The Student-Centered Teachers’ Beliefs Survey: An Initial Validity Study Based on a Unified Latent Variable Framework

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Abstract

The authors describe the steps used to develop an initial version of the Student-Centered Teachers Beliefs Survey (SC-TBS), as well as a single validity study using a unified latent variable framework. The SC-TBS is proposed as an instrument for teachers to assess the degree to which they believe that they use specified practices that promote student-centered instruction. The goal of this research was to construct a quantitative instrument that is short, easily scored, and readily interpretable. This article examines evidence of validity from item response theory (IRT) and structural equation modeling (SEM) traditions to evaluate the internal structure of the SC-TBS. Although a unidimensional model fit the data, the item factor loadings and discriminations were only moderate in size. Future studies should extend the initial efforts of this study and the limitations of the moderate factor loadings and discriminations, as well as compare the self-report data obtained with the SC-TBS against teacher observations of student-centered practices.

Keywords: teacher beliefs, validity, confirmatory factor analysis, structural equation modeling

For many decades, the traditional or teacher-centered approach has dominated practices related to classroom instruction. Within this framework, teachers have had authority with direct supervisory capacities over what content was taught, how it was taught, how student outcomes were assessed and what type of decorum was permitted in classrooms. While many teachers still fulfill these roles, researchers have highlighted the importance of interactions between the classroom culture and the student’s cognitive, emotional and social needs (Brown, 2008, Dewey, 1938, Estes, 2004) evidenced in through process paradigm.
Beginning with work by Dewey (1938), understanding teacher beliefs began to take into account the constructivist or process paradigm and focus on teaching in ways that are responsive to students’ learning needs. Attention to this approach has enhanced teacher reflection about the importance of aligning instructional practices with ways that more nearly match students’ preferred learning styles. However, moving from the dominant approach of teaching-centered instruction to a more student-centered approach requires a substantial shift in beliefs, thinking, and practice. Prawat (1992) argued that in order for teachers to adopt a constructivist perspective, that their beliefs would need to undergo a transformative change – from seeing their roles as managing the curriculum, running activities, and organizing students – towards envisioning the classroom as the center of intellectual activity. Prawat asserted that such change would require considerable teacher reflection and discussion. To make this transition requires that teachers first discover if, and to what degree, they are student-centered in their beliefs about planning for instruction, teaching and assessing student outcomes (Richardson, Anders, Tidwell & Lloyd, 1991). This process also requires articulating the use of actual practices to promote teacher exploration. Often, what teachers think they do is tacit, or remains unexpressed. The authors assert that the development of a scale to measure teacher beliefs with respect to student-centered instruction, will contribute, in part, to helping teachers concretize and identify tacitly held beliefs.

This article presents steps taken for the initial development of the Student-Centered Teachers Beliefs Survey, as well as a single validity study for this instrument. The focus of the article is on the information that latent variable models can provide about validity. In validation studies, latent variable models such as item response theory (IRT) and confirmatory factor analysis (CFA) have been used to provide validity evidence with respect to scales’ internal structure. Although it has been demonstrated that many of the commonly used latent variable models are equivalent (Kamata & Bauer, 2008; Takane & De Leeuw, 1987), researchers usually follow the traditions popularized by users of a certain formulation of a latent variable model (e.g. CFA, IRT models) when performing validation studies. There is a clear division of traditions with respect to latent variable models was identified by Leite, Huang and Marcoulides (2008) in their comprehensive review of articles presenting validations of short-forms of scales. This article attempts to demonstrate that joining practices popularized by users of IRT models (e.g. the examination of information functions) with practices common of users of structural equation modeling (SEM) (e.g. examination of global model fit and relationships between constructs) allows richer

