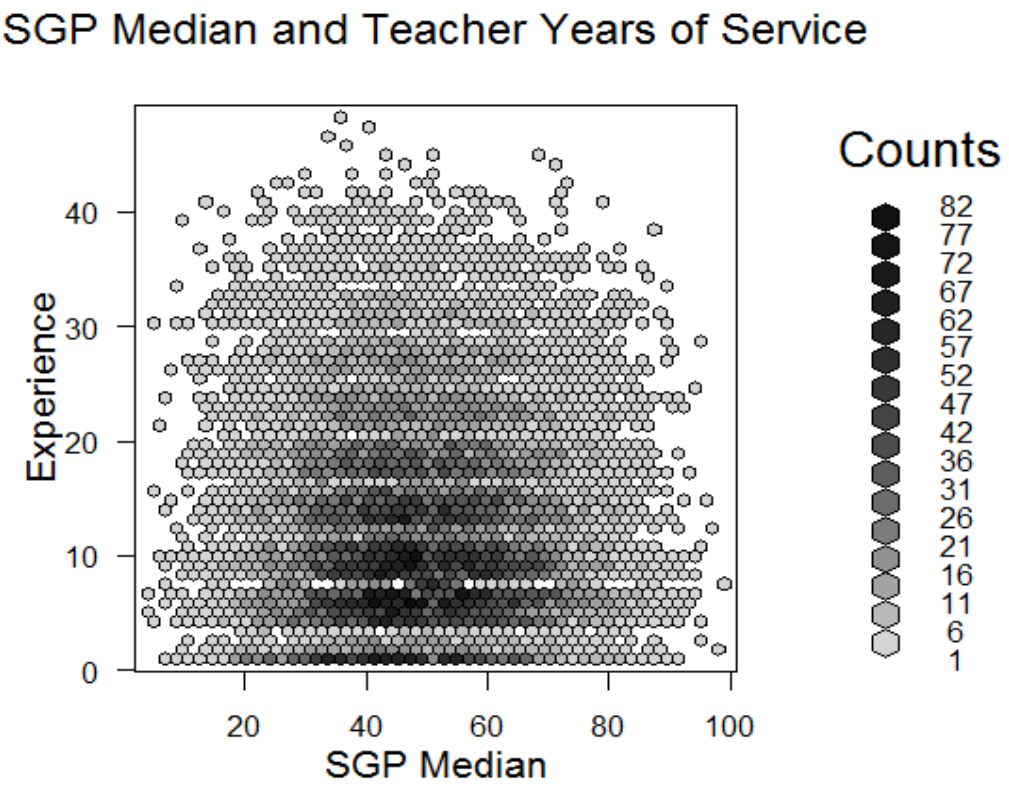

Figure 6. Correlation between SGP Median and Teacher Years of Service (*N*=20,895)

The relationship between the SLO score and teacher years of experience was also examined. The Spearman's rho was found to be statistically significant, $rs(8,069) = .07$, $p < .001$. The polyserial correlation between a teacher's years of experience and SLO score was found to be 0.06 and was significant based on the likelihood Ratio test, $X^2(1, N = 8,069) = 25.28$, $p < .001$. Though the correlation coefficient appears significant, the variance in teacher years of experience is not predictable by knowing the SLO score based on the effect size (R^2=.00).

TKES Discussion

The current analysis demonstrates the TAPS measure shows high internal consistency, particularly for the observational instrument. The ordinal factor analysis for the instrument also indicated the instrument measured one underlying construct. Though the correlations between the component parts, including the student achievement measures were found to be significant, the effect size measures indicated a generally low relationship between component parts.

A multiple regression analysis was performed to evaluate the contributions of each relevant element to the TEM score. Demographic variables (ED, SWD, and LEP) explained very little of the variation in TEM score. Unidentified variables should be investigated to better explain the variation in TEM score

As a means of assessing construct validity, assumptions were tested to investigate an expected positive relationship between teacher years of experience and both TEM score and student achievement data. These analyses showed no meaningful relationship between teacher years of experience and either TEM score or measures of student achievement.

The results of these analyses were mixed, indicating potential problems with the components of the evaluation system. Further investigation is suggested and potential modifications to the TKES and its components may be necessary. One area of particular concern is the variation in the SLO measures as these were created at the local level. Standardizing the SLO measure would potentially impact the analyses outlined in this report for any analysis containing the SLO measure.

The analyses presented here regarding the TKES evaluation system are done so as a means of gathering evidence related to reliability and validity. The ultimate determination of the results of these analyses

regarding the TKES evaluation system is left to the discretion of representatives of the Georgia Department of Education.

Leader Keys Effectiveness System

Activities related to the LKES

I. Is the assessment of the internal consistency of the component parts of the LKES adequate to support an argument for the psychometric soundness of the reliability of the LKES?

II. Does evidence supporting the construct validity of the LEM score exist?

Descriptions and Descriptive Statistics of Component Parts of the Leader Effectiveness Measure

In this section, descriptive information about each of the LKES components is provided. In subsequent sections, we provide results to address each of the activities outlined above.

LEM Score

The LEM score is a composite score derived from the Leader Assessment on Performance Standards (LAPS) score, the Student Growth Percentile (SGP) score, the Student Learning Objective (SLO) score, and the Achievement GAP Reduction Scores by using the weights shown in Table 9.

Table 9
LEM score composition

Scores	Weights (%)
LAPS	30
SGP/SLO	50
Achievement GAP Reduction	20

Note. Weights are given in percentages
LAPS: Leader Assessment on Performance Standards
SGP: Student Growth Percentile
SLO: Student Learning Objectives

At the request of the GaDOE, two methods of LEM score calculation were tested. Each of these methods and done based on the provisional methods of LEM calculation used at the time these data were gathered. The processes are as described below:

Method 1

- The LAPS Summative score was calculated as the sum of the ratings of the leaders on eight performance standards (Barge, 2013, p.26). The LAPS Summative score range is 0-24. This score was divided by 24 and multiplied by 100 to place it on a 100-point scale. The scores were then rounded to the nearest integer. Each leader was assigned an associated LAPS Summative score.
- The SGP score is a measure of a student's growth compared to other students with a similar prior achievement profile on state administered standardized assessments. SGP scores are on a 100-point scale. The median SGP score for all students in a school was used as the SGP score for that school. Leaders of the same school were assigned the same SGP median scores.
- The SLO score is an achievement growth measure for students in courses without state administered standardized assessments. These scores are based on district-determined learning objectives and were on a 4-point scale with values ranging from 0 to 3. SLO scores are converted to 100-point scale using the following scale:
    - 0 equals 12.5
    - 1 equals 37.5
    - 2 equals 62.5
    - 3 equals 87.5

  Leaders of the same school were assigned the same SLO scores.
- Achievement GAP Reduction score is a 4-point scale score having values ranging from 0 to 3. The GAP reduction score included two types of scores: an Achievement GAP Size score or an Achievement Gap Reduction Score. The Achievement GAP Size score was the difference between the focal group

and the reference group. The Achievement GAP Reduction score was the decrease in student performance from one year to another. Each school was assigned both types of scores for each subject area, however, only the greater of them was used to represent the GAP Reduction score. Each school was assigned only one GAP Reduction score which was the average of subject area scores. The final scores were rounded to the closest integer and converted to 100-point scale by using the following:

- 0 equals 12.5
- 1 equals 37.5
- 2 equals 62.5
- 3 equals 87.5

Leaders of the same school were assigned the same GAP Reduction score.

