Assessing Culturally Congruent Instruction: A Development Model and Instrument

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Research Problem and Theoretical Framework

With few exceptions, standardized measures of academic achievement indicate that ethnic minority students in U.S. schools are underachieving compared to their White peers in nearly every academic subject (Education Trust, 2009; Rampey, Dion & Donahue, 2009). A number of factors have been hypothesized as influencing ethnic minority student achievement, including the one addressed in this paper, the cultural incongruence between minority students' home cultures and that of mainstream American schools, schools which are based largely on northern European values and perspectives (Hollins, 2008; Singh, 2011). Montana's American Indian students, who were involved in the present study, are no exception when it comes to experiencing cultural incongruity with schools. Cultural disparities in public education for them began hundreds of years ago when the United States government forced Native children's attendance in public school and continues for many of Montana's Native students today. Similar to other ethnic minorities in the United States, Montana's American Indian students are underachieving compared to their White peers in every discipline across the K-12 spectrum on every standard metric used to evaluate student achievement. Today, 12% of Montana's students are of American Indian heritage, while 97% of Montana's public school teachers are White. The disconnection between teachers' cultures and their students' home cultures is thought to be dampening American Indian students' academic achievement.

For American Indian students, the cultural incongruencies encountered in mainstream schools may be even more pronounced in their science classrooms. Science instruction tends to emphasize strict ways of thinking, behaviors, and content compatible with a Western scientific paradigm that are often far removed from those of many First Nation peoples (Aikenhead & Michell, 2011; Deloria & Wildcat, 2001). Indigenous science knowledge, a rich body of knowledge covering a broad range of topics and accumulated over many thousands of years, is rarely included in science curricula in mainstream schools. Disparate worldviews and epistemologies are also sources of cultural incongruence for American Indian students in science education. One example of this is illustrated in a practice typical in public school science instruction of presenting scientific phenomena in discrete packages, deliberately decontextualized from the larger systems they are a part of, in line with the Western scientific practice of studying phenomena in controlled settings in which variables can be manipulated. American Indian worldviews, in contrast, are frequently more holistic in nature, considering an entity's place within systems and recognizing the interdependent relationships in those systems (Cajete, 2005). Instructional methods in mainstream public schools, which are predominately teacher centered and didactic and tend to evaluate student proficiency using largely objective measures, add to the cultural incongruence of education for many American Indian students. Traditionally, learning in American Indian communities is more student centered and experiential, valuing close relationships in which students observe and work alongside mentors from their families and the larger tribal community, emphasizing valued and practical knowledge that benefits the community, and evaluating proficiency through student demonstration of their skills and knowledge in applied settings (Aikenhead & Michell, 2012; Barnhardt and Kawagley 2005; Cajete, 2005).

A small but growing body of research provides evidence of the importance of culturally congruent instruction (CCI) in increasing diverse students' academic achievement (e.g., Cardell, Cross & Lutz, 1978; Gilbert, 2005; Grimberg & Gummer, 2013; Hilberg, Tharp, & Degeest, 2000; Lipka, Parker and Yanez, 2005; Matthews and Smith, 1994; Sternberg, et al., 2006). As the demographic makeup of our country increases in diversity, advocacy for greater use of CCI as a means to improve diverse students' learning is growing across stakeholders including parents, researchers, government entities, and professional education organizations. Federal laws like the *Elementary and Secondary Education Act* (more commonly known as *No Child Left Behind*) and federal funding streams like *Race to the Top* are calling for increased efforts to ensure equitable educational outcomes for all students, efforts that include the use of CCI. Advocacy for more research on CCI, particularly as a means to better define what works in supporting diverse students' learning, is also increasingly widespread (e.g., Calabrese – Barton & Lee, 2006; Committee on Equal Opportunities in Science and Engineering, 2009; Moses-Snipes & Snipes, 2005; NCTM Achievement Gap Task Force, 2004; Penfield & Lee, 2010; Tyler, et al., 2008).

