

# Scale Validation of the *iKnow My Class* Survey

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## Scale Validation of the iKnow My Class Survey

The iKnow My Class Survey was designed as a formative assessment tool for teachers, giving voice to students' perceptions of various aspects of their individual classes and themselves. The conceptual framework upon which the survey was built—advanced by Dr. Russell J. Quaglia, internationally known leader in the area of school improvement and president and founder of the Quaglia Institute for Student Aspirations, as well as chair and chief academic officer of the Student Engagement Trust—is known as the “Student Engagement Trust Model.”

### The Student Engagement Trust Model

The Student Engagement Trust Model posits that there are three primary factors in every learning environment or situation which give rise to student engagement: the *student*, the *teacher*, and the *content*. In any given classroom, the *student* is there to gather, discover, process, understand, and integrate—ultimately, to learn—the information conveyed by the course. The *teacher* shares, presents, guides, instructs, and/or facilitates this knowledge to that end; he or she needs to not only know content, but have the skills to provide that content in a format that is understandable to the students he or she is teaching. The *content* represents the information that is to be learned (and, at times, discovered) by both the student and the teacher; whether it is physics or fly fishing, some form of “content” exists in every controlled learning environment.

At the heart of the Student Engagement Trust Model is how the connections among these three factors promote student engagement. There are four basic intersections:

*Student – Teacher (Relationship)*. This is the bond that exists between teacher and student. In the best-case scenario, relationships are based on trust and mutual respect. Each party cares about the other, enjoys interacting with the other, and is sensitive to the specific needs of the other. A teacher can positively influence his or her relationship with students by inspiring and expecting students to do their best, treating students' ideas with respect, learning about the students' aspirations, and being open to learning from the students.

*Student – Content (Relevance)*. For students to be engaged in their learning they need to have some level of interest in the subject matter. However, students' particular interests are not always within a teacher's sphere of direct influence. What a teacher does have some control over is the degree to which students' understand why they are learning what they are learning—that is, the relevance of the content. Relevance includes how the content connects to other subjects as well as current events, how the content applies to students' everyday lives, and how it might affect their futures and aspirations. A greater understanding of the relevance of the class content should manifest itself in a greater interest in learning it.

*Teacher – Content (Expertise)*. For teachers to be successful, they need to show a level of expertise not only in pedagogical strategies, but also in knowledge of their subject area(s). While high school and middle school teachers may not be expected to know everything in a particular field, they must be confident enough in their grasp of the subject matter to be able to guide learning and instruction. Although expertise is not something directly measured by the

iKnow My Class Survey (determining the level of content expertise generally falls under the purview of a school's administration or a teacher's department colleagues), it is nonetheless a critical component in the teaching and learning environment.

At the same time, students, perhaps better than anyone else, can evaluate the effectiveness of how the teacher is “teaching” and communicating information. Thus, the iKnow My Class Survey includes items designed to assess various aspects of what might be called “positive pedagogy.” Strategies such as clearly articulating learning goals, giving useful and timely feedback on meaningful assignments, using varied and fair assessments, integrating technology into the class, addressing multiple learning styles, encouraging the use of imagination, and communicating with parents, all contribute to engagement in learning.

*Student – Teacher – Content (Meaningful Engagement).* According to the Student Engagement Trust Model, meaningful engagement is most likely to arise when there is an environment with strong, positive student-teacher relationships; when students are interested in and committed to learning the subject matter because it is in some way relevant to them; and when teachers are well-versed in the content so as to maintain the rigor of the material and provide relevant challenges to the students.

The Student Engagement Trust Model was designed to be particularly attuned to the *malleable* elements in the learning environment. The feedback provided to the teacher through the iKnow My Class Survey is therefore specifically intended to address those factors that are within his or her influence, and that can thus be adjusted so as to improve the meaningful engagement of the students in his or her class(es).

