DOCUMENT RESUME

ED 434 122 TM 030 083

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TITLE The Constructivist Teaching Inventory: A New Instrument for Assessing Constructivist Teaching Practices in the Elementary Grades.
PUB DATE 1999-04-00
NOTE 64p.; Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Quebec, Canada, April 19-23, 1999).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150) -- Tests/Questionnaires (160)
EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Constructivism (Learning); Elementary Education; *Elementary School Teachers; Professional Development; Questionnaires; Teaching Methods; Test Items; Test Reliability; Test Validity; Urban Schools
IDENTIFIERS *Self Report Measures

ABSTRACT

An instrument to evaluate the effectiveness of constructivist teaching methods, the Constructivist Teaching Inventory (CTI), was developed and assessed, the assessment focusing on the validity and reliability of the instrument. A pool of items measuring the presence of identified elements of constructivist teaching was developed; items were grouped into four subscales representing teaching strategies, verbal interaction in the community of learners, learning activities, and curriculum. The classes of 10 primary school teachers in a large urban school district were studied. Results suggest that the CTI was able to identify the extent of constructivist teaching effectively and that the variability associated with teacher, content, and grade level, supports the validity of the instrument and the construct it measures. The reliability of a self-report form of the instrument was also investigated with the same teachers, and data suggest that the self-report form may be appropriate for use in professional development activities. Appendixes contain the observer form for the CTI and the self-report measure. (Contains 3 tables and 20 references.) (SLD)

The Constructivist Teaching Inventory: A New Instrument for Assessing Constructivist Teaching Practices in the Elementary Grades

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Purpose

The value of any instructional methodology must ultimately be determined by its effects on desired student outcomes. While constructivist approaches to teaching have been widely acclaimed, a thorough and comprehensive evaluation of their effectiveness has been hampered by the absence of a valid and reliable instrument for assessing constructivist teaching practices across multiple grade and content levels. The Constructivist Teaching Inventory (CTI) fills this void.

The purpose of this paper is to present the research involved in the development and testing of the CTI, with focus on the validity and the reliability of the instrument.

Theoretical Framework

The Constructivist Teaching Inventory (CTI) is based on key elements of constructivist learning theory briefly summarized below.

- Learners self-construct new and increasingly sophisticated cognitive structures using the processes of assimilation and accommodation to create equilibrium.
- Self-construction is based on experiences gained through the senses.
- Self-construction is based on reflections on experiences, prior structures, and prior reflections.
- Disequilibrium is the catalyst for the constructing process.
- The processes of acquiring experiences, reflecting, and constructing cognitive structures occur within developmental and social contexts.
- The result of the constructing processes is the development of increasingly complex, elaborate, and inter-related knowledge structures.

Several authors (Brooks & Brooks, 1993; Fosnot, 1996; Forman, 1996; and Schifter, 1996) have written about the application of constructivist learning theory to the classroom setting. While terminology and emphases may vary among the authors, there is a thread of commonality throughout their work. The most important aspect of teaching based on constructivist theory is to facilitate students' meaning-making from each individual's point of view within his/her social and developmental context. To accomplish this goal, constructivist teaching practices:

- provide learning experiences such as accessing students' prior knowledge, utilizing reflective and relational thinking, and developing big ideas.
- create and capitalize on opportunities for student disequilibrium, misconceptions, and errors so that students are forced to query meaning.
- provide opportunities for students to verbally interact with others in the pursuit of understanding and growth, enabling students to develop and support their own points of view rather than merely adopt the point of view of others, such as that of the teacher and the text/materials.
- use assessment to guide student learning opportunities, including providing students with the opportunities for self- and group assessment.

In order to measure the extent of constructivist teaching practices, the components of the theory need to be operationalized within the educational setting. Although there is general consensus on what theoretically constitutes constructivism and its application to pedagogy, no widely accepted operationalization of the key elements of either constructivist teaching or learning has emerged. Recently, however, several key components involved in the construction of knowledge have been identified empirically. Researchers have examined the role of prior knowledge (Nuthall &

Alton-Lee, 1992 and 1993; Gooding & Stacey, 1993); the role of misconceptions and errors (Gooding & Stacey, 1993); the use of reflection as a tool to build more complex ideas (Mason & Santi, 1994); and the use of verbal interaction to facilitate student construction of ideas (Gooding & Stacey, 1993; Mason & Santi, 1994; and Webb, 1992).

The fact that these elements of constructivist meaning-making can be measured is significant for the current research. If similar progress can be made in identifying the key elements of constructivist teaching, it may be possible to relate the two and increase our understanding of what works best in the classroom. The purpose of the present research, then, was to identify or develop an instrument for measuring constructivist teaching practices that could be effectively employed in a wide variety of classroom settings.

The search began with a review of the literature that revealed four candidates: Classroom Observation Rubric (Burry-Stock, 1995); Classroom Practices Questionnaire (Thurman, 1996); Constructivist Learning Environment Scale (Taylor, Fraser, & White, 1994), and a scale by Yager (1991) to determine the degree to which a science teacher is utilizing the Constructivist Learning Model (CLM). Each instrument was rejected for use in this project. Burry-Stock's (1995) and Taylor, Fraser, and White's (1994) instruments were developed for use in upper elementary and junior to senior high school science classrooms and, thus, were not appropriate for a general elementary application. Additionally, Burry-Stock's instrument is one part

of a five part evaluation system, making it cumbersome for the current application. Thurman's instrument, while developed for use in primary classrooms, predominantly measures classroom environment, not constructivist teaching practices. Also, reliability and validity data were not available. Yager's (1991) instrument was not developed for research purposes, but as a guide for teachers to examine their own practices. Although none of the instruments reviewed was appropriate for the current research, each provided content and concepts that could be modified to develop an easily administered, valid, and reliable instrument appropriate for measuring constructivist teaching in elementary classrooms.

