1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

- Why is it important to develop teachers’ cultural competence?
- What does the research say about the correlation between improving the cultural competence of teachers’ instructional practice and improving students’ STEM achievement?
- How do the BSSP activities contribute to the development of teachers’ cultural competence?
- To what extent can valid methods and instruments for assessing cultural competence be developed?
- Who are the key players and what are the processes for developing these assessment methods and instruments?

2. Context of the work within the STEM education literature and within your MSP project:

A growing body of STEM education research provides evidence indicating a positive correlation between improving the cultural competence of STEM instruction and increasing students’ STEM achievement. Lipka, et. al. (2005) for example, report the results of fourteen quasi experimental studies conducted in Alaska that correlate significantly higher math achievement for Yupik students taught mathematics using culturally based content and pedagogy compared to a control group of their peers who were taught using traditional methods and content. Likewise, Gilbert (2005) reported that American Indian students taught using a FOSS curriculum with supplemental lessons integrating cultural content showed significantly higher achievement on end-of-unit tests than comparison students taught using the regular FOSS curriculum. Boykin, et. al. (2004) found that African American middle elementary treatment students taught using culturally competent communal methods had significantly higher test scores in math and geography compared to their peers in control groups who were taught using competitive methods that focused on individual efforts. Similarly, Hilberg, Tharp, & Degeest (2000) found that 8th grade American Indian students taught using culturally competent mathematics methods had significantly higher scores on tests and attitude surveys compared to control group.

The Big Sky Science Partnership involves 3 main sets of partners 1) ninety K-8 teachers from schools on three Montana American Indian reservations and towns surrounding the reservations; 2) elders, STEM professionals and other tribal members from the three tribal communities; and 3) Science and Science Education faculty from three Montana IHEs. One of the four main objectives of the BSSP is to increase K-20 partners’ cultural competence in the classroom. Given
the widely varying contexts of our partner schools and IHEs – e.g., schools on three reservations involving five tribal cultures each of which is very different, as well as off reservation schools in nearby towns; schools with high American Indian enrollment and schools with low American Indian enrollment that are nonetheless mandated by state law to teach about Montana Indian tribes; schools in which half of the teachers are Native and schools in which virtually all of the teachers are non Native; IHEs that are public mainstream universities as well as a tribal college – the nature and effects of the BSSP professional development activities for partners are at once specific to each site but also share many common elements.

BSSP, like other MSP projects, also has as one of its main objectives the strengthening of the science content knowledge of participating teachers and their students. The projects’ scientist partners, whose areas of expertise are physics, astronomy, and earth science, have wholeheartedly accepted the project’s charge to establish meaningful links between their scientific knowledge and the traditional and contemporary knowledge of the tribal communities the project serves. Indeed for several of the scientists, the opportunity to learn from local tribes and to connect tribal knowledge to their own research was what drew them to partner with the BSSP in the first place. During individual and focus group interviews, BSSP faculty and teachers report that the project’s dual focus – strengthening science content knowledge and cultural competence – are both necessary and complementary. Several examples of the ways IHE and K12 teachers integrate science and culture in the lessons they design will be shared during the presentation.

BSSP research on cultural competence has initially focused on (1) establishing a project vision for culturally competent practice by drawing upon the knowledge of BSSP teachers and their communities as well as on the research literature; (2) learning what culturally competent practice looks like in BSSP classrooms; and (3) determining how teachers’ culturally competent practice is changing as the project evolves. The project’s vision of culturally competent practice was developed through a process of naturalistic inquiry in two multiple day retreats as well as focus groups and interviews that involved BSSP staff, tribal elders and Indian and non Indian educators. The information gathered in these discussions was further informed through a comprehensive literature review.