*Other Contributing Factors.* There are other factors in the learning environment (aside from the intersecting constructs above, along with positive pedagogy) which are likely to affect engagement that, while not under a teacher's complete control, are nevertheless open to his or her influence and important for him or her to understand. Among these are: facilitation of a cooperative learning environment, development of critical thinking skills, perceptions of discipline problems, and nurturing students' efficacy in the classroom.

While a teacher is not responsible for all the ways in which students interact, he or she can make sure that the classroom is a place of respectful interaction among students. Engagement is supported when students feel they can trust one another with their questions, insights, and ideas and are taught how and given opportunities to work cooperatively.

Additionally, providing opportunities for students to evaluate their own learning and work, to see different perspectives, and to have “breathing space” for deep and/or original thinking and problem solving, can support other efforts to create meaningful engagement in the classroom. When material feels rushed, when there is only one acceptable point of view, or when there is no opportunity to reflect on learning itself, engagement is likely to be stifled. Additionally, when the classroom environment is marred by discipline problems, students are likely to be distracted and consequently less engaged.

Finally, a teacher can support students' sense of efficacy in their class. Ensuring that students are able to be themselves, feel safe enough to inquire about the content, and are comfortable asking the teacher for support in their own learning, all contribute in important ways to students' engagement.

### **Scale validation**

This document is a technical report of the validation process for the use of the iKnow My Class Survey as a measurement tool to operationalize selected constructs of and related to the Student Engagement Trust Model. As noted earlier, the iKnow My Class Survey was designed to gather the perceptions of students, but they are not asked (nor should they be) to assess the intersection of teacher and content (i.e., Expertise). The iKnow My Class Survey may thus be used to operationalize the following aspects of the Student Engagement Trust Model: Meaningful Engagement (Engagement), Relevance of Content to Students (Relevance), and Student-Teacher Relationships (Relationships). Additionally, though not formally part of the Student Engagement Trust Model, items representing the "Other Contributing Factors" to student engagement were included in the design of the iKnow My Class Survey, which are intended to provide additional feedback to teachers for formative purposes. The constructs comprising these other contributing factors include: students' perceptions of the teacher's positive pedagogical practices in the class (Positive Pedagogy), students' sense of efficacy in the class (Class Efficacy), students' perceptions of a cooperative learning environment in the class (Cooperative Learning Environment), students' perceptions of discipline problems in the class (Discipline Problems), and indicators of the presence and fostering of critical thinking in the class (Critical Thinking).

The present technical report document serves dual purposes. First, and primarily, it will demonstrate how groupings of items on the iKnow My Class Survey validly and reliably operationalize each of the constructs listed above for the intended purpose of formative assessment. Specifically, this first objective will be served by way of a description of the process which led to the determination of strong face validity of the scales measuring each construct, as well as via psychometric testing of the reliability (i.e., internal consistency) of the items designed to comprise them.

As its secondary purpose, this technical document will present validation analyses which demonstrate how groupings of items of the iKnow My Class Survey validly and reliably operationalize the student-assessed core constructs of the Student Engagement Trust Model (i.e., Engagement, Relevance, and Relationships) for the more strict purpose of empirical research analysis. This purpose entails greater psychometric scrutiny, since when measures of constructs are subjected to statistical analyses which involve more than one of these constructs, they must not only demonstrate reliability and face validity as independent measures, but also appropriate levels of discriminant validity. That is, when used in the same analyses, measures of conceptually distinct (albeit perhaps highly interrelated) constructs should not be so highly correlated as to suggest empirical indistinguishability. Given the relatively high degree of conceptual overlap between these core constructs of the Student Engagement Trust Model and many of the "Other Related Constructs," one might expect issues with discriminant validity for such purposes. As such, the present document will separately present the validation process of

only the measures of Engagement, Relevance, and Relationships for the purpose of empirical research analysis. This process entails a more rigorous psychometric approach which tests whether, and in what form, the items intended to operationalize these three constructs meet these more strict criteria.

