The Science Classroom Profile:

Design, Development, and Use

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Introduction

There has never been greater consensus among educational researchers and science education leaders as to what constitutes effective science instruction. Documents such the *National Science Education Standards* (National Research Council, 1996), *Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1993) and the *Texas Essential Knowledge and Skills* (Texas Education Agency, 2000) are in agreement with regard to the most appropriate pedagogy that should be employed to foster science literacy for all students. The recommendations are based in large part on a constructivist model of teaching and learning. A standards-based science classroom that is aligned with these recommendations is characterized by an environment in which:

- Student inquiry is the foundation for concept development,
- All students are given multiple and varied opportunities to pose questions, design investigations, dialogue/collaborate with peers and teacher, collect and evaluate evidence, justify conclusions, and demonstrate their understanding,
- Students take an active role in directing inquiry activities, explaining concepts to one another, and evaluating themselves,
- All students participate equally in the learning process,
- Teachers use assessment and questioning to guide instruction,
- Students take responsibility for their own learning,
- Teachers employ multiple and varied instructional and assessment strategies to facilitate conceptual understanding,
- Students see personal value and relevance in the science they learn, and
- Science literacy for **all** students is the goal of instruction.

Given that such a clear consensus exists, instrumentation designed to authentically capture these science classroom characteristics is limited primarily to classroom observation instruments. Tools such as the Expert Science Teaching Enhancement Evaluation Model (ESTEEM) Science Classroom Observation Rubric (Burry-Stock, 1995) and the Classroom Observation and Analytic Protocol created at Horizon Research (1998) have been employed extensively in the evaluation of professional development programs designed to enhance science teaching and learning (Burry-Stock, 2001; Fletcher & Barufaldi, 2002; Fletcher, Bethel & Barufaldi, 2001; Fletcher, Bethel & Barufaldi, 2000; Weiss, Bonilower, Crawford, & Overstreet, 2003). But considering the financial, temporal and logistical restraints to classroom observation, the science education community would be well served by the development of an instrument that does not require the presence of an outside observer. Professional development providers in particular would benefit from a tool that effectively identifies the concrete and observable classroom behaviors and activities that reflect research-based science instruction. The Science Classroom Profile (SCP) was developed to fill this niche in the science education landscape.

Background

The Science Classroom Profile was designed initially to meet the needs of a five-year NSF funded professional development project called *Empowering Science Teachers of Texas. (ESTT)*. Project ESTT was administered by the Texas Regional Collaboratives for Excellence in Science Teaching through the University of Texas at Austin. Through Project ESTT, middle level science teachers from across the state spent a minimum of 105 contact hours over the project year exploring topics related to improving their science content knowledge and pedagogy. Each year, 20 teachers participated at four different sites across Texas, comprising a cohort of 80 teachers per year. Given the size of the state of Texas, these collaborative sites were often hundreds of miles apart. Though direct classroom observations using the ESTEEM rubric were incorporated as part of the project evaluation, these observations were by necessity limited to approximately four per site and only captured a snapshot of the instruction that was occurring over time in Collaborative teachers' classrooms. To assist in data triangulation, project staff felt it necessary to devise an instrument that produced a more longitudinal and comprehensive assessment of classroom practice and could more accurately compare classroom practice before and after training. The SCP was developed with these goals in mind.

Project staff was also cognizant of the limitations inherent in teacher self reports since research indicates that perceptions of teachers may not accurately reflect practice (Fraser, 1994; Shymansky, Yore, Anderson, and Hand, 2001). The solution was to develop a profiling tool that could be reliably administered to both classroom teachers and their students. Such an instrument would possess the dual advantage of combining the external observation components of classroom observations (i.e. individuals other than the teacher documenting what happens in the classroom) with the efficiency of an instrument that can be administered across a broad geographic area and electronically scored on a large scale.

Since students were expected to complete the survey, several important considerations had to be kept in mind in the development of the instrument. First and foremost, the instrument needed to be non-evaluative in nature. To the greatest extent possible, the instrument needed to identify specific, measurable behaviors, not student opinions. Second, the instrument needed to avoid the use of education jargon that might be unfamiliar to students. A term like cooperative learning may mean one thing to teachers and something very different to students. Third, even though the instrument was originally developed for middle school classes, the reading level needed to be no higher than the upper elementary grades since many students may not be reading on grade level. Simplifying the reading level would help to capture the experiences of both high achieving and low achieving students, a task that is vital to an accurate and equitable assessment of classroom practices for all students.