Methods

Instrument Development

Two premises guided the development of the instrument. One, the theory of constructivism makes it clear that the construction of meaning involves all of the elements of constructivism working together, not independently. Therefore, when measuring the presence and strength of constructivist teaching practices, all of the identified elements should be included in the instrument. Two, measurement research indicates that behaviors need to be observed within the context of their occurrence, i.e., where and when they take place. In this case, teaching practices should be examined as they occur in all the events of the classroom.

Given these premises, a pool of items measuring the presence of the identified elements of constructivist teaching was

developed from the examples of constructivist teaching reported in the literature and from the authors' own teaching experiences. Also, a list of classroom activities/characteristics was generated, with ideas again coming from the literature review and the authors' experiences. Analysis of the list of classroom activities/characteristics revealed a pattern: there were four general categories or contexts of classroom events. These categories became the four subscales of the instrument. A set of items incorporating the identified constructivist teaching practices was developed for each subscale, ensuring that all practices would be measured within all contexts. The four subscales, along with some sample descriptors of constructivist behaviors on the subscales, are described briefly below. (The instrument in its entirety is in Appendix A).

The items on the Teaching Strategies Scale (TSS) focus on the teacher as instructional strategist and decision maker. Concepts such as teacher's perception of her primary role and its influence on her instructional decisions; teacher's modification of the lesson to meet individual student interests and/or needs; teacher's provision for scaffolding; and teacher's awareness of students' conceptual understandings were examined. Sample items are: 1) Teacher's primary role is to facilitate critical student inquiry, not to provide knowledge, skills, and answers. 2) Opportunities for students to "not know"[1], to question, and/or to

[1] The phrase "not know" was used by Rueda, Goldenberg, and Gallimore (1992) in their work on instructional conversations.

seek information are the rule rather than the exception.
3) Teacher intentionally provides students with opportunities for cognitive disequilibrium appropriate for their conceptual understanding.

The Community of Learners Scale (CLS) focuses on the verbal interaction within the classroom community, the nature and quality of discourse. Categories include: the relationships and interactions which occur between and among teacher and learners; the types of questioning and conversation which occur; and the types and degree of support for learning found in the classroom. Examples of items in this subscale include: 1) The lesson is characterized by connected discourse (whole and small group). 2) The control of classroom discourse is shared between teacher and students. Participation is widespread. 3) Opportunities for students to think aloud and receive feedback from peers are more the rule than the exception.

The Learning Activities Scale (LAS) focuses on what the teacher has students do to be intellectually active. A learning activity can range from listening to a lecture to building a "weather cup" (Scholastic, 1995) as part of an open-ended thematic, cross-curricular unit. The items in the LAS measure constructivist teaching behaviors as manifested in activity structure, purpose, sequence, and materials. Examples include: 1) Learning activities usually provide opportunities for students to reflect on their own and others' ideas. 2) Activities nearly always require students to relate ideas, concepts, and knowledge. 3) Activities are constructed around big ideas. Details are used

to support the big ideas.

The Curriculum-Assessment Scale (CAS) focuses on areas of curriculum and assessment. For this study, curriculum consists of the content and processes taught, as well as their organization. Assessment involves the means of measuring student performance, the reasons for doing so, and the use of the results. Example items in this subscale include: 1) Teacher frequently organizes knowledge and skills to be learned in such a way that relationships among them are self-evident. 2) Students frequently assess themselves. 3) Diagnosis of reasons for errors is the most important aspect of student assessment.

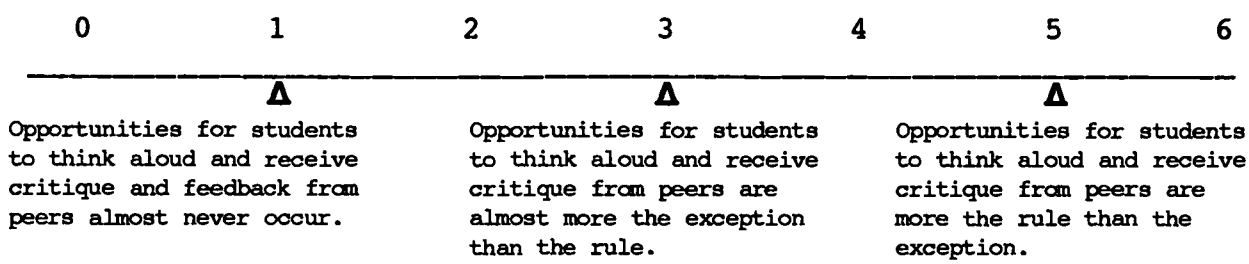
Since the instrument was designed to assess the presence and strength of constructivist teaching practices, items were constructed in a Likert format. Scores at the high end of the continuum indicate frequent or pervasive use of the identified constructivist practice, while low scores indicate infrequent use or absence of the behavior. Verbal anchors define points 1, 3, and 5 along each continuum.

In the literature, constructivist teaching practices are sometimes contrasted with what are commonly referred to as traditional approaches. Readers of this paper may associate the verbal anchors at the low end of some CTI items with such traditional approaches. However, the CTI was designed solely to assess constructivist teaching practices and not to contrast these practices with any other approaches. In other words, it would be a misuse of the instrument to characterize someone who scores low on the CTI as a traditional teacher.

Scale and Item Format

The Constructivist Teaching Inventory described above is organized, then, into four subscales, each consisting of 11 items. There are two forms of the instrument, an observer form and a self-report form. When the observer form is used, the instrument is completed based on a classroom observation lasting approximately 45 minutes. The trained observer rates all 44 items on a 7-point scale (0 - 6). Descriptors are provided for points 1, 3, and 5 on each continuum. Items on the self-report form (see Appendix B) are identical to those on the observer form with the exception of the use of reverse scoring.

The following illustrates the type of items on the instrument.



Scoring

Since each item on the scale can be scored from 0 to 6, the range of scores for each subscale is 0 to 66, and the range for the total scale score is between 0 and 264. In each case, the higher the score, the more constructivist teaching behaviors are observed. Constructivist teaching behaviors can be reported by subscale and by total scale. Data generated by individual items

are ordinal, but, for research purposes, a case is made for using some interval-based analytic methods on scores generated by summing across items (DeVellis, 1991, p. 112).