### *Participants and Procedure*

For the present validation analyses, the iKnow My Class Survey was administered between December of 2010 and April of 2011 to 5,228 students from 13 different secondary-level schools across two different countries (10 in the United States, 3 in the United Kingdom) in grades 6-12 in the U.S., school years 7-13 in the U.K. The total number of classes assessed was 254, with 121 different teachers across those classes. The median grade level was 9<sup>th</sup> grade (year 10 in the U.K.); the number of students in each grade level ranged from 404 in 8<sup>th</sup> grade (year 9 in the U.K.) to 1,066 in 11<sup>th</sup> grade (year 12 in the U.K.). The gender distribution was nearly even (51% female, 49% male). No other demographic statistics were collected.

### *Validation of iKnow My Class Survey for use in formative assessment*

For the primary purpose of formative assessment, validation of the iKnow My Class Survey involved a two-step process. First, the 50 items of the iKnow My Class Survey were grouped independently by three experts in the fields of education and educational psychology as indicators of each of the aforementioned 8 constructs. There was very high agreement among the raters (Randolph's (2005) free-marginal multi-rater kappa = .95). The three items upon which the three raters did not agree were discussed, and consensus was arrived at for their placement. These constructs and the items comprising their indicators can be found in Table 1.

Table 1. Constructs assessed by the iKnow My Class Survey for formative assessment, with indicator items and scale reliabilities

<b>Construct</b>	<b>Indicator item wording (with iKnow My Class Survey item number)</b>
<b>Engagement</b> ( $\alpha = .76$ )	5. I give up when I do not understand something. (reverse-coded)
	6. I come to class ready and willing to learn.
	7. I am able to express my ideas and opinions in this class.
	10. I put forth my best effort in class.
	18. I don't care if I do well in this class. (reverse-coded)
	22. I am bored in this class. (reverse-coded)
<b>Relevance</b> ( $\alpha = .84$ )	24. Attending this class is important to me.
	11. I have personal goals for my learning in this class.
	27. I see how this class relates to my other classes.
	31. I understand how I can apply what I am learning in my everyday life.
	32. In this class, we discuss issues that are interesting to me.
	33. I believe what I am learning in this class is important for my future.
	48. The teacher relates our learning to current events.

Table 1. Constructs assessed by the iKnow My Class Survey for formative assessment, with indicator items and scale reliabilities (cont.)

<b>Relationships</b> ( $\alpha = .90$ )	15. I respect the teacher.
	36. The teacher enjoys working with students.
	37. The teacher inspires me to do my best.
	39. The teacher cares if I am absent from class.
	40. The teacher knows my name.
	41. My ideas and thoughts are valued and respected by the teacher.
	42. The teacher knows my hopes and dreams.
	45. The teacher develops positive relationships with students.
	46. The teacher expects me to be successful.
	50. The teacher is willing to learn from the students.
<b>Class Efficacy</b> ( $\alpha = .82$ )	2. I feel comfortable asking questions in class.
	3. I feel comfortable asking my teacher for individual help about the things we are learning.
	12. I am able to communicate what I have learned in relevant ways to different people.
	17. I am confident in my ability to learn what is being taught.
	19. I am comfortable being myself in this class.
20. Doing well in this class is my responsibility.	
<b>Cooperative Learning Environment</b> ( $\alpha = .78$ )	8. It is important that I share my knowledge to help others.
	13. I have an opportunity to influence my classmates' thinking.
	14. I respect my peers in this class.
	16. It is helpful for me to work with other students.
	26. My peers respect me in this class.
47. The teacher encourages students to work together.	
<b>Critical Thinking</b> ( $\alpha = .76$ )	4. I am open to new ideas and ways of thinking.
	9. I evaluate and improve my work on a regular basis.
	21. I explore issues, events, and problems from different perspectives.
	23. This class challenges my thinking.
35. The teacher allows students time to think and solve problems.	
<b>Positive Pedagogy</b> ( $\alpha = .85$ )	1. I am encouraged to use my imagination.
	25. The homework in this class helps me understand the subject better.
	28. The course materials and/or textbooks used in this class inspire my learning.
	29. We use various forms of technology to improve learning in this class.
	30. My grades on assignments, tests, and/or quizzes represent what I know.
	38. The teacher communicates with my parents on a regular basis.
	43. The teacher presents lessons in ways I understand.
44. The expected learning goals are clearly explained by the teacher.	
49. The teacher provides useful and timely feedback on my learning.	
<b>Discipline Problems</b>	34. Discipline is a problem in this class.