Development

The resulting Science Classroom Profile, or SCP, targets various behaviors and activities by both teachers and students that reflect the core principles of a quality science education described previously, with particular attention paid to the use of constructivist, or inquiry-based, instructional strategies. Documents such as *Benchmarks for Science*

Literacy, and the *National Science Education Standards* were consulted to identify these specific classroom characteristics. Other published instruments such as the National Science Foundation's *Local Systemic Change through Teacher Enhancement Program's Core Evaluation* (Horizon Research, 1998) and *Guidelines for Self-Assessment: Middle/Junior High School Science Programs* (National Science Teachers Association, 1988) also provided guidance in selecting and describing the specific classroom practices that distinguish a constructivist approach from a more traditional approach to science education..

The SCP is split into two component parts, teacher practices and student practices. Respondents are asked to rate the frequency of certain practices in their science class. Both teachers and students complete both sections of the SCP. Though some could question the wisdom of surveying students about classroom practices, many benefits may arise from this technique. First, it is hypothesized that having students complete the SCP along with their teachers will encourage a more reflective and analytical response on the part of teachers to the items. As mentioned previously, prior research indicates that teacher self-assessments are not always aligned with the practices documented by outside observers (Fraser, 1994; Shymansky, Yore, Anderson, and Hand, 2001). Using the model employed by the SCP, the frequency of standards-based classroom practices can by identified by individuals that have had an opportunity to observe and participate in such activities on a daily basis. When such student-generated data are triangulated with evaluations from trained outside observers, teacher self reports and other sources, a very rich and multi-faceted picture of the classroom can be generated.

Pilot Test Results

Pilot testing of the first iteration of the SCP was conducted with teachers and their students in 1999. The teachers involved were all participants in a Texas Regional Collaboratives professional development project for middle school science teacher called *Project ESTT*. The 25-item profile was administered to 1400 students and 62 teachers as a pretest (fall 1999) and 1194 students and 58 teachers as a posttest (spring 2000) in grades six, seven and eight. Items T1 through T9 of the SCP refer to teacher practices. Ratings of 1-5 indicate how often the teacher does each of the items listed, with a rating of 1= Never, 2 = Rarely (a few times of year), 3 = Sometimes (once or twice a month), 4 = Often (once or twice a week), and 5 = Almost All Lessons. For example, item T4 asks how often does the teacher "Encourage students to explain concepts to one another." Questions S1 through S17 are related to how often students engage in certain behaviors. For example, item S7 is "Participate in hands-on activities."

T-tests assuming unequal variances were conducted to determine if statistically significant differences existed between teachers and students in their perception of classroom activities, behaviors, and culture. In pre-testing, 12 out of 26 statements produced significantly different ratings ($p < .05$) while post-testing indicated 11 out of 26 statistically significant differences. Seven statements showed statistically differences in both the pretest and posttest for (T1, T2, T6, T9, S1, S13, S17). In general, the significant differences were found more in assessments of what teachers were doing (T1-T9) rather than what students were doing (S1-S17). While there were differences in the frequency ratings teachers and students assigned to classroom practices, these differences were not as pervasive or as acute as hypothesized by researchers. Further details of these data are reported previously (Fletcher & Barufaldi, 2002).

Exploratory factor analysis of principal components with varimax rotation yielded a two-factor solution when student responses only were analyzed (Table 2). The two resulting scales, inquiry instruction and student centered culture, reflect the essential features of constructivist classrooms advocated by documents such as the *National Science Education Standards.* Table 1 describes the results of the exploratory factor analysis for the pilot version of the SCP.

Table 1: Factor Loadings for Science Classroom Profile Pilot Version

Item No.	Inquiry Instruction	Student-Centered Culture
S10	.688	
S13	.658	
T4	.597	
S11	.551	
S9	.524	
S2	.502	
S7	.493	
S18	.489	
S16	.488	
S1	.487	
S8	.424	
S17	.421	
T5		.724
T9		.648
S4		.610
S12		.558
S6		.525
S15		.524
T1		.496
T7		.491
T8		.478
S14		.421

Factor loadings smaller than .40 have been omitted.

