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The Development of Scales to Measure QISA's Three Guiding Principles of Student Aspirations Using the My Voice™ Survey

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The My Voice Survey was designed to assess various aspects of student aspirations─which refer to students' ability to dream and set goals for the future, while being inspired and supported in the present to reach those dreams─by asking students to respond to 63 statements about their perceptions of their school and school-related self-perceptions regarding the 8 Conditions that Make a Difference®. These 8 Conditions were originally identified and defined by Dr. Russell J. Quaglia, an internationally known leader in the study of student aspirations and president and founder of the Quaglia Institute for Student Aspirations. They include: Belonging, Heroes, Sense of Accomplishment, Fun & Excitement, Curiosity & Creativity, Spirit of Adventure, Leadership & Responsibility, and Confidence to Take Action. A set of three Guiding Principles subsume the 8 Conditions:

- *Self-Worth* (comprising Belonging, Heroes, and Sense of Accomplishment) occurs when students feel accepted at school and believe they are valued members of the school community;
- *Active Engagement (*comprising Fun & Excitement, Curiosity & Creativity, and Spirit of Adventure) happens when students are deeply involved in the learning process as characterized by an enthusiasm and desire to learn new things;
- *Purpose* (comprising Leadership & Responsibility, and Confidence to Take Action) exists when students are goal-directed, apply themselves in their classes, and are motivated to do their best in school.

Objectives

This document is a technical report of the scale development process regarding the use of the My Voice Survey to operationalize the three Guiding Principles. The My Voice Survey was adapted from the Student Aspirations Survey (Plucker & Quaglia, 1998) and was originally constructed to address both intraindividual and environmental factors that support student aspirations. The three Guiding Principles focus on the intraindividual dimensions of student aspirations; as such, the primary goal of the present exploration is to determine whether selected items of the My Voice Survey reliably and validly operationalize each of the Guiding Principles: Self-Worth, Active Engagement, and Purpose.[1]

Participants and Procedure

For the present investigation, the My Voice Survey was administered in the Spring of 2010 to 17,322 students in grades 6-12 from 55 different schools in six different states (from the South, Midwest, and Northeast regions of the United States). The mean age of respondents was 14.25, with a standard deviation of 2.01, and a range of 9-19 years old (88% of respondents were between the ages of 12-17). The gender distribution was nearly even (51% female, 49% male), with a racial/ethnic breakdown as follows: 87% White, 5% African-American, 3% Hispanic, 2%

[1] The survey items intended to assess student perceptions of school climate or other environmental aspects were thus excluded from all analyses.

Asian American, and 3% other race. All respondents took the survey online during school hours in a supervised setting. The average time to complete the survey was approximately 15 minutes.

Analysis plan

The statistical approach to developing the scales intended to assess the Guiding Principles employed two complementary types of factor analysis. Factor analysis is a common psychometric technique used to identify a set of factors representing underlying latent constructs from some larger number of observed variables (typically, as here, items on a survey). Factor analytic techniques, properly employed, help to determine whether groupings of the observed variables/items on a survey demonstrate the psychometric properties necessary to assert they reliably and validly measure one or more intended constructs. There are two main types of factor analysis: exploratory and confirmatory. As the names suggest, exploratory factor analysis (EFA) explores the factor structure of the responses to some set of survey items, while confirmatory factor analysis (CFA) is used to confirm whether specified groupings of items properly measure the theorized constructs of interest.

Typically, when constructing new scales, researchers perform EFA followed by CFA; that is, the survey is first administered to a representative sample and the data are subjected to an EFA, and the factor structure uncovered by the EFA is subjected to a CFA using data collected from a new sample. In the present approach, surveys were collected for the full sample which was then randomly split, with half of the sample (n = 8,661) to be used for the EFA steps and the other half of the sample (n = 8,661) to be used for the CFA. This two-step approach to performing factor analyses, along with nearly all aspects of the present analytical plan, follows the comprehensive guidelines for scale development laid out by Worthington and Whittaker (2006). The present approach will be described separately for EFA and CFA.