Following the grouping of these items by the raters, statistical analyses were run to determine whether each grouping of items demonstrated acceptable reliability as indicators of the construct. This reliability check was conducted by calculating Cronbach's alpha statistics (as reported in Table 1). The conventional cut-off criterion for an acceptable alpha statistic is 0.70 and above (Nunnally, 1978). All scales met this criterion. 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 .55) and that the overall scale alpha was not notably reduced by including the item (see Hinkin, 1998). For each scale, all items met these criteria.

Additionally, to ensure all scales were unidimensional (i.e., that the scale could not be broken down further into sub-constructs), an exploratory factor analysis was run on each scale using the principle factor method (as recommended by Costello & Osborne, 2005). Additionally, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy was conducted to verify the factorability of the data (values greater than .80 are considered to be high). The KMO test results for each scale met the .80 criterion. Once the factors were extracted and the factorability of the data confirmed, the traditional eigenvalue cut-off of 1.0 (Tabachnick & Fidell, 2007) was used to determine the number of factors in each scale. These results showed that all scales only produced one factor, confirming the unidimensionality of each scale.

### ***Validation of iKnow My Class Survey for use in empirical research***

#### *Analytical approach*

As noted earlier, this scale validation for empirical research purposes was intended to test specifically whether the groupings of iKnow My Class Survey items hypothesized to map onto the three core student-assessed constructs of the Student Engagement Trust Model—namely, Engagement, Relevance, and Relationships (as shown in Table 1)—in fact serve as reliable and valid indicators via a more stringent set of psychometric criteria (including a determination of discriminant validity among the scales).

Specifically, these analyses employed a technique known as confirmatory factor analysis (CFA). CFA is commonly used to test whether a set of empirical data fit a hypothesized arrangement of indicators of a construct or set of constructs. While by definition CFA is meant to provide evidence for (or “confirm”) a theory of item groupings, this type of analysis may also be used in an exploratory fashion should the standard criteria for acceptable model fit (i.e., a “confirmed” model) not be met for the hypothesized item groupings (Marsh, Muthen, Asparouhov Ludtke, Robitzsch, Morin, & Trautwein, 2009). In such cases, further changes to the item groupings may be made based on “modification indices” suggested by most structural equation modeling packages (see Byrne, 2005).

The present CFAs were run using the LISREL 8.80 software package (Jöreskog & Sörbom, 2006). Before running the CFAs, the scales of the model were set using the “unit loading identification constraint” method, which fixes the factor loading for the direct effect of one of each factor's indicators to 1.0 (Kline, 2005).

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 is at or below .06; the CFI and TFI fit indices each have a generally accepted cut-off criterion at equal to or greater than .95 (Hu & Bentler, 1999).

Additionally, item loadings onto their hypothesized factors were checked for two criteria. First, item loadings ideally should be at least .50 (Osborne & Costello, 2005). Second, modification indices for the factor loadings were checked to see whether any items crossloaded; this occurs when items load at a .32 level or higher on more than one construct (Tabachnick & Fidell, 2007). Typically, items that crossload are dropped and the analysis rerun (outside of compelling reasons to keep the item as an indicator of the factor on which it loads the strongest).