Instrument Validity

Since CTI items were deduced from a thorough review of the constructivist literature and adaptations of previously developed instruments, e.g., Burry-Stock's Science Classroom Observation Rubric (ESTEEM) (1995) and the Guide to Rating Instructional Conversations (Rueda, R., Goldenberg, C. & Gallimore, R.,1992), content validity was expected to be high. However, to further address the issue of content validity, five experts in the field were asked to examine a pool of 45 items and rate each on its representativeness and relevance with respect to constructivist theory and on its clarity and conciseness. Written responses were obtained from three of the five reviewers; verbal response was received from one reviewer. Of the 45 items submitted for review, thirty-seven were rated as 3 or 4 ("strongly relevant to this category") and were included in the final instrument unchanged. Seven items were rewritten based on suggestions from the reviewers; one item was included even though two of the four reviewers rated it less than 3; and one item was dropped altogether.

Implementation

Sample The study was conducted in a large urban midwestern school system with a purposeful sample of five first and five

third grade teachers. Primary classrooms were chosen because they had not been the focus of the majority of prior research on constructivist teaching practices and they were hypothesized, given the nature of primary instruction, to provide the most opportunity for observing constructivist teaching behaviors. Additionally, Burry-Stock's (1995) findings had indicated more constructivist teaching practices at the fourth rather than the eighth grade. It was hypothesized that this trend would continue to the lower grades. First and third grade classrooms, rather than contiguous grade levels, were selected because the students, by nature of their development, are likely to differ in how they process experiences and interact with others. First graders would likely be in transition between late preoperational and concrete operational thinking, while third graders would likely be concrete thinkers. Data were gathered in the content areas of math and reading because these areas had not been as extensively researched as science and because reading and math are the most predominant content areas taught in the primary grades, ensuring observation opportunities.

An initial pool of teachers was developed from the total first and third grade teaching staff in the district. Screening criteria included: being female, being employed by the district for ten or more years, and possessing at least a Master's degree. Buildings were rank ordered based on the number of teachers who met the screening criteria. Teachers were asked to participate first from the building with the most qualifying teachers, then the second ranked building, and so on, until ten teachers were

obtained. Participation was voluntary and teachers could withdraw at any time.

The selection process described above produced a sample of participating teachers representative of experienced primary grade teachers in a large urban school district. The selected teachers came from four diverse buildings. Building enrollments ranged from 340 to 790 students, and the percentage of students on free or reduced lunch ranged from 9 percent to 98 percent. The size of participating teachers' math and reading classes ranged between 12 and 25 students. Classroom student grouping patterns included multi-aged, nongraded, and self-contained.

Data Collection

The two observers who collected the data trained extensively together before data collection began. To establish interobserver reliability, they completed independent observations of the same teacher on three separate occasions, at the beginning, in the middle, and at the end of the data collection phase. Percentages of agreement (where agreement was defined as ratings that were identical or within one point on the 7-point scale) were .95, .95 and .93, respectively, for the three joint observations.

All ten teachers were observed eight times, four each in math and reading. All observations took place during the first 45 minutes of the regularly scheduled class. Observations were scheduled on consecutive days as often as possible to achieve continuity between lessons and to reduce potential effects of events outside the classroom.

Teachers also completed parallel self-report forms of the instrument for both reading and math. These forms were given to teachers at the time of their first observation and collected at the time of their last observation.

Results and Conclusions

The internal consistency of the instrument developed in the study was estimated by computing Cronbach alpha coefficients across content and grade level taught for the full scale and the four subscales of the instrument. The alpha coefficients for the full scale and each individual subscale were .99. These data indicate that the subscales and total scale of the CTI are highly reliable for measuring the use of constructivist teaching practices by urban primary teachers.

Alpha coefficients were also calculated on the full scale and the subscales separately by grade level, by content area, and for content area by grade level. These coefficients, too, were high, .94 or above. Thus, the CTI is equally reliable for measuring use of constructivist teaching practices by either first or third grade teachers in either math or reading.

The appropriateness of the instrument for use across content areas and grade levels was further examined in a series of one-way ANOVAs. As the assumptions underlying the use of ANOVAs as an inferential statistical procedure were not met, i.e., normal distribution and random sampling, the emphasis in this analysis was on mean squares as variance estimates and not on F-ratios. The relevant data are presented in Table 1.

Teacher differences were examined first. Much greater variation was found between teachers than within teachers. In other words, teachers who were constructivist in one aspect of their practice were likely to be so in other aspects as well, supporting the idea that a coherent pattern of constructivist teaching, a structured whole, exists.

A similar analysis for content area taught found greater variation within content area than between content areas. Teachers who used constructivist practices in math used them in reading as well, again suggesting a consistent, coherent pattern of behavior.

For grade level, an analysis of the between and within mean squares revealed more variation between grade levels than within. More constructivist teaching behaviors were observed in first grade teachers than in third grade teachers. This finding is consistent with the research of Burry-Stock (1995), who found that fourth grade teachers exhibited more constructivist teaching behaviors than eighth grade teachers. Hence, while the instrument is appropriate for teachers at multiple grade levels, one should expect to find more constructivist teaching behaviors among teachers of lower grades.

In summary, the results suggest (1) that the CTI was able to effectively identify the extent of constructivist teaching practices used by these urban primary teachers, and (2) that the variability associated with teacher, content, and grade level supports the validity of the instrument and the construct it measures.

Self-Report Findings

As hiring and training observers to collect data can be costly and time-consuming, a self-report form for measuring the extent of constructivist teaching practices would be useful. A self-report form could also be used by teachers to improve their own practices. For both of these reasons, the reliability of a self-report form of the instrument was also investigated.