**Theoretical Foundations for the SC-TBS**

Student-centered (SC) beliefs refer to the teachers’ inclinations to promote instruction that engages students actively. First described as student-centered instruction around 1900, this concept was identified in the context of constructivism by Vygotsky and Dewey (Brown, 2008). Student-centered instructional beliefs, demonstrated in Dewey’s work at the University of Chicago’s Laboratory School (Dewey, 1938) suggested that experience was the core of experiential education (Estes, 2004). Although Dewey stopped short of claiming that experience alone resulted in learning, he suggested that an experience could be educative depending on whether or not it was engaging and if it had continuity with students’ further experiences. Researchers believe that student-centered instruction promotes instructional practices that encourage students to explore, experiment and make discoveries on their own (Brown, 2008, Dewey, 1938, Estes, 2004). Within this framework, planning, teaching, and assessing are also careful tailored to students’ learning needs and abilities (Brown, 2008).

One example of a teaching model created by Gardner, driven by student-centered instruction, is Harvard’s Project Zero (Brown, 2008). This project initially focused on the arts: music, visual art and imaginary writing. What is salient here is the method by which student-centered instruction occurs: students produce or perform an artistic work, students study others’ work, and students reflect upon their own work. Researchers believe that it is through these pathways that students use their understanding and assessment of others’ work to improve their own work (Brown, 2008).

Through student-centered instruction, students become involved and actively engaged in what they are learning, and thus, learn how to become self-sufficient and creative thinkers (Brown, 2008). For example, students are frequently expected to describe what they are learning in their own words. Teachers may also learn new teaching strategies by observing that ways that students make sense of make they are learning.

In student-centered instruction, the teacher guides students in constructing their own understanding. SC is directed towards: (a) enabling students to think about complex issues, (b) promoting student owner-
ship for their learning, as well as active learning, and (c) learning how to think. These strategies focus on bringing about conceptual change in students' understanding of the world. Thus what students are able to achieve through the understandings that they acquire, are what is important, not what teachers do (Prosser & Trigwell, 1998).

Educational endeavors have been described as a dichotomous process: product-oriented (traditional and teacher-centered) and process-oriented (constructivist and student-centered). The product, traditional or teacher-centered orientation focuses on what skills are needed to achieve success. The process, constructivist or student-centered orientation focuses on what methods are essential to achieve outcomes. In this paper, this discussion is limited solely to the process, or SC orientations as a guiding framework. SC practices were derived from research on teaching effectiveness behaviors (Good & Brophy, 1986; Huba, & Freed, 2000; Porter & Brophy, 1988;) and teaching styles (Fox, 1983; Grasha, 1996; Prosser & Trigwell, 1998).

Method

*Item development*

The researchers wrote an initial set of 30 items that described student-centered behaviors. These initial items were behaviors related to classroom planning, the teaching process, classroom management, and student evaluation. Once the initial set of items was created, cognitive interviews, a focus group, and expert reviews were performed to improve item wording and eliminate items that were unclear or redundant. Furthermore, a pilot test was performed to eliminate items with poor psychometric characteristics. The procedures for scale development are described in detail below.

Cognitive interviews were used to verify whether the wording of the items was clear and consistent with the objective of the items. Following the concurrent probing method described by Willis (1999), the researcher asked the respondents to read each question silently and then explain what they believed the question was asking. Six females with public school teaching experience participated in the first round of concurrent probing. The participants included two African-Americans, and four Caucasians, two high school teachers (math and history) and four elementary teachers. Item wording was improved based on the results of the cognitive interviews. After item revision, two additional cognitive interviews were performed to verify the clarity of the revised items. The interviewees were an elementary teacher and a middle school teacher, both with more than a decade of experience. No problems in the wording of the items were identified with these additional two interviews.
A focus group was performed to verify whether the initial set of items adequately covered common teaching behaviors. Twelve students enrolled in a graduate level curriculum course were asked to participate in a focus group as part of a class activity. In addition, two students were solicited to take notes and document participants' responses. The participants included five males and seven females. All of the participants were either working as teachers or had previous teaching experience.