- LEM scores were calculated by weighting LAPS, SGP/SLO and Achievement GAP Reduction scores (see Table 9). If the school had only a SGP Median score or SLO score, the existing score was weighted by 50% to partially compose the final LEM score. If the school had both SGP and SLO scores, a weighted average of these scores was calculated where the numbers of students in each case served as the weights. The calculated score was then weighted by 50% and used to partially compose the final LEM score.
- Final LEM scores are on a 100-point scale. The scores were rounded to the nearest integer and were then converted to 4-point scale having values ranging from 0 to 3. The values used for conversion were as follows:
  - 0 to 24 was scored 0
  - 25 to 49 was scored 1
  - 50 to 74 was scored 2
  - 75 to 100 was scored 3

Method 2

- LAPS Summative scores were converted to 4-point scale scores using the conversion in Table 10.

Table 10
LAPS scores

4-point scale	100-point scale	Interpretation
0	0-5	Ineffective
1	6-13	Needs Improvement
2	14-21	Proficient
3	22-24	Exemplary

- SGP median scores were calculated on 100-point scale. These scores were converted to 4-point scale using the following:
    - 0 to 24 was scored 0
    - 25 to 49 was scored 1
    - 50 to 74 was scored 2
    - 75 to 100 was scored 3
- SLO 4-point scale scores were used.
- Achievement GAP Reduction scores ranged from 0 to 3. These scores were rounded to the nearest integer. The Achievement GAP Reduction 4-point scale scores were used.
- LEM scores were calculated as a composite score of the 4-point scale LAPS, SGP/SLO and Achievement GAP Reduction scores by using the weights given in Table 9.
- If the school had just the SGP or SLO 4-point scale scores, that score was weighted by 50% to partially calculate the final LEM score. If both the SGP and SLO 4-point scale scores were available, a weighted average of these scores was calculated where the numbers of students in each case served as the weights. The calculated score was then weighted by 50% and used to partially compose the final LEM score.
- Final LEM scores were rounded to the closest integer to place scores on a 4-point scale.

Descriptive statistics for the school leaders and the components of the LEM are shown in Table 11.

A total of 1810 school leaders from 914 schools were included in the LKES study. Leaders from the same school were assigned the same values of SGP, SLO and Achievement GAP Reduction scores. Therefore, descriptive statistics were provided both for leaders and for the schools in the following sections.

Leaders

- There were 567 leaders that had students with only SGP Median scores. These leaders had an associated Achievement GAP Reduction score. Therefore, an LEM score was calculated for each of these leaders.
- There were 40 leaders that had students with only SLO scores. Of these, six had an Achievement GAP Reduction score and a calculated LEM score.
- There were 1145 leaders that had both SGP Median and SLO scores from 567 schools. Each of these leaders had an Achievement GAP Reduction score and therefore a calculated LEM score.
- The SGP Median and SLO scores were both missing for 58 leaders from 38 schools. These leaders did not have calculated LEM scores because a major component, a student achievement measure, was missing. There were also 88 leaders from 60 schools missing the Achievement GAP reductions measure; LEM scores were not calculated. Descriptive statistics are presented for leaders in Table 15.

Table 11

Descriptive Statistics for Leaders

		LAPS Summative Score	LAPS 100-point scale	LAPS 4-point Score	SLO 100-point scale	SLO 4-point scale	SGP 100-point scale	SGP 4-point scale	Achievement GAP Reduction 100-point scale	Achievement GAP Reduction 4-point scale
N	Valid	1810	1810	1810	1185	1185	1712	1712	1722	1722
	Missing	0	0	0	625	625	98	98	88	88
Mean		16.720	69.82	1.968	25.770	0.53	47.629	1.412	61.280	1.950
Median		16	67	2	12.500	0	48	1	62.500	2
Mode		16	67	2	12.500	0	50	1	62.500	2
Std. Deviation		2.181	9.046	0.264	17.454	0.698	8.170	0.501	21.083	0.843
Variance		4.757	81.828	0.070	304.648	0.487	66.743	0.251	444.474	0.711
Range		19	79	3	75	3	48	2	75	3
Minimum		5	21	0	12.5	0	22	0	12.500	0
Maximum		24	100	3	87.5	3	70	2	87.500	3

Note.

SLO: Student Learning Objectives Measure
SGP: Student Growth Percentile Measure
LAPS: Leader Assessment of Performance Standards

School Level

Descriptive statistics at the school level for the SGP Median, SLO and Achievement GAP Reduction scores are presented in Table 12. The missing data rate for the SGP/SLO measure was 4% and the missing data rate for Achievement Gap Reduction was 7% at the school level. Missing data are instances where data were unavailable for any given variable under investigation. While these missing data rates are relatively low, missing data reduce the representativeness of the data, impacting the inferences which can be drawn from analyses on these data.

Table 12
Descriptive Statistics of Leaders for School Level Measures

		SLO 100-point scale	SLO 4-point scale	SGP	SGP 4-point scale	Achievement GAP Reduction 100-point scale	Achievement GAP Reduction 4-point scale
N	Valid	594	594	849	849	854	854
	Missing	320	320	65	65	60	60
Mean		27.441	0.598	47.113	1.384	59.865	1.895
Median		12.500	0	47	1	62.500	2
Mode		12.500	0	49	1	62.500	2
Std. Deviation		18.274	0.731	8.489	0.496	21.765	0.871
Variance		333.934	0.534	72.057	0.246	473.707	0.758
Range		75	3	48	2	75	3
Minimum		12.500	0	22	0	12.500	0
Maximum		87.500	3	70	2	87.500	3

Note.
SLO: Student Learning Objectives Measure
SGP: Student Growth Percentile Measure
LAPS: Leader Assessment of Performance Standards

Method Comparison

There were two methods used for calculating the LEM score outlined above. Neither Method 1 nor Method 2 was found preferable over the other as the polychoric correlation between the methods was 0.95 and the Spearman's rank order correlation was 0.74 (p=.000). The results both indicated that the scores calculated from Method 1 and Method 2 are highly consistent and either method could be used to calculate LEM score.

I. Is the assessment of the internal consistency of the component parts of the LKES adequate to support an argument for the psychometric soundness of the reliability of the LKES?

Internal consistency is an indicator of the consistency of the scores obtained through the use of a measure. The general term for this consistency indicator is reliability.

Reliability

The LAPS instrument included eight items, each representing a performance standard. The outcome from the LAPS instrument is ordinal. Polychoric correlations are appropriate when estimating the correlation between ordinal variables.

Leader Assessment on Performance Standards Instrument

The LAPS scale with eight items has ordinal alpha of 0.87, indicating that the items are strongly associated with one another and appear to be measuring one underlying construct.

Polychoric correlations between the components of LAPS items and item-total correlations are given in Table 13 and Table 14. Item-total correlations are calculated based on the polychoric correlation matrix.

Table 13
Polychoric Correlation Matrix of Component Parts of the LAPS

	PS2	PS3	PS4	PS5	PS6	PS7	PS8
PS1	.50	.69	.42	.48	.50	.47	.37
PS2		.34	.46	.49	.43	.55	.50
PS3			.44	.48	.43	.41	.35
PS4				.47	.41	.46	.43
PS5					.61	.42	.40
PS6						.46	.31
PS7							.58

Note. N=1,810 *PS= Performance* Standards

Table 14
Item-Total Correlations for LAPS

	Not Corrected	Corrected
S1	0.76	0.74
S2	0.74	0.69
S3	0.71	0.68
S4	0.70	0.64
S5	0.75	0.71
S6	0.71	0.66
S7	0.75	0.71
S8	0.68	0.62

Note. N=1,810 *PS*= Performance Standards

These results indicated the LAPS items correlate moderately with one another and item-total correlations between the performance standards were fairly high. This suggests that all of the items were measuring the same construct and may also be indicative of potential redundancy among the items.

Climate Surveys

Climate surveys were one resource used to inform the LAPS rating scores, done so at the discretion of the rater (i.e., superintendent). These scores reflect the leader performance as perceived by the leader's staff. The principals and assistant/associate principals were each evaluated on two different surveys: one rated by full-time certified staff and the other rated by full-time classified staff.