Alpha coefficients for the self-report form were all very high (Total .96; CLS .91; TSS .80; LAS .89, and CAS .86), thus this form of the CTI, too, is highly reliable. Additionally, teachers were moderately to highly consistent in their self-reported use of constructivist teaching practices across subscales (see Table 2) and content areas. These data suggest that the CTI self-report form may be appropriate for use in professional development activities aimed at transforming classroom practice. Caution is warranted, however, because correlations between observer and teacher scores were inconsistent (see Table 3), suggesting that teachers did not view their teaching practices in the same way that observers did.

A further analysis of the inconsistencies between the scores of teachers and observers revealed that seven of the ten teachers viewed their teaching practices in the same way as the observers, while three teachers consistently rated themselves much higher than the observer. This may not seriously impair the usefulness of the self-report form for individual professional development purposes. However, it is suggested that the self-report form not be used for research purposes without corroborating data from

independent observers.

In summary, results indicate that the CTI is a reliable instrument for measuring primary urban teachers' constructivist teaching practices in both math and reading classes. The subscales provide information regarding the extent of constructivist teaching practices in four classroom categories: Community of Learners; Teaching Strategies; Learning Activities; and Curriculum and Assessment. Additionally, the CTI can be used in a self-report format, but it should be corroborated by data from independent observers when used for research purposes.

Educational Importance of the Study

The fact that no instrument was available to measure use of constructivist teaching practices in elementary classrooms precluded much needed research on the ways in which those practices impact student learning. The development of this reliable and valid instrument makes such research possible. Thus, the most important implication of the development of the Constructivist Teaching Inventory is its usefulness in researching the effectiveness of constructivist teaching practices on student learning.

A secondary application of the CTI is in teacher development. There have been and continue to be numerous projects in which practicing and pre-service teachers endeavor to shift toward a more constructivist approach to teaching, e.g., those by Julyan and Duckworth (1996), Fosnot (1989), and Schifter (1993; 1996). Teacher educators in these projects practice what they teach.

They use constructivist teaching practices to assist preservice and in-service teachers to construct their own knowledge--by creating opportunities for them to reflect, relate, use prior knowledge, control their own learning, self-assess, and learn through disequilibria, misconceptions, and error detection.

Much has been written about the challenges and successes of such programs, but to date little empirical evidence exists to document changes in the use of constructivist teaching practices over time as students participate in such programs or as they endeavor to apply what they have learned in their own classrooms. The self-report form of the CTI may provide educators at all levels of experience with a useful tool for assessing the extent of their constructivist teaching practices, providing relevant and reliable input as they continue to construct their own knowledge.

Suggestions for Refining the CTI

The present research was exploratory. Based on the results of this project, several recommendations can be made to refine the instrument and its use.

- Replicating the study with a larger and more diverse sample would permit the use of factor analyis to verify the structure of the subscales and increase generalizability.
- Careful item analysis may identify weak or redundant items. The elimination of such items would maintain the high internal reliability yet decrease the amount of time required to complete the form.
- The study should be replicated with fewer and shorter

observations to determine if the process can be made less costly and time consuming without sacrificing reliability. Both observers in the present study thought that thirty minute observations on two to three occasions would provide comparable data.

- The fact that self-report scores were highly correlated suggests that teachers may not need to complete a separate self-report form for multiple content areas.

Table 1

Mean Squares from One-Way ANOVAs

	Scale				
Variable	CLS	TSS	LAS	CAS	TOTAL
Source					
Teacher					
Between	2931.88	3658.81	3452.16	3251.05	57934.80
Within	90.52	56.67	58.65	54.78	870.29
Grade					
Between	8870.85	10612.10	8892.55	11123.92	183169.80
Within	314.41	340.62	344.28	287.64	5117.48
Content					
Between	18.71	55.91	189.18	17.55	9.80
Within	432.44	477.71	458.79	433.77	7465.69
Observation					
Between	185.86	148.57	155.22	198.35	2022.93
Within	436.91	485.25	467.45	437.69	7582.43

CLS = Community of Learners Subscale
TSS = Teaching Strategies Subscale
LAS = Learning Activities Subscale
CAS = Curriculum and Assessment Subscale

Table 2

Correlaton Matrix of Self-Report Subscales and Total Scale Scores Across Content Area and Grade Level

Scale	CLS	TSS	LAS	CAS	TOTAL
CLS	--	.73	.75	.63	.89
TSS	--	--	.83	.69	.91
LAS	--	--	--	.68	.92
CAS	--	--	--	--	.84

CLS = Community of Learners Subscale
TSS = Teaching Strategies Subscale
LAS = Learning Activities Subscale
CAS = Curriculum and Assessment Subscale

Table 3

Correlation Matrix of Self-Report and Observer Subscales and Total Scale Scores by Grade Level

	Self-Report				
	CLS	TSS	LAS	CAS	TOTAL
Observer			First		
CLS	.88	.57	.78	.87	.84
TSS	.53	.46	.75	.68	.65
LAS	.53	.45	.73	.69	.64
CAS	.59	.65	.89	.73	.76
TOTAL	.66	.55	.81	.77	.75
			Third		
CLS	.67	.51	.39	-.15	.43
TSS	.69	.48	.37	-.15	.43
LAS	.68	.45	.35	-.18	.40
CAS	.70	.47	.38	-.16	.43
TOTAL	.70	.49	.39	-.14	.44

CLS = Community of Learners Subscale
TSS = Teaching Strategies Subscale
LAS = Learning Activities Subscale
CAS = Curriculum and Assessment Subscale

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Appendix A

Observer Form

Constructivist Teaching Inventory

CONSTRUCTIVIST TEACHING INVENTORY

OBSERVATION FORM

DIRECTIONS:

The Constructivist Teaching Inventory Observation Form is used to detect the presence of constructivist teaching behaviors, if any, and to measure the relative strength of the constructivist behaviors observed.