The discussion was guided by the moderator and followed a protocol containing open ended questions. The responses of the participants of the focus group were classified according to whether they described behaviors related to planning for instruction, teaching, classroom management, and student evaluation. The behaviors identified by the focus group were compared with the behaviors in the initial set of SC-TBS items, and behaviors that were not in the scale were included. The focus group provided support for initial practices and agreement that the practices listed were indeed indicative of the domain of student-centered (constructivist) teaching behaviors. No new items were added as a result of the focus group.

Expert reviews were used to define the extent that the initial set of items reflected student-centered behaviors. Six professors with extensive knowledge about teaching and experience were asked to review the survey. They were asked to indicate what behaviors described by the items were student-centered with respect to class planning, teaching process, classroom management, and student evaluation. Their responses along with those of the first author were tabulated. All items that had agreement of less than .50 were deleted from the survey. After deleting 18 of the items, 12 student-centered items remained.

**Pilot test**

Eighty-six teachers at a nearby high school were invited to participate in an online pilot study. Using online survey software, these high school teachers were asked to take the SC-TBS. Of the sample, n = 37 (43%) completed the surveys. The scoring helped to determine to what degree the participants reported a preference for student-centered instructional practices and provided a numerical measure of the individual's preference for instructional practices related within the major domains.

The analysis of the pilot test data was based on Classical Test Theory (CTT) (Lord & Novick, 1968). CTT was used instead of IRT or CFA for the pilot test data because the small sample sizes typical of pilot studies do not allow fitting more complex latent variable models. CTT posits that the discrimination of an item equals the bi-serial correlation between the item scores and total score based on the remaining items.
We looked for items with low or negative discriminations and also examined the variance of the item scores. None of the items had problematic discriminations, but one of the items was deleted due to lack of variability. The Cronbach’s alpha reliability estimate for the scores of the remaining 11 items with the pilot data was .73, which is considered acceptable because the SC-TBS is a non-cognitive scale for low-stakes decisions.

Validity Study
In the validity study, preliminary validity evidence for the Student-Centered Teachers Beliefs Survey was obtained from examining the model fit, item parameters, item and test information functions, reliability of the scores, and the relationship between the student centered beliefs and three latent variables theoretically related to student centered beliefs. Practices common in IRT, CFA and SEM applications were combined to provide comprehensive information about the scale’s internal structure. However, this evidence is considered preliminary because adequate support for the validity of the uses of a certain scale’s scores requires a research program comprised of multiple studies (Kane, 2006).

Participants
Data was collected from 445 elementary, middle and high school teachers from a single school district. From this sample, 80.4% were female, 11.7% were male, and 7.9% did not disclose gender. Furthermore, 46.7% reported to teach Kindergarten to 5th grade, 22.5% reported to teach 6th to 8th grade and 23.6% reported to teach 9th to 12th grade, and 7.2% did not report teaching assignment.

Instruments
The participants completed the SC–TBS and Tschannen-Moran and Woolfolk Hoy’s (2001) Teacher Sense of Self-Efficacy Scale Short-Form (TSES – SF). The TSES – SF contains 12 items in a nine-point Likert-type scale with anchors on odd-numbered points equal to “nothing”, “very little”, “some influence”, “quite a bit” and “a great deal”. This scale measures three latent factors: efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management. The TSES – SF was administered because research has shown that teacher self-efficacy is expected to predict engagement in student-centered instruction, and therefore can be used to obtain validity evidence for the SC-TBS. Researchers found that highly efficacious teachers used student-centered instructional practices more often than teachers with low self-efficacy (Anusavice & Behar-Horenstein, 2005). They also reported that students of highly efficacious teachers scored significantly higher on posttest measures of reading achievement when compared to students
of low self-efficacy teacher (Anusavice & Behar-Horenstein). In professional development aimed at fostering teacher empowerment, teachers developed efficacy in the teaching of mathematics and in the use of student-centered instruction. Furthermore, researchers have found that teachers with higher self-efficacy use student-centered instruction more often than teachers with low self-efficacy (Rivard, Follo, & Walsh, 2004; Goddard, Hoy & Woolfolk Hoy, 2004).