Following these steps, the composite reliability (CR) (Bacon, Sauer, & Young, 1995) and average variance extracted (AVE) (Fornell & Larcker, 1981) were checked; these represent indicators of reliability and validity in measures of latent constructs in the CFA framework (Shook, Ketchen, Hult, & Kacmar, 2004). The CR is generally considered acceptable when at or above .70, and AVE is generally considered acceptable at or above 50%.

Finally, correlations among the three constructs were checked to see whether they were high enough to be considered convergent, without being so high that discriminant validity might be brought into question. With conceptually quite similar constructs such as these, correlations are expected to be high; however, any correlations above .85 should raise potential questions about the empirical distinguishability of the constructs in the sample (Kenny, 1998).

### *Results of CFA analyses*

The CFA of the items comprising the Engagement, Relevance, and Relationships scales from the formative assessment groupings fell just short of an adequate model fit ( $\chi^2$  ( $df = 227, n = 5,228$ ) = 9807.88,  $p < .001$ ; RMSEA = 0.090 (0.088-0.091); CFI = 0.96; TFI = 0.96); additionally, the correlations among the three constructs were all above .85, and the modification indices suggested that a number of the items crossloaded. As such, the item groupings used in the formative assessment were found to be problematic for the purposes of empirical analysis in which two or more of the constructs would be included.

The following steps involved examining the modification indices for crossloading, and in a stepwise fashion removing the item that exhibited the most significant crossloading (i.e., highest loading on multiple constructs and smallest difference in loading across these constructs) and rerunning the CFA with the same checks performed. If either the model fit remained substandard, or more items significantly crossloaded, the process was repeated.

Given that many of the 23 items included in the first CFA pass crossloaded, it was not surprising that this process needed to be repeated numerous times. Specifically, it was repeated six times,

whittling down the total number of items in the final factor solution to 16. This final factor solution retained 3 of the original 7 Engagement items, 8 of the original 10 Relationships items, and 5 of the original 6 Relevance items (see Table 2).