The observer is to observe a teacher's lessons in the same subject across several days. Several different topics may be covered during this time but it is important to have consecutive or nearly consecutive days. During the observation, the researcher should take notes which will be used later to support the rating for the lesson. The observer must complete one observation form for each observation. If four reading lessons are observed, then four sets of notes and four observation forms must be completed.

The observer should rate only those behaviors which are observable in the classroom. However, there are times when relatively accurate inferences can be draw from concrete behaviors. The observer should make such observations, BUT must have support for those inferences in the notes taken during the observation.

The observer should circle the number which corresponds to the observed behavior. Descriptors are provided for points 1, 3, and 5. However, if the classroom behavior would best be described as somewhere between or beyond 1, 3, or 5, then one of the other points should be used to rate the behavior. Ratings should use the numbers provided and should not occur between numbers, for example, between points 3 and 4. Either point 3 or point 4 should be selected.

Community of Learners (O)

	0	1	2	3	4	5	6
1.	The teacher initiates nearly all questions and students answer nearly all questions.			Both teacher and students initiate and answer questions but the teacher controls both.			Both teachers and students initiate and answer questions.
2.	Climate of the classroom is primarily non-challenging (does not push understanding).			Climate of the classroom is somewhat challenging.			Climate of the classroom is primarily challenging (consistently pushing understanding).
3.	In the classroom, students learn predominantly by listening to the teacher.			In the classroom, students learn predominantly by listening to the teacher but occasionally from other students.			In the classroom, students learn predominantly through interaction with others, including teacher.
4.	Opportunities for students to think aloud and receive critique from peers almost never occur.			Opportunities for students to think aloud and receive critique from peers are more the exception than the rule.			Opportunities for students to think aloud and receive feedback from peers are more the rule than the exception.
5.	Interaction to support the challenging and clarifying of ideas seldom occurs.			Interaction to support the challenging and clarifying of ideas occasionally occurs.			Interaction to support the challenging and clarifying of ideas happens frequently.

Community of Learners (continued) (O)

	0	1	2	3	4	5	6
6.	Discourse in which students explain and elaborate their assumptions, points of view, ideas, and reasonings seldom occurs.			Discourse in which students explain and elaborate their assumptions, points of view, and reasonings, occurs occasionally.		Discourse frequently provides opportunities for students to explain and elaborate their assumptions, points of view, and reasonings.	
7.	The lesson is almost never characterized by connected discourse (whole and small group).			The lesson occasionally uses connected discourse, usually in a large group format only.		The lesson is characterized by connected discourse (whole and small group).	
8.	Classroom discourse is teacher controlled and participation is teacher-dominated. (Rueda)			Classroom discourse is controlled by the teacher but both students and teacher participate.		The control of classroom discourse is shared between teacher and students. Participation is widespread.	
9.	Opportunities for students to work collaboratively rarely occur.			Opportunities for students to work collaboratively are occasional.		Opportunities for students to work collaboratively are frequent.	
10.	Students almost never work together.			Students occasionally work together.		Students frequently work together.	
11.	Students are not intellectually active.			Students are occasionally intellectually active.		Students are intellectually active.	

Teaching Strategies (O)

	0	1	2	3	4	5	6
1.	Teacher relies mainly on literal level recall and known-answer questions, and rarely or never uses thematic, discussion-generating questions. (Rueda)			Teacher occasionally uses literal level recall and known-answer questions as well as thematic, discussion-generating questions. (Rueda)		Teacher rarely uses literal level recall and known-answer questions, but frequently uses thematic, discussion-generating questions. (Rueda)	
2.	Teacher does not intentionally provide students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding.			Teacher provides students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding but such occurrences are seldom intentional.		Teacher intentionally provides students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding.	
3.	Teacher does not intentionally provide students with opportunities to reflect on their own and others' ideas.			Teacher occasionally provides students with opportunities to reflect on their own and others' ideas, but rarely intentionally.		Teacher intentionally provides students with opportunities to reflect on their own and others' ideas.	
4.	Teacher seldom provides students opportunities for scaffolding from teacher or other students.			Teacher occasionally provides students opportunities for scaffolding from teacher or other students.		Teacher frequently provides students opportunities for scaffolding from teacher or other students.	
5.	Teacher's role is to provide knowledge, skills, and answers. Efforts to facilitate students' critical inquiry are absent.			Teacher's primary role is to provide students with knowledge, skills, and answers. A less critical role is to facilitate student critical inquiry.		Teacher's primary role is to facilitate critical student inquiry, not to provide knowledge, skills, and answers.	

Teaching Strategies (continued) (O)

	0	1	2	3	4	5	6
6.	Teacher has little or no awareness of students' understandings.			Teacher occasionally has a general awareness of students' understandings.		Teacher routinely has consistent awareness of students' understandings.	
7.	Teacher does not accommodate students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)			Teacher occasionally accommodates students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)		Teacher accommodates students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)	
8.	Teacher makes few, if any, attempts to activate and/or make use of students' background knowledge. (Rueda)			Teacher occasionally attempts to activate and/or make use of students' background knowledge. (Rueda)		Teacher consistently and systematically attempts to activate and/or make use of students' background knowledge. (Rueda)	
9.	Teacher questioning is seldom to help students think through an issue for themselves.			Teacher questioning is occasionally to help students think through an issue for themselves.		Teacher questioning is mostly to help students to think through an issue for themselves.	
10.	Use of questions and classroom discourse is not specifically to reveal students' developing knowledge structures.			Use of questions and classroom discourse may occasionally reveal students' developing knowledge structures, but that is not its intention.		Use of questions and classroom discourse is intended to reveal students' developing knowledge structures.	
11.	Opportunities for students to not know, to question, and/or to seek information almost never occur.			Opportunities for students to not know, to question, and/or to seek information occur occasionally.		Opportunities for students to not know, to question, and/or to seek information are the rule rather than the exception.	