**Procedure**

The TSES – SF and the SC-TBS were administered to the sample of teachers using the internet, following guidelines for internet surveying proposed by Dillman, Smyth and Christian (2008). The implementation consisted of five contacts with the respondent, which included a prenotice e-mail, questionnaire e-mail with cover letter, and three e-mail reminders. The internet-based data collection resulted in 445 responses. From the total sample of teachers, 208 were elementary school teachers, 100 were middle school teachers, 105 were high school teachers, and the remaining did not report the grade they taught.

**Analysis**

For the evaluation of item properties, the CFA model for categorical variables was used (Kaplan, 2000). Item parameters for the CFA model were estimated using weighted least squares with adjusted means and variances (WLMV) with MPLUS 5.1 (Muthén & Muthén, 2008). Item parameters in IRT metric were estimated with MPLUS 5.1 using the MLR estimator and theta parameterization (Muthén & Muthén, 1998-2007). Model fit was evaluated using the chi-square statistic as well as the CFI, TLI, and RMSEA. Item and test information functions were obtained for the SC-TBS, which indicated how much information each item and the combined test provide at different locations of the latent variable scale.

The reliability of the SC-TBS scores was estimated based on the CFA results with the following equation (Raykov, 2001a):

\[
\rho_s = \frac{\left(\sum_{j=1}^{J} \lambda_j^2 \right) \text{var}(\eta)}{\text{var}(\eta) + \sum_{j=1}^{J} \text{var}(\varepsilon_j)}
\]

(0.1)

where \( \rho_s \) is the reliability of the scores of a scale, \( \lambda_j \) are the factor loadings of the items of the scale, \( \text{var}(\eta) \) is the variance of the scale's factor, \( \text{var}(\varepsilon_j) \) are the error variances of the scale's items. This CFA-based method of es-
Estimating composite reliability has been shown to be an improvement over Cronbach’s alpha, because the later is known to underestimate composite reliability for congeneric items (Raykov, 1997, 2001b).

Additional evidence of validity was obtained using a structural equation model (SEM) about the relationship between student-centered beliefs and teacher self-efficacy. This model is presented in Figure 2. The SEM examines whether efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management predict student-centered beliefs. Based on theory, our hypothesis was that these factors significantly predict student-centered beliefs.

**Results**

The overall assessment of fit of the 11-item SC-TBS indicated model fit problems [(33) = 111.360, p < .05, CFI = 0.876, TLI = 0.891, RMSEA = 0.078]. To improve fit, the two items with the lowest standardized factor loadings were removed from the scale. The resulting 9-item scale achieved acceptable fit to the measurement model [(23) = 71.329, p < .05, CFI = 0.913, TLI = 0.929, RMSEA = 0.073]. The reliability estimate for the SC-TBS items was 0.70. The parameter estimates using CFA and IRT metric for the SC-TBS are shown in Table 1. Items have medium factor loadings and discrimination. Next the item information functions were examined (see Figure 1) and indicated that those items which provided the most information for individuals between -2 and 2 standard deviations. As expected, the items with largest factor loadings (i.e. items 1 and 5) provide the most information. The test information function confirms that the items of the SC-TBS provide the most information between -2 and 2 standard deviations, with a quick drop in information after that.

A CFA of the TSES-SF data was performed to examine whether a three-factor structure fit the data. The evaluation of this measurement model is important before fitting a full SEM, because the SEM combines the measurement models of the SC-TBS and TSES-SF scales with a structural model. The three-factor CFA for the TSES-SF was found to fit the data well [(30) = 161.665, p < .05, CFI = 0.962, TLI = 0.984, RMSEA = 0.104]. Standardized factor loadings of the items of the TSES-SF are provided in Table 2, and are large in size.