Climate survey ratings were on a 4-point scale ranging from "Strongly Agree" to "Strongly Disagree". The Climate survey ratings were averaged over staff for each leader on each item. Ordinal alpha was calculated based on the mean ratings in order to evaluate the internal consistency of the instrument.

Principals

Principals were rated using slightly different climate surveys, one specific to certified staff and one specific to classified staff. There were 33 items in the climate survey designed to rate principals by certified staff. The ordinal alpha was found to be .985 and the corrected item-total correlations (see Table 15) ranged from 0.661 to 0.932. The inter-item correlation matrix (see Appendix D) ranged from 0.387 to 0.935. There were 29 items in the climate survey designed to rate principals by classified staff. The ordinal alpha was found to be .992 and the corrected item-total correlations (see Table 16) ranged from 0.856 to 0.933. The inter-item correlation matrix (see Appendix E) ranged from 0.717 to 0.942.

Table 15
Reliability Analysis of Principals Survey Rated by Certified Staff

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	91.102	20.290	.861	.985
Item2	91.121	20.273	.850	.985
Item3	91.137	20.232	.834	.985
Item4	91.104	20.516	.750	.985
Item5	91.153	19.867	.932	.984
Item6	91.101	20.387	.833	.985
Item7	91.344	18.855	.905	.985
Item8	91.184	19.995	.876	.984
Item9	91.235	19.603	.902	.984
Item10	91.090	20.519	.793	.985
Item11	91.072	20.586	.855	.985
Item12	91.038	20.952	.661	.985
Item13	91.072	20.653	.793	.985
Item14	91.158	19.985	.769	.985
Item15	91.192	19.581	.909	.984
Item16	91.124	20.252	.836	.985
Item17	91.131	20.258	.855	.985
Item18	91.206	19.933	.879	.984
Item19	91.167	19.999	.861	.984
Item20	91.132	20.252	.885	.984
Item21	91.216	19.815	.853	.985
Item22	91.086	20.544	.844	.985
Item23	91.125	20.223	.909	.984
Item24	91.160	20.136	.883	.984
Item25	91.198	19.808	.885	.984
Item26	91.132	20.116	.811	.985
Item27	91.113	20.262	.790	.985
Item28	91.148	19.989	.815	.985
Item29	91.080	20.555	.786	.985
Item30	91.103	20.295	.861	.985
Item31	91.096	20.303	.805	.985
Item32	91.116	20.274	.768	.985
Item33	91.137	20.189	.678	.985

Note. N=730

Table 16
Reliability Analysis of Principals Survey Rated by Classified Staff

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
item1	65.977	94.512	.904	.992
item2	65.994	93.653	.933	.992
item3	65.922	95.202	.886	.992
item4	65.980	94.455	.911	.992
item5	66.225	91.966	.935	.992
item6	66.179	92.217	.927	.992
item7	66.005	93.908	.909	.992
item8	66.109	94.496	.899	.992
item9	66.077	94.434	.914	.992
item10	66.016	94.447	.899	.992
item11	66.136	93.399	.924	.992
item12	66.047	94.879	.906	.992
item13	66.070	95.095	.886	.992
item14	66.171	94.106	.915	.992
item15	66.083	94.478	.900	.992
item16	66.077	94.883	.905	.992
item17	66.101	93.793	.917	.992
item18	66.127	94.218	.921	.992
item19	66.185	94.29	.904	.992
item20	66.167	94.546	.882	.992
item21	66.135	93.43	.921	.992
item22	65.991	94.014	.911	.992
item23	65.956	94.517	.911	.992
item24	66.007	93.989	.908	.992
item25	66.084	93.417	.934	.992
item26	66.058	94.781	.883	.992
item27	66.021	95.017	.882	.992
item28	66.011	94.859	.895	.992
item29	65.988	94.918	.842	.992

Note. N=775

Assistant/Associate Principals

Assistant/Associate principals were rated using slightly different climate surveys, one specific to certified staff and one specific to classified staff. There were 32 items in the climate survey designed to rate associate/assistant principals by certified staff. The ordinal alpha was found to be .994 and the corrected item-total correlations (see Table 17) ranged from 0.830 to 0.971. The inter-item correlation matrix (see Appendix F) ranged from 0.669 to 0.976. There were 29 items in the climate survey designed to rate principals by classified staff. The ordinal alpha was found to be .992 and the corrected item-total correlations (see Table 18) ranged from 0.842 to 0.935. The inter-item correlation matrix (see Appendix G) ranged from 0.736 to 0.928.

Table 17
Reliability Analysis of Assistant/Associate Principals Survey Rated by Certified Staff

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	72.655	83.545	.959	.994
Item2	72.735	84.175	.889	.994
Item3	72.693	84.491	.906	.994
Item4	72.800	84.157	.898	.994
Item5	72.756	82.291	.933	.994
Item6	72.740	83.876	.944	.994
Item7	72.827	81.892	.931	.994
Item8	72.831	83.153	.956	.994
Item9	72.682	85.504	.890	.994
Item10	72.658	85.778	.830	.995
Item11	72.739	84.811	.886	.994
Item12	72.813	84.037	.952	.994
Item13	72.799	83.087	.930	.994
Item14	72.770	83.385	.934	.994
Item15	72.725	84.171	.941	.994
Item16	72.765	84.392	.941	.994
Item17	72.792	84.095	.941	.994
Item18	72.815	84.036	.942	.994
Item19	72.755	83.298	.971	.994
Item20	72.753	83.561	.937	.994
Item21	72.678	84.795	.935	.994
Item22	72.740	84.182	.962	.994
Item23	72.774	84.159	.949	.994
Item24	72.758	83.682	.946	.994
Item25	72.625	83.820	.915	.994
Item26	72.599	84.195	.919	.994
Item27	72.649	83.490	.914	.994
Item28	72.657	84.668	.918	.994
Item29	72.768	84.514	.945	.994
Item30	72.707	84.542	.933	.994
Item31	72.630	84.401	.927	.994
Item32	72.559	85.445	.868	.994

Note. N=838

Table 18
Reliability Analysis of Assistant/Associate Principals Survey Rated by the Classified Staff

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item1	66.497	79.566	.916	.992
Item2	66.498	79.962	.905	.992
Item3	66.522	79.790	.910	.992
Item4	66.534	79.631	.906	.992
Item5	66.626	78.154	.911	.992
Item6	66.604	78.479	.910	.992
Item7	66.538	79.033	.912	.992
Item8	66.653	79.346	.897	.992
Item9	66.580	79.849	.904	.992
Item10	66.606	79.125	.921	.992
Item11	66.580	79.487	.925	.992
Item12	66.575	79.873	.899	.992
Item13	66.589	79.759	.908	.992
Item14	66.617	79.485	.906	.992
Item15	66.584	79.886	.890	.992
Item16	66.590	79.360	.933	.992
Item17	66.576	79.646	.898	.992
Item18	66.646	79.580	.896	.992
Item19	66.695	79.628	.879	.992
Item20	66.677	79.594	.856	.992
Item21	66.594	79.257	.887	.992
Item22	66.499	79.695	.906	.992
Item23	66.484	79.860	.910	.992
Item24	66.524	79.356	.922	.992
Item25	66.553	79.302	.927	.992
Item26	66.586	79.733	.856	.992
Item27	66.550	80.047	.867	.992
Item28	66.511	79.961	.898	.992
Item29	66.479	80.041	.868	.992

Note. *N*=723

Overall, the values of alpha were found to be high for all climate surveys. High values of alpha are indicative of high internal consistency between the items; however, the high values of the corrected item-total correlations and the inter-item correlations suggest potential redundancy of items.

Correlation Between Component Parts

Leader Assessment on Performance Standards and Student Growth Percentiles

The Pearson correlation between LAPS and SGP was found to be significant, $r(1,710) = .108$, $p = .00$. As these two measures partially form the basis of the LEM score, it was essential they be correlated. Although a significant correlation coefficient exists, just 1% of the variance in LAPS score was accounted for by the SGP Median score (R^2=.01) indicating the relationship between these measures is minimal. A visual representation of these data can be seen in Figure 7. Both the LAPS rating and SGP Median rating seem to be skewed to higher values.