Such factors align with the theoretical base for standards-based instruction.

- **Inquiry-Based Instructional Processes**

  Student inquiry is essential to effective science instruction. Classroom practices that support student inquiry include:
  - Teachers that actively assess student understanding prior to instruction
  - **Student** explorations and explanations to generate conceptual development
  - All students given multiple and varied opportunities to pose questions, design investigations, dialogue/collaborate with peers and teacher, collect and evaluate evidence, justify conclusions, and demonstrate their understanding.

- **Student-Centered Classroom Culture**
  A critical component of a standards-based classroom acknowledges the social context through which learning is mediated and the importance of personal responsibility for learning by students.
  - Students take an active role in directing inquiry activities, explaining concepts to one another, and evaluating themselves.
  - All students participate equally in the learning process.
  - Students find science meaningful and applicable beyond the walls of the classroom by examining real-world science topics and exploring the social implications of science.
  - Science literacy for all is the goal of instruction.

After pilot testing, classroom teachers provided feedback to researchers regarding the readability and validity of SCP items.

Revised SCP Results

After the initial use of the SCP, items were modified each year based on teacher feedback regarding readability and comprehension for students. In addition, the directions for the student section were modified in order to identify the practices students were personally engaged in rather than those that the class as a whole participated in. While the original version of the SCP asked respondents to rate "how often students were engaged in the following activities", the revised version asked respondents to rate " how often do **you as a student** take part in each of the following types of activities." Teachers were instructed to answer the questions as if they were a student in their class.

In 2002 and 2003, the most recent version of the SCP was administered to a total of 61 teachers and 1188 students in grades 5-12. The instrument consisted of nine items about teacher practices (T1 – T9) and 18 items about student practices (S1 – S18). Teachers were primarily Caucasian (95%) and female (80%) while the student sample was more heterogeneous. Males comprised 46% and females comprised 54% of the sample. Ethnicity distributions are described in Table 2. Grade level distributions for student responses are described in Table 3.

Table 2: Student ethnicity

Ethnicity	**Percentage**
African American	8.6
Asian American	1.9
Caucasian	59.7
Hispanic	22.4
Native American	2.4
Other	5.0

Table 3: Grade level distribution

Grade	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
N	116	115	133	395	60	57	30	16

Because the directions and wording of a number of questions changed after pilot testing, a further examination of the factor structure was necessary. This analysis looks at the data from the students due to the larger sample size. The student sample was further reduced due to missing data on the 27 items. Because the confirmatory and exploratory factor analyses conducted in this study used only complete cases (i.e. listwise deletion) with data for all 27 responses, the effective sample size for these analyses was 971 students (217 students had at least one missing data value).

Prelimary Steps:

All of the negatively-worded items were reverse scored so that higher scores reflected more constructivist practice. In addition, the means and standard deviations were computed for each of the items. Table 3 shows the intraclass correlation (ICC), means, standard deviation for each of the 27 items used in the analysis. The intraclass correlation represents the variation in students' scores due to being part of a particular classroom (Hox, 1993). Both confirmatory and exploratory factor analyses assume that each observation is independent of other observations. However, given that students are nested within classrooms, students' scores within classrooms may be more similar to each other. Higher ICC values indicate that responses on these items were more likely to vary by classroom (n = 61). However, the ICC estimates in Table 4 indicate in general a low proportion of student responses are due to classroom differences. Based on the observed ICC values, a confirmatory factor analysis examined both the between and within classroom variation.

Table 4: ICCs, Means, and Standard Deviations for 27 SCP items for student respondents only.