Our next step was to fit a structural equation model (SEM) to the data. In this SEM (see Figure 3), the student-centered beliefs construct was regressed on efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management. The SEM was found to fit the data well [(76) = 218.001, p < .05, CFI = 0.965, TLI = 0.981, RMSEA = 0.065]. The results indicate that efficacy in student
engagement and efficacy in instructional strategies significantly predict student-centered behaviors, but efficacy in classroom management does not. The standardized regression coefficients, standard errors and t values are shown in Table 3.

Discussion

The SC-TBS offers a preliminary attempt to develop a measure that teachers can use to self-assess their use of specified practices to assist students in making sense of and in constructing meaningfulness from what they are learning. The examination of item scores may help educators determine the relative strength of their beliefs as it pertains to particular practices (items). This scale may be helpful in promoting the use of a common language to describe student-centered practices. The items may assist educators in developing learning experiences that fosters students’ meaning making behaviors compared to when they are using practices that do not foster meaning making.

It is expected that the use of the SC-TBS as an assessment will help educators self-identify their beliefs about their use of student-centered teaching practices and the relative strength of their beliefs. Researchers have shown that there are often disparities between what teachers believe and what practices are observed during instruction (Beswick, 2007; Speers, 2005). Speers suggests that these disparities may be an "artifact of the methods used ... and the particular conceptualizations of beliefs implicit in the research designs" (Speers, 2005, p. 361). Thus, findings from the SC-TBS may provide educators with information previously unavailable or tacitly held, or it may reify their assumptions about their beliefs about using student-centered teaching practices (See Table 4). Scores on this scale may also be helpful for educators who are seeking guidance about what type of learning activities they may need to develop which are responsive to students’ learning needs.

Assessing teachers’ student-centered beliefs may also serve as a catalyst for the development professional activities that seek to expand teacher’s instructional repertoires. This scale might be useful for professional development activities that require examining changes in teachers’ professed beliefs prior to and following workshops when those activities focus on expanding their use of student-centered instructional strategies.

Acquiring information about their use of student-centered beliefs may shape teachers’ decisions regarding what knowledge is relevant (Speers 2005), determine what curriculum objectives are accomplished, influence the instruction plan, and determine how and if curriculum objectives are
met. Identifying student-centered teaching beliefs is essential for educators who are trying to make changes in their practice. Assessing teacher practice is also an important beginning for the development and implementation of new programs (Richardson, et al, 1991).

Results from the SC-TBS may be used to clarify the differences and similarities between professed teaching beliefs and the degree to which the actual practice of student-centered instruction is provided in classrooms and other learning environments. For some educators, just being able to self-identify particular practices can promote reflection and understanding the type of instruction that they provide in classrooms. Enhancing teachers' understanding of instructional strategies that promote successful outcomes has implications for improving teachers' self-efficacy. For example, Dunn (2004) found that when teachers' beliefs and self-concepts changed so did the nature of their instructional practices. As the teachers began to recognize the mathematical abilities of diverse students, the nature of their instructional practices widened and they began using student-centered instruction. Subsequently they began to provide opportunities for students to initiate discussion, debate issues, and offer their own strategies and explanations.

The results of this study are preliminary evidence of the validity of SC-TBS because only the internal structure of the scale was addressed. The authors found that a unidimensional model fits the data, but the item factor loadings and discriminations are only moderate in size. Many factors could have produced attenuation of factor loadings: the wording of the items could have been interpreted differently by elementary, middle and high school teachers, social desirability bias could have reduced the correlations between item responses, and the internet administration could have added random error to the responses. These are factors that should be investigated in future studies about student-centered teacher beliefs. Furthermore, it is important that additional studies collect data from teacher observations to be compared against data obtained with the SC-TBS. Although cost and time efficient, self-report measures such as the SC-TBS, are more vulnerable to random and systematic error. As an alternative to classroom-based teacher observations, a comparison against data from observations would allow a stronger argument for the validity of the SC-TBS scores and provide feedback to teachers about their teaching behaviors.