Learning Activities (O)

	0	1	2	3	4	5	6
1.	Instructional activities which intentionally create opportunities for students to explore their own disequilibria are rare.			Instructional activities which intentionally create opportunities for students to explore their own disequilibria are occasional.			Instructional activities which intentionally create opportunities for students to explore their own disequilibria are frequent.
2.	Opportunities for both confirming and disconfirming solutions are rarely provided.			Opportunities for both confirming and disconfirming solutions are occasionally provided.			Opportunities for both confirming and disconfirming solutions are frequently provided.
3.	Most activities can be completed through routine application of previously learned knowledge. Activities seldom require the use of knowledge and skills in new ways.			Most activities can be completed through routine application of previously learned knowledge. However, some activities require the use of knowledge and skills in new ways.			Most activities cannot be solved through the routine application of previously learned knowledge. Most activities require the use of knowledge and skills in new ways.
4.	Activities are constructed around isolated content. Disconnected detail is stressed rather than big ideas.			Activities are constructed around isolated content. While detail is stressed, big ideas are occasionally developed.			Activities are constructed around big ideas. Details are used to support the big ideas.
5.	Activities are seldom adaptable to accommodate individual students' interests, needs, and abilities.			Activities are moderately adaptable to accommodate individual students' interests, needs, and abilities.			Activities are readily adaptable to accommodate individual students' interests, needs, and abilities.

Learning Activities (continued) (O)

	0	1	2	3	4	5	6
6.	Activities do not require students to relate ideas, concepts, and knowledge.			Activities occasionally require students to relate ideas, concepts, and knowledge.		Activities nearly always require students to relate ideas, concepts and knowledge.	
7.	Activities do not require students to explain and elaborate the results of their learning to other students.			Activities occasionally require students to explain and elaborate the results of their learning to other students.		Activities almost always require students to explain and elaborate the results of their learning to other students.	
8.	Raw data, primary sources, found objects, manipulatives, and/or resource people are almost never used as materials for learning.			Raw data, primary sources, found objects, manipulatives, and/or resource people are occasionally used as materials for learning.		Raw data, primary sources, found objects, manipulatives, and/or resource people are frequently used as materials for learning.	
9.	Activities seldom require students to be self-directed.			Activities occasionally require students to be self-directed.		Activities require students to be self-directed.	
10.	When students encounter contradictions and errors, they do not seek resolution.			When students encounter contradictions and errors, they sometimes seek resolution.		When students encounter contradictions and errors, they seek resolution.	
11.	Learning activities seldom provide opportunities for students to reflect on their own and others' ideas.			Learning activities occasionally provide opportunities for students to reflect on their own and others' ideas.		Learning activities usually provide opportunities for students to reflect on their own and others' ideas.	

Curriculum - Assessment (O)

	0	1	2	3	4	5	6
1.	Selection of content for teaching is almost never based on students' interests, prior knowledge, and/or particular learning needs.			Selection of content for teaching is only occasionally based on students' interests, prior knowledge, and/or particular learning needs.		Selection of content for teaching is frequently based on students' interests, prior knowledge,and/or particular learning needs.	
2.	Teacher seldom organizes knowledge and skills to be learned in such a way that relationships among them are obvious.			Teacher occasionally organizes knowledge and skills to be learned in such a way that relationships among them are obvious.		Teacher frequently organizes knowledge and skills to be learned in such a way that relationships among them are obvious.	
3.	Information and skills are taught to students in an externally determined sequence which is nearly always followed.			Information and skills are taught to students in an externally determined sequence. Occasionally the sequence is altered based on an immediate need for the information or skill.		Information and skills are taught to students because they are needed to complete a relevant task.	
4.	Content is taught without process and/or process is taught without content.			Content and process skills are occasionally integrated.		Content and process skills are most generally integrated. (Esteem, IIJ)	
5.	Students seldom, if ever, assess themselves.			Students occasionally assess themselves.		Students frequently assess themselves.	
6.	Teacher depends solely on the district textbook to present the lesson. Teacher makes no modifications with students.			Teacher depends somewhat on the district textbook to present the lesson. Teacher and students make some modifications. (Esteem IE)		Teacher does not depend on the district textbook to present the lesson. Teacher and students adapt or develop content and materials for their needs.	

Curriculum - Assessment (continued) (O)

	0	1	2	3	4	5	6
7.	All students are expected to perform at the same standard using the same demonstration of performance at the same time.			All students are expected to perform at the same standard using the same demonstration of performance but the timing may vary by student.		All students are expected to perform at the same standards but the demonstrations of performance and the timing may vary by student.	
8.	Correctness of performance is the most important aspect of student assessment. Diagnosis of reasons for errors is not a part of assessment.			While diagnosis of reasons for errors is used, emphasis is primarily on correctness of performance.		Diagnosis of reasons for errors is the most important aspect of student assessment.	
9.	Results of assessment are almost never used to guide instructional decision making.			Results of assessment are only occasionally used to guide instructional decision making.		Results of assessment are usually used as a guide for teacher and students in making instructional decisions.	
10.	Errors and misperceptions are viewed as to be avoided. Teacher and students do not seek to understand them but rather seek the correct answer instead.			Errors and misperceptions are viewed as unavoidable but are minimized. Teacher and students only rarely seek to understand them and/or appreciate their informative value.		Errors and misperceptions are viewed as normal, not minimized or avoided. Teacher and student seek to understand them as they become evident and to learn from them.	
11.	Students seldom, if ever, provide relevant feedback to other students.			Students occasionally provide relevant feedback to other students.		Students frequently provide relevant feedback to other students.	

Appendix B

Self-Report Form

Constructivist Teaching Inventory

CONSTRUCTIVIST TEACHING INVENTORY

Teacher Self-Rating Form

DIRECTIONS:

The Constructivist Teaching Inventory Self-Rating Form is intended to detect your perception of the presence of constructivist teaching behaviors in your classroom and to measure the relative strength of those behaviors. The list is not intended to be comprehensive and it is recognized that many good teaching methods you employ are not included on this form. There are other forms already in existence which measure many other behaviors.