Education research is a complex endeavor and research on CCI in American Indian communities can be even more complex, for many reasons. Often there are cultural differences between the researchers and the prioritized community. To work successfully in cultures different than one's own, researchers must develop and practice cultural competence in the prioritized culture. In working with American Indian cultures, for example, researchers must take time to develop trusting relationships with key members of the tribal community, such as respected tribal elders and tribal leaders. Potential differences in behavioral norms, worldviews, epistemologies, and communication styles between researchers and participants must be recognized and addressed when working with tribal communities. Engaging in participatory research processes deemed to be more compatible with American Indian cultures, a paradigm that may be new to many researchers, is also important (LaFrance and Nichols, 2004; Quigley, 2001). The history of research and education as tools for hegemony and assimilation has created a legacy of distrust in Indigenous people, further hindering research in Indian country and CCI. Another significant research challenge lies in the paucity of tested methods and valid instruments available for use in the rigorous and culturally appropriate study of CCI (Boykin, Tyler, Watkins-Lewis & Kizzie, 2006; Lee, Luyckx, Buxton & Shaver, 2007; Luxyk & Lee, 2007; Moses-Snipes & Snipes, 2005). The inherent specificity of CCI practices and content for each cultural context limits generalizability, necessitating the development of instruments tailored for the specific cultural context in which they are to be used.

This paper describes the participatory processes employed in a partnership with tribal communities, K-8 schools and institutes of higher education (IHEs) in the development of an instrument for use in the study of CCI in science education with K-8 American Indian students. The work was done collaboratively with input contributed by all relevant stakeholders utilizing participatory methods in an inclusive, deliberate and iterative process. The result was the development of the Culturally Congruent Instruction Survey (CCIS), a teacher self report survey designed to assess teachers' frequency of use of CCI practices in their science instruction. The research question that this study addresses is: What does a culturally congruent process for developing a valid instrument for assessing the use of CCI in teaching science with Montana American Indian students look like?

Methodology

This work was conducted as part of a National Science Foundation funded Math-Science Partnership that partnered three institutes of higher education (IHEs) with five tribal communities, dozens of K-12 schools, and over one hundred teachers teaching on or near American Indian reservations in Montana. As a part of the MSP evaluation and research efforts, representatives from all partner groups worked collaboratively to design and validate the CCIS, a 41 item instrument that operationalizes culturally congruent instruction in terms of content, pedagogy and instructional environment for K - 8 science education for the five tribal cultures in the partnership. Cultural protocols were carefully considered and practiced throughout the development process. Both qualitative and quantitative research methods were used to design the CCIS, to begin to characterize its nature, and to gather evidence of its validity. A description of the qualitative and participatory methods employed to design the instrument is provided below.

Qualitative Methods Employed in Developing the CCIS

Evaluating culturally congruent instruction is a complex undertaking on many levels, some of which were described in an earlier paragraph in this paper. The design and characterization of the CCIS described here was likewise complex, for example, in operationalizing CCI for the prioritized cultural contexts, in deciding what aspects of CCI should be assessed, and in identifying by what means it should be assessed. After a review of existing instruments in the research literature and in depth conversations with project stakeholders and assessment specialists, it was decided that evidence of teachers' CCI would be collected through the administration of a project designed survey on which individual teachers would self report the frequency with which they employed specific culturally competent practices in their science instruction. These practices would address the three elements identified by the project as key to CCI – content, pedagogy and instructional environment. While this is one way to evaluate CCI, the project recognized that this method has limitations in that it does not provide qualitative information about the nature of CCI occurring in teachers' classrooms. To compensate for this limitation, other types of data about teacher instructional practice were also collected by the project partners.

The first prototype of the Culturally Congruent Instruction Survey or CCIS, as it came to be known, was developed during a project preceding the MSP that also focused on teacher professional development in science education in reservation schools. The formal process of developing the CCIS began with a literature review, conducted by the first author of this paper. A large body of literature relevant to American Indian culture and culturally competent teaching with American Indian students was pored over and issues, practices, and other ideas relating to CCI were identified and recorded. Research studies and other scholarly writings by experts in American Indian culture and education were reviewed. The compilation of identified relevant ideas was then categorized and vetted for use in creating items for a draft survey. Vetting decisions were based on 1) the apparent relative importance of each idea as portrayed by their frequency and emphasis in the literature; 2) the relevance of ideas to the prioritized tribal context; and 3) the relevance of ideas to K-12 science education. The author's personal experience from her graduate studies in American Indian education, her seven years of teaching in a tribal high school, and consultations with tribal members who worked at the tribal school also factored into the choosing of items. The comprehensiveness of the items, i.e., whether they were well distributed across the many elements thought to constitute CCI for this context, was the final criterion for choosing ideas for inclusion in the draft instrument. Ideas were then

changed into individual survey items as statements of instructional practice, compiled into categories, and formatted into the original prototype version of the CCIS. A four point Likert type scale indicating frequency of use was also applied to each item. This first prototype instrument was then used in assessing impacts of the earlier PD project on teachers' use of CCI. Descriptive statistics describing the frequencies of use of specific CCI practices pre and post treatment were generated from the data, but no other information, for example, on the validity of the instrument, was obtained at that time.