		N = 971 students		
Item	**Description**	**ICC**	**Mean**	**Std Dev**
t1	Make a point to include a variety of students in classroom interactions.	.20	4.09	1.08
t2	*Use lessons that allow only some students to actively participate.	.14	3.94	1.26
t3	*Ask students questions that require one or two word responses.	.20	2.56	1.26
t4	Encourage students to explain concepts to one another	.17	3.52	1.23
t5	Find out what students know about a topic before introducing it	.18	3.5	1.26
t6	Teach a concept with hands-on activities	.19	3.77	1.04
t7	Use resources other than the textbook including videos, probes, software, laser discs, digital cameras or computers.	.26	3.6	1.11
t8	Give students time to think about answers to questions	.12	4.3	.96
t9	Relate concepts in science class to real-world topics	.13	3.9	1.1
s1	Teach other students	.18	3.23	1.26
s2	Make presentations to the class	.27	2.62	1.05
s3	*Read from a science textbook	.36	2.31	1.28
s4	Discuss current events related to science	.17	3.34	1.2
s5	*Answer textbook/worksheet questions	.35	1.91	1.04
s6	Work on solving real-world problems	.17	2.55	1.18
s7	Participate in hands-on science activities	.22	3.81	1.12
s8	Design or complete your own investigations	.20	2.66	1.21
s9	Work on extended science investigations or projects (a week or more)	.19	2.63	1.11
s10	Participate in investigations outside the science classroom	.14	2.4	1.1
s11	Use math to understand science better	.27	3.16	1.22
s12	Demonstrate what you have learned in ways other than taking a written test or quiz	.17	3.09	1.17
s13	Work like a scientist	.19	2.93	1.28
s14	Evaluate yourself	.17	2.91	1.3
s15	Explain your reasoning when answering questions	.19	3.64	1.16

s16	Write lab reports	.36	2.81	1.31
s17	*Take short answer tests (e.g. multiple choice, true/false, fill-in-the-blank)	.18	2.12	1.03
s18	Use technology to learn science	.19	3.3	1.19

Confirmatory Factor Analyses of SCP Data: Student Responses

To test the construct validity of the SCP, a confirmatory factor analysis (CFA) was conducted using an initial, hypothesized grouping of items. The confirmatory analysis tested whether the constructs represented by the hypothesized sets of items fit the observed data. The CFA attempted to take the nested structure of the data into account for the analyses (students responses were nested within teachers). The CFA was estimated using Lisrel 8.5.

Appendix 2 shows the estimated relationships from the within-classroom. However, the matrix of factor inter-correlations was non-positive definite which makes these estimates reported in the diagram non-useful. The Chi-square goodness of fit test was statistically significant (Chi-square(636)=1644.4, $p < .0001$) and the Root Mean Square Error of Approximation (RMSEA) was .057 should be interpreted cautiously. Although several methods were use to resolve the estimation problem including providing starting values (Byrne, 1998), none were successful. As a result, an Exploratory Factor Analysis was performed.

Exploratory Factor Analyses of SCP Data: Student Responses

Since the model estimates were questionable, Exploratory Factor Analysis (EFA) was used to assist with identifying the underlying dimensions. SAS Proc Factor was used to estimate the model. The student scores were standardized within classrooms to remove the confounding influence of the mean between teacher variation.

An iterated principal-factor analysis method was used to extract the factors from the squared-multiple correlation of each variable. Principal factor analysis doesn't require multivariate normality that may not be present given the ordinal nature of the SCP items (Hatcher, 1994; Hair, Anderson, Tatham, & Black, 1998). Principal factor analysis involves identifying the initial estimates of the communality for each variable and replacing the correlation matrix diagonals with those estimates. Factors were then extracted and the process was repeated until no further improvement was found (Hair et.al., 1998). Four factors were retained based on the proportion of variance explained of the common variance that was 100%.

After the initial factor extraction, the common factors are uncorrelated with each other. If the factors are rotated by an *orthogonal transformation*, the rotated factors are also uncorrelated. If the factors are rotated by an *oblique transformation*, the rotated factors become correlated. Rotating a set of factors does not change the statistical explanatory power of the factors. Since there is no statistical basis to choose among rotated solutions, each rotated solution was reviewed for maximum interpretability (Hatcher, 1994). Table 5 shows the varimax orthogonal rotated solution. The column entitled Comm represents the final communalites for each item that indicates the proportion of variation of that variable which is shared with the squared multiple correlation of other variables.

Communality estimates reflect the amount of variation each item contributed to the factor analysis.