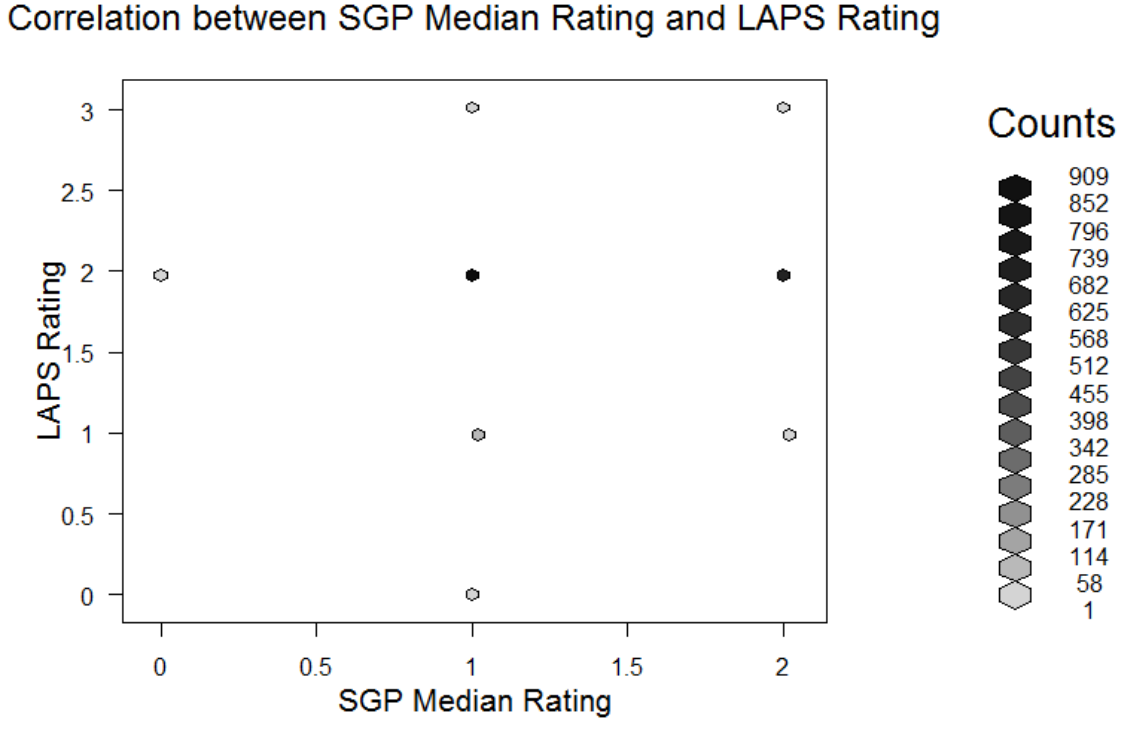

Figure 7. Scatter plot for correlation between LAPS and SGP.

Leader Assessment on Performance Standards and Student Learning Objectives

The Spearman's rho between the LAPS score and the SLO 100 point scale score was not found to be significant, $rs(1,185) = .05$, $p=.104$. These findings failed to support combining LAPS scores and SLO scores, which are meaningful components of the LEM score. This finding is likely impacted by the variation in SLO measures and scoring at local levels.

The polyserial correlation between LAPS and SLO score was 0.06 and was not found significant based on the likelihood Ratio test, $X^2(1, N = 1,185) = 3.485$, $p = .06$. A visual representation of these data can be seen in Figure 8. The LAPS Summative Score covered the entire scale while the SLO measure was skewed toward lower values.

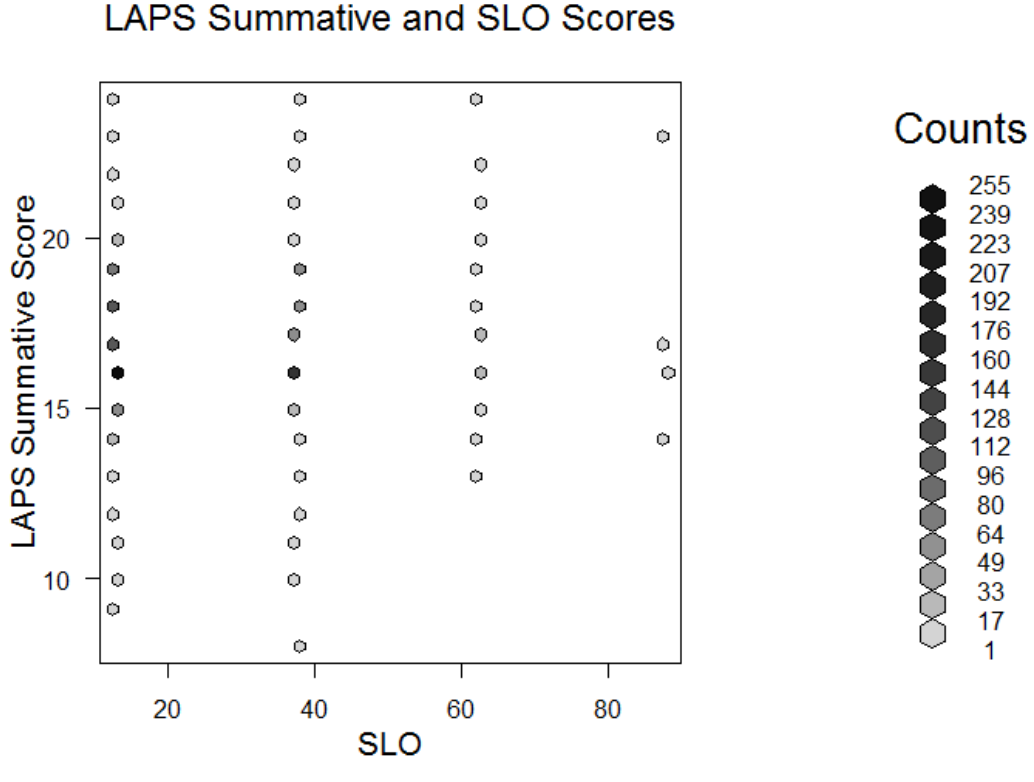

Figure 8. Scatter plot for correlation between LAPS and SLO.

Student Growth Percentiles and Student Learning Objectives

The Spearman's rho was also not statistically significant $rs(567) = .10$, $p=.017$. These findings failed to support combining SGP scores and SLO scores, which are meaningful components of the LEM score.

The polyserial correlation between SGP Median score and SLO Rating score was 0.09 and was not significant based on the likelihood Ratio test $X^2(1, N=567) = 3.16$, $p=.076$. A visual representation of these data can be seen in Figure 9. The SGP Median score covered the entire scale while the SLO measure was skewed toward lower values.

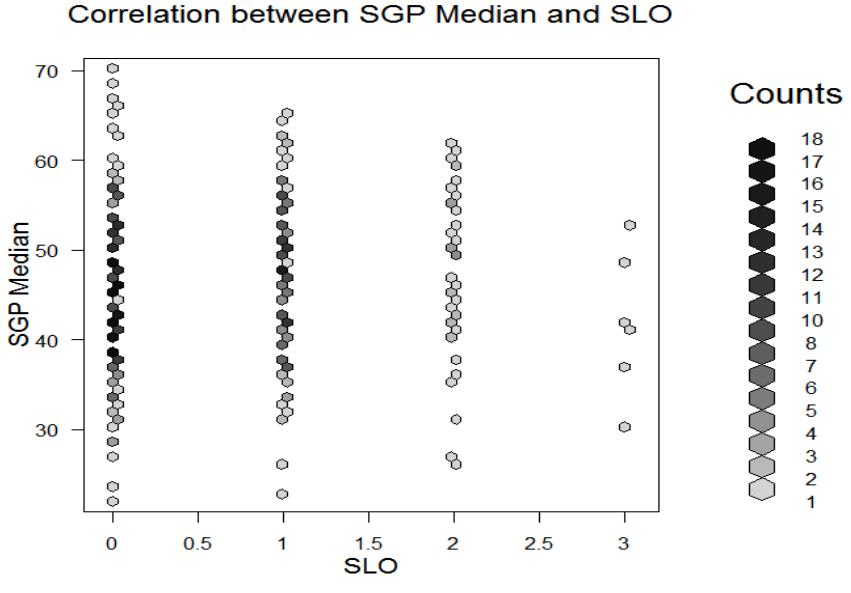

Figure 9. Scatter plot for correlation between SGP and SLO.