The MSP that is the subject of the current study covered a broader geographic area than the earlier project, to include five tribal cultures and teachers from three reservations across the state. Before the second phase of instrument development work began, numerous visits to respected elders and educators in each of the partner tribal communities were made. The purpose of the visits was to discuss the nature of the intended work, to request approval for the work from the elders, and to invite their collaboration in the development work. This involved considerable time and deliberate effort since the five tribal community partners lay on opposite sides of a large state, and each had unique protocols and histories, all of which had to be considered in approaching them. Much of the groundwork had already been laid for the three tribal communities on the western side of the state during the work of the earlier project. A tribal community member who was working as a program coordinator with the project led this phase of the work in the two tribal communities on the eastern side of the state. On both sides of the state, the relevant personnel deliberately identified and invited elders to join the development team who were recognized as respected knowledge keepers and teachers in their respective communities.

The main author of the first prototype of the instrument (also first author of this paper) is a non Indian woman who had worked at that point for a combined twelve years as an educator in the Flathead Reservation tribal secondary school and tribal college. During that time she had built close relationships with tribal members with whom she had worked extensively in these educational settings. When the MSP project's leadership team decided that the CCIS should be used as part of the project evaluation, she collaborated with four of these local tribal consultants to revise the prototype instrument items' content, language and format to improve the instrument's clarity, accuracy and ease of use. Meetings for revising the instrument were informal and often were one on one but occasionally occurred in groups of three, and were commonly conducted after sharing a meal, in line with tribal protocol. Two of the tribal collaborators were women who were members of the Salish tribe. One was a 65 year old elder who had worked in many different jobs with the tribes, including as a paraprofessional in the tribal secondary school and as a tribal cultural specialist. The other was a 50 year old tribal educator who had held many prestigious positions in tribal education and was well known in the state and nationwide for her expertise and advocacy in Indian education. The other two collaborators were members of the Kootenai band, a man and a woman. The Kootenai woman was a 63 year old elder who had also held many different positions as a tribal employee and was currently acting as a designated cultural representative for the Kootenai people, often in formal and informal educational settings. The Kootenai man was a Kootenai language specialist who worked for the Kootenai Elders Committee and held advanced degrees in Native studies and education. Each person contributed suggestions for improving the instrument's content and layout, which were then incorporated into the first prototype. The resultant survey was a 35 item instrument (34 forced choice and one open ended item) that utilized a four point Likert type scale. This second prototype of the CCIS was piloted through a pre/post administration with the

MSP project's first cohort of treatment and comparison group teachers. Data were then analyzed using statistical tests designed to examine changes in CCI amongst the teachers as well as to gather evidence of the nature and validity of the instrument itself.

The next step taken in the development process occurred several months later at a two day meeting with representatives from every partner stakeholder involved in the PD project participating – elders from five tribal cultures involved in the project (Northern Cheyenne, Crow, Salish, Kootenai, and Lakota), project leadership from each of the IHEs, project professional developers and classroom mentors (former K-8 teachers), practicing K-8 teachers from participating reservation schools from the two tribal communities located on the eastern side of the state, an external evaluator, and science and science education faculty members and graduate students from the three partners IHEs. The sole evaluator was a member of the Turtle Mountain Chippewa Tribe. Otherwise, each partner group participating included both Indian and non Indian representatives, creating a well balanced ethnic mix of professional educators and non educators. Many of the participants knew each other, having worked together previously. These measures were taken deliberately to ensure a balanced and friendly group and to help create a safe environment for all that would enable candid conversation.

The two day meeting was held in a hotel conference room located about midway between the eastern and western reservations. This was considered "neutral territory", as opposed to holding the meeting at a university or school, and partners made nearly equidistant journeys from their homes. Participants were seated around tables arranged in a U shape, with the evaluator in the middle of the U. The extended length of the meeting allowed time for the group to become comfortable with the meeting venue and to "bond" as a group. Most of the group stayed overnight at the meeting hotel and everyone ate meals together, a culturally competent practice that was also deliberately observed. These types of details in the meeting's format and atmosphere fostered a safe environment and allowed group members to become more comfortable with one another, again enabling candid and meaningful group conversations. These mesaures also provided extensive opportunities for participants to reflect deliberately on CCI and related topics, thereby supporting members in sharing their personal and professional experiences and deep thoughts on these topics. This supportive environment proved to be particularly important when several Native members of the group recounted their traumatic experiences in boarding schools, resulting in very emotional and painful conversations.