Would you please respond to each item as it applies to your classroom, in general, and specifically to the class sessions which were observed for this project. You should complete two forms, one each for reading and math.

Please circle the numbers which correspond to the behaviors as you perceive them to exist in your classroom. Descriptors are provided for points 1, 3, and 5. However, if the classroom behavior would best be described as somewhere between or beyond 1, 3, or 5, then one of the other points should be used to rate the behavior. Ratings should use the numbers provided and should not occur between numbers, for example, between points 3 and 4. Either point 3 or point 4 should be selected. However, any whole number on the scale may be circled it if best describes your classroom behavior.

Thank you for taking the time to complete this form. It is greatly appreciated.

YOU MAY COMPLETE THESE FORMS AT ANY TIME BETWEEN THE FIRST AND LAST OBSERVATIONS.

PLEASE RETURN BOTH FORMS TO THE OBSERVER AFTER YOUR LAST OBSERVATION.

DO NOT PUT YOUR NAME OR YOUR SCHOOL'S NAME ON THE SHEETS. THANK YOU.

Community of Learners (SR)

	0	1	2	3	4	5	6
1.	Interaction to support the challenging and clarifying of ideas happens frequently.			Interaction to support the challenging and clarifying of ideas occasionally occurs.		Interaction to support the challenging and clarifying of ideas seldom occurs.	
2.	Climate of the classroom is primarily challenging (consistently pushing understanding).			Climate of the classroom is somewhat challenging. (Rueda)		Climate of the classroom is primarily non-challenging (does not push understanding).	
3.	In the classroom, students learn predominantly through interaction with others, including teacher.			In the classroom, students learn predominantly by listening to the teacher but occasionally from other students.		In the classroom, students learn predominantly by listening to the teacher.	
4.	Opportunities for students to work collaboratively rarely occur.			Opportunities for students to work collaboratively are occasional.		Opportunities for students to work collaboratively are frequent.	
5.	Discourse in which students explain and elaborate their assumptions, points of view, ideas, and reasonings seldom occurs.			Discourse in which students explain and elaborate their assumptions, points of view, and reasonings, occurs occasionally.		Discourse frequently provides opportunities for students to explain and elaborate their assumptions, points of view, and reasonings.	

Community of Learners (continued) (SR)

	0	1	2	3	4	5	6
6.	The lesson is almost never characterized by connected discourse (whole and small group).			The lesson occasionally uses connected discourse, usually in a large group format only.		The lesson is characterized by connected discourse (whole and small group).	
7.	Classroom discourse is teacher controlled and participation is teacher-dominated. (Rueda)			Classroom discourse is controlled by the teacher but both students and teacher participate.		The control of classroom discourse is shared between teacher and students. Participation is widespread.	
8.	Both teachers and students initiate and answer questions.			Both teacher and students initiate and answer questions but the teacher controls both.		The teacher initiates nearly all questions and students answer nearly all questions.	
9.	Students almost never work together.			Students occasionally work together.		Students frequently work together.	
10.	Students are not intellectually active.			Students are occasionally intellectually active.		Students are intellectually active.	
11.	Opportunities for students to think aloud and receive feedback from peers are more the rule than the exception.			Opportunities for students to think aloud and receive feedback from peers are more the exception than the rule.		Opportunities for students to think aloud and receive feedback from peers almost never occur.	

Teaching Strategies (SR)

	0	1	2	3	4	5	6
1.	Teacher's primary role is to facilitate critical student inquiry, not to provide knowledge, skills, and answers.			Teacher's primary role is to provide students with knowledge, skills, and answers. A less critical role is to facilitate student critical inquiry.		Teacher's role is to provide knowledge, skills, and answers. Efforts to facilitate students' critical inquiry are absent.	
2.	Teacher intentionally provides students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding.			Teacher provides students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding but such occurrences are seldom intentional.		Teacher does not intentionally provide students with opportunities for cognitive disequilibrium appropriate for their cognitive understanding.	
3.	Teacher intentionally provides students with opportunities to reflect on their own and others' ideas.			Teacher occasionally provides students with opportunities to reflect on their own and others' ideas, but rarely intentionally.		Teacher does not intentionally provide students with opportunities to reflect on their own and others' ideas.	
4.	Teacher questioning is seldom to help students think through an issue for themselves.			Teacher questioning is occasionally to help students think through an issue for themselves.		Teacher questioning is mostly to help students to think through an issue for themselves.	
5.	Teacher has little or no awareness of students' understandings.			Teacher occasionally has a general awareness of students' understandings.		Teacher routinely has consistent awareness of students' understandings.	

Teaching Strategies (continued) (SR)

	0	1	2	3	4	5	6
6.	Teacher does not accommodate students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)			Teacher occasionally accommodates students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)		Teacher accommodates students' needs and interests by modifying the lesson when the opportunity occurs. (Esteem IIIN)	
7.	Teacher makes few, if any, attempts to activate and/or make use of students' background knowledge. (Rueda)			Teacher occasionally attempts to activate and/or make use of students' background knowledge. (Rueda)		Teacher consistently and systematically attempts to activate and/or make use of students' background knowledge.	
8.	Teacher rarely uses literal level recall and known-answer questions, but frequently uses thematic, discussion-generating questions. (Rueda)			Teacher occasionally uses literal level recall and known-answer questions as well as thematic, discussion-generating questions. (Rueda)		Teacher relies mainly on literal level recall and known-answer questions, and rarely or never uses thematic, discussion-generating questions. (Rueda)	
9.	Use of questions and classroom discourse is not specifically to reveal students' developing knowledge structures.			Use of questions and classroom discourse may occasionally reveal students' developing knowledge structures, but that is not its intention.		Use of questions and classroom discourse is intended to reveal students developing knowledge structures.	
10.	Opportunities for students to not know, to question, and/or to seek information almost never occur.			Opportunities for students to not know, to question, and/or to seek information occur occasionally.		Opportunities for students to not know, to question, and/or to seek information are the rule rather than the exception.	
11.	Teacher frequently provides students opportunities for scaffolding from teacher or other students.			Teacher occasionally provides students opportunities for scaffolding from teacher or other students.		Teacher seldom provides students opportunities for scaffolding from teacher or other students.	