Exploratory factor analysis approach

There are a variety of types of extraction methods in EFA, the most prominent of which include principal factor, principal-component factor, and maximum likelihood factor. There is no commonly agreed-upon approach, though under conditions of non-normal data (as is the case with many of the My Voice Survey items) the principle factor method is recommended (Costello & Osborne, 2005) and was used in the present analyses. Once an extraction method is decided upon and the EFA is run, it is advised to verify the factorability of the data. The method employed in the present analyses was the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, where values greater than .60 are considered to be adequate and greater than .80 are considered to be high.

Once the factors are extracted and the factorability of the data confirmed, there are several different guidelines for determining the number of factors to retain; the present analyses used the traditional eigenvalue cut-off of 1.0 (Tabachnick & Fidell, 2007).

Following determination of the number of factors, the factor solution is “rotated” so the factors may be interpreted. There are multiple approaches to rotation of the factor solution. When the factors are expected to be correlated, as is the case with the Guiding Principles, the most appropriate rotation method is oblique (rather than the commonly-used varimax, which assumes orthogonality of factors). Specifically, the present analyses were rotated via a direct oblimin rotation.

Once a factor solution is rotated, important decisions must then be made about which items in that solution adequately represent the factors. Following the guidelines of Tabachnick and Fidell (2007) and Worthington and Whittaker (2006), the loadings of each of the items on the factors should be at least .32, and not double-load (a.k.a., cross-load) onto any other factors at the .32 level. Double-loading is determined both by the .32 loading guideline, as well as by a separation in loadings of at least .15. For example, an item that loads .35 onto one factor and no higher than .20 onto any other factor may be considered representative of that factor; but an item that loads .44 onto one factor and .30 onto another factor would be considered double-loading. These guidelines would suggest that all items that double-loaded and/or loaded no higher than .32 on any factor may be considered insufficient indicators of the factors produced in the EFA, and when any items met these criteria the EFA was rerun with those items removed. It is important to note, however, that factor solutions produced by an EFA are always contingent upon the items included in that analysis; when multiple iterations of EFAs are run, the latter iterations may have not included items that were dropped from the previous iterations but may in fact have not met the criteria for exclusion with the new set of variables from those latter iterations. This fact was considered in the present analyses, such that under certain circumstances, latter iterations of the EFAs checked whether inclusion of items dropped from previous iterations was appropriate (see below).

One additional step was taken upon completion of the preceding steps. As the objective of the EFA was ultimately to produce a valid and reliable scale for each underlying construct, the internal consistency of the items comprising the resultant factors was checked via Cronbach's alpha. The conventional cut-off criterion for an acceptable alpha statistic is 0.70 and above (Nunnally, 1978). For any scale that did not meet this criterion, the items which were dropped in earlier iterations of the EFA were reconsidered (based on theory/face validity) in light of whether they might enhance the internal consistency of that scale. In such cases, these items were reintroduced into the last iteration of the EFA, and all steps of the analysis rerun. Additionally, for each item in the scales, the item-test correlation (i.e., the correlation between each item and the total scale) was inspected to ensure the correlation was sufficiently high (here, at or above .60) and that the overall scale alpha was not reduced by including the item (see Hinkin, 1998). For scales in which one or more items did not contribute to the internal consistency, those items were dropped and all steps of the EFA rerun.

As noted earlier, the My Voice Survey items selected for the present investigation included only those intended to address intraindividual aspects of student aspirations.[2] These selected items, along with their item numbers on the survey, are presented in Table 1 of the Appendix.

[2] One item which may be considered intraindividual, Item #41 (Going to college is important to my future), was also excluded from consideration, since the QISA framework does not view students' post-high school aspirations as restricted to college going.

Confirmatory factor analysis approach

Once the scales were established via the EFA approach using the first half of the overall sample and checked for internal consistency, the items comprising these scales and the factor structure uncovered by the EFA were subjected to a CFA using the second half of the overall sample. As this CFA step was intended to be purely confirmatory, the results were not intended to be subject to further changes based on the model respecifications typically suggested in the results produced by most structural equation modeling packages (once model respecification takes place following a CFA, the process effectively reverts to the exploratory phase; see Byrne, 2005). The present CFA was run using the LISREL 8.80 software package (Jöreskog & Sörbom, 2006).