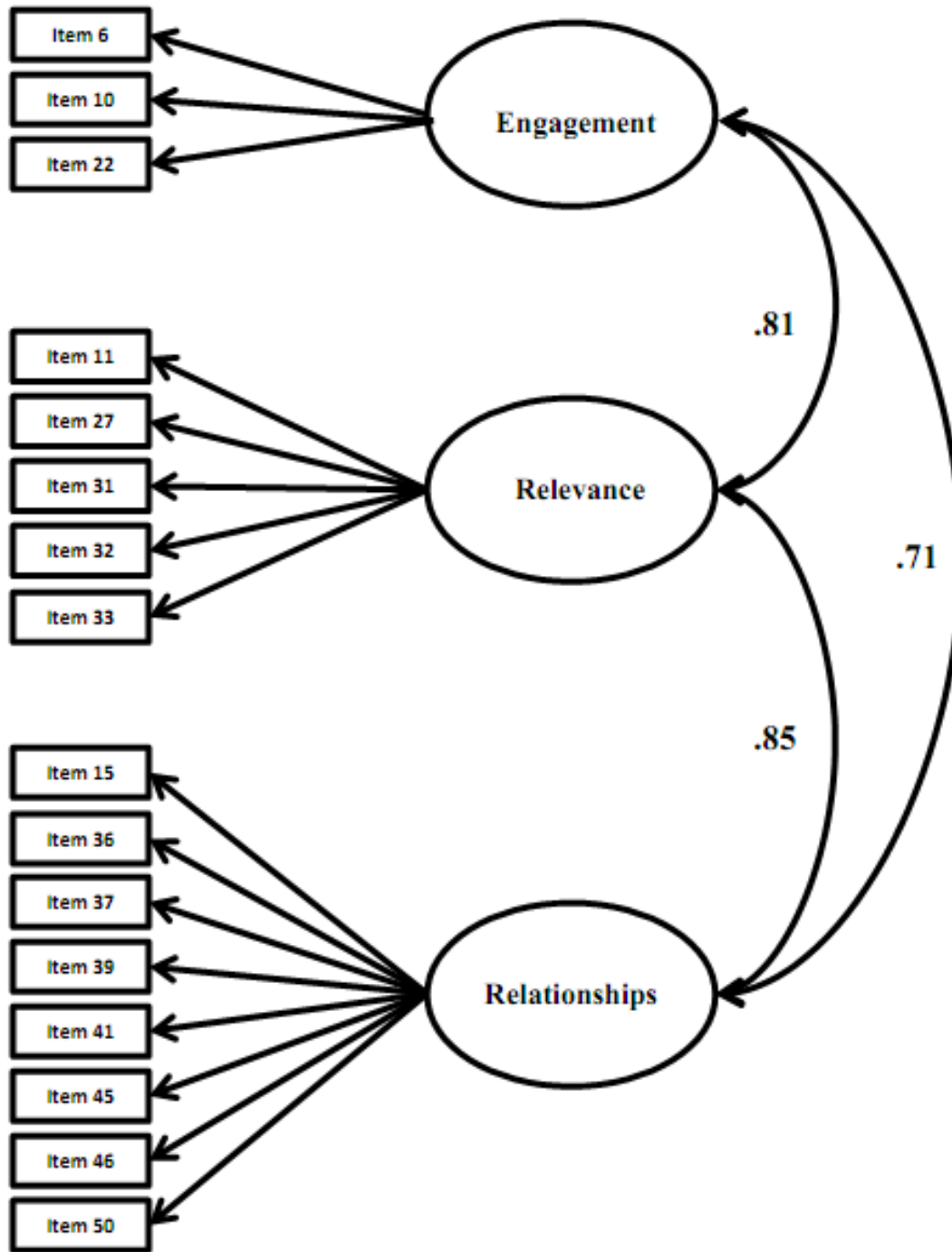
The model fit statistics for this final CFA indicated an acceptable fit of the model to the data:  $\chi^2$  ( $df = 101, n = 5,228$ ) = 2353.67,  $p < .001$ ; RMSEA = 0.065 (0.063-0.68); CFI = 0.98; TFI = 0.98. The CRs for each of the scales were roughly at or above the recommended levels; the AVE for Relationships was above the recommended level of .50, though the AVEs for Engagement and Relevance were slightly below this level.

Figure 1 shows the results of this final CFA model, including fit statistics. The items of the scales—along with their CRs, AVEs, and item loadings—are shown in Table 2. All loadings were significant at the  $p < .05$  level and equal to or above the desired level of .50. Additionally, these results showed that Engagement, Relationships, and Relevance were highly intercorrelated: Engagement was strongly significantly related to Relevance ( $r = .81, p < .001$ ) and Relationships ( $r = .71, p < .001$ ), and Relevance and Relationships were strongly significantly related to one another ( $r = .85, p < .001$ ). However, none of these correlations were so high as to bring into question their discriminant validity. Thus, these item groupings represent the Engagement, Relevance, and Relationships scales to be used for empirical research analyses.

Table 2. Constructs assessed by the iKnow My Class Survey for empirical research, with indicator items, item loadings, scale composite reliabilities and average variances extracted

<b>Construct</b>	<b>Indicator item wording (with item number and item loading)</b>
<b>Engagement</b> (CR = .69, AVE = 44%)	6. I come to class ready and willing to learn. [Loading = .77]
	10. I put forth my best effort in class. [Loading = .69]
	22. I am bored in this class. (reverse-coded) [Loading = .50]*
<b>Relevance</b> (CR = .82, AVE = 48%)	11. I have personal goals for my learning in this class. [Loading = .66]
	27. I see how this class relates to my other classes. [Loading = .63]
	31. I understand how I can apply what I am learning in my everyday life. [Loading = .76]
	32. In this class, we discuss issues that are interesting to me. [Loading = .65]
	33. I believe what I am learning in this class is important for my future. [Loading = .76]
<b>Relationships</b> (CR = .90, AVE = 54%)	15. I respect the teacher. [Loading = .70]
	36. The teacher enjoys working with students. [Loading = .82]
	37. The teacher inspires me to do my best. [Loading = .80]
	39. The teacher cares if I am absent from class. [Loading = .59]
	41. My ideas and thoughts are valued and respected by the teacher. [Loading = .80]
	45. The teacher develops positive relationships with students. [Loading = .77]
	46. The teacher expects me to be successful. [Loading = .71]
50. The teacher is willing to learn from the students. [Loading = .77]	