Table 5: Varimax rotated iterated principal components four factor solution

Item	Decription	Comm.	Multi-Modal Instruction	Student Directed Learning	Science Applications	Traditional Instruction
t6	Teach a concept with hands-on activities	.41	.56	.25	.02	.17
s7	Participate in hands-on science activities	.43	.54	.35	.07	.10
t9	Relate concepts in science class to real-world topics	.34	.50	.09	.11	-.27
t7	Use resources other than the textbook including videos, probes, software, laser discs, digital cameras or computers.	.34	.49	-.02	.28	.13
t4	Encourage students to explain concepts to one another	.25	.41	.21	.10	-.15
t1	Make a point to include a variety of students in classroom interactions.	.20	.40	.06	-.05	-.18
t5	Find out what students know about a topic before introducing it	.22	.40	.10	.19	-.13
t8	Give students time to think about answers to questions	.29	.39	.05	-.03	-.37
s13	Work like a scientist	.44	.29	.56	.21	-.01
s14	Evaluate yourself	.41	.08	.54	.19	-.27
s8	Design or complete your own investigations	.34	.13	.44	.34	-.08
s12	Demonstrate what you have learned in ways other than taking a written test or quiz	.37	.30	.43	.26	-.17
s16	Write lab reports	.23	.18	.41	.12	.12
s11	Use math to understand science better	.27	.19	.41	.19	-.18
s15	Explain your reasoning when answering questions	.38	.30	.39	.22	-.30
s18	Use technology to learn science	.35	.33	.38	.31	-.01
s10	Participate in investigations outside the science classroom	.41	.14	.20	.59	-.10
s9	Work on extended science investigations or projects (a week or more)	.31	.13	.28	.47	.00
s2	Make presentations to the class	.27	.18	.17	.46	-.06

s6	Work on solving real-world problems	.23	.16	.18	.37	-.18
s4	Discuss current events related to science	.34	.25	.21	.35	-.33
s3	*Read from a science textbook	.30	.01	-.03	-.10	.54
s5	*Answer textbook/worksheet questions	.21	-.07	.01	.00	.45
s1	Teach other students	.18	.27	.16	.24	-.17
s17	*Take short answer tests (e.g. multiple choice, true/false, fill-in-the-blank)	.08	-.21	-.06	-.10	.14
t3	*Ask students questions that require one or two word responses.	.11	-.12	.26	-.15	.06
t2	*Use lessons that allow only some students to actively participate.	.04	.09	.02	-.18	-.02

For most applications, the preferred rotation is that which is most easily interpretable. Hair et.al. (1998, pg. 111) recommend the following guidelines for practical significance: ±0.3 Minimal; ±0.4 More Important; and ±0.5 Practically Significant. Four items do not appear to load on any factor: s1, s17, t3, and t2. Overall, the factor loadings were moderate with no factor loading over .6.

Reliability Analyses:

The coefficient alpha for each factor identified above was examined separately and reported in Table 6. In addition, the factor scores were computed by averaging the raw scores for each factor. The means and standard deviations are reported below.

Table 6: Number of Items, Coefficient Alpha, Mean, Standard Deviation and minimum and maximum values.

Variable	Number of Items	Alpha	Mean	Std Dev	Minimum	Maximum
f1	8	.72	3.81	0.65	1	5
f2	8	.78	3.06	0.77	1	5
f3	5	.68	2.8	0.71	1	5
f4	2	.54	2.11	0.96	1	5

In addition, the correlations between factor scores were computed using averaging scores for each factor. Table 7 shows the correlations between factor 1 through factor 4. The first three factors were positively correlated with each other and negatively correlated with factor 4. Since factor 4 represents a more textbook oriented approach, this suggests that f1, f2, and f3 represent constructivist dimensions that inversely vary with more textbook oriented instructional practice.

Table 7: Intercorrelations between factors

Inter-Factor Correlations				
	Factor1	**Factor2**	**Factor3**	**Factor4**
Factor1	1.00			
Factor2	.52	1.00		
Factor3	.46	.56	1.00	
Factor4	-.13	-.22	-.26	1.00

Note: All correlations were statistically significant a $p < .01$.