Before running a CFA, the scales of the model were set. There are a number of different (and under most circumstances equally valid) ways to approach scale setting (Kline, 2005). In the present analyses, the unit loading identification constraint—which fixes the factor loading for the direct effect of one of each factor's indicators to 1.0—was imposed. This is the most common approach to scale setting in CFA (Byrne, 1998).

The following model fit indices will be reported: (1) the model chi-square with corresponding degrees of freedom and level of statistical significance, (2) the Root Mean Square-Error of Approximation (RMSEA) with corresponding 90% confidence intervals, (3) the Comparative Fit Index (CFI), and (4) the Tucker-Lewis Index (TFI; a.k.a., Non-normed Fit Index). In large samples (i.e., over 200), the model chi-square statistic is nearly always statistically significant; thus, it is typically ignored in large samples (Kline, 2005). The traditional cut-off criterion for acceptable fit using the RMSEA index remains under debate; fit has been alternatively considered acceptable at levels below 0.08 (MacCallum, Browne, & Sugawara, 1996), below 0.07 (Steiger, 2007), and below 0.06 (Hu & Bentler, 1999). Some have even suggested there should be no universal cut-off criterion for RMSEA fit (Chen, Curran, Bollen, Kirby, & Paxton, 2008). With this uncertainty in mind, the preferred RMSEA in the present work will be at or below .06, with values between .06 and .08 viewed as acceptable with room for improvement. The CFI and TFI fit indices each have a more generally accepted cut-off criterion at equal to or greater than .95 (Hu & Bentler, 1999).

Results

The results of the first run of the EFA on the items in Table 2 revealed a probable three factor solution, which cumulatively accounted for 93% of the variance. The eigenvalue for the first factor was 9.54, by far accounting for the greatest proportion of the variance (74%); the second factor eigenvalue was 1.46 (11% of the variance), and the third factor eigenvalue was 1.08 (8% of the variance). No other factors had eigenvalues > 1. The inspection of the rotated solution revealed five items that clearly double-loaded (Items 11, 12, 22, 27, and 67) and one item that did not load onto any of the three factors at .32 or above (Item 36), necessitating second run of the EFA with these items dropped. The overall KMO statistic on this first EFA run was 0.93, with no item KMO under .72.

The second run of the EFA with the six poorly loading items from the first run dropped produced a more clear three factor solution, which explained all of the variance (first factor eigenvalue = 7.14, proportion of variance explained = 0.75; second factor eigenvalue = 1.29, proportion of variance explained = 0.14; third factor eigenvalue = 1.08, proportion of variance explained = 0.11). The inspection of the rotated solution revealed that one item did not load onto any of the three factors at .32 or above (Item 39), necessitating third run of the EFA with this item dropped. As before, the overall KMO statistic was 0.93, with no item KMO under .72.

The third run of the EFA with the one poorly loading item from the second run dropped again produced a clear three factor solution, and explained all of the variance (first factor eigenvalue = 7.14, proportion of variance explained = 0.77; second factor eigenvalue = 1.23, proportion of variance explained = 0.13; third factor eigenvalue = 1.06, proportion of variance explained = 0.11). This time, the rotated factor solution was clean (no items double-loaded or loaded below .32), and the KMO statistics were again strong (overall KMO = .93, with no item KMO under .72).

With an acceptable factor solution, the next step was to check the internal consistency of the resultant scales. The scale produced by the first factor consisted of 12 items (including Items 50, 64, 60, 59, 54, 21, 57, 58, 14, 61, 66, and 23). The Cronbach's alpha was high ($\alpha = .88$); however, one item (Item 61) did not positively contribute to the scale alpha. The scale produced by the second factor consisted of six items (Items 10, 37, 46, 47, 56, and 65), all of which contributed to the internal consistency with a strong Cronbach's alpha ($\alpha = .81$). The scale produced by the third factor consisted of five items (Items 16, 25, 31, 33, and 52), all of which contributed to the internal consistency; however, the internal consistency ($\alpha = .66$) was below the recommended cut-off criterion of .70.