II. Does evidence supporting the construct validity of the LEM score exist?

LAPS

Factor Analysis

Ordinal factor analysis based on the polychoric correlation matrix (see Table 13) was conducted as a means of assessing the construct validity of the LAPS instrument.

Iterative principal factor analysis of the LAPS indicated one underlying factor according to the Kaiser-Guttman rule, meaning there was only one eigenvalue greater than one. Likewise, scree plot analysis also suggested one underlying factor. The proportion of variance explained by the first factor was nearly 1, indicating almost all of the variance was explained by this factor. The scree plot as well as the variance explained can be seen in Figure 10.

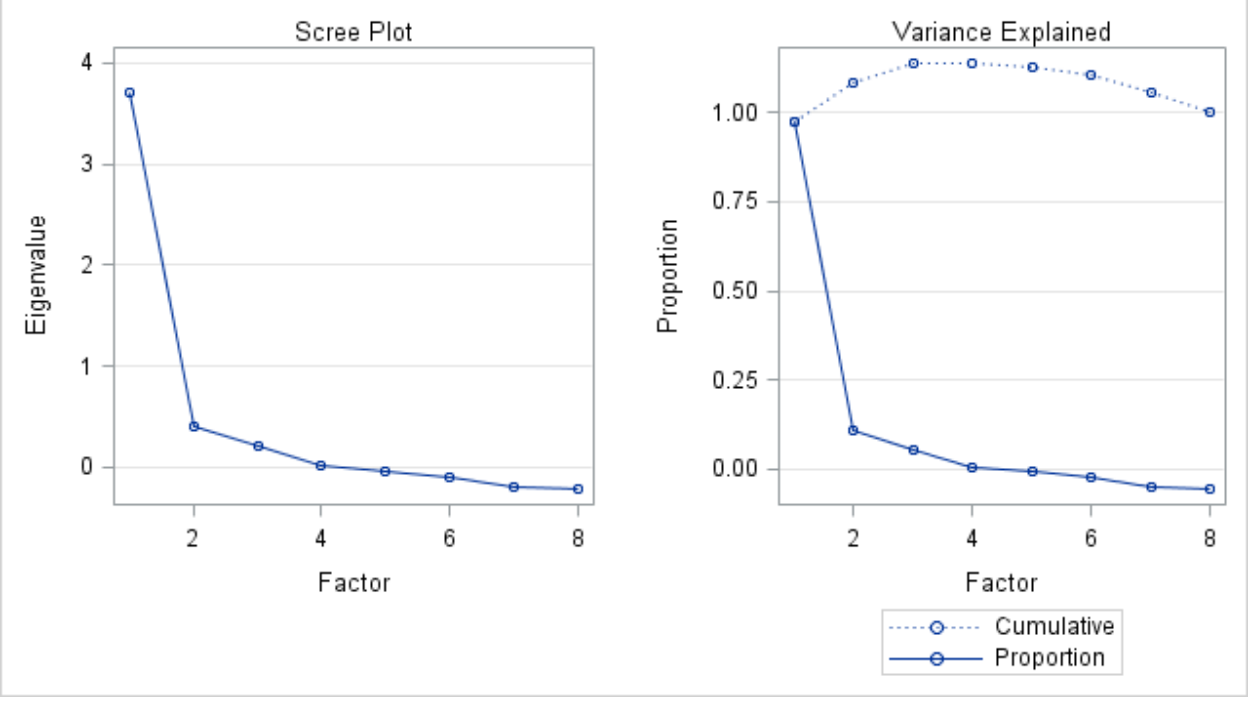

Figure 10. Scree Plot and Variance Explained Plot or Factor Analysis on LAPS Instrument

All items, representative of performance standards, were highly loaded on this factor as shown in Table 19. This factor could be named "Leader Performance" as assessing leader performance was the goal of the LAPS instrument.

Table 19
Factor Loadings and communalities based on iterative principal factor analysis for LAPS items

	Factor1	Communality
PS1	.73	.54
PS2	.69	.48
PS3	.66	.44
PS4	.65	.42
PS5	.71	.50
PS6	.67	.44
PS7	.71	.50
PS8	.61	.37

Note. N=1,810 *PS*= Performance Standards

LKES Discussion

The current analysis has demonstrated that the LAPS measure shows a high degree of internal consistency, particularly for the observational instrument. Additionally, ordinal factor analysis also supports the instrument measures one underlying construct. The correlation analysis between the component parts, including the student achievement measures, provided mixed results. When a statistical relationship was found, it was minimal, at best.

The two methods of LEM score calculation provided similar results.

The climate surveys each showed a high degree of internal consistency. There existed evidence to suggest potential redundancy of the items. These surveys should be examined for redundancy.

The results of these analyses were mixed, indicating potential problems with the components of the evaluation system. Further investigation is suggested and potential modifications to the LKES and its components may be necessary. One area of particular concern is the variation in the SLO measures as these were created at the

district-level. Standardizing the SLO measure would likely impact the analyses outlined in this report for any analysis containing the SLO measure.

The analyses presented here regarding the LKES evaluation system are done so as a means of gather evidence related to reliability and validity. The ultimate determination of the results of these analyses regarding the LKES evaluation system is left to the discretion of representatives of the Georgia Department of Education.

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Appendix A Inter-item correlation matrix of the SIP instrument for grades 3 - 5

Inter-Item Correlation Matrix for Grades 3 through 5

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9
Item2	.232								
Item3	.561	.302							
Item4	.593	.299	.675						
Item5	.450	.486	.469	.497					
Item6	.351	.404	.411	.418	.422				
Item7	.512	.368	.655	.762	.478	.424			
Item8	.392	.520	.372	.408	.429	.301	.380		
Item9	.512	.351	.656	.686	.514	.466	.623	.342	
Item10	.593	.405	.555	.555	.495	.417	.503	.465	.519
Item11	.399	.381	.569	.609	.411	.461	.662	.322	.579
Item12	.278	.418	.383	.414	.424	.453	.430	.308	.471
Item13	.478	.430	.689	.642	.493	.507	.655	.391	.690
Item14	.371	.463	.472	.417	.432	.470	.459	.327	.547
Item15	.300	.449	.485	.469	.438	.491	.505	.300	.604
Item16	.456	.272	.360	.407	.375	.246	.368	.385	.337
Item17	.441	.431	.569	.575	.469	.436	.613	.38	.576
Item18	.306	.377	.393	.389	.323	.320	.463	.282	.385
Item19	.364	.440	.548	.532	.489	.470	.547	.358	.618
Item20	.397	.496	.528	.553	.525	.457	.598	.420	.574

Note. N=7,914

Inter-Item Correlation Matrix for Grades 3 - 5 (Continues)

Items	Item10	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19
Item11	.454									
Item12	.359	.470								
Item13	.517	.652	.473							
Item14	.468	.512	.446	.585						
Item15	.444	.650	.620	.662	.622					
Item16	.395	.260	.286	.292	.248	.206				
Item17	.482	.624	.464	.635	.537	.599	.351			
Item18	.378	.469	.404	.447	.462	.470	.262	.554		
Item19	.478	.599	.483	.672	.561	.679	.234	.606	.404	
Item20	.495	.620	.539	.624	.544	.617	.358	.691	.507	.652