Discussion

The following four-factor solution resulted from the exploratory factor analysis of the revised SCP:

1. Multi-modal Instruction
   - How can a teacher design instruction to promote personal knowledge construction? This factor captures the teachers' use of a variety of instructional and informal assessment techniques to engage students, scaffold

their own personal concept development, and help them develop more complex knowledge structures

2. Student Directed Learning
   - What practices do students engage in that make them responsible for their own learning? This factor addresses student practices that promote “ownership” of the knowledge they personally generate.
3. Science Applications
   - How can students explain and apply classroom science concepts? This factor explores the connection between classroom science and the student’s ability to apply those concepts in real world or personally defined contexts.
4. Traditional Instruction
   - What student practices reflect more non-interactive instructional experiences? This emerging factor may address instructional techniques that demand little to no personal mental engagement from students.

Each of these factors can be mapped to the theoretical constructs and constructivist practices identified by researchers in the initial stages of instrument development.

It is interesting to note the differences found between the original principal components analysis of the pilot test and the factor analysis employed for the revised version of the SCP. In the pilot SCP, a two-factor solution was found but this solution only explained 35% of the total variance in the instrument, even though factor loadings were much higher. Principal component analysis uses total variation of each item while factor analysis uses only shared variation. Factor analysis that employs estimates of communality in the correlation matrix eliminates any error that may confound interpretation of the specific constructs in question and is therefore a more conservative approach. Removing both error and between teacher variance from the analysis may have contributed to lower factor loadings.

Another issue to consider is the change in directions on the student section of the SCP. As mentioned previously, the pilot version’s broader statement “About how often do **students** in this class take part in each of the following types of activities as part of their science instruction?” differs from the more directly personal instructions on the revised SCP: “ About how often **do you as a student** take part in each of the following types of activities as part of science instruction?” Moving from an assessment of the class in general to an assessment of their personal experiences may have contributed to greater variability and therefore less consistency in student responses.

Future Research

Communality estimates, reliability, and factor loadings show promise that the SCP will prove to be an effective tool for measuring the degree of constructivist practice in science classrooms. However, further revision and testing of the instrument will be conducted to improve its utility. Revisions to the SCP will continue to be made to increase the validity and reliability of the instrument overall. If the traditional instruction construct is going to be retained, additional items will need to be generated to bolster the reliability of this factor. Items that failed to load on any factor will need to be modified or eliminated before further testing is conducted. Grade level variations in item response should also be analyzed to determine the influence of grade level on student response patterns. Factor analysis using teacher responses also will be conducted to determine if similar underlying constructs are present. In addition, consideration will be given as to how the student directions in the revised SCP may have impacted responses. Cross tabulation of responses for each individual item on the survey form would test whether the survey form is associated with a differential pattern of response for individual item categories. Another future direction will be to measure the degree of association between teacher and student ratings of similar constructs to identify whether there is agreement in the classroom on the degree of constructivist science education. Prior analysis of this relationship with the pilot SCP indicates a high degree of association (Fletcher & Barufaldi, 2002) but as with the factor analysis, this needs to be confirmed with the revised version of the instrument as well.