In light of the internal consistency checks, a fourth run of the EFA was warranted, with two adjustments. The item which reduced the internal consistency of the first factor's scale (Item 61) was removed; and in an attempt to compensate for the low internal consistency of the third factor's scale, an item that was originally hypothesized to contribute to this factor but was dropped following the first run of the EFA due to double-loading (Item 11) was reintroduced. This run produced a clear three factor solution, which explained all of the variance (first factor eigenvalue = 7.14, proportion of variance explained = 0.78; second factor eigenvalue = 1.22, proportion of variance explained = 0.13; third factor eigenvalue = 1.09, proportion of variance explained = 0.12). The rotated factor solution, however, revealed a new double-loading item (Item 23). The KMO statistics were strong (overall KMO = .93, with no item KMO under .74).

The fifth (and final) run of the EFA with the one poorly loading item from the fourth run dropped produced a clear three factor solution, which explained all of the variance (first factor eigenvalue = 6.86, proportion of variance explained = 0.78; second factor eigenvalue = 1.20, proportion of variance explained = 0.14; third factor eigenvalue = 1.08, proportion of variance explained = 0.12). The rotated factor solution was not entirely clean; though no items loaded below .32, two items double-loaded (Items 11 and 33) with separations of loadings of .12 (on factors 1 and 3) and .14 (on factors 2 and 3), respectively. However, removing these items would unacceptably reduce the internal consistency of the third factor; as such, it was determined to be best (and reasonable) to keep these two items. The KMO statistics were again strong (overall KMO = .93, with no item KMO under .74).

Following this EFA run, the internal consistencies of the resultant scales were again checked and each was above or very near acceptable levels (factor 1: $\alpha = .89$; factor 2: $\alpha = .81$; factor 3: $\alpha = .68$). The final scale compositions and item factor loadings are presented in Table 2. The content of the items comprising each scale, in combination with existing theory, helped to inform the following scale labels: Factor 1 = Purpose, Factor 2 = Active Engagement, Factor 3 = Self-Worth.

With the factor structure established, the CFA was run using the second half of the sample. Figure 1 shows the CFA model and results of the analysis, including fit statistics. The item loadings of the CFA are shown in Table 3; all loadings were significant at the $p < .05$ level, and nearly all were near or above .50. The fit statistics suggest the model was a reasonably acceptable fit to the data, given the guidelines described earlier. The RMSEA index was less than ideal (.075), but the relative strength of the CFI (.97) and TFI (.96) helped offset the middling RMSEA and contribute to an overall picture of satisfactory model fit. Additionally, these results show that the three Guiding Principles scales are highly intercorrelated: Purpose was strongly significantly related to Active Engagement ($r = .78$, $p < .001$) and Self-Worth ($r = .66$, $p < .001$), and Active Engagement and Self-Worth were strongly significantly related to one another ($r = .78$, $p < .001$).

The final version of the scales, as suggested by the EFA and supported by the CFA, can be found in Table 4.

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Appendix

Table 1. Intraindividual items of the My Voice Survey for use in scale development

My Voice Survey item number and wording

10. I enjoy being at school.
11. I feel comfortable asking questions in class.
12. I like challenging assignments.
14. I believe I can be successful.
16. I feel accepted for who I am at school.
21. I push myself to do better academically.
22. I see myself as a leader.
23. I believe I can make a difference in this world.
25. I have difficulty fitting in at school.
27. I have never been recognized for something positive at school.
31. Other students see me as a leader.
33. I enjoy working on projects with other students.
36. I give up when schoolwork is difficult.
37. School is boring.
39. I am afraid to try something if I think I may fail.
46. I enjoy participating in my classes.
47. I enjoy learning new things.
50. I work hard to reach my goals.
52. I am a valued member of my school community.
54. I put forth my best effort at school.
56. I learn new things that are interesting to me at school.
57. I want to do my best at school.
58. I am a good decision maker.
59. I am excited about my future.
60. I think it is important to set high goals.
61. I know the kind of person I want to become.
64. Getting good grades is important to me.
65. Learning can be fun.
66. What I learn in school will benefit my future.
67. I am excited to tell my friends when I get good grades.