Since there are no known established instruments for assessing culturally competent instruction for Montana tribal contexts, the project has directed resources at the development of valid and reliable tools and methods for assessing the cultural competence of its partners. Using information gleaned from the literature review on the essential elements of and experiences necessary for developing educators’ cultural competence, along with information gained through in depth conversations with tribal elders and both Native and non Native K-20 educators, the project is developing a survey, a classroom observation protocol, and three interview protocols for assessing educators’ cultural competence and the factors that contribute to it. These tools are being piloted with BSSP teachers as part of the project’s research and evaluation efforts to establish their validity and reliability.

Project partners have developed additional artifacts reflective of their developing cultural competence including 1) a body of culturally competent science curriculum generated by both teachers and IHE faculty partners working with tribal partners that effectively incorporates
Indigenous science, tribal oral history and culturally responsive pedagogy with the teaching of core science concepts; 2) written reflections from teachers on the meaning and value of culturally competent instruction; and 3) teacher portfolios of instructional practice that provide evidence not only of changes in teachers’ science instruction in terms of reformed pedagogy use, but also of changes in culturally competent science instruction. The presentation will share this suite of products as well as the results of the preliminary data analyses and lessons learned on the process and significance of developing educators’ cultural competence.

An important next step for BSSP will be to examine the influences of culturally competent science teaching on the learning and engagement of BSSP teachers and their students. As stated earlier, the modest body of research existing on this topic shows positive connections between culturally competent practice and student achievement. BSSP provides a rich variety of contexts for research since the project serves three reservations involving five tribal cultures, as well as multiple school districts and grade levels. We see this variability as a strength, since it will allow us to examine student learning across school, district and tribal contexts.

3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

- Educators who participate as partners in the BSSP will show significant increases in their culturally competent classroom practice.
- Valid and reliable tools and methods for assessing cultural competence can be developed.

4. Evaluation and/or research design, data collection and analysis:

An important first step in the BSSP’s development of tools for assessing culturally competent instruction, was the assemblage of a purposeful sample of experts to contribute to the project’s definition of the construct of cultural competence and to identify empirical indicators of culturally competent classroom practice. The experts involved in these discussions included tribal elders, Native and non Native K-20 educators, and professional developers. Discussion forums included multiple day retreats, focus groups, interviews, and one on one electronic communications. Information gained through these discussions was combined with that gathered through a comprehensive literature review and was used to develop item sets for a pilot survey and a pilot observation protocol. Assessment design experts and statisticians were consulted to assist with technical issues like scale development and format of the instruments. Tribal consultants and non Indian educators then reviewed the pilot survey and protocol items to help establish the instruments’ face validity.

The pilot survey developed has been administered pre and post to treatment and comparison group teachers, once in the spring before they began the project, and every spring thereafter for two years. The first set of pre and post data is currently undergoing statistical analysis. Exploratory factor analysis has identified six survey factors for culturally competent instruction with high internal reliability. Preliminary analysis also shows significantly higher increases in treatment teachers’ culturally competent classroom practice pre/post compared to comparison
group teachers on several of these factors. Findings will be used to develop a next draft of the instrument that will be tested in later years of the project.

The classroom observation protocol, a challenging tool to develop on many levels, is in its early stages of development and no analysis has been undertaken to date. It is currently being used in assessing the classroom instruction of all of the BSSP treatment teachers.

The interview protocols have been piloted with a purposeful sample of six BSSP treatment teachers, including new partner teachers, veteran partner teachers, Native and non Native teachers. Preliminary analyses of the interviews are revealing a number of themes regarding the process, essential experiences, and effects of developing culturally competent educators.

5. Key insights that have value for the Learning Network:

- The successful development of cultural competence in K-20 educators is possible, but it is a context specific and long term enterprise that includes several key experiences and elements.
- A participatory process involving tribal elders as well as both Native and non Native K-20 educators and professional developers is highly beneficial to developing valid and reliable instruments to assess cultural competence.
- The development of valid and reliable instruments for assessing teachers’ culturally competent instruction is possible, but the process is complex. In particular, the development of a classroom observation protocol for use in tribal contexts is challenging on many levels, including finding trained observers to effectively use the instrument.

References