Note. N=7,914

Appendix B Inter-item correlation matrix of the SIP instrument for grades 6 - 8

Inter-Item Correlation Matrix for Grades 6 through 8

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9
Item2	.779								
Item3	.838	.833							
Item4	.745	.783	.827						
Item5	.643	.702	.676	.700					
Item6	.782	.772	.806	.754	.761				
Item7	.808	.790	.843	.774	.654	.760			
Item8	.808	.841	.889	.785	.652	.786	.875		
Item9	.774	.691	.761	.718	.685	.811	.743	.749	
Item10	.666	.629	.632	.619	.638	.703	.665	.644	.651
Item11	.760	.725	.754	.699	.634	.770	.815	.794	.773
Item12	.820	.808	.847	.743	.703	.826	.822	.865	.781
Item13	.698	.611	.638	.554	.640	.714	.610	.625	.706
Item14	.826	.783	.868	.755	.656	.802	.852	.876	.796
Item15	.767	.717	.788	.692	.615	.765	.826	.809	.748
Item16	.501	.580	.507	.507	.593	.542	.503	.513	.461
Item17	.792	.718	.775	.669	.641	.798	.712	.780	.771
Item18	.841	.812	.860	.778	.673	.782	.867	.872	.771
Item19	.840	.773	.847	.802	.665	.784	.835	.837	.784
Item20	.863	.782	.830	.737	.670	.789	.834	.831	.780

Note. N=1,565

Inter-Item Correlation Matrix for Grades 6 - 8

Items	Item10	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19
Item11	.668									
Item12	.65	.819								
Item13	.559	.615	.704							
Item14	.677	.838	.865	.665						
Item15	.652	.850	.861	.649	.860					
Item16	.462	.443	.512	.512	.466	.420				
Item17	.594	.731	.877	.751	.794	.782	.503			
Item18	.665	.792	.847	.672	.867	.814	.553	.773		
Item19	.661	.767	.839	.653	.839	.788	.566	.789	.886	
Item20	.689	.801	.852	.692	.859	.813	.574	.800	.894	.890

Note. N=1,565

Appendix C Inter-item correlation matrix of the SIP instrument for grades 9 - 12

Inter-Item Correlation Matrix for Grades 9 through 12

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9
Item2	.879								
Item3	.875	.857							
Item4	.838	.863	.886						
Item5	.837	.855	.845	.861					
Item6	.865	.899	.864	.882	.904				
Item7	.852	.856	.905	.858	.828	.859			
Item8	.870	.925	.899	.890	.861	.907	.912		
Item9	.859	.861	.917	.872	.843	.869	.921	.914	
Item10	.859	.859	.869	.863	.848	.875	.862	.881	.890
Item11	.854	.922	.825	.835	.846	.893	.854	.904	.846
Item12	.889	.838	.884	.837	.829	.854	.870	.862	.892
Item13	.843	.850	.867	.861	.829	.888	.870	.882	.886
Item14	.837	.794	.810	.805	.803	.825	.792	.805	.814
Item15	.834	.822	.847	.821	.802	.828	.869	.849	.881
Item16	.837	.835	.853	.824	.803	.842	.878	.864	.895
Item17	.848	.833	.856	.846	.811	.842	.844	.852	.866
Item18	.682	.658	.688	.672	.683	.657	.680	.676	.707
Item19	.881	.869	.913	.877	.854	.879	.917	.914	.927
Item20	.873	.879	.892	.883	.868	.896	.892	.912	.897
Item21	.897	.886	.884	.859	.863	.889	.896	.907	.899

Note. N=5,670

Inter-Item Correlation Matrix for Grades 9 - 12

Items	Item10	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19	Item20
Item11	.849										
Item12	.881	.827									
Item13	.885	.835	.871								
Item14	.869	.786	.853	.849							
Item15	.846	.808	.894	.859	.809						
Item16	.854	.827	.886	.875	.784	.918					
Item17	.896	.811	.866	.873	.875	.841	.830				
Item18	.749	.643	.706	.648	.734	.684	.656	.763			
Item19	.883	.864	.892	.883	.826	.875	.881	.863	.714		
Item20	.886	.871	.874	.889	.835	.852	.859	.869	.735	.930	
Item21	.885	.887	.890	.872	.834	.869	.872	.865	.730	.928	.934

Note. N=5,670

Appendix D Inter-item correlation matrix of the Climate survey for principals rated by certified staff

Inter-Item Correlation Matrix for Principals Survey Rated by Certified Staff

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10
Item2	.843									
Item3	.827	.890								
Item4	.693	.722	.703							
Item5	.783	.778	0.760	.696						
Item6	.804	.817	.773	.704	.800					
Item7	.757	.716	.717	.639	.895	.707				
Item8	.728	.673	.667	.608	.829	.647	.864			
Item9	.751	.717	.702	.630	.858	.686	.901	.935		
Item10	.691	.694	.679	.618	.729	.663	.649	.765	.772	
Item11	.798	.825	.834	.708	.783	.776	.702	.708	.741	.772
Item12	.702	.726	.773	.587	.572	.682	.472	.526	.509	.641
Item13	.782	.830	.863	.687	.693	.747	.622	.644	.658	.716
Item14	.703	.719	.708	.692	.766	.815	.675	.586	.633	.596
Item15	.801	.807	.781	.754	.871	.844	.825	.749	.788	.711
Item16	.779	.746	.705	.666	.759	.699	.739	.758	.757	.665
Item17	.707	.700	.670	.622	.795	.722	.789	.797	.826	.734
Item18	.746	.707	.695	.669	.810	.685	.857	.821	.844	.684
Item19	.740	.772	.750	.641	.807	.737	.783	.732	.767	.679
Item20	.745	.760	.734	.659	.809	.751	.782	.804	.818	.754
Item21	.706	.681	.659	.577	.819	.658	.884	.834	.850	.618
Item22	.735	.714	.742	.646	.818	.698	.761	.759	.758	.688
Item23	.843	.773	.755	.674	.839	.749	.815	.827	.823	.732
Item24	.755	.762	.766	.684	.815	.730	.801	.779	.792	.715
Item25	.761	.681	.700	.617	.849	.688	.883	.819	.832	.663
Item26	.600	.576	.572	.525	.823	.575	.829	.781	.786	.635
Item27	.612	.585	.591	.560	.771	.601	.771	.713	.723	.614
Item28	.652	.582	.580	.499	.825	.570	.854	.816	.828	.608
Item29	.766	.767	.730	.640	.742	.721	.673	.639	.664	.651
Item30	.739	.735	.713	.606	.803	.710	.774	.754	.798	.740
Item31	.713	.716	.685	.644	.721	.728	.701	.643	.685	.648
Item32	.633	.657	.626	.590	.716	.633	.683	.681	.682	.637
Item33	.588	.653	.591	.578	.618	.622	.586	.555	.582	.559

Note. N=730

Inter-Item Correlation Matrix for Principals Survey Rated by Certified Staff

Items	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19	Item20
Item12	.809									
Item13	.879	.873								
Item14	.688	.563	.645							
Item15	.777	.607	.719	.882						
Item16	.733	.583	.694	.660	.764					
Item17	.746	.546	.665	.653	.787	.706				
Item18	.730	.514	.662	.658	.790	.741	.815			
Item19	.714	.553	.690	.738	.818	.754	.740	.746		
Item20	.801	.634	.756	.671	.790	.749	.868	.837	.782	
Item21	.638	.433	.576	.583	.745	.730	.737	.798	.758	.764
Item22	.744	.585	.706	.629	.736	.723	.725	.734	.708	.760
Item23	.788	.606	.730	.677	.796	.854	.755	.815	.791	.815
Item24	.755	.574	.717	.673	.796	.757	.762	.766	.794	.810
Item25	.715	.507	.639	.637	.777	.743	.753	.841	.768	.771
Item26	.643	.420	.552	.522	.696	.633	.726	.750	.673	.720
Item27	.659	.465	.569	.539	.709	.612	.681	.728	.652	.708
Item28	.618	.387	.525	.503	.678	.673	.717	.759	.689	.711
Item29	.781	.656	.744	.640	.730	.677	.669	.689	.657	.700
Item30	.767	.566	.696	.639	.778	.702	.776	.751	.754	.783
Item31	.730	.573	.670	.692	.819	.682	.731	.696	.723	.727
Item32	.602	.460	.554	.586	.717	.645	.601	.648	.678	.646
Item33	.577	.469	.541	.594	.667	.573	.533	.561	.612	.577