The external evaluator who facilitated the meeting conversation was carefully chosen for her extensive evaluation experience in Indian Country and her known expertise in facilitating emergent conversations using participatory evaluation processes. The meeting began with a prayer, as is traditional for the tribal people who participated. The evaluator then initiated the discussion by facilitating an open ended conversation with all participants about the meaning and significance of culture and CCI. After extended discussion about these topics over several hours in which people freely expressed their views, she slowly and deliberately moved the group toward discussing the nature of CCI for the specific tribal communities involved, and how CCI would look in K-8 classrooms, particularly for science instruction.

During the conversations there was no interview protocol employed or rules for speaking, although the evaluator did consult with project representatives in advance of the meeting to discuss the meeting's objectives and again during breaks in the meeting as touchpoints to determine what other types of information were desirable. The format of the meeting was that of a "Talking Circle", in which any participant was welcomed but not obligated to speak. Protocols for Talking Circles can vary with specific tribal cultures, but generally they are semi structured,

naturally flowing, informal conversations focused on a central topic but often addressing many related topics. Participants are free to contribute when they feel that they have something important to say, and are allowed to speak as long as they desire without interruption. Other members of the circle listen respectfully and may respond to any speaker, or choose to move on to related topics. This type of format is a thorough and egalitarian one commonly used in tribal settings, and can be very time consuming compared to more structured meetings that follow an agenda and are pushed along so that all items are discussed. The extra time sometimes associated with a Talking Circle is time well spent in attaining objectives like those of this phase of the instrument development; the open ended nature of the Talking Circle enables ideas to emerge naturally from the conversation, often with more depth than could be achieved in a more structured format. For the development of the CCIS, this format was particularly effective given the diversity of the stakeholders participating and the objectives of defining and operationalizing the construct of CCI for the specific cultures and contexts involved. Several of the IHE faculty members involved in the project had limited familiarity with the construct and with the tribal cultures participating in the project, so the meeting also served to deepen their personal understanding of these things and to build relationships with tribal partners in the project.

It was anticipated that the most significant outcome of this meeting of stakeholders would be the important input about CCI and science education provided by members of the tribal cultures with whom the instrument would be used. The methods employed helped to ensure that the survey was culturally competent and possessed cultural and face validity for these specific tribal cultures. Although about 95% of the contributions to the discussion were made by the tribal partners, the meeting also provided opportunities for input from the project staff, many of whom were non Indian K-20 science educators and science faculty. It was anticipated that the feedback received from the science educators, both Indian and non Indian, would especially be useful in ensuring that the CCIS was designed to comprehensively address relevant aspects of K-8 science instruction and that the survey would be teacher friendly, for example, by utilizing jargon familiar to professional educators.

The meeting's discussion was recorded in two ways: the evaluator wrote brief notes about emergent big ideas on a large chart for all participants to see while the project director recorded the conversation in greater detail on a laptop computer. The two sets of notes from the conversation of the first day of the meeting were analyzed by the evaluator at the end of the day to identify overarching themes that had emerged on Day One that could be probed further to elicit more in depth information during Day Two's discussions. On the second day of the meeting the evaluator approached the group with four teaching scenarios that emerged from the previous day's conversation as characteristic of the professional development project and whose examination she felt would provide additional valuable information. The four scenarios were:

1. American Indian teachers teaching mostly American Indian students of the same culture in reservation schools
2. American Indian teachers from a different culture teaching mostly American Indian students in reservation schools
3. Non Indian teachers teaching mostly American Indian student in reservation schools
4. Non Indian teachers teaching mostly non Indian students in off reservation schools

These four scenarios provided fodder for the second day's conversation as the whole group engaged again in a Talking Circle and discussed the similarities and differences in CCI for each

scenario. Midway through the second day of meetings the evaluator shared the second prototype CCIS with the meeting participants and solicited their feedback on the instrument, again through open discussion. The resultant ideas from the two day discussion were then used to modify the instrument items into a third generation instrument referred to as the Revised CCIS.