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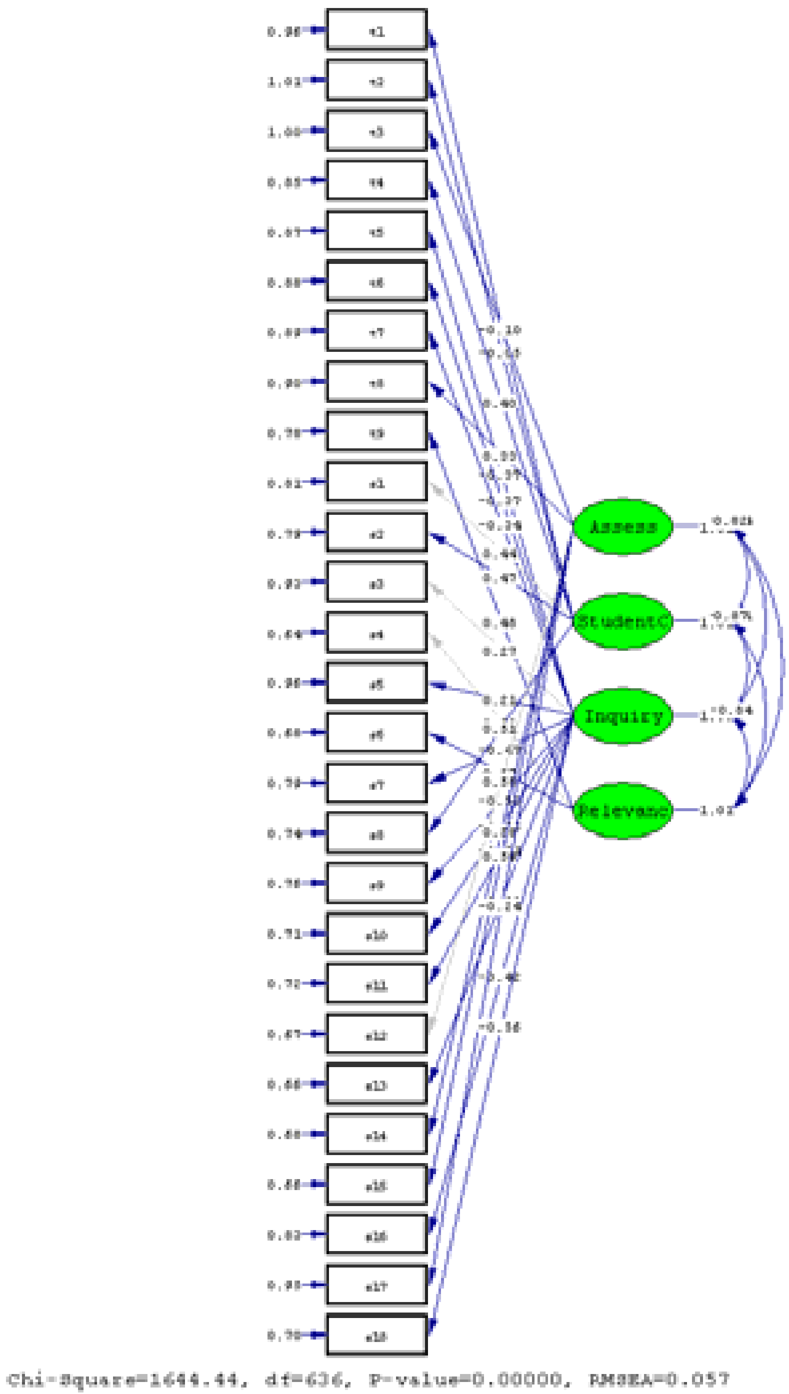
Appendix 1: Hypothesized Confirmatory Factor Solution

ITEM	ITEM	Inquiry	Assess-ment	Rele-vancy	Student Centered
T1	Make a point to include a variety of students in classroom interactions.				X
T2	*Use lessons that allow only some students to actively participate.				X
T3	*Ask students questions that require one or two word responses.		X		
T4	Encourage students to explain concepts to one another				X
T5	Find out what students know about a topic before introducing it	X			
T6	Teach a concept with hands-on activities	X			
T7	Use resources other than the textbook including videos, probes, software, laser discs, digital cameras or computers.	X			
T8	Give students time to think about answers to questions		X		
T9	Relate concepts in science class to real-world topics			X	
S1	Teach other students				X
S2	Make presentations to the class				X
S3	*Read from a science textbook	X			
S4	Discuss current events related to science			X	
S5	*Answer textbook/worksheet questions	X			
S6	Work on solving real-world problems			X	
S7	Participate in hands-on science activities	X			
S8	Design or complete your own investigations				X
S9	Work on extended science investigations or projects (a week or more)	X			
S10	Participate in investigations outside the science classroom	X			
S11	Use math to understand science better	X			
S12	Demonstrate what you have learned in ways other than taking a written test or quiz		X		
S13	Work like a scientist	X			
S14	Evaluate yourself		X		
S15	Explain your reasoning when answering questions		X		
S16	Write lab reports	X			
S17	*Take short answer tests (e.g. multiple choice, true/false, fill-in-the-blank)		X		
S18	Use technology to learn science	X			

Appendix 2: Within-group confirmatory factor Analysis solution



Fletcher, C.L., Meyer, J.D., Barufaldi, J.P., Lee, E., Tinoca, L. and Bohman, T. (March, 2004). The Science Classroom Profile: Design, Development, and Use. Paper presented at the meeting of the National Association for Research in Science Teaching, Vancouver, Canada.