Note. \*indicates item crossloaded on Relevance at .40; it was kept under Engagement given its higher loading and face validity, and to ensure there are at least three indicators as is preferred with latent constructs (Kline, 2005).



Model Fit :  $\chi^2$  ( $df = 101, n = 5,228$ ) = 2353.67,  $p < .001$ ; RMSEA = 0.065 (0.063-0.68); CFI = 0.98; TFI = 0.98.  
 Note. Item loadings on factors and error terms not shown due to space constraints. All coefficients are standardized.

Figure 1. Results of Final Model of Confirmatory Factor Analysis of Items Comprising Engagement, Relevance, and Relationships Scales.

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## Appendix A

### **iKnow My Class Survey all items, item number and wording**

1. I am encouraged to use my imagination.\*
2. I feel comfortable asking questions in class.\*
3. I feel comfortable asking my teacher for individual help about the things we are learning.\*
4. I am open to new ideas and ways of thinking.
5. I give up when I do not understand something.
6. I come to class ready and willing to learn.\*
7. I am able to express my ideas and opinions in this class.
8. It is important that I share my knowledge to help others.
9. I evaluate and improve my work on a regular basis.
10. I put forth my best effort in class.\*
11. I have personal goals for my learning in this class.\*
12. I am able to communicate what I have learned in relevant ways to different people.
13. I have an opportunity to influence my classmates' thinking.
14. I respect my peers in this class.
15. I respect the teacher.
16. It is helpful for me to work with other students.\*
17. I am confident in my ability to learn what is being taught.\*
18. I don't care if I do well in this class.
19. I am comfortable being myself in this class.
20. Doing well in this class is my responsibility.
21. I explore issues, events, and problems from different perspectives.\*
22. I am bored in this class.
23. This class challenges my thinking.\*
24. Attending this class is important to me.
25. The homework in this class helps me understand the subject better.\*
26. My peers respect me in this class.
27. I see how this class relates to my other classes.
28. The course materials and/or textbooks used in this class inspire my learning.
29. We use various forms of technology to improve learning in this class.
30. My grades on assignments, tests, and/or quizzes represent what I know.\*
31. I understand how I can apply what I am learning in my everyday life.
32. In this class, we discuss issues that are interesting to me.\*
33. I believe what I am learning in this class is important for my future.
34. Discipline is a problem in this class.
35. The teacher allows students time to think and solve problems.

36. The teacher enjoys working with students.
37. The teacher inspires me to do my best.
38. The teacher communicates with my parents on a regular basis.
39. The teacher cares if I am absent from class.\*
40. The teacher knows my name.
41. My ideas and thoughts are valued and respected by the teacher.
42. The teacher knows my hopes and dreams.\*
43. The teacher presents lessons in ways I understand.\*
44. The expected learning goals are clearly explained by the teacher.
45. The teacher develops positive relationships with students.\*
46. The teacher expects me to be successful.\*
47. The teacher encourages students to work together.
48. The teacher relates our learning to current events.\*
49. The teacher provides useful and timely feedback on my learning.\*
50. The teacher is willing to learn from the students.

*Note.* \* indicates items that are on 20-item short version of the iKnow My Class Survey. The present validation study does not apply to the 20-item short version of this survey.