References


Prawat, R. S. (1992). Teachers' beliefs about teaching and learning: A


**Appendix**

**Table 1. Item parameters of Student-Centered Teacher Beliefs Scale (final form)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Standardized Factor Loading</th>
<th>Discrimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>0.651</td>
<td>1.438</td>
</tr>
<tr>
<td>Item 2</td>
<td>0.308</td>
<td>0.703</td>
</tr>
<tr>
<td>Item 3</td>
<td>0.499</td>
<td>0.807</td>
</tr>
<tr>
<td>Item 4</td>
<td>0.428</td>
<td>0.860</td>
</tr>
<tr>
<td>Item 5</td>
<td>0.629</td>
<td>1.400</td>
</tr>
<tr>
<td>Item 6</td>
<td>0.552</td>
<td>1.106</td>
</tr>
<tr>
<td>Item 7</td>
<td>0.481</td>
<td>1.108</td>
</tr>
<tr>
<td>Item 8</td>
<td>0.585</td>
<td>1.118</td>
</tr>
<tr>
<td>Item 9</td>
<td>0.460</td>
<td>1.048</td>
</tr>
</tbody>
</table>
### Table 2. Standardized factor loadings of TSES – SF

<table>
<thead>
<tr>
<th>Factor 1: Efficacy in student engagement</th>
<th>Standardized Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 2</td>
<td>0.839</td>
</tr>
<tr>
<td>Item 3</td>
<td>0.876</td>
</tr>
<tr>
<td>Item 4</td>
<td>0.860</td>
</tr>
<tr>
<td>Item 11</td>
<td>0.642</td>
</tr>
<tr>
<td>Factor 2: Efficacy in instructional strategies</td>
<td></td>
</tr>
<tr>
<td>Item 5</td>
<td>0.682</td>
</tr>
<tr>
<td>Item 9</td>
<td>0.744</td>
</tr>
<tr>
<td>Item 10</td>
<td>0.694</td>
</tr>
<tr>
<td>Item 12</td>
<td>0.867</td>
</tr>
<tr>
<td>Factor 3: Efficacy in classroom management</td>
<td></td>
</tr>
<tr>
<td>Item 1</td>
<td>0.830</td>
</tr>
<tr>
<td>Item 6</td>
<td>0.877</td>
</tr>
<tr>
<td>Item 7</td>
<td>0.849</td>
</tr>
<tr>
<td>Item 8</td>
<td>0.901</td>
</tr>
</tbody>
</table>

### Table 3. Coefficients of the regression of student-centered beliefs on teacher self-efficacy factors

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Standardized coefficient</th>
<th>Standard Error</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficacy in student engagement</td>
<td>0.273</td>
<td>0.089</td>
<td>0.000*</td>
</tr>
<tr>
<td>Efficacy in instructional strategies</td>
<td>0.420</td>
<td>0.086</td>
<td>0.002*</td>
</tr>
<tr>
<td>Efficacy in classroom management</td>
<td>-0.060</td>
<td>0.085</td>
<td>0.484</td>
</tr>
</tbody>
</table>

* p < 0.05
Table 4. Final Student-Centered Teaching Behaviors Survey (TBS)

Directions: Consider how you typically teach and please indicate how frequently you behave according to each statement, using a scale from [1] = Never to [5] = Always.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Occasionally</th>
<th>Always</th>
</tr>
</thead>
</table>
Figure 1. Item characteristic functions of SC-TBS
Figure 2. Test information function of the SC-TBS

Figure 3. Structural equation model of relationship between student-centered teacher beliefs and teacher self-efficacy

Note. * indicates significant coefficients at p < .05.