Table 2. Exploratory factor analysis of the three Guiding Principles results: scale compositions with item factor loadings.

Factor 1	Factor 2	Factor 3	My Voice Survey item number and wording
0.77	-0.05	0.01	50. I work hard to reach my goals.
0.76	0.06	-0.08	64. Getting good grades is important to me.
0.70	0.07	-0.08	54. I put forth my best effort at school.
0.68	0.01	0.09	60. I think it is important to set high goals.
0.67	0.02	0.00	21. I push myself to do better academically.
0.64	-0.07	0.16	59. I am excited about my future.
0.54	0.23	-0.06	57. I want to do my best at school.
0.48	-0.07	0.19	58. I am a good decision maker.
0.46	0.02	0.30	14. I believe I can be successful.
0.43	0.28	0.02	66. What I learn in school will benefit my future.
-0.08	**0.68**	0.10	10. I enjoy being at school.
0.20	**0.63**	0.06	65. Learning can be fun.
0.14	**-0.61**	-0.05	37. School is boring.
0.06	**0.61**	0.18	46. I enjoy participating in my classes.
0.19	**0.59**	0.00	56. I learn new things that are interesting to me at school.
0.26	**0.51**	0.01	47. I enjoy learning new things.
0.01	0.10	**0.65**	16. I feel accepted for who I am at school.
0.09	0.06	**-0.56**	25. I have difficulty fitting in at school.
0.11	0.05	**0.45**	31. Other students see me as a leader.
0.11	0.08	**0.43**	52. I am a valued member of my school community.
0.03	0.22	**0.36**	11. I feel comfortable asking questions in class.
0.20	-0.01	**0.32**	33. I enjoy working on projects with other students.

Note. *n* = 8,661. Loadings equal to or above .32 are bold.

Table 3. Confirmatory factor analysis of the three Guiding Principles factor loadings.

Purpose	**Active Engagement**	**Self-Worth**	**My Voice Survey item number and wording**
0.77			50. I work hard to reach my goals.
0.77			64. Getting good grades is important to me.
0.76			54. I put forth my best effort at school.
0.74			60. I think it is important to set high goals.
0.74			21. I push myself to do better academically.
0.66			59. I am excited about my future.
0.72			57. I want to do my best at school.
0.55			58. I am a good decision maker.
0.63			14. I believe I can be successful.
0.67			66. What I learn in school will benefit my future.
	0.67		10. I enjoy being at school.
	0.74		65. Learning can be fun.
	-0.53		37. School is boring.
	0.77		46. I enjoy participating in my classes.
	0.76		56. I learn new things that are interesting to me at school.
	0.76		47. I enjoy learning new things.
		0.69	16. I feel accepted for who I am at school.
		-0.38	25. I have difficulty fitting in at school.
		0.53	31. Other students see me as a leader.
		0.61	52. I am a valued member of my school community.
		0.53	11. I feel comfortable asking questions in class.
		0.46	33. I enjoy working on projects with other students.

Note. *n* = 8,661. All coefficients are standardized.

Table 4. Three Guiding Principles scales with accompanying My Voice Survey item number and wording.