Note. N=730

Inter-Item Correlation Matrix for Principals Survey Rated by Certified Staff

Items	Item21	Item22	Item23	Item24	Item25	Item26	Item27	Item28	Item29	Item30
Item22	.730									
Item23	.802	.818								
Item24	.790	.790	.862							
Item25	.822	.818	.863	.815						
Item26	.760	.713	.744	.719	.813					
Item27	.694	.692	.714	.699	.793	.891				
Item28	.814	.701	.771	.723	.824	.919	.822			
Item29	.603	.711	.736	.683	.696	.612	.609	.590		
Item30	.724	.713	.764	.729	.741	.751	.702	.751	.704	
Item31	.657	.628	.694	.712	.652	.615	.649	.600	.645	.800
Item32	.664	.652	.703	.705	.665	.618	.605	.621	.552	.696
Item33	.568	.544	.609	.614	.538	.453	.472	.459	.504	.617

Note. N=730

Inter-Item Correlation Matrix for Principals Survey Rated by Certified Staff

Items	Item31	Item32
Item32	.662	
Item33	.638	.859

Note. N=730

Appendix E Inter-item correlation matrix of the Climate survey for principals rated by classified staff

Inter-Item Correlation Matrix for Principals Survey Rated by Classified Staff

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10
Item2	0.913									
Item3	0.905	0.893								
Item4	0.901	0.890	0.894							
Item5	0.840	0.904	0.827	0.843						
Item6	0.844	0.897	0.837	0.859	0.937					
Item7	0.866	0.871	0.845	0.891	0.862	0.878				
Item8	0.829	0.830	0.806	0.807	0.841	0.821	0.819			
Item9	0.828	0.839	0.805	0.829	0.859	0.843	0.844	0.868		
Item10	0.856	0.847	0.845	0.895	0.831	0.844	0.888	0.800	0.821	
Item11	0.858	0.873	0.839	0.888	0.872	0.879	0.899	0.821	0.858	0.897
Item12	0.831	0.832	0.805	0.834	0.824	0.827	0.836	0.832	0.840	0.837
Item13	0.793	0.796	0.770	0.789	0.820	0.807	0.803	0.833	0.843	0.800
Item14	0.797	0.829	0.787	0.807	0.860	0.840	0.818	0.842	0.871	0.809
Item15	0.827	0.829	0.804	0.815	0.831	0.819	0.798	0.828	0.826	0.818
Item16	0.820	0.816	0.814	0.834	0.826	0.819	0.816	0.844	0.861	0.818
Item17	0.808	0.853	0.800	0.833	0.888	0.864	0.811	0.830	0.829	0.803
Item18	0.824	0.842	0.802	0.842	0.851	0.836	0.811	0.838	0.855	0.826
Item19	0.822	0.822	0.784	0.820	0.838	0.816	0.795	0.832	0.837	0.797
Item20	0.796	0.796	0.758	0.805	0.802	0.788	0.780	0.805	0.826	0.788
Item21	0.804	0.851	0.785	0.826	0.874	0.854	0.829	0.832	0.865	0.812
Item22	0.797	0.872	0.789	0.795	0.887	0.880	0.821	0.818	0.827	0.786
Item23	0.805	0.869	0.803	0.814	0.871	0.872	0.833	0.805	0.826	0.802
Item24	0.773	0.865	0.768	0.783	0.887	0.864	0.796	0.809	0.823	0.766
Item25	0.818	0.882	0.794	0.826	0.906	0.888	0.838	0.841	0.851	0.812
Item26	0.778	0.819	0.763	0.771	0.811	0.809	0.775	0.811	0.821	0.763
Item27	0.802	0.826	0.781	0.807	0.800	0.807	0.813	0.785	0.805	0.825
Item28	0.803	0.838	0.794	0.800	0.835	0.825	0.796	0.811	0.807	0.809
Item29	0.775	0.809	0.767	0.783	0.778	0.778	0.774	0.740	0.743	0.793

Note. N=775

Inter-Item Correlation Matrix for Principals Survey Rated by Classified Staff

Items	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19	Item20
Item12	0.861									
Item13	0.826	0.833								
Item14	0.852	0.840	0.871							
Item15	0.826	0.847	0.821	0.844						
Item16	0.846	0.828	0.882	0.875	0.859					
Item17	0.847	0.859	0.801	0.854	0.837	0.822				
Item18	0.854	0.857	0.828	0.850	0.862	0.858	0.869			
Item19	0.836	0.846	0.822	0.848	0.845	0.842	0.859	0.920		
Item20	0.808	0.836	0.816	0.827	0.819	0.823	0.812	0.875	0.921	
Item21	0.855	0.829	0.821	0.877	0.833	0.841	0.870	0.873	0.851	0.842
Item22	0.811	0.796	0.790	0.835	0.806	0.807	0.861	0.825	0.795	0.780
Item23	0.819	0.803	0.796	0.830	0.797	0.803	0.847	0.819	0.796	0.789
Item24	0.805	0.797	0.794	0.835	0.800	0.803	0.862	0.832	0.803	0.793
Item25	0.842	0.820	0.825	0.865	0.819	0.830	0.877	0.861	0.831	0.814
Item26	0.808	0.807	0.808	0.832	0.832	0.819	0.816	0.811	0.800	0.777
Item27	0.826	0.823	0.781	0.799	0.813	0.792	0.791	0.811	0.788	0.780
Item28	0.803	0.812	0.794	0.819	0.814	0.809	0.817	0.831	0.808	0.792
Item29	0.773	0.768	0.717	0.746	0.755	0.744	0.765	0.774	0.738	0.726

Note. N=775

Inter-Item Correlation Matrix for Principals Survey Rated by Classified Staff

Items	Item21	Item22	Item23	Item24	Item25	Item26	Item27	Item28
Item22	0.856							
Item23	0.863	0.941						
Item24	0.864	0.942	0.922					
Item25	0.889	0.916	0.898	0.925				
Item26	0.830	0.808	0.812	0.833	0.847			
Item27	0.803	0.796	0.808	0.808	0.828	0.857		
Item28	0.808	0.829	0.820	0.831	0.853	0.805	0.826	
Item29	0.772	0.766	0.777	0.766	0.797	0.758	0.789	0.895

Note. N=775

Appendix F Inter-item correlation matrix of the Climate survey for associate/assistant principals rated by certified staff