In the next few months following the two day meeting described above, the evaluator conducted smaller focus groups with subsets of teachers from the two sites from the western side of the state that were involved in the professional development project. The teacher participants in the focus groups were selected by the project leadership at each site based on their perceived advanced level of cultural competence compared to their peers. One meeting was held on a reservation with teachers who all taught in reservation schools with high percentages of American Indian enrollment. The other meeting was held off reservation with teachers who all taught in off reservation schools with low percentages of American Indian student enrollment. These focus groups utilized a semi structured interview protocol whose questions were co designed by the first author of this paper and the evaluator to address important issues that emerged from the original meeting. About midway through the focus groups the evaluator shared the list of CCI attributes identified by the American Indian participants in the two day meeting and asked participants to compare this list with the one that they had brainstormed during their focus group. The ideas generated in both focus groups were then used by the author of the instrument to further modify the items that comprised the Revised CCIS.

The next step for the development of the CCIS was to engage in member checking of the instrument. The first author of this study met face to face with several members of the original two day meeting group to go over each of the instrument items. The CCIS items were checked for face validity, inclusiveness, bias, clarity of the language, and accuracy in portraying the ideas that emerged from the instrument development meetings. Additional feedback was garnered via e mail communications with project personnel, both those who participated in the three meetings (the two day meeting plus the two focus groups) and those who did not. Also, feedback was solicited via e mail from three tribal members external to the project who are recognized experts in American Indian education. The feedback from the face to face meetings and e mail communications was used to once again modify the items on the Revised CCIS. The final revised survey that resulted increased the number of items from the 34 forced choice items found on the previous iteration of the CCIS (plus one open ended “Other” item) that were divided into three categories, to 37 items plus 4 open ended “Other” items that were divided into four categories. Also, language used in the revised CCIS was modified to reflect the feedback provided by the development group meetings participants. For example, items that previously used the term “American Indian Tribes” now use the term “Montana Indian Tribes”. The final revised survey items were also more clearly delineated into categories with prominent category headings, and a short paragraph was included beneath each category heading with explicit directions about how to respond to the category items.

The earlier analysis of the data from the pilot administration of the second prototype of the CCIS revealed a number of significant findings regarding positive changes in teachers’ cultural competency. Based on the results of that analysis, it was decided that a finer grained scale should be employed on the final Revised CCIS as a means to try and improve the quality of the survey data collected. The study’s first author combed the literature on survey scale design and consulted with three assessment design experts, using the information gathered to design a new six point scale that was used on the final Revised CCIS, replacing the four point scale found on earlier versions of the instrument.

Findings, Contributions and Limitations

The CCIS has been extensively field tested and empirical evidence suggests that it provides data that are reliable and valid. Partners brought together for the work reported here continue to collaborate on this project and other ventures. Partners praised the process and the product and the CCIS was taken by several elders and teachers for distribution to tribal education departments and school administrators. The CCIS has also been disseminated nationally and internationally through professional channels to the research and education communities and has been received with interest by many researchers working in culturally congruent education and teacher preparation programs. The instrument is in wide use, either intact or with context specific adaptations, both as a tool for framing and assessing CCI, particularly in American Indian education contexts but also in other cultural contexts. Project partners agree that it holds significant potential to transform our thinking about CCIS, equitable education outcomes, and teacher preparation.

There are several limitations to the instrument development and instrument itself that should be noted. The collaborative model employed in this work was designed and implemented in specific tribal contexts, and so is particularly valuable to researchers and others working in tribal colleges and schools in those communities. While perhaps not fully generalizable to other contexts, we believe that the model for development is adaptable for use in other cultural contexts, thus enabling in depth study of CCIS, and potentially improving equitable educational outcomes for diverse and underrepresented students, particularly in science.

Secondly, the CCIS provides information on the frequency of CCI practices, but does not provide rich information about the nature of these practices or their impacts. In the present project's research and evaluation, other types of data were collected to provide a fuller picture of the impacts of the project including classroom observations, teacher and faculty surveys, focus groups with tribal elders, teachers and faculty, and student content assessments.

Finally, the instrument was developed for use in the five specific tribal communities that were part of this project. While it is believed to be somewhat generalizable for use in other tribal contexts, it is strongly recommended that practitioners scrutinize the instrument and modify it as deemed appropriate for their specific context.

While this paper does not delineate the outcomes of the psychometric analyses that provide evidence of the the instrument's ability to provide data from which valid and reliable inferences can be drawn, if you are interested in these numbers please contact the paper's first author via electronic mail at regina_sievert@skc.edu.

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