Purpose

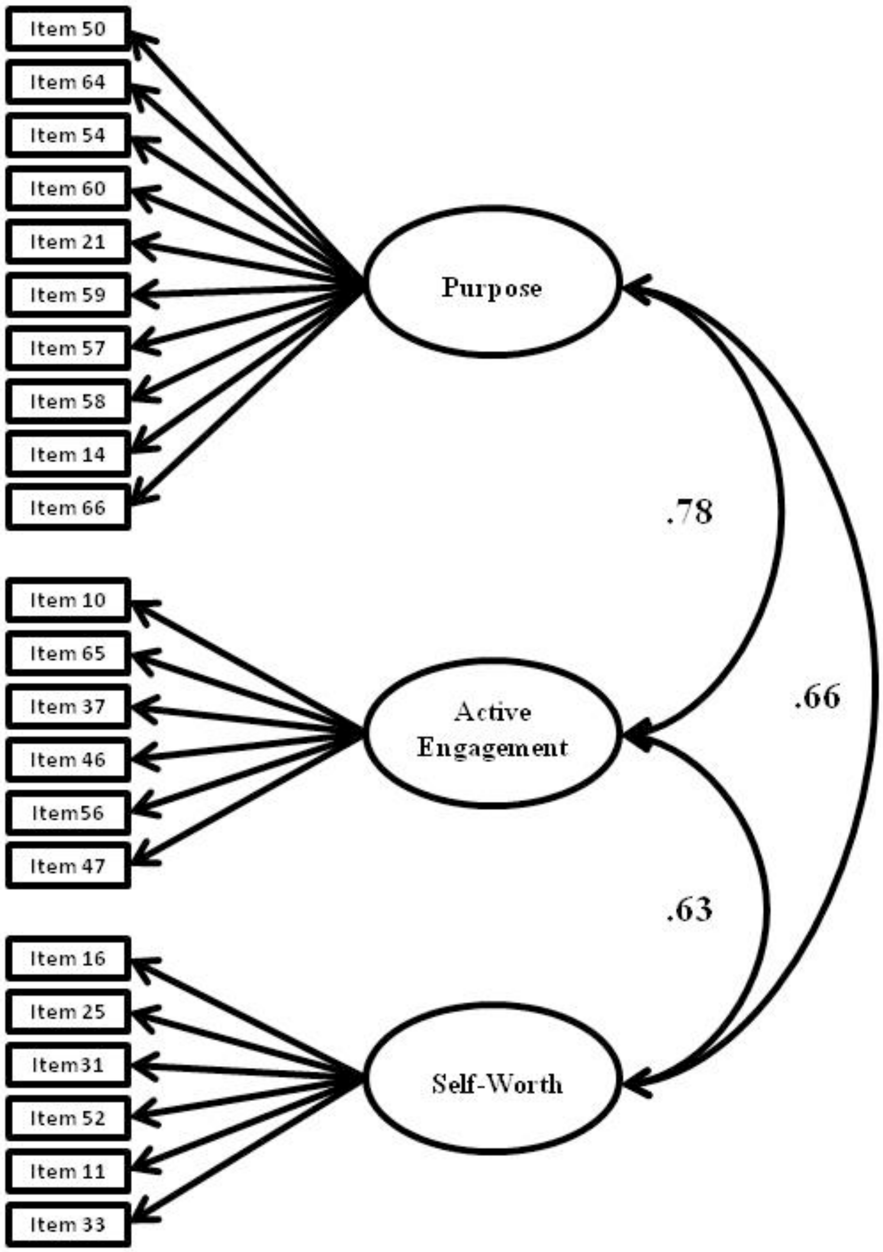
14. I believe I can be successful.
21. I push myself to do better academically.
50. I work hard to reach my goals.
54. I put forth my best effort at school.
57. I want to do my best at school.
58. I am a good decision maker.
59. I am excited about my future.
60. I think it is important to set high goals.
64. Getting good grades is important to me.
66. What I learn in school will benefit my future.

Active Engagement

10. I enjoy being at school.
37. School is boring.
46. I enjoy participating in my classes.
47. I enjoy learning new things.
56. I learn new things that are interesting to me at school.
65. Learning can be fun.

Self-Worth

11. I feel comfortable asking questions in class.
16. I feel accepted for who I am at school.
25. I have difficulty fitting in at school.
31. Other students see me as a leader.
33. I enjoy working on projects with other students.
52. I am a valued member of my school community.



Model Fit : χ^2 (*df* = 206, *n* = 8,661) = 10205.93, p<.001; RMSEA = 0.075 (0.074-0.076); CFI = 0.97; TFI = 0.96
Note. Item loadings on factors and error terms not shown due to space constraints. All coefficients are standardized.

Figure 1. Confirmatory factor analysis of the three Guiding Principles scales model with results.