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Certified Staff

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10
Item2	.876									
Item3	.885	.956								
Item4	.863	.950	.941							
Item5	.931	.781	.803	.793						
Item6	.910	.811	.829	.818	.908					
Item7	.925	.756	.777	.773	.960	.923				
Item8	.918	.821	.838	.838	.921	.952	.945			
Item9	.835	.901	.906	.913	.780	.814	.766	.828		
Item10	.779	.902	.901	.911	.697	.746	.672	.752	.937	
Item11	.835	.937	.936	.946	.759	.806	.742	.816	.930	.941
Item12	.896	.869	.884	.890	.868	.917	.878	.941	.882	.832
Item13	.888	.826	.840	.835	.900	.867	.874	.879	.822	.757
Item14	.889	.841	.851	.845	.892	.866	.865	.878	.837	.776
Item15	.893	.852	.858	.857	.852	.889	.850	.895	.847	.791
Item16	.878	.809	.831	.833	.875	.905	.880	.919	.828	.765
Item17	.890	.788	.815	.805	.895	.909	.899	.919	.812	.733
Item18	.884	.827	.831	.845	.867	.898	.878	.905	.833	.769
Item19	.935	.846	.857	.848	.918	.931	.930	.942	.838	.766
Item20	.911	.790	.799	.796	.894	.915	.926	.929	.790	.718
Item21	.886	.843	.871	.850	.846	.892	.858	.891	.851	.806
Item22	.918	.860	.873	.863	.874	.912	.884	.915	.862	.810
Item23	.896	.845	.859	.863	.863	.898	.872	.903	.856	.809
Item24	.908	.788	.813	.809	.908	.914	.929	.927	.809	.729
Item25	.922	.746	.766	.752	.924	.887	.934	.902	.746	.675
Item26	.916	.782	.804	.778	.911	.869	.902	.883	.774	.715
Item27	.931	.753	.767	.757	.918	.884	.940	.902	.742	.669
Item28	.885	.900	.936	.901	.832	.839	.803	.850	.882	.860
Item29	.900	.817	.836	.827	.884	.901	.887	.921	.826	.766
Item30	.878	.823	.845	.840	.857	.863	.844	.876	.836	.785
Item31	.900	.798	.819	.806	.872	.885	.870	.885	.792	.738
Item32	.833	.743	.764	.756	.814	.819	.810	.820	.785	.720

Note. N=838

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Certified Staff

Items	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19	Item20
Item12	.893									
Item13	.817	.876								
Item14	.833	.879	.976							
Item15	.850	.909	.899	.903						
Item16	.829	.924	.890	.894	.913					
Item17	.800	.903	.895	.896	.894	.925				
Item18	.834	.909	.881	.884	.915	.909	.913			
Item19	.831	.920	.921	.921	.930	.917	.932	.935		
Item20	.772	.893	.858	.860	.884	.891	.890	.907	.938	
Item21	.850	.898	.846	.854	.890	.888	.881	.884	.912	.886
Item22	.859	.915	.879	.887	.921	.909	.908	.922	.945	.919
Item23	.851	.909	.875	.882	.908	.906	.895	.911	.922	.906
Item24	.782	.902	.866	.864	.879	.905	.917	.900	.931	.926
Item25	.728	.843	.825	.822	.838	.854	.877	.856	.902	.904
Item26	.766	.844	.843	.844	.847	.853	.880	.855	.897	.875
Item27	.726	.843	.822	.819	.838	.845	.871	.856	.904	.912
Item28	.895	.877	.857	.865	.869	.846	.839	.844	.874	.827
Item29	.825	.911	.873	.876	.887	.915	.914	.909	.918	.892
Item30	.840	.893	.904	.912	.897	.905	.895	.905	.900	.859
Item31	.795	.872	.881	.885	.888	.873	.889	.880	.918	.868
Item32	.748	.818	.841	.849	.826	.822	.827	.821	.848	.809

Note. N=838

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Certified Staff

Items	Item21	Item22	Item23	Item24	Item25	Item26	Item27	Item28	Item29	Item30	Item31
Item22	.943										
Item23	.929	.958									
Item24	.917	.932	.930								
Item25	.842	.878	.859	.912							
Item26	.845	.881	.860	.897	.959						
Item27	.837	.883	.861	.910	.972	.945					
Item28	.870	.887	.870	.843	.816	.851	.813				
Item29	.889	.916	.897	.903	.883	.877	.884	.864			
Item30	.876	.895	.892	.871	.837	.852	.830	.863	.929		
Item31	.870	.901	.873	.876	.854	.855	.857	.840	.892	.904	
Item32	.817	.838	.827	.824	.781	.783	.780	.789	.834	.856	.917

Note. N=838

Appendix G Inter-item correlation matrix of the Climate survey for associate/assistant principals rated by classified staff

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Classified Staff

	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10
Item2	.922									
Item3	.903	.926								
Item4	.885	.875	.886							
Item5	.877	.829	.828	.867						
Item6	.863	.837	.834	.840	.926					
Item7	.867	.860	.859	.868	.863	.865				
Item8	.827	.802	.807	.831	.848	.827	.824			
Item9	.831	.823	.824	.832	.831	.821	.834	.876		
Item10	.852	.840	.846	.862	.845	.843	.887	.837	.858	
Item11	.851	.850	.864	.874	.845	.835	.879	.836	.872	.928
Item12	.822	.815	.830	.808	.794	.793	.821	.814	.819	.845
Item13	.816	.819	.838	.802	.818	.808	.801	.839	.833	.834
Item14	.808	.803	.797	.809	.819	.802	.822	.837	.851	.859
Item15	.804	.802	.823	.798	.773	.786	.800	.808	.819	.826
Item16	.857	.846	.835	.837	.844	.847	.838	.837	.839	.869
Item17	.817	.807	.800	.804	.842	.835	.792	.805	.811	.811
Item18	.801	.819	.817	.791	.784	.799	.793	.786	.805	.816
Item19	.781	.782	.797	.773	.780	.794	.780	.770	.774	.799
Item20	.763	.775	.787	.762	.748	.757	.753	.750	.746	.767
Item21	.789	.778	.784	.774	.798	.811	.777	.790	.816	.807
Item22	.841	.796	.804	.786	.848	.847	.809	.813	.812	.803
Item23	.854	.820	.832	.813	.850	.845	.844	.808	.816	.828
Item24	.867	.819	.818	.824	.875	.875	.843	.839	.829	.834
Item25	.858	.821	.824	.831	.877	.873	.846	.826	.836	.849
Item26	.756	.780	.780	.767	.764	.776	.783	.803	.791	.797
Item27	.754	.788	.807	.798	.747	.756	.823	.795	.800	.830
Item28	.820	.801	.805	.828	.814	.807	.829	.789	.813	.837
Item29	.793	.778	.778	.791	.788	.788	.807	.783	.776	.792

Note. N=723

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Classified Staff

	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18	Item19	Item20
Item12	.849									
Item13	.859	.850								
Item14	.859	.833	.876							
Item15	.827	.828	.822	.836						
Item16	.865	.863	.846	.854	.867					
Item17	.809	.817	.823	.815	.817	.869				
Item18	.820	.839	.834	.819	.823	.871	.857			
Item19	.807	.836	.826	.809	.793	.848	.828	.907		
Item20	.774	.785	.805	.780	.784	.812	.794	.869	.902	
Item21	.800	.816	.831	.830	.802	.837	.815	.831	.831	.825
Item22	.816	.806	.834	.831	.790	.861	.831	.796	.786	.777
Item23	.825	.808	.816	.824	.801	.844	.822	.786	.764	.765
Item24	.837	.834	.836	.822	.797	.865	.851	.808	.791	.758
Item25	.843	.823	.831	.831	.817	.882	.852	.817	.807	.781
Item26	.801	.756	.783	.799	.791	.796	.752	.755	.741	.745
Item27	.831	.779	.795	.810	.815	.810	.736	.758	.736	.739
Item28	.844	.805	.825	.820	.811	.849	.811	.805	.774	.755
Item29	.799	.773	.795	.795	.784	.808	.789	.782	.754	.746

Note. N=723

Inter-Item Correlation Matrix for Assistant/Associate Principals Survey Rated by Classified Staff

	Item21	Item22	Item23	Item24	Item25	Item26	Item27	Item28
Item22	.842							
Item23	.818	.925						
Item24	.830	.921	.927					
Item25	.838	.891	.903	.925				
Item26	.772	.769	.772	.785	.793			
Item27	.763	.772	.796	.785	.812	.859		
Item28	.788	.833	.816	.838	.841	.773	.814	
Item29	.766	.793	.806	.793	.811	.760	.779	.899

Note. N=723