Learning Activities (SR)

	0	1	2	3	4	5	6
1.	Activities are seldom adaptable to accommodate individual students' interests, needs, and abilities.			Activities are moderately adaptable to accommodate individual students' interests, needs, and abilities.		Activities are readily adaptable to accommodate individual students' interests, needs, and abilities.	
2.	Opportunities for both confirming and disconfirming solutions are frequently provided.			Opportunities for both confirming and disconfirming solutions are occasionally provided.		Opportunities for both confirming and disconfirming solutions are rarely provided.	
3.	Most activities cannot be solved through the routine application of previously learned knowledge. Most activities require the use of knowledge and skills in new ways.			Most activities can be completed through routine application of previously learned knowledge. However, some activities require the use of knowledge and skills in new ways.		Most activities can be completed through routine application of previously learned knowledge. Activities seldom require the use of knowledge and skills in new ways.	
4.	Activities seldom require students to be self-directed.			Activities occasionally require students to be self-directed.		Activities require students to be self-directed.	
5.	Activities do not require students to relate ideas, concepts, and knowledge.			Activities occasionally require students to relate ideas, concepts, and knowledge.		Activities nearly always require students to relate ideas, concepts and knowledge.	

Learning Activities (continued) (SR)

	0	1	2	3	4	5	6
6.	Activities do not require students to explain and elaborate the results of their learning to other students.			Activities occasionally require students to explain and elaborate the results of their learning to other students.		Activities almost always require students to explain and elaborate the results of their learning to other students.	
7.	Raw data, primary sources, found objects, manipulatives, and/or resource people are almost never used as materials for learning.			Raw data, primary sources, found objects, manipulatives, and/or resource people are occasionally used as materials for learning.		Raw data, primary sources, found objects, manipulatives, and/or resource people are frequently used as materials for learning.	
8.	Instructional activities which intentionally create opportunities for students to explore their own disequilibria are frequent.			Instructional activities which intentionally create opportunities for students to explore their own disequilibria are occasional.		Instructional activities which intentionally create opportunities for students to explore their own disequilibria are rare.	
9.	When students encounter contradictions and errors, they do not seek resolution.			When students encounter contradictions and errors, they sometimes seek resolution.		When students encounter contradictions and errors, they seek resolution.	
10.	Learning activities seldom provide opportunities for students to reflect on their own and others' ideas.			Learning activities occasionally provide opportunities for students to reflect on their own and others' ideas.		Learning activities usually provide opportunities for students to reflect on their own and other's ideas.	
11.	Activities are constructed around isolated content. Disconnected detail is stressed rather than big ideas.			Activities are constructed around isolated content. While detail is stressed, big ideas are occasionally developed.		Activities are constructed around big ideas. Details are used to support the big ideas.	

Curriculum - Assessment (SR)

	0	1	2	3	4	5	6
1.	Selection of content for teaching is frequently based on students' interests, prior knowledge, and/or particular learning needs.			Selection of content for teaching is only occasionally based on students' interests, prior knowledge, and/or particular learning needs.		Selection of content for teaching is almost never based on students' interests, prior knowledge, and/or particular learning needs.	
2.	Teacher frequently organizes knowledge and skills to be learned in such a way that relationships among them are obvious.			Teacher occasionally organizes knowledge and skills to be learned in such a way that relationships among them are obvious.		Teacher seldom organizes knowledge and skills to be learned in such a way that relationships among them are obvious.	
3.	Information and skills are taught to students because they are needed to complete a relevant task.			Information and skills are taught to students in an externally determined sequence. Occasionally the sequence is altered based on an immediate need for the information or skill.		Information and skills are taught to students in an externally determined sequence which is nearly always followed.	
4.	Content and process skills are most generally integrated. (Esteem, IIJ)			Content and process skills are occasionally integrated. (Esteem, IIJ)		Content is taught without process and/or process is taught without content. (Esteem, IIJ)	
5.	Students frequently assess themselves.			Students occasionally assess themselves.		Students seldom, if ever, assess themselves.	
6.	Teacher depends solely on the district textbook to present the lesson. Teacher makes no modifications with students. (Esteem IE)			Teacher depends somewhat on the district textbook to present the lesson. Teacher and students make some modifications. (Esteem IE)		Teacher does not depend on the district textbook to present the lesson. Teacher and students adapt or develop content and materials for their needs. (Esteem IE)	

Curriculum - Assessment (continued) (SR)

	0	1	2	3	4	5	6
7.	All students are expected to perform at the same standard using the same demonstration of performance at the same time.			All students are expected to perform at the same standard using the same demonstration of performance but the timing may vary by student.		All students are expected to perform at the same standards but the demonstrations of performance and the timing may vary by student.	
8.	Correctness of performance is the most important aspect of student assessment. Diagnosis of reasons for errors is not a part of assessment.			While diagnosis of reasons for errors is used, emphasis is primarily on correctness of performance.		Diagnosis of reasons for errors is the most important aspect of student assessment.	
9.	Results of assessment are almost never used to guide instructional decision making.			Results of assessment are only occasionally used to guide instructional decision making.		Results of assessment are usually used as a guide for teacher and students in making instructional decisions.	
10.	Errors and misperceptions are viewed as to be avoided. Teacher and students do not seek to understand them but rather seek the correct answer instead.			Errors and misperceptions are viewed as unavoidable but are minimized. Teacher and students only rarely seek to understand them and/or appreciate their informative value.		Errors and misperceptions are viewed as normal, not minimized or avoided. Teacher and student seek to understand them as they become evident and to learn from them.	
11.	Students seldom, if ever, provide relevant feedback to other students.			Students occasionally provide relevant feedback to other students.		Students frequently provide relevant feedback to other students.	

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